उत्तराखण्ड शासन

UTTARAKHAND ECONOMIC SURVEY 2018-19

Volume – II

DIRECTORATE OF ECONOMICS AND STATISTICS,
Government of Uttarakhand
100/06, Neshvilla Road , Gate No. 4, Dehradun, Uttarakhand

Supported By

CENTRE FOR PUBLIC POLICY AND GOOD GOVERNANCE,
DEPARTMENT OF PLANNING,
Government of Uttarakhand
4th Floor, Vishwakarma Bhawan, 4 Subhash Road, Dehradun, Uttarakhand

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Amit Singh Negi
(I.A.S.)
Secretary

उत्तराखण्ड शासन

Department of Planning
4- Subhash Road,
Secretariat Dehradun
Govt. Of Uttarakhand

Preface

Directorate of Economics and Statistics (DES), Govt. of Uttarakhand brings out Economic Survey of the State every year. It reflects on the developments in the State economy over the year and review the progress of major development programs and projects.

It is for the first time that DES, Govt. of Uttarakhand has brought out a second volume on Economic Survey of the State with the objective to provide an analytical perspective on State's economy and growth scenario.

Besides providing an holistic analysis of current and future trends in the State's economy and finances, the report also reflects on the status of major growth drivers and enablers. It examins the ecological challenges, particularly in the context of climate change for the hill State. The report has further covered status of social sector development programmes, potentials and prospects of new technologies and future areas of development.

The report has reviewed global and Indian best practices and successful programme models keeping in view their adaptability in the State.

It is hoped that this attempt will bring focus on the State's development agenda and acceleration of evidence based action to further strengthen implementation processes of on-going programmes and projects in the State.

We also expect that this document shall catalyse discussion and brainstorming, leading to a shelf of project concepts, proposals and plans emanating from State Departments in all fields to bolster investment in social sectors of the State as well as to make the State a more attractive destination for private investment.

Amit Singh Negi
Secretary (Planning)

Sushil Kumar
Director

उत्तराखण्ड शासन

Directorate of Economics and Statistics (DES),
Department of Planning
Govt. Of Uttarakhand

Foreward

The Directorate of Economics and Statistics (DES), Department of Planning, Government of Uttarakhand has been preparing the Economic Survey of the State, which is an overview of the performance of the State's economy during the previous year.

This is for the first time that the DES has brought out Volume - II of the Economic Survey of Uttarakhand reflecting on various aspects of State economy, macro-economic aggregates, analytical review of important sectors of the economy, growth drivers, growth prospects for the State, best practices across the globe and country relevant for our State, new emerging areas of development and important issues and challenges before the State.

It is hoped that this report shall be instrumental in developmental planning, support ubiquitous growth of sunrise sectors and provide a direction for future growth of the State economy bringing abundance and high quality of life for our people.

On behalf of the Directorate of Economics and Statistics, I congratulate Mr Deepak Bhandari and his whole team from EHI International consisting of Prof. R. S Goyal, Professor S. P. Singh, Ms Elizabeth Chaudhary, Dr Ravendra Singh, Dr Mahendra Babu Kuruva, Dr. V.B. Chaurasia, Dr Vishal Singh, Prof (Dr) Karunakar Jha, Prof (Dr) T. J. Rao, Dr Hiranmoy Roy, Ms Niyati Naudiyal, Dr. C. P. Garg, Prof. J. Sahoo, Dr. M. Y. Bhat, Prof. Shantanu Trivedi, Dr. Narinder Dalei, Mr Ashutosh Kandwal and Ms Gargi Dangwal for their effort to bring out this report.

Sushil Kumar

Director

Acknowledgements

The team expresses its gratitude to the Directorate of Economics and Statistics (DES), Planning Department, Government of Uttarakhand, Shri Amit Singh Negi, IAS (Secretary, Planning and Finance), Shri. Sushil Kumar (Director, DES) and Dr. Manoj Kumar Pant, (Joint Director, DES) and Nodal Officer SSS for allocating this important assignment to EHI International and extending wholehearted support during its execution.

We express our deep appreciation for the immense help throughout the execution of the assignment and valuable suggestions received from Shri Sushil Kumar and Dr Manoj Kumar Pant on sections of the report. Their regular guidance and feedback was invaluable for the project team in completing such an extensive exercise within stipulated short time period, which would not have been possible otherwise. We are indebted to all the officials of the DES who have regularly helped by providing data and other material pertaining to specific areas of this report. We would like to particularly mention the names Shri Trilok Singh Anna, Shri Amit Punetha, Shri G. S. Pandey, Shri Manish Rana, Smt. Rashmi Haldhar, Dr Ila Pant Bisht and Smt. Chitra (Deputy Directors) for their guidance and valuable comments from time to time which helped us immensely to finalise this report.

Deepak Bhandari
Managing Director
EHI International Pvt. Ltd.

Contributors

Shri Deepak Bhandari,
Managing Director, EHI International
Prof. R. S. Goyal- *Team Leader*,
Director, Research, Envisions Institute of Development, Dehradun
Prof. S. P. Singh,
Former Vice Chancellor, HNB Garhwal University, Tehri Garhwal
Prof. (Dr) Karunakar Jha
Dean, School of Business, UPES University, Dehradun
Dr Mahendra Babu Kuruva
Assistant Professor, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand
Shri K D Purohit
Adviser, Education Dept., Govt. of Uttarakhand, Dehradun
Dr Vishal Singh
Dy. Executive Director, CEDAR, Dehradun
Prof (Dr) T. J. Rao
Dr Hiranmoy Roy,
Dr. C. P. Garg,
Prof. J. Sahu,
Dr. M. Y. Bhat,
Prof. Shantanu Trivedi,
Dr. Narinder Dalei,
Faculty members, UPES University, Dehradun
Dr V. B. Chaurasia,
Associate Professor, D.A.V. P.G. College, Dehradun
Dr Monika Kashyap
Assistant Professor, H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand
Ashutosh Kandwal , Gargi Dangwal,
Niyati Naudiyal , Ina Bahuguna
Research Associates

Advisory and Technical Support from DES & CPPGG

Shri Amit Singh Negi
Secretary Planning
Shri Sushil Kumar
Director, DES

Dr. Manoj Kumar Pant
Joint Director, DES, ACEO, CPGG

Shri G S Pandey
Ms. Chitra
Mrs. Gitanjali Sharma
Shri Trilok Singh Anna
Shri Maneesh Rana
Dr. Ila Pant Bisht
Shri Amit Punetha
Smt. Rashmi Haldhar
Dy Directors, DES
Shri S. K Giri
Shri Sandeep Pandey
Shri Ram Salone
ADSo

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Abbreviation

ADB	:	Asian Development Bank
AIDS	:	Acquired Immune Deficiency Syndrome
AEZs	:	Agriculture Export Zones
AMR	:	Automatic Meter Reading
AMSL	:	Average Mean Sea Level
ANC	:	Ante-Natal Care
ANMTC	:	Auxiliary Nurse Midwives Training Centre
AI	:	Artificial Intelligence
ANMs	:	Auxiliary Nurse Midwives
APBS	:	Aadhaar Payment Bridge System
APFAMGS	:	Andhra Pradesh Farmer Managed Groundwater System
APL	:	Above Poverty Line
APMC	:	Agricultural Produce Market Committee
APPI	:	Azim Premji Philanthropic Initiative
AR	:	Augmented Reality
ASHA	:	Accredited Social Health Activist
AYUSH	:	Ayurvedic, Yoga and Naturopathy, Unani, Siddha and Homeopathy
BC	:	Business Correspondents
BCG	:	Bacillus Calmette–Guérin (TB Vaccine)
BMC	:	Biodiversity Management Committee
BPL	:	Below Poverty Line
BRAP	:	Business Reform Action Plan
BSI	:	Botanical Survey of India
BT	:	Bio-technology
CA	:	Controlled Atmosphere
CAGR	:	Compound Annual Growth Rate
CAMPA	:	Compensatory Afforestation Fund Management and Planning Authority
CAP	:	Centre for Aromatic Plants
CBI	:	Convention on Biological Diversity
CBR	:	Crude Birth Rate
CCA	:	Consolidated Consent and Authorization
CCIIAC	:	Capital Investment Incentive for Access to Credit
CDM	:	Clean Development Mechanism
CHC	:	Community Health Centre
CFC	:	Common Facility Centres
C2N	:	Co-ordination & Network Participation
CME	:	Continuing Medical Education
CPC	:	Communist Party of China
CRDA	:	Capital Development Authority Region
CSC	:	Common Services Centre
CSR	:	Corporate Social Responsibility
CST	:	Central Sales Tax
CWMI	:	Composite Water Management Index
MOCA	:	Ministry of Civil Aviation
MoU	:	Memorandum of Understanding
MNRE	:	Ministry of New and Renewable Energy
MSME	:	Micro, Small & Medium Enterprises
MSE	:	Micro & Small Enterprise
MSW	:	Municipal Solid Waste
MuDSM	:	Municipality Demand Side Management
NABARD	:	National Bank for Agriculture and Rural Development
NABH	:	National Accreditation Board for Hospitals
NAFED	:	National Agricultural Cooperative Marketing Federation of India Limited
NCAER	:	National Council for Applied Economic Research
NDP	:	Net Domestic Product
NHAI	:	National Highways Authority of India
NHM	:	National Health Mission
NIC	:	National Information Centre
NIEPA	:	National Institute of Educational Planning and Administration
NIMHANS	:	National Institute of Mental Health and Neurosciences
NLP	:	Natural Language Processing
MoEF	:	Ministry Of Environment & Forests
MoEF&CC	:	Ministry of Environment, Forest & Climate Change
MoHFW	:	Ministry of Health & Family Welfare
NMHS	:	National Mission on Himalayan Studies
NMMI	:	National Mission on Micro Irrigation
NMSHE	:	National Mission on Sustaining the Himalayan Ecosystem
NSDP	:	Net State Domestic Product
NSDC	:	National Skill Development Corporation
N-SIPI	:	NCAER's State Investment Potential Index
OBC	:	Oriental Bank of Commerce
OBS	:	Operation Blackboard Scheme
ORS	:	Oral Rehydration Salts
OTR	:	Own Tax Revenue
PAHAL	:	Pratyaksh Hanstantrit Labh
PDAs	:	Personal Digital Assistants
PDS	:	Public Distribution System
PFMS	:	Public Financial Management System
PGMEP	:	Prime Minister's Employment Generation Programme
PHC	:	Primary Health Centre
PMGSY	:	Pradhan Mantri Gram Sadak Yojana
PMKVY	:	Pradhan Mantri Kaushal Vikas Yojana
PMMVY	:	Pradhan Mantri Matru Vandana Yojana
PMU	:	Project Management Unit
PPP	:	Public Private Partnerships
PRB	:	People Biodiversity Register

Abbreviation

DBT	:	Direct Benefit Transfer
DDP	:	District Domestic Product
DFCS	:	Department of Food and Civil Supplies
DES	:	Directorate of Economics & Statistics
DIPP	:	Department of Industrial Policy and Promotion
DISK	:	Dairy Information System Kiosk
DLEC	:	District Level Empowered Committees
DOTS	:	Directly Observed Treatment Short-Course
DPR	:	Detail Project Reports
EA	:	Executing Agency
ECBC	:	Energy Conservation Building Code
EoDB	:	Ease of Doing Business
EGP	:	Exnora Green Pammal
ERP	:	Enterprise Resource Planning
ETP	:	Effluent Treatment Plant
FAO	:	Food and Agriculture Organisation
FDI	:	Foreign Direct Investment
FPS	:	Fair Price Shops
FRBM Act	:	Fiscal Responsibility & Budget Management Act
FRU	:	First Referral Unit
GAP	:	Good Agricultural Practices
GBPNIHESD	:	GB Pant National Institute for Himalayan Environment and Sustainable Development
GDP	:	Gross Domestic Product
GFCF	:	Gross Fixed Capital Formation
GHP	:	Good Horticulture Practices
GNM	:	General Nursing and Midwifery
GNMTC	:	GNM Training Centre
GPRS	:	General Packet Radio System
GPS	:	Global Positioning System
GSDP	:	Gross State Domestic Product
GST	:	Goods and Services Tax
GoUK	:	Government of Uttarakhand
GIS	:	Geographic Information System
GIDS	:	Global Index Data Service
GLOF	:	Glacier Lake Outburst Flood
HARC	:	Himalayan Action Research Centre
HIV	:	Human Immunodeficiency Virus
HIMAP	:	Hindu Kush Himalayan Monitoring and Assessment Programme
HIMFED	:	Himachal Pradesh State Co-operative Marketing and Consumers Federation Limited
HMIS	:	Health Management Information System
HPMC	:	Himachal Pradesh Horticultural Produce Marketing and Processing Corporation
HRDI	:	Herbal Research & Development Institute
PSA	:	Priority Sector Advance
PSU	:	Public Sector Undertaking
PTA	:	Parent-Teachers Association
PTR	:	Pupil to Teacher Ratio
RAMSA	:	Rashtriya Madhyamik Shiksha Abhiyan
RBSK	:	Rashtriya Bal Swasthya Karyakram
RCH	:	Reproductive and Child Health
RDF	:	Refuse Derived Fuels
RE	:	Renewable Energy
RF	:	Radio Frequency
RHFWTC	:	Regional Health & Family Welfare Training Centre
RIDF	:	Rural Infrastructure Development Fund
RKSK	:	Rashtriya Kishore Swasthya Karyakram
ROI	:	Return On Investment
RoSS	:	Robotic Surgery Simulator
ROW	:	Right of Ways
RPA	:	Robotic Process Automation
RPS	:	Renewable Purchase Standards
RRB	:	Regional Rural Banks
RUSA	:	Rashtriya Uchchatar Shiksha Abhiyan
R&D	:	Research and Development
SAPCC	:	State Action Plan for Climate Change
SAR	:	Sub-project Appraisal Report
SDG	:	Sustainable Development Goals
SDMA	:	State Disaster Management Authority
SECF	:	State Energy Conservation Fund
SFPUC	:	San Francisco Public Utilities Commission
SGST	:	State Goods and Services Tax
SHG	:	Self-Help Group
SHSB	:	State Health Society, Bihar
SHSRC	:	State Health System Resource Centre
SIDBI	:	Small Industries Development Bank of India
SIFF	:	Sustainable India Finance Facility
SIIDCUL	:	State Industrial Development Corporation of Uttarakhand
SLEC	:	State Level Empowered Committee
SME	:	Small and Micro Enterprises
SMPB	:	State Medicinal Plants Board
SPV	:	Special Purpose Vehicle
SSA	:	Sarva Shiksha Abhiyan
SSI	:	Small Scale Industries
SWM	:	Smart Water Management
SWOT	:	Strengths, Weaknesses, Opportunities And Threats

Abbreviation

HSRC	:	Health System Resource Centre
HWC	:	Human Wildlife Conflict
HYV	:	High Yielding Varieties
ICDS	:	Integrated Child Development Services
ICIMOD	:	International Centre for Integrated Mountain Development
ICOR	:	Incremental Capital-Output Ratio
ICT	:	Information Communication Technology
ICT&E	:	Information & Communication Technology in Education
IEC	:	Information Education and Communication
IFA	:	Iron and Folic Acid
IFC	:	International Finance Corporation
IIFM	:	Indian Institute of Forest Management
ILSP	:	Integrated Livelihood Support Project
IMR	:	Infant Mortality Rate
IPP	:	Independent Power Producer
ISRO	:	Indian Space Research Organisation
IT	:	Information Technology
ITI	:	Industrial Training Institution
IQF	:	Individually Quick-Frozen
JSSK	:	Janani Shishu Swasthya Karyakram
JSY	:	Janani Suraksha Yojana
KVIB	:	Khadi and Village Industries Board
KVIC	:	Khadi Village Industries Commission
KSWAN	:	Karnataka State Wide Area Network
LPG	:	Liquid Petroleum Gas
MAP	:	Medicinal & Aromatic Plants
MCGM	:	Municipal Corporation of Greater Mumbai
MCTS	:	Mother and Child Tracking System
MDR-TB	:	Multi-Drug-Resistant Tuberculosis
MEA	:	Millennium Ecosystem Assessment
MHRD	:	Ministry of Human Resource Development
MIS	:	Management Information System
MLD	:	Million Litres per Day
MMU	:	Mobile Medical Units
TASK	:	Telangana Academy for Skill & Knowledge
TBI	:	Technology Business Incubator
TCGL	:	Tourism Corporation of Gujarat Ltd.
TIDES	:	Technology Innovation & Development of Entrepreneurship Support
TIES	:	Trade Infrastructure for Export Scheme
TLR	:	Temperature Lapse Rate
TSIC	:	Telangana State Innovation Cell
TSTSP	:	Technical Support and Training Service Provider
TTR	:	Total Tax Revenues
UAPCC	:	Uttarakhand State Action Plan on Climate Change
UBI	:	Union Bank of India
UCADA	:	Uttarakhand Civil Aviation Development Authority
UCB	:	Uttarakhand Council for Biotechnology
UDISE	:	Unified District Information System for Education
UEAP	:	Uttarakhand Emergency Assistance Project
UHHDC	:	Uttarakhand Handloom & Handicrafts Development Council
UJVNL	:	Uttarakhand Jal Vidyut Nigam Ltd
UK	:	Uttarakhand
UKUMP	:	Uttarakhand Krishi Utpadan Mandi Parishad
ULB	:	Urban Local Bodies
UNFCCC	:	United Nations Framework Convention on Climate Change
UPCL	:	Uttarakhand Power Corporation Limited
UREDA	:	Uttarakhand Renewable Energy Development Agency
USDI	:	Uttarakhand State Spatial Data Infrastructure
UUHF	:	Uttarakhand University of Horticulture and Forestry
UWMRA	:	Uttarakhand Water Management and Regulation Act
VAT	:	Value Added Tax
VCE	:	Village Computer Entrepreneur
VP	:	Van Panchayat
VR	:	Virtual Reality
VFR	:	Visual Flight Rules
VSAT	:	Very Small Aperture Terminal
ZBNF	:	Zero Budget Natural Farming
ZSI	:	Zoological Survey of India

UTTARAKHAND ECONOMIC SURVEY- 2018-19

EXECUTIVE SUMMARY

The Directorate of Economics and Statistics (DES), Department of Planning, Government of Uttarakhand brings out the Economic Survey of the State with the support from Centre for Public Policy and Good Governance, providing an annual overview of the performance of the State's economy. This year for the first time, DES has brought out a second volume of the Economic Survey providing an analytical perspective of the State's economy, growth drivers and prospects, new and emerging areas of development, challenges and areas requiring priority attention. The main objective of this report is to facilitate development planning, support ubiquitous growth of sunrise sectors of the State economy and provide direction for future growth to achieve declared Strategic Development Goals by 2030.

The report consists of twelve chapters. The first three chapters present an overview of State's economy, macro-economic aggregates and fiscal developments. Chapter four analyses the growth drivers - horticulture and tourism. Chapter five reflects on industry, the growth enablers and includes small and medium enterprises. Chapter six examines the status of infrastructure with a focus on transportation and energy. Chapter seven reviews the status of forests, climate change, human wildlife conflict and dealing with disasters. Chapter eight takes up issues and challenges of water resources. Chapter nine analyses the social development sectors - health and wellness, education, migration and urbanisation. Chapter ten reviews the potential and prospects of use of technology in the State; Chapter eleven explores new areas of development in the State and finally Chapter twelve discusses the way forward.

Overview of the State Economy: After its formation in the year 2000, the State has achieved encouraging growth in all aspects of the economy. To a large extent, it could be attributed to better utilization of the existing resources, capacities, and successfully attracting investments in key areas. However, the sectoral composition of the State's economy indicates that most of this growth has been achieved in secondary and tertiary sectors, while the contribution of primary sector to the GDP has rather shrunk. This is a cause of concern, as seventy percent of the rural population of the State have agriculture and allied activities as the mainstay of their livelihoods. The State envisages addressing this challenge, with explicit policy interventions, addressing region specific and micro issues.

District Domestic Product data suggest that the plain districts are performing better than the hill districts in terms of growth rate and per capita income. This growth disparity would be addressed through measures to achieve significant rise in the income of people, particularly in the hill districts. The State proposes to focus on employment generation through pro-active schemes in tourism and horticulture sectors, as well as promotion of medium and small-scale industrial clusters.

State's fiscal deficit started rising due to increase in both the capital expenditure and revenue expenditure during 2017-18. The State may consider polices to achieve a sustainable level of fiscal deficit, by bringing changes in the pattern of expenditure, thereby striking a balance between revenue expenditure and capital expenditure, without sacrificing the momentum of economic growth. It is also taking progressive steps by establishing institutional mechanisms to facilitate the on-going fiscal reforms, particularly in the area of Goods and Service Tax (GST).

Sectors like food processing, horticulture, floriculture, herbal and aromatic plants; tourism and hospitality; wellness and AYUSH; pharmaceuticals; IT; renewable energy; biotechnology and film shooting hold great potential to boost the State's economic growth. Several programmes are in place to further strengthen these sectors and attract investments.

The State also faces a challenge to achieve better performance in its *Incremental Capital-Output Ratio* (ICOR), which is a function of many factors like the quality of labour, which in turn depends upon skills, educational

levels and advancement of technology, requiring up-gradation concurrently. Policies directed towards incremental qualitative change in all the areas affecting the capital-output ratio are under consideration. These would facilitate a higher and sustainable economic growth.

Measures are being put in place for effective implementation and concurrent monitoring of policies, strategies, implementation plans & processes, departmental functioning and outcomes, to enable timely course corrections and to ensure higher impact. All departments shall be supported to develop evidence backed, professionally prepared project concepts and implementation plans to develop a strong portfolio of projects.

Besides the efforts to secure investment in commercial enterprises in the State, empowered structures and mechanisms are being considered to harness financial and other resources for development of social sectors, by accessing traditional and non-traditional sources and active engagement with national/international agencies.

Macro Economic Aggregates: The advance estimates of State Income for the year 2018-19 at current prices is estimated to be ₹2,37,147 crores (size of the economy), showing a growth rate of 10.34% over the GSDP estimates for the previous year. The State's GDP at constant prices for 2018-19 is estimated to be ₹1,84,902 crores (AE) showing a GSDP growth rate of 7.03% over the previous year. Per capita NSDP at current prices i.e. per capita income of the Stare is estimated as ₹1,90,284 for the year 2018-19 recording a growth rate of 8.97% over the previous year. During the year, contributions to State's GSVA from primary, secondary and tertiary sectors are 10.81%, 48.28% and 40.91% respectively.

Total advances of banks increased during 2016 to 2018 while the Credit to Deposit ratio fluctuated. Share of Priority Sector Advances (PSA) in total advances decreased during 2016 to 2018. Share of agricultural advances in total advances also decreased from 2016 to 2018.

Uttarakhand witnesses a high per capita income along with a high incidence of poverty and high consumption inequality amongst different population segments. State policies would target inclusive growth where the benefits flow to the most disadvantaged and marginalized sections of the economy.

Revamping of the agricultural sector (including horticulture) is the need of the hour, which would be addressed by strengthening and increasing productivity in this sector.

Fiscal Developments: GST is the biggest indirect tax reform in India since independence. Be it the passing of the State GST Bill or the implementation of e–way bills, the State has been pro-active in its implementation, though it faced tough challenges posed by the frequent changes in the tax system. The State's tax revenue declined in the post GST period. The in-built structural design of the GST, which makes it a destination based tax and the lack of consistency in the tax policy since its inception, are identified as the major reasons for the short fall in State's tax revenue. Against this backdrop, the GST Council may be approached to provide a positive, differential treatment in addition to the assured compensation it provides to the State. The State is assured of 14% revenue growth for five years, as far as taxes subsumed under GST are concerned.

With the introduction of E–way bills in the State, the problem of un-invoicing has been solved to a large extent, yet further efforts are needed to plug the remaining gaps. A consumer centric, incentive based approach and focused awareness programmes about GST, particularly among small traders could yield better results in tackling the menace of under-invoicing and boost the revenue of the State.

There is a need to review the Non-GST tax revenue growth in the years to come, as in recent years, the trend of Non-GST revenue growth has been a matter of concern. Measures like effective supervision and proper imposition of fines and duties could help protect the revenues from falling further.

With the change to GST, the State's scope to generate revenues from various taxes has shrunk and it's avenues of revenue generation through taxes have become limited. It is in this context, emphasis needs to be laid upon generating non- tax revenue where the State has a large scope to improvise its revenue collection. Sectors like forestry and wild life, power, tourism, tertiary medical care, higher education and urban services offer a plethora of opportunities to improve non-tax revenue.

Alongwith improving the non-tax revenue collection, there is also an urgent need to effectively manage the

State's expenditure by focusing on cost recovery and cost efficiency across different sectors.

Analysis of the fiscal indicators of the State suggest that its fiscal deficit is rising due to increased levels of capital expenditure and revenue expenditure. However the revenue expenditure component dominates the State's fiscal composition, relative to capital expenditure. A lower capital expenditure could have an impact on the creation of capital stock in the economy and could impact the growth prospects of the State in the long run. A change in the pattern of spending could yield sustainable results on the fiscal deficit front. A modest increase in the capital expenditure and simultaneous phased compression in the revenue expenditure, over a period of time is a better proposition. Emphasis needs to be laid upon bringing efficiency in operations of Government departments and planned reduction on the expenditure front, especially on subsidies. Plugging leakages in the provision of subsidies could further bring down the revenue expenditure.

Improvements in the State's finances could also be brought by restructuring expenditure in such a way that it promotes development expenditure. This in turn would lead to a higher economic growth, which eventually results in sustainable fiscal profile of the State.

Growth Drivers-

A. Horticulture: A new revolution, the horticulture revolution has begun in India. What has been an ancillary to food grain production, has grown astonishingly large to overtake it. From a production level of 145 million tonnes/year at the beginning of the millennium, it has reached 305.4 million tonnes/year in 2017-18, surpassing the food grain production of 279.5 million tonnes in 2017-18, by several million tonnes. The horticulture sector has now established itself as one of the largest export earners, employer and poverty alleviator (particularly for poor and marginal farmers).

By virtue of its sheer size, growth and income potential, horticulture is fast moving from rural confines to becoming a commercial venture. It is time to nurture this shift, to realise its full potential in a secure, systematic and sustainable manner.

Uttarakhand has been a key player in national horticulture revolution due to its ecological and climatic advantages. The growth of horticulture has received a boost after year 2000 when financial, technical and managerial support from the State started pouring into this sector. There is a perceptible shift in horticulture practices, particularly of medicinal plants, fruits, vegetables, flowers, organic farming, spices etc. At present about 2.83 lakh hectare of land is under horticulture. The State intends to increase this to 4.95 lakh ha by the year 2030. The annual turnover of horticulture crops in the State is approximately ₹2300 crores. Of the total annual production of 16.92 lakh MT, fruits contribute 6.59 lakh MT, vegetables 5.87 lakh MT, potato 3.60 lakh MT and spices and flowers contribute rest. Uttarakhand leads in the production of several fruits like Pear, Peach, Plum and Apple, Spices and Walnut in the country. However, the State needs to augment its food processing capabilities to add value and reduce wastage for the benefit of growers and strengthen its manufacturing base.

The State has vast growth potential in horticulture sector by introducing modern practices, high value and high yielding varieties of crops. There is a need to vitalise the existing horticulture extension infrastructure and re-deploy the personnel in mission mode to realise the envisaged State goals of horticultural development. Several structural and programmatic challenges require to be addressed to overcome growth constraints.

B. Tourism: It is one of the fastest growing sectors in the State. During 2017-18, the State received over 30 million tourists and this number is projected to reach to 67 million by 2026. However, almost all of them are domestic tourists, and a little less than half of them have come for pilgrimages.

Several challenges are faced by the State in expansion and diversification of tourism sector in terms of providing services and catering to the growing number of tourists with a variety of interests and expectations. There are broader issues like, carrying capacity of mountains and programmatic issues such as access and ease of transportation, status of physical infrastructure and facilities, appropriate hotel accommodations, parking and health facilities, management of solid waste, availability of efficient tour guides, strength of local establishments

and importantly, participation of local communities in the tourism sector of the State. To realise the Vision of Uttarakhand as the most favoured tourist destination in the country, which attracts national and international visitors having multiple interests, the above-mentioned challenges need to be addressed on priority basis.

State tourism policy proposes to expand tourism in several new geographical areas and add new themes in the tourism bouquet such as water sports, adventure, heli-skiing, eco-tourism, spiritual Yoga, wellness, heritage and culture etc., to attract both national and international tourists in increasing numbers.

However, catering to the needs of prospective Indian and foreign tourists in coming years (about 6 times of State's current population) will entail substantial expansion in physical infrastructure, building linkages, human resources, marketing and branding, and more significantly, coordination amongst concerned line departments and maintenance of the delicate eco-systems in the State.

Growth Enablers –

Industry: Uttarakhand's achievement in the industrial sector is the result of political consensus on developmental issues; dynamic, visionary and motivating political and bureaucratic leadership. As a result, the industrial sector recorded the highest CAGR of 16.5% during the years 2004-05 to 2014-15, which is much higher than National average of 7.2%. The share of secondary sector in the State GDP grew to 49% in 2017-18 from 19.2% in 1999-2000. The index of industrial production in Uttarakhand was 155.84 in 2016-17 as compared to 145.92 in the previous year.

The State is home to about 50,400 SMEs, 1,000 Khadi/Gramudyog units and 2,950 factories providing employment to more than 6.3 lakh persons. Labour force participation has increased. Worker population ratio has increased during last decade from 377 to 488 and 388 to 425 for rural and urban areas respectively.

In order to address challenges in the agro-processing sector, reforms at policy level are under active consideration. The State has taken several policy measures including the Special Integrated Industrial Development Policy for the hill regions in 2008, the MSME Policy in 2015 and AYUSH Policy in 2018.

Uttarakhand has been taking big strides on Ease of Doing Business front. Due to extensive efforts, Uttarakhand jumped from BRAP rank of 23 in 2015 to 09 in 2016. The State achieved 96.13% BRAP score in 2016 as against 13.36% in 2015. This enabled the State to be in leader category as per BRAP score. However, full benefits of this achievement are yet to be fully realised on the ground.

Uttarakhand Investors' Summit organised in October 2018 led to signing of 623 MoUs worth INR 1.24 Lakh crores across 12 focus sectors, which include Food Processing, Horticulture and Floriculture, Herbal and Aromatic plants, Tourism and Hospitality, Wellness and AYUSH, Pharmaceuticals, Automobiles, Natural Fibres, IT, Renewable Energy, Biotechnology and Film Shooting.

The State intends a paradigm shift to high-end manufacturing. However, large scale investment in digital infrastructure is a pre requisite, besides requirement of physical infrastructure to allow plug and play options, which attract MSMEs who will have a larger role to play, to make high end manufacturing feasible with localized smart manufacturing units. This also needs developing a digital eco system, establishing common high tech equipment facilities, meeting the skills gaps, inviting PPPs and supporting MSMEs in the process of paradigm shift to high end manufacturing.

Status of Infrastructure: Uttarakhand has developed reasonably good infrastructure networks in the transport area (road and air transport) and power sector. However, investment levels have fluctuated significantly over the time. Public investment in infrastructure needs to increase from its current level to strengthen overall physical infrastructure to keep pace with the growing and changing needs of the State.

A. Road Transportation: Importance and unique challenges of road transportation in Uttarakhand are well recognised. Uttarakhand had total road length of 2,841.9 km of national highways in 2017. Number of vehicles in the State has increased five fold during 2002-03 to 2016-17, posing a major challenge to safety, security and management of road transportation.

B. Railways: Though Uttarakhand's topography acts as a barrier to expansion of existing rail network, progress is visible on several fronts. Firstly, the Government has taken steps to start monorail services between Dehradun, Haridwar and Rishikesh. Under State Budget 2018-19, an allocation of ₹86 crore has been made for development of metro rail. Secondly, Rishikesh-Karnprayag rail line is expected to be functional by 2024-25. The State is focusing on increasing the share of railways in both cargo and passenger transport.

C. Air Transport: The State intends to build air transport as a reliable all-weather transport option for the hills. Uttarakhand's growth as a preferred tourist and industrial destination, the State Government is focusing on upgrading the Jolly Grant airport as an international airport in coordination with Airports Authority of India. Under the Centre's regional connectivity scheme, clearance has been given for two new airports and 14 helipads. The Civil Aviation component of the UEAP, envisages up-gradation/construction of about 37 Helipads, 19 Heliports and 4 Helidroms. Possibilities of setting up an aircraft/helicopter maintenance facility at Jolly Grant, are being explored.

D. Energy: With an ambitious 'Power for All' vision in a difficult geographical terrain, the Government of Uttarakhand has strived to harness all the energy options available in the State. At present demand for power in the State is around 1500 to 1600 MW. Around 50% of it is generated in the State and the rest met through imports. As per projections, the deficit which has being showing a rising trend, is likely to increase to 10,670 MU in 2030.

E. Renewable Energy: Renewable Energy (RE) potential of Uttarakhand is 8115 MW (*UREDA*), which is more than sufficient to meet its demand of 1600 MW. Uttarakhand's Future Electricity Road Map 2030 emphasises taking full advantage of State's RE potential especially through solar, small, mini and micro hydro power projects. In the Vision 2030 document of the State, there is focus on simultaneous development efforts to tap renewable energy sources in the form of small hydropower and solar. Due to large projected demand and supply gap in the State till 2030, a framework for integrated policy and strategy for rapid RE implementation, that complements the existing and planned conventional power projects, is called for.

Forests and Climate Change: Forest cover in Uttarakhand is fairly large and stable, *forest cover between 45.3% and 45.8% of geographical area during 2013-2017 and forest area 71% of total geographical area*. However, one study in 2016 found that of the 1284.6 km2 forest area sampled, only 43.6% had crown cover more than 40%, and 16.6% was in severely degraded condition (<20% crown density) and 39.7% moderately degraded (20-40% crown density). This is a matter of further, more comprehensive investigation and follow-up action.

Ban on tree cutting needs a review in view of the fact that *Chir* forests are growing at the cost of *Oak* forests. Litter removal policies also need review. Establishment of nurseries to promote plantation of *Kharsu Oak* will help local communities in high altitude mountains with economic activities such as sericulture, and extraction of *lichens (Jhula).*

The immediate requirements are to: (i) Establish an Interpretation Centre on Himalayan Treelines, (ii) Implement a data storage and sharing plan, and (iii) Initiate long term data collection based on plots established under NMHS project; revive alpine meadow pastoralism, create a milk brand of cows grazing there, package and market the same. Alpine meadows can contribute substantially to the meat industry of the State, again branded to recognise the pristine region where the livestock grazes. Alpine treelines and meadows are important as carbon stocks, hence the need to conserve and estimate them, and link them to national accounting and money transfer from Centre to State.

A recent study by IIFM in Uttarakhand provides economic estimates for as many as 21 ecosystem services from the forest areas of State. The study findings indicate that the monetary value of flow benefits emanating from the Uttarakhand forests is approximately ₹95,112 crores annually. This requires proactive representation to the Government of India to access this funding for sustaining the eco-system and providing large scale employment to mountain communities for managing eco-system services.

Himalayas, in parts are warming at rates 2-3 times more than global average rate in several areas and Uttarakhand is not any different. The warming would be more (by 0.3°C - 0.7°C) even when global mean temperature rise is restricted to 1.5°C (HIMAP, 2019). As for precipitation, it is on decline in recent decades. A dry winter and pre-monsoon period is another feature of the climate change predictions. However, more comprehensive and rigorous data analyses are required. Though, the State has established a climate change cell, its activities are to be mainstreamed. We need to progress development and implementation of specific programmes and activities to address known challenges.

Forest Fires in the State are generally surface fires, small and short-lived, they are not stand-changing. However, high frequency of such fires is a serious problem. According to statistics available from different sources, incidences of forest fires have increased several folds in recent years. As per the SEPI reports during 2016 forest forest fires affected area of over 4437 ha. In 2015, the figure was 701 ha. Preparation to deal with fire can be improved considerably by putting in place an improved warning system based on rainfall forecast of pre-monsoon months (e.g., high fire frequency, if pre-monsoon rain is going to be less than 200mm). Providing incentives for 'no smoke in a valley' can increase people's role in fire control. Schemes could be developed for prescribed burning with involvement of people to avert big fires.

Water Resources: As the glaciers continue to recede in the Uttarakhand Himalaya, the formation of moraine dammed lakes and their eventual collapse cannot be ruled out. Due to recession of glaciers the river flows will be impacted but not drastically, as the contribution of the snow and glacial melt to annual flows of rivers is only 30%. However, more systematic studies are required to estimate reliably the quantum of water available from the glaciers. Given the mountain characteristics of the State 'nature based solutions' such as rainwater harvesting, rejuvenation of critical recharge zones and water efficient technologies are most suited. Digital metering systems, differential pricing system and incentivising individuals/communities for better water use practices are required in urban areas. The demand and supply gap needs to be reassessed especially for the urban areas given that most urban centres in the State are rapidly growing.

Springs are the major source of water in Uttarakhand, hence needs more attention by policy makers and scientists. It is imperative to build technical and institutional capacities of stakeholders for sustaining springs. Success stories from Uttarakhand and other parts of Himalayas are available where spring revival programmes have been implemented, which need upscaling.

In terms of way forward for development of sustainable water resources of the State, rigorous data, knowledge empowerment and citizen involvement would be the keys as Government alone would not be able to capture all aspects related to water resources. The deficiency in developmental planning and policy analysis with regard to water needs to be addressed on priority. Backed by evidence and data, policy makers, implementers, research intitutions and civil society needs to come together to jointly devise strategies, joint plans and work in a concerted manner. Based on the existing information, a multipronged strategy for short, medium and long term is also discussed.

Social Development Sector -

A. Health and Wellness: Uttarakhand's broad health indicators like, birth, death, infant mortality rates, maternal mortality ratio have improved a great deal, while micro indicators including access to primary and secondary medical care, immunization coverage and malnutrition continue to lag behind. In recent years, the State has witnessed a surge in some communicable (Tuberculosis) and non-communicable diseases (diabetes, hypertension), attributable to life style changes.

New and innovative approaches and systemic reforms are called for to achieve SDGs targets and ensure wellness for all people in the State. These include: Providing benefits of Ayushman Bharat to all citizens; optimal use of technology such as telemedicine for primary, secondary and tertiary medical care; strengthen and expand secondary medical care through PPP for quality care in existing hospitals, engage private sector to establish new hospitals, particularly in commercially viable hill towns; strengthening process and outcome monitoring

systems for healthcare; strengthening State's training institutions for better management and delivery of quality care; engage with community for health education and health promotion activities and promoting a culture of wellness; strengthen AYUSH services as standalone and as supplement to allopathic medical care.

B. Education: Education apparatus in Uttarakhand has seen remarkable growth in terms of increase in infrastructure and improvement in accessibility to schools during past two decades. This has helped in achieving a nearly 100% enrolment at primary level and an equally high enrolment at secondary level. Uttarakhand is known as a schooling hub. Some of the best public schools in the country are located in the State. However, for quality education further consolidation is required through improved monitoring of delivery of education with pro-active development of necessary processes and use of technology by the Education Department.

About 10 point decline in enrolment from secondary to senior secondary level and almost 40 point decline from senior secondary to higher education institutions is reported in the State. Generally, most of these dropouts enter the labour force, but without required vocational skills. It makes a strong case for adding vocational skills component in secondary and senior secondary level curricula.

Quality of education at junior and secondary education level, particularly in government schools is an area of concern for the State. As stated in Vision 2030, the State is committed to "Ensure Inclusive and Equitable Quality Education and Promote Lifelong Learning Opportunities for All". To achieve this, the focus is on further improvement in infrastructure, reduction in absenteeism of teaching staff, capacity building of teachers to ensure availability of good teachers working in mission mode and introduction of smart class rooms and expansion of model schools.

SMART classes have been successfully piloted in many schools with the help of community-based organisations. The State intends to scale up this initiative using available ICTE solutions. For technology-enabled education, collaboration is being sought with institutions and universities of repute for devising ways to grapple with problems of lack of science labs in remote areas. It is also being realised that monitoring of education delivery requires use of new and innovative methods as well as revitalising present assessment processes.

Expansion of private schools and shifting of students from government to private schools though could be seen as expansion of educational facilities, is also a call for government schools to improve performance. State could consider inviting private schools to run Government and aided schools in PPP mode.

The State has several institutes of higher learning which have made their mark. In recent years, a number of universities, medical and engineering colleges have been established. Some of them have evolved well and many are struggling. Higher education department may establish an efficient monitoring and support system to help upcoming institutions to establish themselves and make the State a hub for higher education as well.

C. Migration and Urbanisation: Uttarakhand has historically been an out-migrating State. However, in recent years, a new trend is noted. Rural people are migrating with their families for good and villages are being deserted one after another. These families are settling in nearby towns or other cities where more economic opportunities are available or quality of life is better. It has led to another problem, i.e., unplanned growth of several towns in the State. Meagre civic services in many towns are not measuring up to the growing needs of the residents and chaotic conditions are witnessed with influx of tourists in summer months. It is noted that, most urban areas in the State have grown far beyond the services their natural ecosystems could provide.

Rapid desertion of villages in several districts has touched an emotional chord and has implications for socio-cultural fabric of the State as well. As stated in the Vision 2030 document, several initiatives are underway to contain the outward tide by creating more employment opportunities, infrastructure facilities including roads and communication in affected areas.

One of the key considerations is building satellite towns adjacent to existing large towns and cities, having enough land space and viable ecosystem. These towns will be developed in a planned manner, initially drawing upon the services of mother towns. These are also seen as future growth centres to become hubs of economic,

education, healthcare, wellness and tourism services. These growth centres are expected to contribute to containing migration and promoting systematic urbanisation. The process has begun with approval of Urban Living Lab in *Doiwala*.

Uses of Technology: An overview of the use of technology, in multiple aspects of a citizen's life and the future uses of technology that are likely to influence how people learn, work, look after their health, live, interact amongst themselves and with the Government, use services provided by the government and private sector, are briefly touched in this Chapter, to catalyse dialogue followed by need based action appropriate for the State. Certain best practices in various spheres, adopted within the country and globally that are applicable to Uttarakhand are discussed.

Usage of technology in the areas of; information technology, water resources, urbanisation, poverty alleviation, direct benefit transfer, public grievance redressal, health, education, citizen centric services and solid waste management, are outlined.

New Areas of Development: In order to maintain if not exceed the present rate of growth of its economy, provide opportunities for gainful employment to all people and ensure good quality of life for them, it is essential that the State keeps pace with the emerging trends and technologies and deploy those suitable, in its developmental planning. Some of the new areas of development discussed include; artificial Intelligence to propel its educated youth to secure higher paying jobs at the cutting edge of technological transformation; acquisition of skills in the sunrise sectors of growth like; horticulture, medicinal and aromatic plants, floriculture, animal husbandry, forestry, tourism services, ICT and bio-technology.

With the growth in the economy, urbanisation and tourism, the issue of management and disposal of waste, be it solid or liquid, becomes paramount in the State, particularly against the backdrop of its ecological sensitivity. The State needs to adapt successful waste management processes to suit its growing and evolving requirements.

With rapid rural to urban migration, towns and cities in the State are growing haphazardly disregarding the carrying capacity of eco-systems' and municipal bodies' abilities to provide civic services. A huge inflow of tourists in summer months, further compounds the scenario. The concept of distributing and decongesting urban areas bursting at their seams, through development of strategically located growth centres and satellite towns, is discussed.

Putting Strategies into Practice: Best of intentions, strategies and plans do not often come to fruition, largely due to lack of robust implementation structures, organisational issues, programmatic gaps and lack of close monitoring. In order to realise the Vision 2030 of the State in mission mode, **A Vision Steering Task Force** may be established in CPPGG and assigned the responsibility of developing systemic and stakeholder capacities/capabilities, putting plans into action, stewardship, monitoring, timely feedback and course corrections. Following broad components/stages are suggested in the process:

- ✓ Identification of stakeholder groups;
- ✓ Dissemination of goals and strategies to stakeholders;
- ✓ Constitution of empowered task forces to spearhead each thematic area;
- ✓ Developing road maps – setting short, medium and long term priorities and milestones:
- ✓ Preparation of annual action plans with measurable indicators, assigned responsibilities and time frames for each stage; Preparation of budget estimates;
- ✓ Securing resources from central government, State budget, development partners, development banks, CSR funds of corporate houses, development bonds, financial institutions and philanthropic societies and donors.

Establishing "The Uttarakhand Environment Services Trust" may be a way forward to garner non-traditional financial resources for environmental protection and deployment of hill communities for environmental protection of natural resources and regenerative work.

CHAPTER- 1

Overview of State's Economy

"Theory of economics does not furnish a body settled conclusions immediately applicable to public policy. It is a method rather a doctrine. An apparatus of the mind, a technique of thinking, which helps its possessors to draw correct conclusions" – ***John Maynard Keynes***

Abstract:

The State of Uttarakhand came into existence to cater to the needs of the largely hill population. In the process, it has grown from strength to strength by successfully navigating the tough waters of socio, economic and environmental challenges. The economic growth achieved by the State is largely due to better utilization of the existing capacities and attracting investments in selected areas. Larger scope for growth exists through opening a broader canvas for investment, reaching all districts and opening new avenues of employment and growth.

The sectoral composition of the State's economy suggests declining contribution of primary sector to its GDP. State envisages to address this challenge by adopting explicit policy interventions, based on region specific issues.

District Domestic Product data indicates that the plain districts are performing better than the hill districts in terms of growth rate and per capita income. State intends to address this growth disparity by laying emphasis on achieving significant rise in the rural incomes, particularly in the hill districts of the State, with a focus on employment generation through pro-active schemes to promote tourism and horticulture coupled with medium and small scale industries.

Fiscal deficit is rising due to increased levels of capital expenditure and revenue expenditure. However the revenue expenditure component dominates the State's fiscal composition, relative to capital expenditure. The State is considering polices to achieve a sustainable level of fiscal deficit, by bringing in changes in the pattern of expenditure, thereby striking a balance between revenue expenditure and capital expenditure, without sacrificing the momentum in economic growth. The State is also in the process of taking progressive steps, establishing institutional mechanisms to cope up with the ongoing fiscal reforms in the form of Goods and Services Tax (GST).

The State recognizes the potential of infrastructure development to foster economic growth and is taking necessary measures. While Uttarakhand is performing better in the field of primary education, the senior secondary level witnesses a decline in enrolment. Adding vocational skill building from secondary level itself is a solution, which would help youth to find employment/ entrepreneurial opportunities in their own environment. It will also contribute to contain out-migration. The State envisages to strengthen in-service training to secondary school teachers to update their knowledge and teaching methods.

On the Health front, broad health indicators like birth, death and infant mortality rates and maternal mortality ratio have improved a great deal during past two decades. However, there is a need for further improvement in micro indicators including access to primary and secondary medical care, immunisation coverage, malnutrition etc. Access to medical care could be enhanced through widespread use of telemedicine and adopting public private partnerships (PPP) to strengthen delivery of secondary medical care.

AYUSH grams are proposed to promote wellness and medical tourism and herbal cultivation. In addition, YOGA grams would be established as wellness, counselling, meditation centres under PPP mode.

Food processing, horticulture including floriculture, herbal and aromatic plants, tourism and hospitality, wellness and AYUSH, pharmaceuticals, IT, renewable energy, biotechnology and film shooting hold great potential to boost the State's economic growth. Several programmes are in place to strengthen these sectors by attracting investments.

In the long run, the State has a challenge to achieve better performance of its Incremental Capital-Output Ratio (ICOR). It is a function of many factors like the quality of labour, which in turn depend upon skills, educational levels and advancement of technology, which need up-gradation concurrently. Policies directed towards incremental qualitative change in all the areas affecting the capital-output ratio shall be contemplated. This would ensure a higher and sustainable economic growth. Endeavours are in place to grow from strength to strength with an agenda of inclusive and sustainable economic growth with jobs.

1. MACRO-ECONOMIC AGGREGATES:

1.1 GSDP and Sectoral Composition:

According to the advance estimates, GSDP at current prices for the year 2018-19 is estimated to be ₹2,37,147 crores showing a growth rate of 10.34% over the previous year. The State's GDP for the same year, when calculated at constant prices is estimated as ₹1, 84,902 crores showing a GSDP growth rate of 7.03% over the year 2017-18. From 2011-12 till date, Uttarakhand's GDP, both at current and constant prices, has shown a rising trend. The per capita NSDP at current prices of the State is estimated as ₹1, 90,284 crores for 2018-19 recording a growth rate of 8.97% over the previous year.

In Uttarakhand's economy, primary sector is being replaced by the tertiary sector, which is emerging as a major contributor to the State's GSDP. Even the figures depicted by the provisional estimates for the year 2017-18 (at current prices) reveal that tertiary sector is growing at the rate of 13.34% followed by the secondary sector at 9.40% while the primary sector is lagging behind at 7.81%. For the same period, the advance estimates suggests that primary, secondary and tertiary sector contributed a share of 11.38%, 49.01% and 39.61% respectively to the State's GDP. Similarly, the share of primary, secondary and tertiary sectors in GSDP at current prices more or less remains the same as per the advance estimates for the year 2018-19 i.e. 11%, 48% and 41% respectively.

In terms of GSDP, Uttarakhand is performing relatively better than Himachal Pradesh. The GSDP growth rate at current prices for Uttarakhand for 2015-16 is 9.74%, which is an improvement compared to 8.29% recorded during 2014-15. It continued its growth momentum in 2016-17, to touch 8.60% GSDP growth rate. However Himachal Pradesh shows a mixed pattern in terms of GSDP growth rates. The GSDP growth rate at current prices for Himachal Pradesh for 2014-15 is 9.5%, which is quite lower than its earlier growth rate of 14.4% during 2013-14. It fell to 10.1% in 2015-16 and then again to 9.5% in 2016-17.

The pertinent concern that arises in this context is the declining share of primary sector as a percentage of Uttarakhand's GDP. Although emergence of horticulture sector offers some respite, it is not yet fully developed, in comparison with Himachal Pradesh. This gap is largely due to fragmented and small land holdings, lack of forward linkages and access to all weather roads. Decline in primary sector is also playing a role in accelerating the outward migration from the rural areas in the State. The State endeavours to address these challenges with explicit interventions, based on region specific challenges, while addressing the structural constraints.

1.2 District Domestic Product (DDP):

District Domestic Product (DDP) estimates are a vital indicator of economic development and provide a fair idea of regional differences within the State. DDP data indicates that the plains districts are better off than the hill districts in terms of size of the economy, rate of growth as well as the per capita income. According to the provisional estimates, Dehradun was the fastest growing district in year 2016-17 recording a growth rate of 7.62% while the district with the lowest growth rate was Champawat at 5.75%. In terms of size of the economy for the year 2016-17, Haridwar district was the largest with a size of ₹5,816,824 lakhs and Rudraprayag district was the smallest with a size of ₹251,040 lakhs. Haridwar district registered the highest per capita income at ₹2,54,050, while Rudraprayag district was at the bottom with a per capita income of ₹83,521 for year 2016-17.

These trends can be attributed to the fact that the plain districts have a large Industrial base and in addition, they have IT parks and a large number of educational institutions. Connectivity is also an important factor behind plain districts' better performance than the hill districts. These factors, have not only pushed the economic growth in the plains but also acted as the pull factor for migration from the hills to plain districts of the State. This concern is being addressed through programmes to promote income of people in hill districts, through employment generation by developing tourism, horticulture and micro, small & medium industries.

2. PUBLIC FINANCE:

2.1 Fiscal Indicators:

The revenue expenditure of the State as a percentage of GSDP was 13.03% in 2015-16, it decreased to 12.95% in 2016-17. However it increased to 13.05% in 2017-18. The capital expenditure which was at 2.38% of the States' GDP in 2015-16 rose to 2.54% in 2016-17 ,and in 2017-18 it increased to 2.65% of GSDP.

The fiscal deficit, which was 3.46% of GSDP in 2015-16 reduced to 2.8% in 2016-17. This fall could be largely attributed to the reduction in the revenue expenditure as a percentage of GSDP during the same period. However the fiscal deficit increased to 3.45% in 2017-18.

Analysis of fiscal developments suggests that the revenue expenditure component contributed relatively a larger share to the State's fiscal deficit, compared to the capital expenditure. This could have an impact on the creation of capital stock in the economy and could affect the growth prospects of the State in the long run.

In this context, the State is reviewing its polices to achieve a sustainable level of fiscal deficit, by bringing in changes in the pattern of expenditure, thereby striking a balance between revenue expenditure and capital expenditure, without sacrificing the momentum of economic growth. Emphasis shall be laid to bring efficiencies in operations of Government depts., reduction in subsidies, improved targeting, higher economic growth and a sustainable fiscal profile of the State.

2.2 Goods and Services Tax:

Uttarakhand has been the front runner in adapting to this new indirect tax regime introduced countrywide from the 1st of July 2017. Uttarakhand was the fifth State in the country to pass the State GST Bill. It implemented e–way bills with effect from 20th April, 2018. During the eight month period between July 2017 and March 2018 after adoption of GST, Uttarakhand recorded a revenue short fall of 39%. In neighbouring State of Himachal Pradesh this shortfall was somewhat higher as 42%. During next nine months i.e., during April–December 2018, Uttarakhand had a revenue short fall of 35% against shortfall of 36% in Himachal Pradesh.

The major reasons for this decline in tax collection are; lack of consistency in the GST policy since its inception and the structural design of GST, which makes it a destination based tax rendering a strategic disadvantage to a manufacturing surplus State like Uttarakhand where its revenue is transferred out in the form of Integrated GST. However the State has been pro-active in facing the other challenges posed by the changes in the tax system. A unique concept of *GST Mitra* has been devised to help business persons to file their tax papers. At present, more than 2,022 GST Mitras are assisting traders. Over 3,000 workshops have been conducted statwide to orient traders about GST.

A 24X7 help desk service is established at the State Tax headquarters and in the State Tax offices at Haridwar and Rudrapur for redressal of any difficulty arising with respect to the provisions of GST, especially regarding preparation of e-way bills.

Non-GST revenue consisting of Excise, Stamps and Registration Fees poses a challenge.

Although the revenue from the State excise has gone up from 17.83% of OTR in 2014-15 to 18.50% in 2015-16, it fell to 17.49% in 2016-17. However there is an improvement in the state excise as a percentage of OTR, as it increased to 22.25% during 2017-18. Stamps and Registration Fees as a percentage of OTR witnessed an increased trend from 2002-03 to 2006-07. It rose from 12.10% to 21.73% during this period. Except during 2012-13 and 2015-16, it registered a declining trend from 2007-08 and continued this trend till 2016-17, to touch 7.12%. But in 2017-18, the State earned Stamps and Registration Fee of ₹882.26 crore and the Stamps and Registration Fees as a percentage of OTR improved to 8.68%.

2.3 Tax Revenues:

Percentage of tax revenue to total revenue for Uttarakhand for the period 2015-16 is 69.28%, while the same for Himachal Pradesh is 43.97%. However Himachal Pradesh fared better in terms of percentage of non-tax revenue to total revenue at 7.84% as compared to Uttarakhand (5.74%) during 2015-16. It is pertinent to note that, tax collection of the State

which stood at ₹233 crores at the time of its creation has increased about 33 fold to ₹7,637 crores in 2017-18. In the financial year 2018-19, the State Tax Department has earned total revenue of ₹8796 crore including ₹2843 crore as compensation.

2.4 Non Tax Revenue:

Non-Tax Revenue as a percentage of GSDP stood at 0.98% in 2011-12 and improved to 1.29% in 2012-13. However it declined in 2012-13 and 2014-15, to touch 0.78%. In 2015-16, there was a slight recovery and by 2017-18, the Non-Tax Revenues as a percentage of GSDP stood at 1.43%. The State is contemplating policy measures to improve non-tax revenue from sectors like forestry and wild life, power, urban local bodies, tertiary medical care etc.

While the country moves towards making new strides in realizing India's dream of 'one country one tax', the State is taking progressive steps by making necessary institutional arrangements to cope up with the on going fiscal reforms.

3. IMPORT-EXPORT PROFILE OF STATE:

3.1 Import Profile:

The manufacturing sector in Uttarakhand is still evolving (so far largely confined to the plain districts). Its services sector is developing to cater to the growing tourist inflow as well as its residents. Barring the niche products/services in which it has comparative advantage, its export to other States is limited. As the industries in the State are not producing the range of products to meet residenys' consumption needs, a large number and amount of goods are imported from other States. Trade balance is not in favour of the State.

The States from whom Uttarakhand imports its requirements are, Uttar Pradesh, Delhi, Haryana, Maharashtra, Rajasthan, Gujarat, Punjab, Himachal Pradesh and Tamil Nadu. These States account for roughly 90% of imports to Uttarakhand. Commodity wise, Uttar Pradesh dominates as source of food products while Delhi and Maharashtra are prominent as the sources for machinery, motor vehicles & other industrial goods.

According to a report on import-export of all commodities in Uttarakhand, compiled by Giri Institute of Development Studies in November 2017, total imports of Uttarakhand account for 80% of its GSDP with a diversified import basket. The top ten industries which roughly account for about 80% of the imports are; machinery and equipment, motor vehicles, trailerd and semi-trailerd cloths, rubber and plastics products, electrical equipment, chemicals and chemical products, basic metals, food products, computers, electronic and optical products. Data from 2013-14 suggests that industrial goods and durable goods form the bulk of imports to the State. This is a pointer to the limitations of industrial base in the State. Other way round, this also reflects production opportunities in terms of market for these products in the State.

Interestingly, there have not been many changes in the commodity composition of imports. Bulks of imports are still in the same commodities as were in 2013-14 (GIDS, 2017). State could actively consider promotion of relevant industries to reduce dependence on imports, particularly for which raw materials could be locally sourced.

3.2 Export Profile:

Exports from the State gained momentum in the last decade. Government initiatives in the form of subsidies to industries, quality industrial infrastructure and monetary and fiscal benefits as incentives to industries have played a key role in the growth of exports from the State (GIDS, 2017). These policy changes brought in a shift in the pattern of production from traditional items to high tech products like electronics, computers and accessories, tele-communication and processed foods. In the recent years, productivity of herbal and medicinal plants and their trade has also increased substantially.

In relation to the country as a whole, exports from Uttarakhand constitute a very low value of less than 1%. This also indicates a high potential of Uttarakhand's economy to boost its exports (GIDS, 2017). The State is already well diversified in terms of export destinations. Its exports also go to several countries outside India. In view of the large scale

demand nationally and internationally for agro-based products like herbs, fruits, frozen Tulsi, fruit juices, and jams, handicraft products and wooden items, the State foresees a greater export potential to be tapped.

4. INFRASTRUCTURE:

A sound infrastructure is crucial for economic growth of a State. It comprises of both social infrastructure such as schools and hospitals and economic infrastructure that includes energy, water, transport and digital communications. Theoretically, infrastructure may affect aggregate output in two following ways; (1) It directly contributes to gross domestic product (GDP) as an additional input in the production process and, (2) indirectly, by raising total factor productivity, by reducing transaction and other costs thus allowing a more efficient use of resources. Therefore, infrastructure is considered as a complementary factor for economic growth. Two key components of State's infrastructure are reviewed here.

4.1 Power:

Total power consumption in the State during the year 2015-16 was 10298.14 MU while the total production was 4942.33 MU, a production deficit of 52%. According to the linear trend projections, there would be a deficit of 10670.13 MU in 2030.

Renewable energy (RE) has vast but largely untapped potential in the State. As per UREDA, it has RE potential of 8115 MW more than enough to meet its entire present energy needs. Uttarakhand's Future Electricity Road Map- 2030, has laid a huge emphasis harnessing the State's RE potential over the next few year through solar, small, mini and micro hydro power projects. A framework for an integrated policy strategy for rapid RE implementation is being developed that complements both the existing and planned conventional power projects. The State also recognizes the need for an assessment of investment in renewable energy sector, including sources of investment, private and public sector roles, and how greater private investment in particular can be stimulated.

4.2 Roads:

Over the years, the State has developed an extensive transport infrastructure and networks. However, the level of investment has fluctuated significantly over time. The share of overall transports, which includes railways and other means of transport, was approximately 2% of the GSDP during 2011-12 to 2017-18.

In 2016-17, the length of roads in the State was 43,762 km. Of this, national highways were 2,841.9 kms. The public works department has completed construction of 437 km of new roads in 2017-18. The Central Government is widening the existing 900-km highway connecting the 4 abodes of Gangotri, Yamunotri, Kedarnath and Badrinath in the Himalayas, at an investment of US$ 1.85 billion and it has announced the initiation of 70 road projects at a cost of US$ 7.72 billion by 2019. Uttarakhand stood second among all the States in the country for constructing maximum number of roads under the Pradhan Mantri Gram Sadak Yojana (PMGSY) during 2017-18. 1,839 km roads were constructed during this period, against the annual target of 1,500 km. The State has also achieved another distinction of being ranked second in connecting 207 habitations with roads during 2017-18, against the target of 172 habitations under PMGSY.

State Government is continuously planning to develop road transportation network in pursuit of sustainable development goals of 2030. Under the State Budget 2018-19, an amount of ₹2,053.92 crores was allocated for Roads and Bridges.

Although total road length has increased by 72% between 2002-03 and 2016-17, the numbers of vehicles have increased five fold in the same period. The challenges of safety, security and management of road transportation are being considered in the designing of the policies related to roads in the State.

4.3 Railways:

Hilly terrain of Uttarakhand acts as a barrier in development and management of railways. Uttarakhand has 344.91 km of rail routes. The State is focusing on increasing the share of railways in cargo and passenger transport. The Government has taken initiatives to start monorails at Dehradun, Haridwar

and Rishikesh. Under State Budget 2018-19, an allocation of ₹86 crore (US$13.28 million) has been made for development of metro rail. Rishikesh-Karnprayag rail line is also being developed and likely to be functional by 2024-25.

This 125 km route project will reduce Rishikesh to Karnaprayag travel time from 7 hours to 2 hours. It will have 16 bridges and 105 km tunnels. A 15.1 km tunnel, reported to be the country's longest, will be built between Devprayag and Lachmoli on the route.

4.4 Airports:

The State intends to build air transport as a reliable all-weather transport option. As Uttarakhand is emerging as a major tourist and industrial destination, the State Government is focusing on upgrading the Jolly Grant airport as an international airport, in coordination with Airports Authority of India. In the State Budget of 2018-19, an amount of ₹10 crores has been allocated for commencement of air services under the UDAN scheme. Under the Centre's regional connectivity scheme, clearance has been given for two airports and 14 helipads. The Civil Aviation component of the UEAP, envisages undertaking up-gradation/ construction of about 37 Helipads, 19 Heliports and 4 Helidroms. The Preparatory Consultant, UCADA, has already worked on the Sub-project Appraisal Report (SAR) and Detail Project Reports (DPRs) for 19 helipad sites on priority, which includes 12 Helipads and 7 Heliports, to be executed through 3 DPRs/Contract Packages covering 19 locations spread over 9 districts (Chamoli, Rudraprayag, PauriGarhwal, Tehri Garhwal, Nainital, Udham Singh Nagar, Almora, Bageshwar, and Champawat) initially planned for phase- I.

5. EDUCATION:

5.1 Primary and Secondary Education:

The State is known for ancient teaching and learning centres and also for some of the best schools in the country. The education infrastructure in Uttarakhand has seen remarkable growth in terms of and improvement in accessibility to schools over the years. Since inception, it has shown phenomenal growth in number of educational Institutions from elementary to higher levels. The State has 14489 primary, 5363 junior, 1308 secondary and 2438 higher secondary Government schools and 4395 primary and 937 secondary private schools. The quantitative growth though poses a challenge to maintain the quality aspects as well

The State has achieved a Gross Enrolment Ratio of more than 95% and literacy rate above 80%. Programmes like Sarva Shiksha Abhiyan and Rashtriya Madhyamik Shiksha Abhiyan have helped in providing basic infrastructure, books, uniforms and learning material to students in distant and remote locations. This has helped in achieving a nearly 100% enrolment at primary level and retaining good enrolment percentages at upper primary and secondary level. The State was ranked second under the SSA in the country.

Some of the steps taken by the State to improve schooling in Uttarakhand are - Increasing the availability of funds, merger of SSA and RAMSA and merger of some schools in 2017 and 2018 to cope with the shortage of teachers and retention of children in the schools.

Decline of almost 20% in enrolment from secondary to senior secondary level and about 50% from senior secondary to higher education institutions is a cause of concern. Though this pattern is not much different from the national scenario, yet relevant. This challenge is further compounded, as present secondary level curriculum is not adequate to equip the drop-outs for available employment openings, particularly in the organised sector.

Another issue under active consideration of the State is the quality of education in junior and secondary levels. As stated in State Vision 2030, the State is committed to "Ensure Inclusive and Equitable Quality Education and Promote Lifelong Learning Opportunities for All". To achieve this, the focus is on further improvement in infrastructure, reduction in absenteeism of teaching staff, capacity building of teachers to ensure availability of good teachers working in mission mode, introduction of smart class rooms and expansion of model schools. SMART classes have been successfully piloted in many schools and State will try and scale up along with various ICT models. For technology-enabled

education, collaboration is being sought with institutions of repute like IITs and private universities for devising ways to address lack of labs in remote areas. It is also realised that monitoring the delivery of education is to be further strengthened with the help of frequent/ quarterly standardized assessments.

The State envisages to effectively provide in-service training to secondary school teachers and periodical exposure to new teaching pedagogy to ensure that they are updated on changing knowledge, ideas, methods and programmes. Critical areas like infrastructure facilities, pupil-teacher ratio in the Government run schools, maintaining quality standards of education, filling up the gender gap in schooling, assessing the gender structure of teaching community in the Government schools, addressing the issues of the shortage of teachers and improving the standards of public schools are also being considered.

5.2 Higher Education:

There were only three State/deemed Universities and four Institutes of National Importance in Uttarakhand before 2000. As of today the State has 11 State and 3 deemed Universities, 16 private Universities and 7 Institutes of National Importance. The State has taken many new initiatives to mitigate the problem of faculty, infrastructure like land, building, library and labs and other amenities at higher learning institutions. Four universities and 51 colleges have received funds under the Rashtriya Uchchatar Shiksha Abhiyan (RUSA) phase 1 and 2 under various components. However, to make Uttarakhand a destination hub for higher education, a quantum leap is required in terms of quality of education, branding of courses and universities, research and development facilities at the universities. Significant resource mobilisation is required to realise this objective.

5.3 Professional, Technical and Medical Education:

In the area of technical education the State has 48 ITIs, 71 Polytechnics, 10 Government and 26 Private Engineering Colleges, 5 Medical and Ayurvedic Colleges, 9 Nursing Colleges and 14 Pharmacy Colleges. However, not all ITIs are functional due to the lack of infrastructure, required tools and machinery. This serious issue, which directly impacts ability of youth to avail of available job opportunities and set up enterprises of their own, need priority attention. Engagement of industry would help in strengthening these institutions. Several engineering colleges are working below their optimum capacity due to multiple reasons. This issue requires review and appropriate corrective action.

6. HEALTH AND WELLNESS:

Uttarakhand's commitment towards bringing in quality health care to its people is evident from its adoption of a health and population policy as early as 2002. It was revised in 2013 and, an AYUSH policy was adopted in 2018. Its broad health indicators like Birth Rate, Death Rate, Infant Mortality Rates, Maternal Mortality Rate have improved a great deal and there is a further scope for improvement in micro indicators including access to primary and secondary medical care, immunisation coverage, malnutrition etc. However, in recent years we have witnessed a surge in some communicable and non-communicable diseases.

State's *Vision 2030* document has provided a trajectory and a roadmap to bridge these gaps in a systematic manner. The State is contemplating innovative approaches and reforms in health sector. These includes; providing benefits of *Ayushman Bharat* (health insurance) to all citizens of the State, adoption of digital technology such as tale-medicine for primary, secondary and tertiary medical care; strengthening and expanding secondary medical care through PPP for quality care at existing hospitals, engaging private sector for establishing new hospitals particularly in commercially viable hill towns; revamping mobile medical unit programme, revamping and strengthening monitoring system; rationalising the promotion processes to overcome the shortage of medical manpower particularly of specialist doctors; revamping and strengthening State's training institutions; engaging local communities for health education and health promotion activities and promoting a culture of wellness; strengthening AYUSH services as standalone as well as to supplement allopathic medical care. Some of the interventions

have already begun and some are being planned and will be implemented in due course of time.

Investment Summit 2018 has given impetus to the State's desire to become a hub for wellness tourism and contribute to the State's economy. Some institutions have already excelled and set the path. State has put required policy and strategies in place. It is also identifying potential sites for establishing AYUSH grams.

Medical packages combined with leisure activities, fun and fitness are planned and would be offered for attracting patients/clients from different parts of the country and abroad. Under wellness based AYUSH projects. State will develop wellness centres and AYUSH grams. In addition, YOGA Grams would be established as wellness, Yoga, counselling, meditation, Panchakarma, and naturopathy services centres under PPP mode.

7. MIGRATION AND URBANISATION:

The continued rural out-migration from hill districts in the State is a growing concern. This phenomenon is attributed to several factors including decline in primary sector, man-wildlife conflict, and slow pace of infrastructure development and above all, rising aspirations for a better quality of life. Interestingly, most of this migration is short–distance as migrants are settling down in nearby towns and cities. Several policy and programme interventions have been undertaken to turn the tide by promoting employment and economic opportunities in affected areas.

This migratory trend has given rise to another problem in terms of unplanned urban growth of several hill towns beyond their carrying capacities, putting their eco-systems under strain. Summer and pilgrimage tourism also stretch the capacity of urban services and harms the eco-systems. Innovative approaches are required to address these concerns including planned development of satellite towns; pro-active enforcement of town planning norms; creation of public amenities and development of waste-disposal and sewerage systems.

8. GROWTH DRIVERS-HORTICULTURE:

The Horticulture sector encompasses a wide range of crops. The horticulture crops include fruits, vegetable, spices, plantation crops, medicinal, aromatic plants and flowers. The percentage share of horticulture in total agriculture output is around 30%. It is a matter of pride that Uttarakhand is the largest producer of spices, peach, pear and plum in India. In this backdrop, horticulture in the State could be an important instrument to enhance employment and income of farmers.

Growth of horticulture sector in the State is attributed to initiatives taken by the Government of India and the State Government. Under schemes like State Horticulture Mission, Prime Minister's Developmental Package, Paramparagat Krishi Vikas Yojna, Pradhan Mantri Kisan Sampada Yojna, due attention is being given to establishing high density orchards, advanced irrigation practices, better post-harvest management by establishment of fruit mandis, creating *Controlled Atmospheric Storage* facilities in addition to establishment of *Fruit/Vegetables Processing* units, technological support, awareness/publicity initiatives, research etc. Despite the progress, it is pertinent to note that, Himachal Pradesh outpaced Uttarakhand in horticulture segment. During 2015-16, its total production was 9,28,787 MT, while it was 6,59,094MT in Uttarakhand. Himachal Pradesh has 2,26,799 ha under fruit cultivation while in Uttarakhand it is 1,75,330 ha, indicating the scope for growth.

There is a general increase in the ratio between the output-marketed to output-produced, over the years. However, the marketed surplus may not be finding optimal value because it is monetized at the first available instance, at nearby markets. These local markets do not necessarily have sufficient demand from its consumer catchment, to absorb the entire supply. Therefore, the value gets pushed down in the local market's price discovery process. It is important that besides marketed surplus, the market surplus is also monitored.

Farmers should have the ability to direct their supply to markets that are optimal – i.e. have sufficient demand in their catchment, or have ready links to other consumption centres. It is in this context, there is a need to emphasize on - value chain development, infrastructure creation and identifying the investment

required to develop the uninterrupted flow of produce from farm to fork.

In addition to the creation of infrastructure, enabling environment for storing, processing and marketing needs to be in place. The State envisages to develop demand based horticulture production, storage, primary, processing infrastructure and develop organized marketing and distribution system under the suitable acts, i.e. APMC act, Companies act or Societies Act. The State is also mulling to bring out the Organic Farming Bill soon.

9. GROWTH DRIVERS-TOURISM:

Uttarakhand has a large diversity in landscape, abundant natural endowments, rugged topography and untapped natural resources. All these attributes collectively make it a prime tourist destination contributing a major share to the State's GDP. The number of tourists visiting Uttarakhand for Char Dham Yatra and Hemkund Sahib is also rising steadily.

In terms of foreign tourist's arrivals, there is a larger scope for development, relative to other States.

Uttarakhand outnumbered Himachal Pradesh in terms of number of tourist arrivals. In the year 2016. While Himachal had 184.51 lakh visitors, Uttarakhand reported 317.77 lakh tourists. However, Himachal Pradesh has a comparative advantage in terms of infrastructure and thus attracted a larger number of foreign tourists (4.52 lakh) in comparison to Uttarakhand (1.13 lakh) in 2016.

To further improve the prospects of tourism sector in the State, the Government plans to have a comprehensive tourism plan based on theme and destination specific inputs, as different tourist destinations possess different potential and confront varying challenges. For instance, the Char Dham tourist sites need a comprehensive management plan to regulate the spurt of tourists during the peak season, while the sites of adventure tourism need to overcome basic problems of connectivity, accommodation, local establishments, public infrastructure and market development.

Estimates of tourist inflow in Uttarakhand by 2026 are in the region of 67 million. The State plans to give equal attention to pilgrimage tourism, adventure tourism, heritage and eco-tourism. Plans of establishing a world class infrastructure, attracting more private players along with the identification and documentation of new tourism destinations is under way. The larger idea is to redefine the contours of the present tourism policy, in order to harness the tourism potential of Uttarakhand. As a part of these endeavours, emphasis would be laid upon bringing in a qualitative change in the service providers associated with tourism industry, focussing on skills development in hospitality, camping, adventure sports, wellness, naturalists training for trekking and bird watching, health and hygiene, housekeeping, necessary social etiquettes, regional and foreign languages and solid waste disposal management.

Growth Centres driven by homestays and rural tourism opportunities in a hub and spokes model is being considered, where it is proposed to develop carefully selected tourism centric growth centres within 25-30 kms distance from highly frequented tourist destinations in Uttarakhand. These new tourism zones will consist of the hub where tourists will be able to experience rural life, culture, cuisine, performing arts and crafts. The tourism hubs will consist of homestay options to suit various pockets, a village where there will be facilities to shop for locally produced artefacts, clothing, food products, organic fruits and vegetables, flowers, eateries offering local recipes, a performance centre for shows of local music and dance, outlets to sell/rent equipment and gear for trekkers, adventure sports. These tourism hubs will be connected to the established tourist destination through shuttle bus services and to nearby villages in radius of 15-20 Kms where additional homestays will be available. It is envisaged that with each of the tourism hubs 10-15 villages will be connected each offering 10 guest rooms on their properties/orchards. This will also decongest the popular tourist destinations and take care of the spill over of the seasonal rush.

The concept of 'Ghost Tourism' is being considered to attract foreign tourists. Uninhabited haunted sites

will be used for promotion of ghost tourism. Several hilly villages have been abandoned, and they are available to enthusiasts to use them for tourism related activities.

The Government envisages a grand idea to develop Uttarakhand as a comprehensive, world class tourism destination by realising the untapped potential of sustainable tourism, through the design of innovative tourism products that build on the inherent strengths of the State as a natural destination which can cater to all categories of tourists. The objective is to make the State one of the top 10 tourism destination States of the country by 2020, up from its present rank of 12, to acquire a place among the top 5 destination States by 2024, and finally to attain a position among the top 3 destination States by 2030.

10. GROWTH ENABLER - INDUSTRIES:

The revival and growth of traditional industries with the objective of economic growth was the primary target of industrial policy of Uttarakhand. During the year 2016-17 the index of manufacturing production in Uttarakhand (base 2011-12 =100) was 155.84 as compared to 145.92 in the previous year. Industries like; drugs and pharmaceuticals, biotechnology, mines and minerals, textiles, and leather are in a comparatively advantageous position due to the availability of natural resources in the State. Uttarakhand has also been successful in attracting IT business by providing required support. The agro-processing sector is being supported through reforms at policy and programme levels.

The Government has constantly brought out progressive policies related to *Micro, Small, Medium Enterprises (MSME), Ease of Doing Business (EoDB),* exports and overall growth of the industrial sector. Despite the challenges of complex terrain, high transportation and logistics costs, the State is pulling out hurdles on the path of industrialization.

After its formation in 2000, the State embarked on developing the industrial base by offering tax holidays and other incentives. It helped in attractinginvestments as well as develop the services sector. The State has around 50,400 SMEs, 1,000 Khadi/Gram Udyog units and 2,950 factories providing employment to more than 6.3 lakh people. However, after 2014, when the tax holidays and incentives got over, investments started drying up. Hence, the polices aimed at maintaining sustained investment climate are the need of the hour.

Efforts are underway to provide a conducive market environment for MSMEs by addressing challenges linked to regulatory issues, lack of credit availability and the lack of skilled labour and through EoDB initiatives in favour of start-ups, MSMEs, and investors so that they can grow and generate employment for the local people.

Uttarakhand plans to take proactive steps and strategies for maximum utilization of Capital Investment Incentive for Access to Credit (CCIIAC). However there is a significant paucity of the data on the number of industries, which have benefited from this scheme. In fact little information is available on its current status. Therefore, a comparative study on impact of CCIIAC on industrial growth of Uttarakhand and Himachal shall be conducted to serve as a guide to policy making in this direction.

11. ENVIRONMENT AND CLIMATE CHANGE:

The chapter on forests, environment and climate change discusses some of the priority issues that require to be addressed by the State. These include; forests, biodiversity, wildlife, water, environmental disaster; forest degradation and its consequences, such as species loss and carbon depletion; frequent man-made surface fires, spread of invasive alien species, human wildlife conflicts, impact of ban on tree-cutting, and expansion of *Chir* pine into *Banj* Oak forests, treeline ecotone dynamics and other related issues such as drying of springs and water scarcity, conflict between electricity generation and flow of environmental services, migration leading to depopulation in rural areas and finally, air pollution, solid waste management and chahaotic urban build up are also reviewed. It is in this backdrop, the State State recognizes the need for incorporating ecosystem services flowing from the mountainous regions in national accounting and assess the climate change-impact and adaptation of safety measures.

The Economic Survey has devoted a separate chapter

for the discussion on the usage of technology in the areas of- Information Technology (IT), water resources, urbanisation, poverty alleviation, direct benefit transfer (DBT), public grievance redressal, health, education, citizen centric services and solid waste management. Another chapter focuses on the scope and possibilities of new areas of development relevant for the growth of Uttarakhand.

12. POLICY OUTLOOK:

Uttarakhand came into existence to cater to fulfil the aspirations of hill centric development. Policies and institutions were created to promote inclusive and sustainable economic growth. With the passage of time, the policy outlook and approach have become more specific and target based.

In this process, horticulture, tourism, power – small hydro projects and AYUSH are identified as the growth drivers for the State, while Industries and IT have been identified as the growth enablers.

Although Uttarakhand fares better on the horticulture front, there is considerable scope for growth by developing organized processing, supply chain, marketing and distribution systems.

Tertiary sector has become the largest employment generator in the State. Tourism is the biggest sub sector of the services sector that contributes in economic growth and provides employment to large numbers. Further growth is planned, bolstering new avenues for different tourist segments and through qualitative change in the services.

Industries in the State are performing better despite the odds posed by the topographical and environmental factors. In addition to the measures taken in relation to EoDB and attracting investments, focus is also be laid on developing the State into high end manufacturing hub by adopting global best practices. Growth in industrial base of the State will be supported by facilitation of start-ups and MSMEs fuelled by skilled workforce developed in the skilling centres in partnership with industrial players and centres of excellence existing in the State.

Recently the State has organized its maiden Destination Uttarakhand Investors Summit in October 2018. This was a hallmark summit that led to the convergence of business leaders, business honchos, premier educational institutions and innovators on a single platform to explore investment potential in Uttarakhand. 623 MoUs worth ₹1.24 Lakh crores were signed across 12 focus sectors of the State. Further policies to ensure faster, sustainable growth which would ensure job creation are being contemplated with the realization of the fact that the State's sectoral composition of GDP is tilting towards the tertiary sector.

Meeting the Challenge - Economic Growth along with Jobs:

The State has been showcasing a positive and progressive trend in terms of economic growth. But the challenge is to achieve economic growth that also generates employment. It is observed that the State's GDP has been rising, while unemployment continues to persist.

The State also has a challenge to achieve better performance in its Incremental Capital-Output Ratio (ICOR). However, it is a function of many factors like the quality of labour, which in turn depends upon their skills, educational levels and the advancement of technology, which needs up-gradation almost on a constant basis. Policies directed towards incremental qualitative change in all the factors affecting the capital-output ratio are under consideration. This would ensure a higher and sustainable economic growth. Effective measures are needed for successful implementation, monitoring and concurrent evaluation of these policies, by adopting Convergence, Co-ordination and Network Participation (C2N) model.

CHAPTER-2
Macro-Economic Aggregates

Abstract:

The advance estimate of State Income for the year 2018-19 at current prices is ₹2,37,147 crore (Size of the Economy) showing a growth rate of 10.34% over the previous year. The State's GDP for 2018-19 is estimated to be ₹1, 84,902 crore, showing a GSDP growth rate of 7.03% over the previous year. Per capita NSDP at current prices i.e. per capita income of the State is estimated as ₹1,90,284 for the year 2018-19 recording a growth rate of 8.97% over the previous year. Contributions to State's economy from primary, secondary and tertiary sectors were 10.81%, 48.28% and 40.91% respectively.

Total advances of banks increased from 2016 to 2018 while the Credit to Deposit ratio fluctuated. Share of PSA in total advances decreased during 2016 to 2018. Uttarakhand witnesses a high per capita income along with a high incidence of poverty and high consumption inequality amongst different population segments of the State. Policies are contemplated to target inclusive growth where benefits flow to the most disadvantaged and marginalized sections of the people.

Revamping of the agricultural sector is the need of the hour, which would be addressed by expanding horticulture, adoption of collective farming and building food processing facilities.

2.1 Introduction:

The advance estimates of State Income for the year 2018-19 at current prices is ₹2,37,147 crore (Size of the Economy) showing a growth rate of 10.34% over the previous year. The State State's GDP for 2018-19 is estimated to be ₹1, 84,902 crore, showing a growth rate of 7.03% over the previous year.

Since 2011-12, Uttarakhand's GDP, both at current and constant prices shows a rising trend. Per capita NSDP at current price of the State is estimated as ₹1,90,284 for the year 2018-19 recording a growth rate of 8.97% over the previous year.

As far as the sectoral composition of GSDP is concerned, Uttarakhand's economy witnessed the secondary sector replacing the tertiary sector as a major contributor to the State's GSDP, though, the tertiary sector growth rate is relatively higher. Provisional estimates for 2017-18, at current prices, reveal that tertiary sector grew at the rate of 13.34% followed by the secondary sector at 9.40% while the primary sector lagged behind at 7.81%. For the same period, primary, secondary and tertiary sector contributed 11.38%, 49.01% and 39.61% respectively to the State's gross value addition.

2.1.1 Comparison:

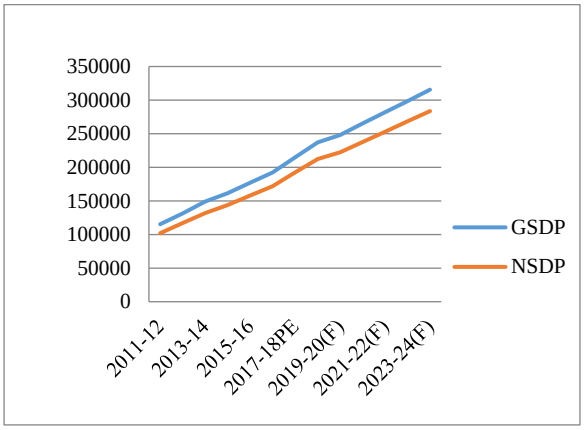
In comparison to national scenario, the State has shown better results. In 2017-18, provisional growth rate of NDP at current prices was recorded at 10% while it was 11.54% for Uttarakhand. At constant prices, both the State and the nation are growing almost at the same pace as far as the Gross Domestic Production is concerned. The Per Capita Income of the Uttarakhand at ₹190,284 is much higher than the all India estimates of ₹125,397 for the year 2018-19. However, its growth rate of 7.03% is slightly less than the all India growth rate of 7.2% for 2018-19. When compared with its neighbouring State of Himachal Pradesh, Uttarakhand shows a better performance as far as fas as GSDP figures are concerned for the period 2011-12 to 2016-17. Uttarakhand has witnessed a higher (though comparable) per capita income, as well as GSDP growth rate when compared with Himachal Pradesh.

2.1.2 Gross State Domestic Product (GSDP) and Net State Domestic Product (NSDP):

Macro-economic indicator-GSDP at current prices is an indicator of the size of the economy while NSDP at current prices indicates its value after deducting depreciation during production process. These two indicators at current prices

have shown a continuing increasing trend since the formation of the State. However, the growth rates of these two indicators have been fluctuating during the period 2011-12 to 2018-19 and likely to remain so during forecasted period of 2019-20 to 2023-24.

Figure-2.1: Representation of GSDP and NSDP at Current Prices

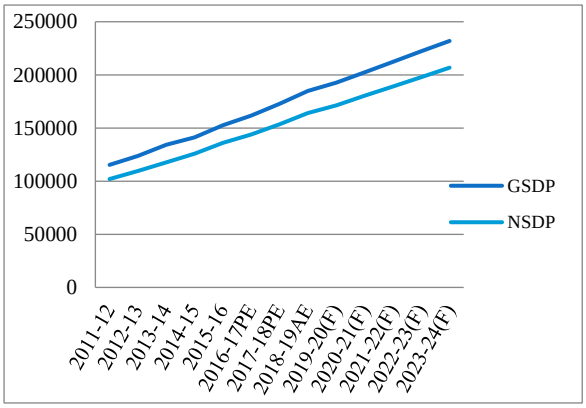


Source: Calculations are based on data released by DES, GoUK of Uttarakhand -2019

Figure 2.1 shows that both the indicators indicate an increasing trend while the distance between them is widening.

The GSDP and NSDP estimates at constant prices show a real increase in the output of an economy while excluding the rise in prices during the estimated period, providing a real picture of growth of an economy.

Figure 2.2: Representation of GSDP and NSDP at Constant Prices

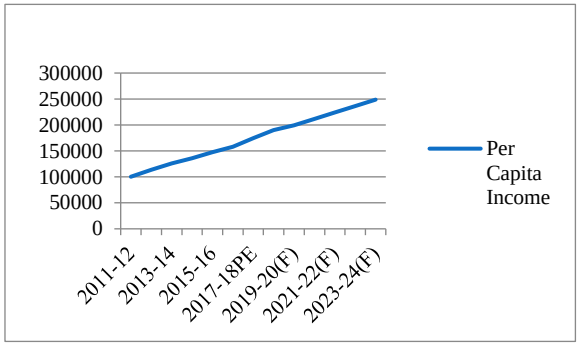


Source: Calculations are based on data released by DES, GoUK of Uttarakhand -2019

2.1.3 Per Capita Income:

Per capita Income or the average income of an economy serves as an indicator of the economic development of a State. Per Capita Income of the State is higher than the national average. For the period 2016-17, 2017-18 and 2018-2019 is estimated as ₹158,112, ₹174,622 and ₹190,284 respectively, while at the national level this is estimated as ₹103,870, ₹112,835 and ₹125,397 respectively for the same time periods. **Figure 2.3** indicates a steady increasing trend in Per Capita Income for the reference period.

Figure-2.3: Per Capita Income Trend 2011-24

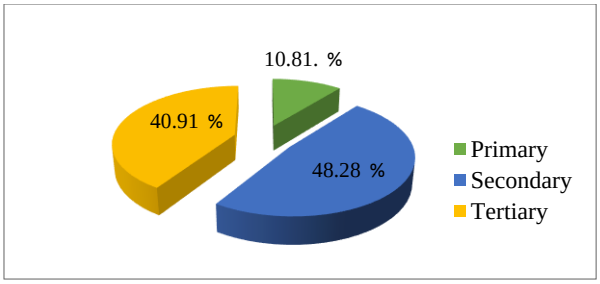


Source: Calculations are based on data released by DES, GoUK of Uttarakhand -2019

2.2 Structure of the Economy:

Uttarakhand's economy has been expanding and experiencing structural changes since the formation of the State. Earlier tertiary sector's contribution to the GSDP was higher followed by the secondary and then the primary sector. However over a period of time, the secondary sector has started contributing more, followed by tertiary and then the primary sector in that order. It is interesting to note that the gap between the secondary and tertiary sector will increase in the coming years. A comparision with Himachal Pradesh shows that both the States have potential in secondary sector, while a general slackness has *been observed in the tertiary sector.*

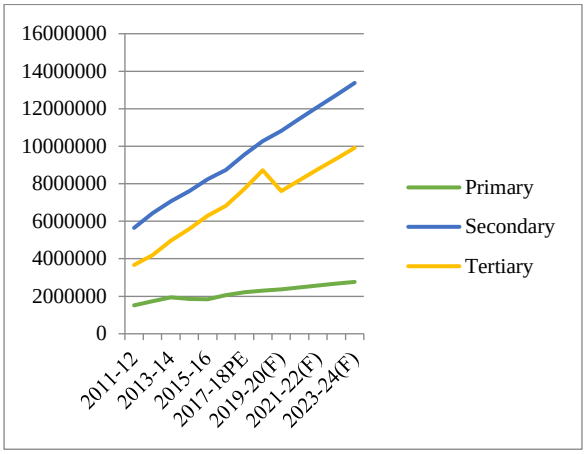
Fig 2.4: Sectoral Contribution to GSDP at Current Prices 2018-19 AE



Source: Calculations are based on data released by DES, GoUK of Uttarakhand -2019

Figure 2.5 indicates an increasing trend in Secondary and Tertiary Sectors. Tertiary Sector has risen parallel to Secondary Sector till 2018-19, however thereafter a slowing trend is seen in tertiary sector and the gap between these two is estimated to become wider. The Primary Sector has shown signs of revival.

Figure 2.5: Trend of Sector Wise Contribution Towards GSDP

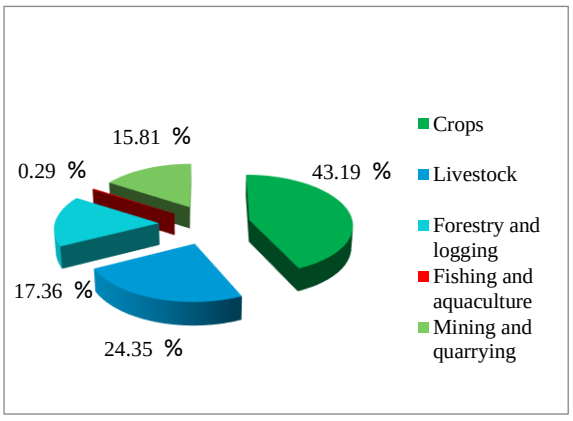


Source: Calculations are based on data released by DES, Government of Uttarakhand

2.2.1 Primary Sector Components of GSDP:

The share of primary sector to GSDP has been reducing though agriculture continues to be the main occupation of 70% rural masse in the State. Agriculture, which is one of the main components of Primary Sector is contributing approximately 84% to the primary sector while the remaining 16% is contributed by mining and quarrying and other allied economic persuits.

Figure 2.6: Primary Sector Components of GSDP at Current Prices in 2018-19

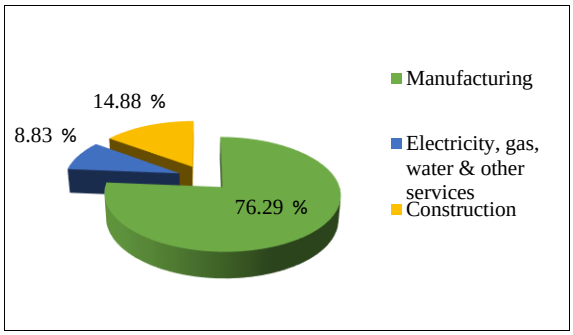


Source: Calculations are based on data released by DES, GoUK

2.2.2 Secondary Sector Components of GSDP:

In 2018-19 (AE), secondary sector contributed maximum to the GSDP at current prices. It includes manufacturing**,** construction, electricity, gas, water and other services with relative shares of 76%, 15% and 9% respectively. The State has an edge in the secondary sector and its potential can be further enhanced.

Figure 2.7: Secondary Sector Components of GSDP at Current Prices in 2018-19

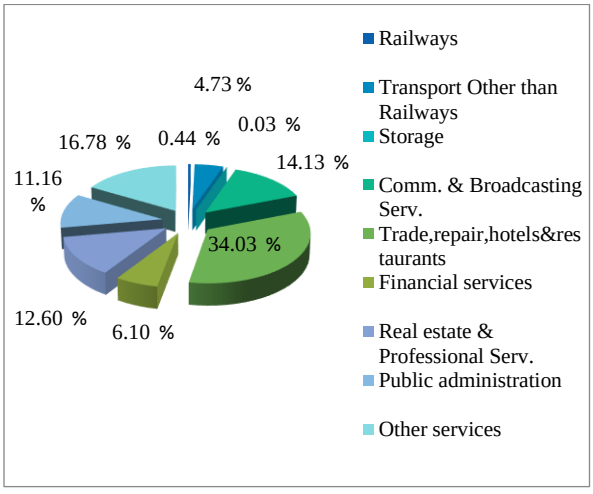


Source: Calculations are based on data released by DES, GoUK of Uttarakhand -2019

2.2.3 Tertiary Sector Components of GSDP:

The advance estimates for the year 2018-19 reveal that the Tertiary Sector's contribution to GSDP is significant and includes transport, storage, trade, repair, hotels and restaurants, financial services, real estate, professional services, and other related services. Contribution of trade, repair, hotels and restaurants is highest because of tourism.

Figure 2.8: Tertiary Sector Components of GSDP at Current Prices in 2018-19



Source: Calculations are based on data released by DES, GoUK

2.3 Gross Fixed Capital Formation:

Capital formation plays a vital role in development of the State's economy and is considered as an indicator of economic development. Capital formation estimates enable decisions for balanced economic development of the State. Gross Capital Formation that is calculated at the national level broadly comprises of public sector, private sector, household sector and valuables. However at the State level, Uttarakhand has estimated and published data on gross fixed capital formation of public sector only, which has been further divided into four asset categories; namely building sector, machinery and equipment, cultivable biological resources and intellectual property products for the period of 2011-12 to 2016-17. The table below shows Gross Fixed Capital Formation for the public sector in Uttarakhand.

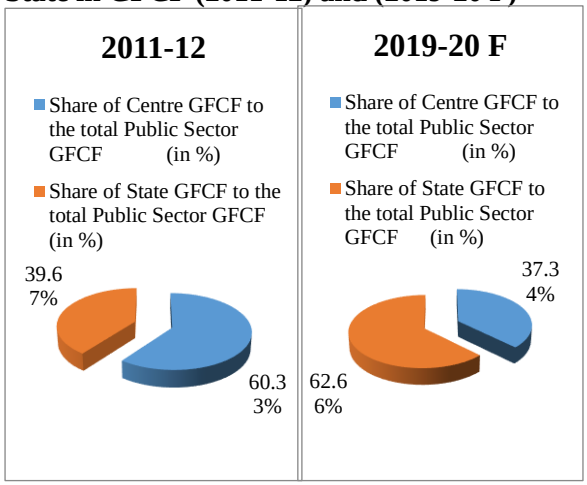
Table 2.1: Gross Fixed Capital Formation (GFCF) Public Sector

Year	Public Sector GFCF (₹Crore)	Index of GFCF (2011-12=100)	Central Share of GFCF (₹ Crore)	Index of Central GFCF (2011-12=100)	State Share of GFCF (₹ Crore)	Index of State GFCF (2011-12=100)	Share of Centre GFCF to the total Public Sector GFCF (in %)	Share of State GFCF to the total Public Sector GFCF (in %)
2011-12	6046	100	3648	100	2398	100	60.33	39.67
2012-13	6851	113	3363	92	3488	145	49.09	50.91
2013-14	8798	146	4451	122	4347	181	50.59	49.41
2014-15	10862	180	3969	109	6892	287	36.54	63.46
2015-16 RE	12150	201	5357	147	6793	283	44.09	55.91
2016-17 PE	14585	241	6075	167	8510	355	41.65	58.35
2017-18 F	15948	264	6241	171	9707	405	39.13	60.87
2018-19 F	17681	292	6745	185	10936	456	38.15	61.85
2019-20 F	19414	321	7248	199	12165	507	37.34	62.66

Source: Calculations are based on data released by DES, Govt. of Uttarakhand.

Table 2.1 reveals that GFCF (public sector) increased from ₹6,046 crores in 2011-12 to ₹14,585 crores in 2016-17(PE) and according to the forecast its value is to further increase to ₹19,414 crores in 2019-20.

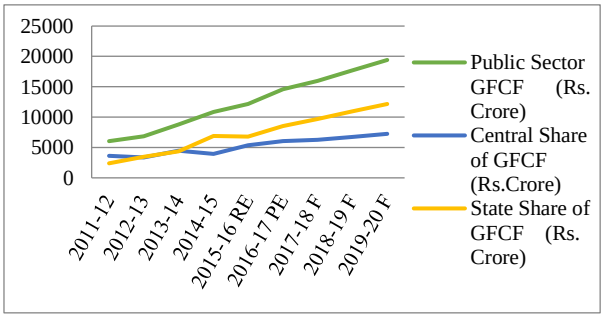
Figure 2.9: Percentage Share of Centre and State in GFCF (2011-12) and (2019-20 F)



Source: Calculations are based on data released by DES, Govt. of Uttarakhand

The Central and State share in the public sector GFCF was 60.33% and 39.67% respectively in 2011-12. However, in 2016-17, Centre's share has significantly declined to 41.65% and the State's increased to 58.35%. This trend is likely to continue for the forecasted period and is estimated at reach 37.34% for Centre and 62.66% for the State in 2019-20. It is a healthy signal for the State that its contribution to public sector GFCF is increasing over time.

Figure 2.10: Gross Fixed Capital Formation (GFCF) Public Sector



Source: Calculations are based on data released by DES, GoUK

2.3.1 Sector Wise Contribution to GFCC:

Table- 2.2 reveals that in absolute terms the Primary, Secondary and Tertiary sector GFCF of the State is increasing during the period 2011-12 to 2019-20. However, in proportionate terms the share of Primary Sector in the public sector GFCF has declined from 12.89% (2011-12) to 11.21% in (2016-17) and to 11.47% for 2019-20 (forecasted value). The share of Secondary Sector has also declined but the Tertiary Sector has gained.

Table 2.2: Sector Wise Contribution to GFCF

Year	Primary Sector GFCF of the State (₹ Crore)	Secondary Sector GFCF of the State (₹Crore)	Tertiary Sector GFCF of the State (₹ Crore)	Share of Primary Sector to the GFCF of the State (in %)	Share of Secondary Sector to the GFCF of the State (in %)	Share of Tertiary Sector to the GFCF of the State (in %)
2011-12	779.00	3470	1797	12.89	57.39	29.72
2012-13	716.00	4110	2025	10.45	59.99	29.56
2013-14	942.00	4710	3147	10.71	53.53	35.76
2014-15	1163.00	5533	4165	10.71	50.94	38.34
2015-16 RE	1542.00	5555	5054	12.69	45.72	41.60
2016-17 PE	1636.00	6742	6207	11.21	46.23	42.56
2017-18 F	1828.07	7172	6948	11.46	44.97	43.57
2018-19 F	2027.61	7787	7867	11.47	44.04	44.49
2019-20 F	2227.15	8401	8785	11.47	43.27	45.25

Source: Calculations are based on data released by DES, Govt. of Uttarakhand

2.3.2 Institution Wise Estimates of GFCF of Public Sectors (Central Share):

Table 2.3: Institution Wise Estimates of GFCF (₹ In Lakhs)

Years	Railways	Communication	Financial Services	Central Autonomous Bodies	Central Dept. Enterprises	Central Govt. Administration	Central Non Dept. Enterprises
2011-12	4693	4962	6262	53363	1253	53558	240721
2012-13	9664	4218	8616	59764	1860	45167	207012
2013-14	7203	6358	9325	68129	2405	112112	239592
2014-15	5881	4574	7575	88124	3969	95468	191343
2015-16 RE	11684	2368	10904	95785	2503	103768	308666
2016-17 PE	16034	2058	12924	114822	3127	128088	330447
2017-18 F	15337	1904	13110	123533	3806	142874	323498
2018-19 F	17093	1280	14208	135972	4173	158069	343650
2019-20 F	18848	655	15306	148410	4541	173263	363803

Source: Calculations are based on data released by DES, Govt. of Uttarakhand

Table 2.3 shows institution wise estimates of GFCF of public sector (Central Share) during 2011-12 to 2016-17 and for the future. It shows that Central non-departmental enterprises followed by Central Government administration and Central Autonomous Bodies have contributed more in GFCF of public sector during the period. Contribution of Communication sector is decreasing in GFCF of public sector during the same period.

2.3.3 Institution Wise Estimates of GFCF from Public Sectors (State's Share):

Table 2.4 shows institution-wise estimates of GFCF of Public sector in the State's share. It is clearly observed that the State public administration is highly important in the GFCF whereas State non-departmental enterprises,

State local bodies and State departmental enterprise are also contributing relatively more than the State autonomous institutions.

Table 2.4: Institution Wise Estimates of GFCF (State's Share) **(₹ In Lakhs)**

Years	State Non Departmental Enterprise	State Autonomous Institutions	State Local Bodies	State Departmental Enterprises	State Public Administration
2011-12	-16599	1507	38934	45515	170478
2012-13	76882	2840	33193	50488	185396
2013-14	79148	7362	32394	40321	275480
2014-15	141193	3099	36180	50282	458464
2015-16 RE	64468	3645	41387	43974	525871
2016-17 PE	95118	3570	61549	51606	639115
2017-18 F	131707	4517	54750	49118	730560
2018-19 F	148375	4759	58792	49715	831920
2019-20 F	165044	5001	62833	50311	933280

Source: Calculations are based on data released by DES, Govt. of Uttarakhand

2.3.4 Assets-Wise GFCF of Uttarakhand:

Table-2.5 shows assets wise GFCF of Uttarakhand in which dwellings and other building structures contribute maximum followed by machinery and equipment, intellectual property produce and cultivated biological resources respectively.

Table 2.5: Asset Wise Estimates of GFCF **(₹ In Lakhs)**

Type of Asset	Dwellings, Other Buildings Structures	Machinery and equipment	Cultivated biological resources	Intellectual Property Produce IPP	Total
2011-12	428074	157662	106	18805	604647
2012-13	452721	212049	355	19975	685100
2013-14	569125	278995	154	31555	879829
2014-15	770673	293532	93	21854	1086152
2015-16 RE	921271	259235	128	34389	1215023
2016-17 RE	1114097	305006	221	39134	1458458
2017-18 F	1213058	340361	159	41137	1594716
2018-19 F	1356981	365870	155	45000	1768006
2019-20 F	1500905	391379	150	48862	1941296

Source: Calculations based on data released by DES, Govt. of Uttarakhand

Capital formation plays a vital role in the development of an economy and is considered as an indicator of economic development of any State or nation. Estimates of capital formation are required to take decision about the balanced development of State economy. Gross Capital Formation is calculated at the national level broadly comprises of public sector, private sector, household sector and valuables, Uttarakhand Government has estimated and published data on gross fixed capital formation of public sector. It is, broadly divided into 4 assets categories - buildings and other building sector, machinery and equipment, cultivable biological resources and intellectual property products for the period 2011-12 to 2016-17.

Hence, other than public sector components, components like private sector, household sector and valuables are excluded in the GFCF estimates of the State. It presents an incomplete picture of State's gross fixed capital formation. Directorate of Economics and Statistics can consider collecting data on other components so that the actual position of GFCF can be studied at the State level.

2.4 Banking Sector:

Banking facilities are extremely important for resource mobilization, development activities and financial inclusion. There are a total of 2,351 branches of all categories of banks in the State as on 30 September 2018. Of these, maximum branches are of public sector banks numbering 1513 followed by cooperative banks-288 and Regional Rural Banks–287. Private banks have 263 branches in Uttarakhand. There is a bank's branch for every 4,290 people of the State as per census 2011.

Table 2.6 shows all key indicators of State banks' performance. Total advances of banks increased during 2016 to 2018 while the credit to deposit ratio fluctuated firstly showing a decline from 2016 to 2017, and then increasing from 2017 to 2018. Share of PSA in total advances decreased during 2016 to 2018. Furthermore, share of agricultural advances in total advances has also decreased from 2016 to 2018. Number of banks' branches increased in absolute terms during 2016 to 2018.

Table 2.6: Key Indicators: All Scheduled Commercial Banks Including RRBs in Uttarakhand State

As On September 2018 : (₹ In Crores)

Sr. No.	PARTICULARS	As On March 2016	As On March 2017	As On March 2018	As On Sept 2018	RBI B. Marks
1	Deposits	91463	109263	116457	124001	
	Growth During The Year	8803	17800	7194	7544	
	Percentage Of Growth During The Year	10.65	19.46	6.58	6.48	
2	Advances Including Investment	58767	61780	64769	66975	
3	Credit+ Investment To Deposit Ratio	64.25	56.54	55.62	54.01	
4	Advances (Within State) (Credit As Per Place Of Sanction)	40208	45594	51423	55121	
	Advances (From Outside State) (Cu)	9640	9741	9355	10114	
	Ridf	4316	5216	5963	6164	
	Total Advances (Cs+Cu+Ridf)	54164	60551	66740	71399	
	Growth During The Year	4520	6387	6189	4659	
	Percentage Growth During The Year	9.10	11.79	10.22	6.98	
5	C.D. Ratio Percentage: Whole State	59.22	55.42	57.31	57.58	60%
	Rural	64.00	58.00	69.00	66.00	
	Semi-Urban	64.00	53.00	50.00	51.00	
	Urban	53.00	55.00	54.00	56.00	
6	Priority Sector Advances (Psa)	28093	28600	30826	30720	
7	Share Of Psa In Total Advances (Percentage)	69.87	62.73	59.95	55.73	40%
8	Agriculture Advances	9711	10968	11081	11427	
9	Share Of Agriculture Adv. In Total Adv (Percentage)	24.15	24.06	21.55	20.73	18%
10	Micro and Small Enterprises(MSE) Adv.	12405	11691	12618	12373	
11	Share Of MSE Adv. In Total Adv (Percentage)	30.85	25.64	24.54	22.45	
12	Advances To Weaker Section	8662	8767	9310	10737	
13	Share Of Weaker Section Adv. In Total Adv. (Percentage)	21.54	19.23	18.10	19.48	10%
14	Dir Advances	61.41	78.15	82.36	10.5	
15	Share Of DRI Adv. In Total Adv. (Percentage)	0.15	0.17	0.16	0.02	1%
16	Advances To Women	2210	2742	3348	3532	
17	Share Of Women Adv. In Total Adv. (Percentage)	5.5	6.01	6.51	6.41	5%
18	Advances To Minorities	6315	7128	4917	5158	
19	Share Of Minorities Adv. In Total Adv. (Percentage)	15.71	15.63	9.56	9.36	
20	Branch Network (In Nos.)					
	A. Rural	1104	1116	1127	1131	
	B. Semi Urban	673	654	606	620	
	C. Urban/Metro	426	499	572	600	
	Total Number Of Branches	2203	2269	2305	2351	

Source: 67th SLBC BOOK

2.4.1 Sector-Wise Credit of Banks:

Table 2.7 represents the sector-wise outlay and achievement of banks upto September 2018, and reveales that non-farm sector achievement is the highest at 53%. Other priority sectors reported 52% achievement. Farm sector achievement was at 31% only. Overall achievement of the State's banks was 41%.

Table 2.7: Sector Wise Bank Outlays

(₹ In Lakhs)

Sector	Outlay	Achievement	Percentage
Crop Loan (a)	7,03,706	2,48,040	35
Term Loan (b)	3,64,345	88,310	24
Farm Sector (a)+(b)	10,68,051	3,36,350	31
Non-Farm Sector	6,10,248	3,22,043	53
Other Priority Sector	3,24,255	1,67,235	52
Total	20,02,554	8,25,628	41

Source: 67thSLBC BOOK As on Septermber 2018

2.4.2 Credit Deposit Ratio of All Banks:

Credit deposit ratio of banks is a gauge of industry's health because it reflects the amount banks lend out of their mobilized deposits. Table 2.8 reveals that the Credit Deposit Ratio of private banks is the highest at 73 followed by cooperative banks at 62, lead and non-lead banks at 49 and finally the Regional rural banks at 45. Nevertheless it is 53 for all banks in the State up to 30 September 2018. As far as sector wise advances are concerned, agricultural advances are maximum provided by the public sector banks followed by cooperative banks, private banks and then the RRBs. Further both public sector banks and private banks are playing significant role in providing advances to the services sector. It is important to note that in the advances made to the weaker sections and SC/ST categories, public sector banks, cooperative and RRBs have played a more vital role than the private banks.

Credit deposit ratio of commercial banks is higher in Uttarakhand at 52% as compared to Himachal Pradesh at 29.3% during 2016-17. These figures indicate that both the States more efforts for investments in various economic sectors are required.

Table 2.8 depicts the current situation of the State banks' performance. This shows an investment allocation to various sectors as on September 2018. Agriculture sector got the highest share of bank investment followed by SMEs and services sectors respectively. Cooperative banks show better allocation than RRBs in agriculture whereas in SMEs and services sectors RRBs allocated better than Cooperative Banks. Total advances made by NABRD under RIDF is reported as ₹6,164 crores till September 2018.

Table 2.8: Bank Performance in Uttarakhand

(₹ In Crore)

S. No	Name of the Bank	No. of Br.	Total Deposits	Total Advances	C:D Ratio	Investmen	Adv+ Inv	C+I:D Ratio	Total Agri	MSE	Serv.	Others	Total $ PSA	Adv. To W/S	SC/ST
1	**Total Lead and Non Lead Bank**	1513	96168	47218	49	1719	48937	51	7404	3235	5809	5586	22033	7377	1431
2	**Total R.R.B.**	287	4725	2135	45	21	2156	46	412	128	449	396	1384	320	395
3	**Total Cooperative**	288	9113	5679	62	0	5679	62	1916	59	683	388	3046	381	656
4	**Total (1+2+3)**	2088	110006	55032	50	1740	56772	52	9731	3422	6940	6370	26464	8078	2481
5	**Total Pvt Bank**	263	13996	10203	73	0	10203	73	1696	576	1435	550	4256	2659	156
6	**All Bank (4+5)**	2351	124001	65235	53	1740	66975	54	11427	3998	8375	6919	30720	10737	2637
7	**RIDF**	0	0	6164	0	0	6164	0	0	0	0	0	0	0	0
8	**Total (6+7)**	2351	124001	71399	58	1740	73139	59	11427	3998	8375	6919	30720	10737	2637

Source: 67thSLBC BOOK *As on Septermber 2018*

2.5 SWOT Analysis for the Economy of Uttarakhand:

SWOT analysis of the economy provides inputs about strengths, opportunities, weaknesses and threats.

STRENGTHS	WEAKNESSES
• High Economic Growth and Per Capita income • Good Social and Human Indicators • Availability of Natural Resources • Relatively Honest and Hardworking People • Peaceful and Healthy environment • Scenic beauty	• Adverse Geographical conditions (Topography of the Hill Region) • Poor Infrastructure and connectivity • Unskilled workforce and low workers' participation • Low capital availability • Low quality of education, specially higher education • Limited availability of relaevent statistics in several areas.
OPPORTUNITIES	**THREATS**
• Hydro and solar power generation • Organic farming and Horticulture including medicinal plants • MSMEs in manufacturing and Agricultural food processing • Tourism - Adventure Sports, Wellness • Information Technology enabled services (ITES)	• Vulnerable Environment • Unemployment and Under employment • Hills-Plains disparity • Limited reach of medical services • Skewed industrialization

It lists, high economic growth and per capita income, good social and human development indicators and availability of natural resources as strengths, hydropower generation, horticulture and organic farming, MSME, tourism etc. as opportunities. Poor infrastructure and connectivity, unskilled workforce as major weaknesses and, vulnerable environment, limited reach of medical care services, hill-plain disparities, and skewed industrialisation as major threats.

Way Forward:

- Uttarakhand witnesses a high per capita income along with a high incidence of poverty and high consumption inequality amongst different population segments. Future policies may address the goal of inclusive growth where the benefits flow down seamlessly even to the most disadvantaged and marginalized sections of the population.
- The primary sector requires focussed attention. With 70% people residing in rural areas of the State, its revival will be a high priority. Expanding the scope of agriculture sector especially horticulture, organic farming, dairy development, establishing food processing industries, strengthening backward and forward linkages and supply chains, are some of the suggested initiaitves.
- Secondary sector has ample scope for further expansions. Particular efforts are required attract SMEs to lower hills using cluster approach.
- Scope in hydro and solar power needs to be actively harnessed to make Uttarakhand a power surplus State.
- Scope in tourism and wellness sectors are huge requiring sustained and systematic efforts to support growth.
- Infrastructure gaps though being addressed, pace of development needs to be accelarated.
- Skills development is the need of the hour. It will promote employment in all sectors of the economy, supporting their envisaged growth.

CHAPTER-3
Review of Fiscal Developments

"A tax collector should collect taxes from a tax payer just like a bee collects honey from a flower in an expert manner without disturbing its petals" **- *Kautilya's Arthashastra***

Abstract:

Good and Services Tax is the biggest indirect tax reform in India since independence. Be it the passing of the State GST Bill or the implementation of e–way bills, the State has been pro-active and faced tough challenges posed by the changes in the tax system. The State recorded tax revenue short falls in the post GST period. The in-built structural design of the Goods and Services Tax, which makes it a destination based tax and the lack of consistency in the tax policy since its inception, are identified as the major reasons for the State's tax revenue short fall in the post GST period. It is in this backdrop, the GST Council needs to have a positive, differential treatment for the State in addition to the assured compensation it provides to Uttarakhand.

While the introduction of e–way bills in the State had solved the problem of un-invoicing to a large extent, further efforts are needed to address the issue of under-invoicing, which is largely responsible for the lesser realization of tax revenue. A consumer centric incentive based approach and focused awareness programmes about GST, particularly among small traders could yield better results in tackling the menace of under-invoicing and boost the revenues of the State.

There is a need to look at the Non-GST tax revenues growth in the years to come and in the recent years the trends of the major non-GST revenues of the State is a matter of concern. Measures like effective supervision and proper imposition of fines and duties could help protect the excise revenues to improve further.

With the adaption of GST, the scope of the State to generate revenues from various taxes has shrunk and thus its capabilities on revenue generation through taxes have become limited. It is in this context, emphasis needs to be laid upon the non-tax revenue, where the State has a larger scope to improvise its revenue collection. Sectors like forestry and wildlife, power, higher education, tourism, tertiaty medical care and urban services offer a plethora of opportunities to improve non-tax revenue of the State.

Alongwith improving the non-tax revenue, there is also a need to effectively manage the State's expenditure with focus on cost recovery and cost efficiency across different sectors. Analysis of the fiscal indicators of the State suggests that fiscal deficit has started rising. The dominance of revenue expenditure component, relative to the capital expenditure, in the composition of State's fiscal deficit is a matter of concern. This could have an impact on the creation of capital stock in the economy and could impact the growth prospects of the State in the long run. A change in the pattern of spending by the State could yield sustainable results on the fiscal deficit front. A modest increase in the capital expenditure and phased compression in the revenue expenditure simultaneously, over a period of time is a better proposition. Emphasis needs to be laid upon bringing in efficiency of running Government departments and targeted reduction on the expenditure front, especially on subsidies. Plugging leakages in the provision of subsidies could further bring down the revenue expenditure.

Improvements in the State's finances could be brought by restructuring the expenditure in such a way that it promotes development expenditure. This in turn would lead to a higher economic growth, which eventually results in sustainable fiscal profile of the State.

3.1 Goods and Services Tax: The Game Changer:

GST regime that started on 1st July 2017 is a major reform in the segment of indirect taxes. The country has moved from one commodity -17 taxes in the past, to one commodity -one tax. It eliminated taxes on production and distribution and now the tax is paid only on final consumption. It is basically a destination-based tax that is collected at the point of consumption.

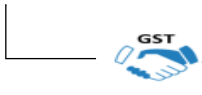
GST is a major step towards making India a common market, after more than seven decades of its independence. The integration of the Indian market as well as the rewiring of supply chains because of GST is expected to lower transaction costs and improve economic efficiency.

Among many changes it brought in, the biggest change that had larger implications for States across India, including Uttarakhand, was the inclusion of sales tax, under GST ambit. As GST is applicable to all the goods and services, with few exemptions, the sales tax also came under GST's ambit, thus leaving the State with lesser options of revenue generation, despite getting a share in tax collections.

Along with the sales tax, many such taxes, which used to contribute largely to the Own Tax Revenue of the State also got incorporated under GST. Table 3.1, provides a list of all the taxes which are subsumed under GST at Central and State level.

Table 3.1: Taxes Covered by the Goods and Services Tax (GST)

Central Tax	State Tax
• Central Excise Duty • Additional duties of excise • Excise duty levied under Medical & Toilet Preparation Act • Additional Duties of customs (CVD & SAD) • Service Tax • Surcharges & Cesses	• State VAT/ Sales Tax • Central Sales Tax • Purchase Tax • Entertainment Tax (other than those levied by local bodies) • Luxury Tax • Entry Tax (All forms) • Taxes on lottery, betting & gambling • Surcharges & Cesses



3.1.1 Uttarakhand's Experience with GST:

Uttarakhand is the fifth State in the country, to pass the State GST Bill, after Telangana, Bihar, Rajasthan and Jharkhand. It paved the way for a simplified system of taxation in the State, in the larger interest of traders and the Government.

Analysing the State's experience with GST since its introduction would help understand the shortcomings and areas with scope for improvement, which could be helpful in further policy making. An attempt is made to bring together the activities and achievements of the State after the implementation of GST regime.

3.1.2 Collection:

With around 66% share in the gross revenue receipts of the State, Trade Tax/Value Added Tax was a major and important source of income of the State. Tax collection of the State, which was ₹233 Crores at the time of creation of the State in the year 2000- 2001, increased about 33 fold to become ₹7,637 crores in year 2017-18.

In the financial year 2018-19, the State Tax Department has earned a total revenue of ₹8796 crore including ₹2843 crore as compensation.

3.1.3 Registration:

During the period between 01 July 2017 and 31 December 2018, a total of 82,934 dealers were registered, whereas 83,104 registered dealers migrated from VAT into the new system. Thus up to 31st December 2018 total number of registered dealers in the State reached 1, 66,038. Among them, a total of 35,041 dealers opted for Composition scheme under GST.

3.1.4 Deemed Assessment Scheme:

For the facilitation of the dealers, Government has implemented a deemed assessment scheme from 30th June 2017 for financial years 2013-14, 2014-15 and 2015-16. Under this scheme a total of 85,172 dealers have been self-assessed for different years.

3.1.5 Tax Friendly Measures:

In view of public interest, VAT rate on Petrol and Diesel was made reasonable vide notification no. 897 dated 04.10.2018, by virtue of which the rate

of tax on Petrol is reduced from 25% or ₹17 per litre, whichever is greater, to 22.07% or ₹14.50 per litre, and the rate of tax on Diesel from 17.48% or ₹9.41 per litre, whichever is greater, is reduced to 13.53% or ₹8.40 per litre.

3.1.6 Measures to Facilitate Manufacturing Units:

On the purchase of Diesel and Natural Gas, input tax credit on the same is not allowed as the said products are in the ambit of VAT which results in the increase of input cost of the manufacturing units. So to rationalize the rate of tax on Diesel and Natural Gas for industrial use, notification dated 29.12.2017 was issued vide which 5% rate of tax is specified on the aforesaid products for manufacturing units. Apart from facilitating the manufacturing units, the measure has also resulted in protection of the revenue of the State.

The MSME units of the State have been facilitated by way of reimbursing them the SGST portion deposited on business to consumer point. The facilitation is important in the context that the manufacturing units which were earlier availing the full rebate of Central Excise are now getting the reimbursement of only 58% of the Central Taxes under GST.

3.1.7 GST Mitra:

Uttarakhand is a mountainous State having tough terrains. Due to this peculiarity, approaching people and creating awareness among small taxpayers of the State is an arduous task. For overcoming this problem a unique concept of GST Mitra has been devised and so far 1189 GST Mitras have been trained. More than 2,022 GST Mitras are assisting traders and over 3,000 workshops with traders have been conducted across the State.

3.1.8 Dealer Insurance Scheme:

In the general interest of dealers, an insurance scheme has been made applicable for a period of one year beginning from 19.11.2018. The scheme covers all the dealers registered with the State tax Department and in case of death of any registered dealer, a claim of ₹5 Lakhs will be provided immediately.

3.1.9 24X7 Help Desk Service:

A 24X7 help desk service is established at the State Tax headquarters as well as in the State Tax offices at Haridwar and Rudrapur for redressal of any difficulty with regard to the provisions of GST especially regarding the preparation of e-way bills.

3.1.10 Immediate Concern:

During the eight month period between July 2017 and March 2018, Uttarakhand recorded a revenue short fall of 39% while the revenue shortfall was 42% for Himachal Pradesh. For the period between April–December 2018, Uttarakhand had a revenue short fall of 35% while Himachal Pradesh recorded a shortfall of 36%.

Persisting trend of shortfall in revenue is a major concern, as it would pose serious challenges in fulfilling the fiscal commitments of the State. The underlying reasons are as follows.

- One of the main reasons for the short fall in revenue is the in-built structural design of the GST. After the implementation of GST, the very principle of taxation has changed from source based tax to destination based tax. Uttarakhand being a manufacturing surplus State, most of the GST is transferred out of the State in the form of IGST.
- Since its implementation, GST rates were sharply brought down many items. As the Economic Survey, 2018-19 went to press, the highest slab of 28% had only 27 categories of products, down from close to 228 at the time of the rollout of GST while 97.5% of commodities are taxed at 18% or less. The frequent changes in the tax rates created policy uncertainty, resulting in lesser revenues.
- During the pre-GST period, majority of the goods were taxed at the rate of 14.5% and 5%, but in post-GST period SGST tax rates have been reduced to 9%, 6% and 2.5% on most of the commodities.
- Uttarakhand does not consume services in a big way. Thus the loss of revenue on goods cannot be compensated by services.

3.1.11 Policy Suggestions:

Majority of reasons mentioned above are exogenous in nature, upon which the State Government has a limited control. However it is pertinent to look beyond these factors and attempt to identify the endogenous factors that could be responsible for the shortfall in GST revenue collection of the State.

- First there is a need to look at this aspect from the angle of tax evasion. In general, it happens in two ways i.e., un-invoicing and under invoicing.
- Government of Uttarakhand made it mandatory to generate e-way bill for intra-State movement of taxable goods of value above ₹50,000 with effect from 20th April, 2018. This initiative, based on Information Technology is largely helpful in tackling tax evasions that are basically of un-invoicing in nature.
- However, the e-way bills could not address the issue of under invoicing, which could be causing substantial tax revenue losses. Hence there is a need to identify sectors where there is a larger scope for under invoicing so that necessary measures could be taken on this front.
- In identifying the under invoicing prone sectors in the State, it would be better if the most important stake holder - the consumer is involved in the process. Better results could be expected by following the consumer incentive based approach.
- The second aspect of looking at the falling tax revenue is to assess the structural changes in the State's economy and their impact on the tax revenues. Further research is needed to enquire into this aspect and resort to corrective measures.
- Endeavours could be undertaken to further widen and speed up creating awareness about GST amongst small traders given the tough terrain of the State. This would help in facilitating tax compliance measures.

Way Forward:

GST is undoubtedly a game changer in India's economy. Uttarakhand has been a front runner in adapting to this new tax regime.

Currently the State is in the process of adapting to the change and attempts are being made to identify shortcomings in achieving tax revenue collection targets under GST. Adequate measures will be taken to overcome the limitations and achieve the targets.

Simplification of some reporting procedures and the rationalization of GST rates is a welcome step. It is expected that the standard rate would converge to around 15% the midpoint of the existing standard rates of 12% and 18%.

As a result of these measures, GST could soon evolve itself into a stable tax system to facilitate tax compliance, ease of tax administration and protection of revenue and it is further expected to bring in stability in the GST system and also promote ease of tax administration. In fact these measures are progressive steps towards realizing India's dream of 'one country one tax.

3.2 Analysis of Non-GST Revenue Growth Dynamics in Uttarakhand:

There is not much ambiguity about the GST revenues, since the State Governments are assured of 14% revenue growth for 5 years, as far as taxes which are subsumed under GST, according to GST law. It is in this context that there is a need to look at the Non-GST Own Tax Revenue (OTR) growth in the years to come. This section lays emphasis on the growth and the magnitude of the Non-GST OTR of Uttarakhand State. An attempt is made to estimate the composition of Non-GST tax revenues in the OTR of Uttarakhand and predict their growth till 2022.

A detailed explanation of the classification of the GST and Non-GST revenues with the respective budget codes and categories are explained in Appendix-I while details of the total tax revenues (TTR), OTR and Non-GST OTR of Uttarakhand is provided in table 3.2.1.

Table 3.2.1: TTR, OTR and Non-GST Revenues of the State: (₹ In Crores)

Year	Total Tax Revenue (TTR)	Own Tax Revenue (OTR)	OTR as % of TTR	Major Non-GST Revenues			
				State Excise	State Excise % OTR	Stamps and Registration Fees	Stamps and Registration Fees % OTR
2002-2003	1393.23	1079.11	77.45	245.86	24.12	123.35	12.10
2003-2004	1660.99	1227.76	73.92	273.37	22.27	168.94	13.76
2004-2005	1964.32	1444.34	73.53	292.01	20.22	207.80	14.39
2005-2006	2794.51	1784.68	63.86	292.75	16.40	333.39	18.68
2006-2007	3645.61	2513.78	68.95	372.91	14.83	546.32	21.73
2007-2008	4166.45	2738.70	65.73	441.56	16.12	424.27	15.49
2008-2009	4551.50	3044.91	66.90	528.35	17.35	357.46	11.74
2009-2010	5109.05	3559.04	69.66	704.64	19.80	398.70	11.20
2010-2011	6865.55	4405.48	64.17	755.92	17.16	439.50	9.99
2011-2012	8481.66	5615.62	66.21	843.65	15.03	524.05	9.34
2012-2013	9687.13	6414.25	66.22	1117.92	17.43	648.40	10.10
2013-2014	10928.72	7355.34	67.30	1269.29	17.26	686.71	9.34
2014-2015	12130.77	8338.47	68.74	1486.66	17.83	714.06	8.56
2015-2016	14710.98	9377.79	63.75	1735.39	18.50	870.67	9.28
2016-2017	17308.88	10897.31	62.96	1905.54	17.49	777.58	7.12
2017-2018	17249.83	10164.93	58.93	2261.68	22.25	882.26	8.68

Sources: i) Budget Documents, Government of Uttarakhand; ii) Department of Excise Duty, Government of Uttarakhand iii) Department of Stamps and Registration, Government of Uttarakhand

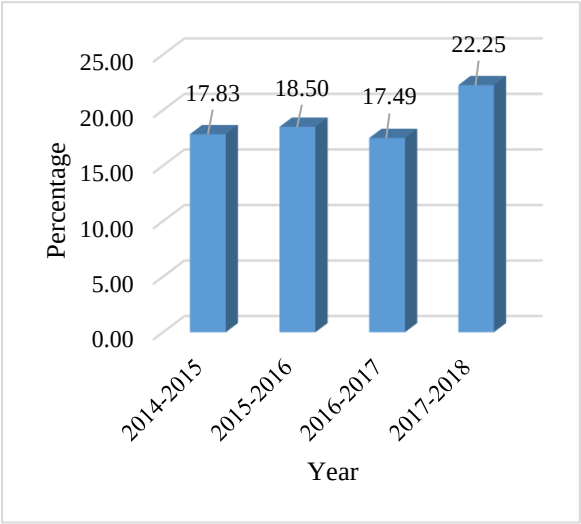
TTR has witnessed an increasing trend as the collections rose from ₹1393.23 crores in 2002-03 to ₹17249.83 crores in 2016-17. On the other hand Uttarakhand's OTR has been growing in absolute terms between 2002-03 and 2017-18. The State's OTR jumped from ₹1079.11 crores during 2002-03 to ₹10164.93 crores during 2017-18.

However this growth as a percentage of Total Tax Revenue is not consistent for the same period. Pertinent point to be noted here is that OTR as a percentage of TTR was 63.75% during 2015-16. It declined to 62.96% during 2016-17 and further declined to 58.93% 2017-18.

3.2.1 Trends in the Non-GST Revenues:

Major Non-GST Revenues of the State, consisting of State Excise and Stamps and Registration fees have been analysed from 2002-03 to 2017-18. Although the revenue from the State excise has gone up from 17.83% of OTR in 2014-15 to 18.50% in 2015-16, it fell to 17.49% in 2016-17. However there is an improvement in the state excise as a percentage of OTR, as it increased to 22.25% during 2017-18, as suggested by Figure 3.2.1.

Figure 3.2.1: State Excise as a percentage of Own Tax Revenue (OTR)



Source: Department of Excise Duty, Government of Uttarakhand

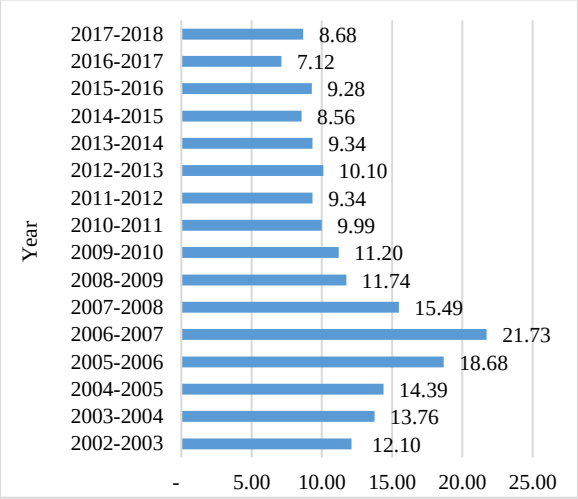
The revenues from excise duty can be further improved by focusing on preventing the loss of tax revenue, which could have larger implecations for the State's exchequer.

Infact the large-scale loss could be avoided further, by effective supervision and proper imposition of fines and duties.

3.2.2 Stamps and Registration Fees:

Stamps and Registration Fees as a percentage of OTR witnessed an increased trend from 2002-03 to 2006-07. It rose from 12.10% to 21.73% during this period. Except during 2012-13 and 2015-16, it registered a declining trend from 2007-08 and continued this trend till 2016-17 , to touch 7.12%. But in 2017-18, the State earned stamps and registration fees of ₹882.26 crore and the Stamps and Registration Fees as a percentage of OTR improved to 8.68%.

Figure 3.2.2: Stamps and Registration Fees as a percentage of Own Tax Revenue (OTR)



Source: Department of Stamps and Registration, Government of Uttarakhand

Although it is a good news that the stmaps and registration fees as a percentage of OTR has improved during 2017-18, it is still a matter of concern that it is low when compared to the levels of 2002-03, which was 12.10%.There could be two possible explanations for this trend. The first being a significant increase in the Total Tax Revenue of the State, relative to the revenues from stamps and registration fees. The second reason could be a real fall in the revenues on Stamps and Registration. In case the second reason, there is an urgent need to arrest the fall as this is an important source of revenue. The following measures can be considered.

3.2.3 Measures:

1. Measures to be taken to arrest the revenue losses occurring due to the Non/short levy of stamp duty and registration fees and mitigate the losses that are caused due to non-registration of instruments, which are compulsorily registerable.
2. Fully computerize the Stamp and Registration department and ensure the registration of documents electronically.
3. Effective supervision and monitoring over the under valuation of properties during registration.

3.2.4 Projections of Revenues from Major Taxes of the State:

The tax revenues are predicted for the period 2018-19 to 2022-23 assuming two scenarios and presented in Table 3.3.1 Under scenario one, the tax revenues are estimated based on the linear regression model and the results suggests that it is expected to grow linearly with time trend.

Under scenario two, tax revenues are expected to grow by 10 percentage points annually. The rationale for these scenarios comes from the historical growth trends observed in the tax revenues over the years since the inception of the State. Since tax revenues of the State are determined by various factors, these two possible scenarios present the tax revenues growth based on historical trends and under the conditions of *ceteris paribus*.

Table 3.2.2: Projections of Revenues from Major Taxes of the State

(₹ in Crores)

	Year	Total Tax Revenue (TTR)	Own Tax Revenue (OTR)	OTR as % of TTR	Major Non-GST Revenues			
					State Excise	State Excise % OTR	Stamps and Registration Fees	Stamps and Registration Fees % of OTR
Scenario-01	2018-19	19 933.69	12947.54	64.95	2272.82	17.55	936.71	7.23
	2019-20	21521.49	13966.05	64.89	2453.16	17.57	991.25	7.10
	2020-21	23109.29	14984.56	64.84	2633.49	17.57	1045.79	6.98
	2021-22	24697.09	16003.07	64.80	2813.82	17.58	1100.33	6.88
	2022-23	26284.89	17021.58	64.76	2994.16	17.59	1154.87	6.78
Scenario-02	2018-19	22588.64	14795.18	65.50	2541.00	17.17	946.18	6.40
	2019-20	24847.51	13966.05	56.21	2795.10	20.01	1040.79	7.45
	2020-21	27332.26	14984.56	54.82	3074.61	20.52	1144.87	7.64
	2021-22	30065.48	16003.07	53.23	3382.07	21.13	1259.36	7.87
	2022-23	33072.03	17021.58	51.47	3720.28	21.86	1385.30	8.14

Source: Calculations based on data released by DES, Govt. of Uttarakhand-2019

The estimates under scenario 01 suggest that the Total Tax Revenue (TTR) of the State is expected to be ₹19,933.69 crores and could reach ₹26,284.89 crores by 2022-23. On the other hand the Own Tax Revenues of the State is expected to be ₹ 12,947.54 crores in 2018-19, which accounts for 64.95% of TTR. It is expected to be ₹ 17,021.58 crores by 2022-23, which would be equal to 64.76% of TTR. The projected OTR as a percentage of TTR is lesser in comparison to its previous year's values, due to the impact of historical trends in the past data. Similar trend could be observed in the case of the stamps and registration fees as a percentage of OTR. It is estimated to be 7.23% in 2018-19 and 6.78% in 2022-23. However it is pertinent to note here that despite the changes in the relative values, the absolute values of all the variables like TTR, OTR and the major non-GST revenues tend to be showing an increasing trend, which is a positive sign for future revenues.

The estimates under scenario 02 suggest that the Total Tax Revenue (TTR) of the State is expected to be ₹22,588.64 crores and could reach ₹33,072.03 crore by 2022-23. On the other hand the Own Tax Revenues of the State are expected to be ₹14,795.18 crores in 2018-19, which accounts for 65.50% of TTR. It is expected to be ₹17,021.58 crores by 2022-23, which would be equal to 51.47% of TTR.

The major non-GST revenues, the State excise and stamps and registration fees are estimated to be ₹2,541.00 crores and ₹946.18 crores respectively, during 2018-19. They are expected to touch ₹3,720.28 crores and ₹1,385.30 crores by 2022-23 respectively.

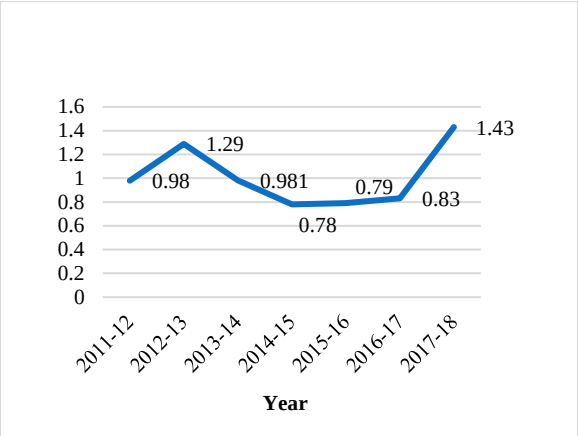
The estimates under both the scenarios could lead to an inference that the TTR of the State during 2018-19 could possibly lie between ₹19,933.69 cores and ₹22,588.64 crores. By 2022-23, it can be expected to be between ₹26,284.89 crores and ₹33,072.03 crores.

Similarly, the OTR of the State during 2018-19 could possibly lie between ₹12,947.54 cores and ₹14,795.18 crores. By 2022-23, it can be expected to be ₹17,021.58 crores.

3.3 Non-Tax Revenues:

Non-Tax revenue plays an important role in the State's finances. However, Uttarakhand's Non-Tax revenues as a percentage of GSDP has been following a trend that is not consistent, as depicted in Figure 3.3.1

Figure 3.3.1: Trends of the Non-Tax Revenue as a percentage of GSDP



Source: Budget Documents, Government of Uttarakhand

Non-Tax revenue as a percentage of GSDP was 0.98% of GSDPP in 2011-12, which improved to 1.29% in 2012-13. However it declined in 2012-13 and 2014-15, to touch 0.78%. In 2015-16, there was a slight recovery and by 2017-18, the Non-Tax Revenues as a percentage of GSDP stood at 1.43%.

As the non-tax revenue is generated from a variety of sources, pin pointing the underlying causes for the inconsistencies could be increasingly difficult. However there are larger possibilities to bring improvement in the realization of non-tax revenues. This could be done by identifying the sectors that have the scope and potential for further revenue generation and achieving cost effectiveness.

The following sectors offer wide range of opportunities for the same.

3.3.1 Forestry and Wild Life:

Almost half of land area in Uttarakhand is covered with forests. Though tree cutting is banned, it still has huge potential to generate revenue. However, at present revenue from forests is far less than the expenditure of the Forest Department. Some suggestions to augment revenue from forest sourare as follows.

1. If accountability is enhanced at every stage of processing of forest produce, and auction procedures are streamlined, there is a large scope for improvement of revenue receipts on this front.
2. There are several successful initiative to tap eco-tourism as a sustainable revenue source for the forest department, which can be taken up also in public private partnership mode, in which case it should be ensured that the private players do not violate the environmental regulations of the State.
3. Valuation of ecosystem services flowing from Uttarakhand for incorporation into national accounting – the green bonus.
4. The State envisages bringing in best practices to sustainably manage, expand and develop a value chain for forest industry, which would not only create jobs but also improve revenue generating potential. These value chains, in turn could be supported by market linkages.
5. The Government is contemplating to exclusively develop Small and Medium Forest Enterprises (SMFEs) to boost revenues, in line with the practices of many developing countries across the world. Thus, endeavours would be made to develop an eco-system that promotes employment and revenue generation from forests in the State.

Strategies would be designed and implemented to bridge the gap between ever growing demand for forest products of the State and the existing supply, by incorporating better forest management practices. For instance, **Mexico** successfully developed commercial community forestry enterprises, around both non timber and timber products, with the funding of the World Bank. These enterprises became the poster boy of success. Government there could achieve this feat by actively involving the forest communities in this project. **Liberia** developed a system, which keeps track of the timber from the forests till the point of export, using data forms and bar codes. It was done with funding from the World Bank and this system helped the country to gain $27 million net tax revenue between 2008-2012

Hence, by learning from the best practices in forest management from different parts of the world and adapting them to suit the State, reforms are envisaged on the front of forest resource protection and monitoring, through use of technological interventions, which could go a long way in securing revenue generation from the forests.

3.3.2 Power:

Power sector contributes a major share to the non-tax revenue of the State. Revenues in this segment could be further improved by following measures aimed at bringing down operational costs and arresting the theft of electricity.

1. Improving the distributional and operational efficiency
2. Rehabilitation or closure of plants with low plant load factor and high station rate.
3. Ensuring the high precision and tamper proof metering of customers from all categories could help prevent tampering of the meters and could help prevent revenue loss.
4. Review & upward revision of electricity duty.

3.3.3 Education:

Education is a public good, largely associated with the human development. In general, expenditure on education yields results over a long run. Government expenditure on education in Uttarakhand is equivalent, if not more as compared to the highest spending States in the country. However, it is still possible to generate revenues or at least recover the costs to certain extent by adopting certain measures. These measures can be applied in the field of higher education. The following measures could yield dividends.

1. Revision of tuition fee in the Government institutions of higher education on an incremental basis every year. To address the concerns of the economically backward classes, provision of simplified procedures for educational loans may be made available. For students below poverty line, there can be a relaxation. This would assure higher revenue, improve student accountability & commitment.
2. Higher Education Institutions of the State may have paid seats, with their fee nearly equivalent to the market rates for the respective courses.
3. Government Colleges and Universities to be encouraged to raise additional revenues by starting self-financing courses, that help the students in skill development and also provide them employment opportunities.
4. Providing incentives to the faculty members in Universities, and to both Government and aided colleges, to apply and get research projects, external funding, taking up consultancy projects that could generate additional revenues.
5. Encouraging higher educational institutions to start, maintain and strengthen the Alumni Associations and seeking alumni donations to improve the finances of the educational institutions. Many public institutions in India and abroad are successfully applying this concept. This task could be facilitated by the official social media handles of the respective institutions.

3.3.4 Municipal Finances:

At present municipal bodies in the State are hugely depended on state for their upkeep. The revenue generated by them is just not enough to sustain these bodies. There are several success stories in India and elsewhere showcasing successes of ULBs who have even been successful to generate suplus revenue for development activities. Some of the suggestions are as follows.

1. Property tax is an important source of revenue for urban local bodies (ULB). Universalization of the use of technology to map and measure properties, generation of computerised demand notices, monitoring of payments and follow-up using available communication means will bolster the finances of ULB thus reducing the strain on the State to some extent.
2. ULBs may be encouraged to designate and develop parking areas for vehicles and auction these parking lots to contractors who charge annually designated parking fee. This measure

can generate additional revenue for the ULBs.

3. ULBs could contract and train traffic wardens who could be responsible for their designated wards to check traffic violations, unauthorised parking and encroachments on roads and pavements. Traffic wardens would be authorised to issue violation tickets, which can be paid online by the violators. In case of serious violations, matters could be referred to the traffic police for follow-up. The traffic wardens would be provided with helmet-mounted cameras fitted with Wi-Fi devices to share visuals of traffic violations in real time. This measure will not only provide additional revenue to the ULBs but will improve traffic flow, reduce encroachment and allow the ULBs to create better facilities in public spaces including pavements, facilities for the disabled, playgrounds and recreation spaces for residents and visitors.
4. Restoration and maintenance of heritage buildings and structures and places of tourist interest coupled with visitor tickets could be another source of steady revenue for ULBs.

3.4 Fiscal Indicators of the State:

3.4.1 Expenditure:

The task of analysing the State's finances remains incomplete without a discussion on the expenditure side. Table 3.4 indicates that the revenue expenditure of the State as a percentage of GSDP was 13.03% in 2015-16, and decreased slightly to 12.95% in 2016-17. However it again raised to 13.05% in 2017-18, which is a major concern. This level is infact higher than what it was during 2015-16.

Table 3.4: Revenue and Capital Expenditure

as a Percentage of GSDP at Constant Prices (2011-2012 as the base year):

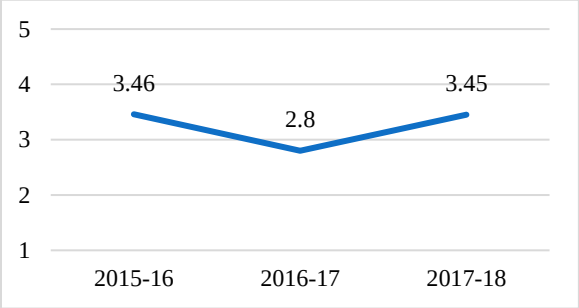
	2015-2016	2016-2017	2017-2018
Revenue Expenditure	13.03	12.95	13.05
Capital Expenditure	2.38	2.54	2.65

Source: Directorate of Budget, Government of Uttarakhand

On the other hand, capital expenditure which was at 2.38% of the States' GDP in 2015-16, increased to 2.54% in 2016-17 and further raised to 2.65% in 2017-18. The changes in revenue expenditure and capital expenditure are reflected in the deficit figures in Table 3.4.

3.4.2 Deficits:

Figure 3.4: Fiscal Deficit as a percentage of GSDP



Source: Directorate of Budget, Government of Uttarakhand

Figure 3.4 indicates that the fiscal deficit, which was 3.46% of GSDP in 2015-16 reduced to 2.8% in 2016-17. This fall could be largely attributed to the reduction in the revenue expenditure as a percentage of GSDP during the same period.

However the fiscal deficit increased to 3.45% in 2017-18. The increase in the fiscal deficit can be better understood by analysing the data on capital expenditure and revenue expenditure presented in table 3.4. Although there is a year-by-year increase in the capital expenditure as a percentage of GSDP, its comparision to that of revenue expenditure reveals that the revenue expenditure component still dominate the fiscal deficit composition and there is still a further scope of improvement for the capital expenditure part. On the other hand, sustaining the current levels of fiscal deficit is a bigger challenge at a time when the tax revenues are volatile due to a change in the indirect tax regime along with the large fiscal commitments of the State.

3.4.3 Policy Suggestions:

Lower levels of capital expenditure could have an impact on the creation of capital stock in the economy and could affect the growth prospects of the State in the long run. A change in the pattern of spending by the State could yield sustainable results in relation to fiscal deficit and its composition. A modest increase in the capital expenditure and phased compression in the

revenue expenditure simultaneously, over a period of time is a better proposition.

Emphasis could be laid upon bringing in efficiency of running Government departments and target bound reduction in expenditure on subsidies. Plugging leakages in the provision of subsidies could further bring down the revenue expenditure.

Efforts need to be made to bring in improvement in the State's finances by restructuring the expenditure in such a way that it promotes development expenditure. This in turn would lead to higher economic growth, which eventually results in sustainable fiscal profile of the State.

3.5 Conclusions and Policy Intentions:

Indian Constitution clearly demarcates the distribution of tax powers between the Centre and the States. Given the delineations provided in the Constitution of India, State has a limitation on generating tax revenues within the ambit of its powers. It is in this backdrop that the Goods and Services Tax regime started in July 2017 and the taxes that used to largely contribute to the State's own tax revenue came under GST's ambit. The State envisages digging deeper into the existing tax base, subject to constitutional limitations, by resorting to measures to ensure high tax compliance of indirect taxes in the State by improved supervisory and monitoring mechanism.

At a time when the major sources of own tax revenues of the State have been included under GST, achieving significant improvement in the non-GST revenues of the State is a major challenge . Efforts will be made to improve the share of the non-GST revenue in the Own Tax Revenue by addressing the institutional and structural issues of the tax collection mechanisms in the State. Non-tax revenues would be boosted by emphasis on cost efficiency and cost recovery in sectors with potential.

The State envisions keeping the fiscal deficit well within the limits set by the FRBM Act and aims at achieving the fiscal deficit targets that are sustainable. Improving the capital expenditure that could ensure economic growth, coupled with measured and calculated reduction in the revenue expenditure appears to be the way ahead in realising sustainable fiscal conditions of the State. While the country braces towards making new strides in realizing India's dream of 'one country-one tax', the State is in the process of taking progressive steps by making necessary institutional arrangements, in order to cope up with the ongoing fiscal reforms.

CHAPTER - 4
Growth Drivers
4.1 Horticulture

Abstract

A new revolution, the horticulture revolution has begun in India. What has been an ancillary to food grain production has grown astonishingly large to overtake it. From a production level of 145 million tonnes/year at the beginning of millennium, it has reached to 305.4 million tonnes/year in 2017-18 surpassing the food grain production (279.5 million tonnes in 2017-18), by several million tonnes. The horticulture sector has now established itself as one of the largest export earners, employer and poverty alleviator, particularly for poor and marginal farmers.

By virtue of its sheer size, growth and income potential, horticulture is fast moving from rural confines to becoming a commercial venture. It is time to nurture this shift, to realise its full potential in a secure, systematic and sustainable manner.

By virtue of its ecological and climatic advantages, Uttarakhand has been a key player in national horticulture revolution. The horticulture sector has received a boost after year 2000 when financial, technical and managerial support from the State started pouring in. There was a perceptible shift to horticulture practices, particularly of medicinal plants, fruits, vegetables, flowers, organic farming, spices etc. At present, about 2.83 lakh hectare of land is under horticulture. The State intends to increase this to 4.95 lakh ha by the year 2030. The annual turnover of horticulture crops in the State is approximately ₹2300 crores. Of total production of 16.92 lakh MT of horticultural crops, fruits contribute 6.59 lakh MT, vegetables 5.87 lakh MT, potato 3.60 lakh MT and spices and flowers contribute rest. Uttarakhand leads in the production of several fruits like Pear, Peach, Plum and Apple, Spices and Walnut in the country. However, the State needs to augment its food processing capabilities to add value and reduce wastage for the benefit of growers and strengthen its manufacturing base.

The State has the required infrastructure base to promote horticulture. However, it needs to introduce modern practices, high value and high yielding variety crops. There is also a need to revitalise this infrastructure and redeploy the personnel in mission mode to realise the envisaged State goals of horticultural development. Some key strategies to achieve Vision 2030 targets are:

1. *Identify horticultural crops, MAP and flowers suitable to be grown in UK climatic zones;*
2. *Develop planting material and establish district level demonstration plots/training centres;*
3. *Train farmers in planting and care of horticultural crops;*
4. *Provide good quality planting material and handhold farmers;*
5. *Establish backward and forward linkages; strengthen supply chains in each district;*
6. *Develop agri-horti food processing units/clusters.*

Several structural and programmatic challenges require to be addressed by the Government to overcome constraints in growth.

4.1.1 Introduction:

Out of a total geographical area of 5.35 million hectare in the State, 4.6 million hectare (86%) is hilly area and 0.74 million hectare (14%) is the plain area. About 6.98 lakh hectare of land is under agriculture, which is 11.65% of total area. Out of which, 2.83 lakh hectare of land is under horticulture[1].

The share of net sown area is only about 14% as against the National Average of 43.37%. It is mainly due to the topographical challenges and limited irrigation facilities particularly in the hilly areas. However, because of its diverse climatic zones, the State has certain unique advantages to develop its horticulture sector with focus on organic farming, cultivation of vegetables that are off-season in the country, cultivation of medicinal and aromatic plants, which can be gainfully exploited and promoting agro-processing industries.

The share of cultivable wasteland is about 7%, which again offers good potential for fodder and related produce.

The total number of land holdings are 9,21,554 out of which 6,58,214 (71.4%) are marginal farmers, 1,62,881 (17.7%) small farmers and 1,00,459 (10.9%) farmers hold land above 2 hectare[2]. The share of small and marginal holdings is higher in Uttarakhand as compared to the National Average. The agriculture sector in the State, particularly in the hill districts, continues to remain heavily dependent on rainfall. The net Irrigated area in the State is 3.45 lakh ha, out of which 85.83% is in plains and 14.17% in hills. The irrigation intensity in the State is 159%, which varies between 155% in plains to 184% in the hilly region. Since the year 2000, when the State was created, food grain production has gone down by 6% and land under cultivation reduced by 11%, while in neighbouring Himachal Pradesh, having similar mountainous terrain, during the same period food-grain production has increased by 29% and in the country as a whole by 28%.

4.1.2 Horticulture Profile:

The State is producing a variety of horticultural produce, including a wide range of temperate fruits like apple, pear, peach, plum, apricot and subtropical fruits like mango, guava, citrus, litchi etc. besides medicinal and aromatic plants, flowers, mushrooms, plantation crops and vegetables. Apart from these, well-known fruits, various spices, and millets etc. are also being cultivated in some pockets of the State.

There is a perceptible shift in the concept of horticulture development in the State. Horticulture development is acknowledged as one of the growth drivers and a number of programmes have been implemented in the past, resulting in realisation of higher income of farmers. The growth in horticulture sector can be attributed to various initiatives undertaken by the State Horticulture Mission and several schemes of Govt. of India such as, Prime Minister's Developmental Package, High-Density Plantation Programme and Pradhan Mantri Krishi Sampada Yojna. Under these schemes, due attention is given to establishment of high-density orchards, better post-harvest management, establishment of fruit mandis, and creating *Controlled Atmospheric Storage* facilities. Further, establishment of fruit/vegetables processing units, technological support, awareness/publicity initiatives, research and extension etc. were also given due importance. Encouraged by the outcomes and future potential, the State intends to increase the land area under horticulture to 4.95 lakh has by the year 2030.

The annual turnover of horticulture crops in the State is approximately ₹2300 crore, which is more than 30% of the State's agriculture sector in GSDP. Of total production of 16.92 lakh MT horticultural crops, fruits contribute 6.59 lakh

[1] http://agriculture.uk.gov.in/files/agriculture_proposed_draft_policy_1.pdf

[2] http://shm.uk.gov.in/pages/display/6-state-profile

MT, vegetables 5.87 lakh MT, and potato 3.60 lakh MT. The rest is contributed by spices and flowers.

The State offers a wide range of benefits to horticulturists in terms of interest incentives, financial assistance, subsidies and concessions.

The geographical attributes and climatic conditions of the State are ideal for the production of temperate and subtropical fruit crops. At present, in hilly areas, fruits like apple, pear, peach, plum, apricot and walnut are produced. While mango, litchi, malta, oranges, lemon, aonla, guava, and pomegranate are grown. in terai and valley areas. Major vegetables grown in the State are potato, cauliflower, tomato, onion, brinjal, pea, cabbage and okra. The State has a unique advantage for producing off-season vegetables in hilly areas, which can fetch good prices in the market. Major spices produced in the State are, ginger, garlic, turmeric and chilly. Details of the area under different crops, production and productivity of major Horticulture crops in the State are shown in table 4.1.1.

Table 4.1.1: Area Under Different Crops in the State for 2017-18

Crops	Area (lakhs ha)	Prodn. (lakhs MT)	Productivity (MT/ha) State	Productivity (MT/ ha) National Level	Rank in the Country Productivity	Rank in the Country Production
Fruits	1.77	6.62	3.76	11.70	30th	18th
Vegetables (incl. Potatoes)	0.91	9.44	10.52	17.30	23th	19th
Spices	0.12	0.876	6.82	1.80	01st	19th
Flowers	0.014	Loose-0.027, Cut-1565 L		-	-	Overall 8th; 2nd in cut flowers
Total	**2.826**	**16.99**				

Source: Ministry of Agriculture and Farmer Welfare GoI, http://agricoop.nic.in/sites/default/files/2017-18-%28Final%29_updt.pdf

4.1.3 Horticulture Infrastructure:

The State has the required infrastructure to promote growth of horticulture. It has ninety four Government nurseries for production of quality planting material and seeds. Of these, twenty four nurseries are developed as state-of-the-art gardens. Three hundred and ninteen horticulture mobile teams (Input Centres) are operational for distribution of horticulture material and dissemination of technical and managerial information to the farmers. Fifty community fruit preservation- cum- training centres are established. There are three pasteurized compost production centres at Dehradun, Jeolikot and Bhimtal in Nainital for the promotion of Mushroom cultivation. Two horticulture training centres at Chaubatia and Srinagar are working at present and two new centres are being set up at Kashipur (USN) and Jarmola (Uttarkashi). Honey production centre at Jeolikot, Nainital. Uttarakhand Horticulture Marketing Board. State Horticulture and Forestry University at Bharsar (Pauri) and Agriculture and Technology University at Pantnagar and thriteen Krishi Vigyan Kendras are established for the dissemination of technology and extension services.

Rank of Uttarakhand in Horticulture Production in India

- First in the country in production of Pear (1.02 lakh MT), Peach (0.48 lakh MT) and Plum (0.38 lakh MT)
- First in productivity of spices (7.2 MT/hectare) in the country. The national average is 1.80 MT/hectare
- Second in the country in production of Walnut (0.21 lakh MT) J&K has 1st rank (2.61 lakh MT)
- Third in the country in the production of Apples (0.91 lakh MT). Leading States are J&K (13.48 lakh MT) and HP (4.12 lakh MT)
- Eighth rank in the country in the production of cut flowers (14.70 crore spikes)
- Eighteenth rank in the country in establishing food processing units.

Sources: (State Horticulture mission website) http://shm.uk.gov.in/pages/display/6-state-profile and ttps://investuttarakhand.com/themes/backend/uploads/IP-UK-Horticulture%20Sector%20Profile-2018-09-10.pdf

4.1.4 Issues and Challenges:

In spite of significant efforts by the State, there are several issues and challenges in the growth of horticulture sector. Prominent among these are:

- Lack of climatic zone specific data on soil, water and weather conditions
- Cold chain issues,
- Marketing
- Transportation
- Post-harvest processing
- Packaging,
- Technology,
- Quality and safety,
- Supply chain efficiency,
- Financial,
- Climate Change
- Infrastructure,
- Farmer's knowledge and awareness,

Some of these are chronic and some have emerged over time. and need to be assessed carefully and addressed.

4.1.4.1 Climatic Zone Specific Horticulture Development Plans Based Empirical Data:

Uttarakhand needs to identify horticulture and vegetable crop clusters with the help of climatic data. Paucity of necessary data of the State, such as humidity, soil pH value, soil type and fertility status etc. needs to be overcome at the very earliest.

The State Horticulture Department may give top priority to conduct a survey to collect climatic zone specific data, which will act as the basis for preparing climatic zone specific horticulture development plans.

Farmers in each of the climatic zones may be encouraged and supported to plant and grow crops suitable for respective climatic zones. They may be provided real time weather and market data to help them to be better prepared for changing weather conditions as well gets best possible value for their crops.

4.1.4.2 Cold Chain:

Development of Cold chain infrastructure at suitable locations in the vicinity of major horticulture production and processing belts is the key ingredient for the growth of sector. At present twenty four cold chain projects with a total installed capacity of 254108 MT are underway in the State. Of the 15 cold storages already functional, 1 is in cooperative sector, 2 in the public sector and 12 in the private sector. Besides, one Controlled Atmosphere (CA) storage has been set up by private sector for storage of apples in Nawgaun, district Uttarkashi. There is need to assess their utilization against the installed capacity. Also, a mapping exercise will help in identifying and bridging the gaps in cold chain in the State.

4.1.4.3 Marketing:

One of the main issues in the marketing of horticultural produce is a large number of local traders and intermediaries who corner a disproportionate share of income from its sale. The State has taken several measures to facilitate the marketing of agriculture and horticulture produce . Uttarakhand Krishi Utpadan Mandi Parisad (UKUMP) is the nodal agency responsible for agricultural marketing in the State. UKUMP has a created State-wide network for marketing of agricultural produce with *25 principal market yards, 31 sub market yards and 27 weekly markets*. To ensure marketing of horticulture produce, 18 separate marketing yards have been established in the State.- Three wholesale markets have been established under Mini Mission – III of HMNEH at Dehradun, Haldwani and Haridwar. Under RKVY, 3 *Farmer- Consumer- Markets* have been setup in Dehradun Government has also established a separate *Uttarakhand Horticulture Marketing Board* to assist farmers in marketing of their horticulture produce. The State Government has amended the APMC Act, in line with Model Act-2003. The amended Act facilitates setting up of private markets, farmer consumer markets, contract farming, e-trading etc.

However, there is need to study the functioning of these markets and cooperatives in the context of their usefulness for the producers and undertaking corrective action.

4.1.4.4 Transportation:

Transport infrastructure is critical in growth and sustainability of horticulture sector. Due to inadequate last mile connectivity, it becomes an uphill task for farmers to bring their harvests to the motor-able roads for transportation to nearby mandis. Existing transport system is not very economical or dependable. This factor alone substantially increases the cost and wastage of their produce. Transport infrastructure gaps need to be addressed on priority basis.

4.1.4.5 Post-Harvest Processing and Value Addition:

Processing and value addition increases the shelf life of horticulture produce and reduces wastage and losses. It offers an immense opportunity for the export of processed food. The State's horticulture processing capacity will be enhanced from 7.5% to 15% of the total horticulture production by 2030[3]. *To achieve desired results, processing units are to be established in close proximity to horticulture clusters in different climatic zones of Uttarakhand if not in every district.*

Cluster based food processing can play a vital role in this regard. Though NGOs like HARC and private sector industries like Parle Agro have taken some initiatives, these need to be supplemented by the system. Small size food parks could also be developed at various central points of districts with the facilities of packaging, semi-processing, grading, better equipment for loading and unloading and machinery for value addition in the horticulture supply chain. At present two food parks have been set-up by private players such as Patanjali and Himalaya, but more investment in this area would be helpful.

Four Agri Export Zones (AEZs) have already been declared under the AEZ scheme of Government of India for litchi, floriculture, herbs medicinal plants and basmati rice. A Mega Food Park has been set up at Haridwar under The Mega Food Parks Scheme of Ministry of Food Processing Industries. Another Mega Food Park has been granted by MoFPI in Udham Singh Nagar district. Leading players in food processing industry like Nestle, Britannia, Dabur and ITC have setup their processing facilities in the State with cumulative investments of over ₹250 crore. In addition, there are a number of small and medium sized food processing units in the State.

The status of Food Processing Industry in the State is as under:-

- Total established units: 512
- Horticulture based units: 403
- Non-horticulture based units: 109[4]
- Total private sector investment made: ₹594.37 crore
- Subsidy sanctioned by the Govt. ₹90.55 crore

The State will review the progress of these initiatives to bridge the gaps and consolidate.

4.1.4.6 Packaging:

Packaging is very important for fruits and vegetables as horticulture produce is highly perishable. Without proper packaging, it is very difficult to maintain their shelf life. Cost of packaging is a very important factor. The high cost of packaging material eats into the margin of farmers. At present the State has a very fragmented packaging manufacturing base. *Packaging units could be set up at selected strategic locations, which will also provide employment to local people.*

4.1.4.7 Technological Issues:

Horticulture sector in the State is also held back due to limited access to new technology particularly for post-harvest processing. Due to lack of latest available technology, farmers and agri-businessman suffer post-harvest losses and time.

Existing State horticulture universities and district demonstration units need to be vitalised to play a lead role in bridging the gaps. Wherever necessary, external agencies could be approached for support. Model adopted by HP Horticulture University at Nauni, Solan could be studied in State's context. Focus on technology front needs to be on

[3] Uttarakhand Vision Document
http://des.uk.gov.in/files/Uttarakhand_Vision_2030.pdf

[4] State Horticulture Mission Uttarakhand

following aspects:

- *Development of rural entrepreneurs in technologies, engineering and food sciences.*
- *Access to Food Parks.*
- *Communication of modern technologies,*
- *Marketing knowledge, seminars, exhibitions*
- *Extension work by the State institutions.*

4.1.4.8 Climate Change:

Temperature is the key factor that determines the climatic properties of a place. The distribution of temperature condition over Uttarakhand varies greatly from -1.7°C at Mukteswar to 42°C at Pantnagar. The average temperature of Almora which is 17.55° C has increased by 0.46°C during the last 53 years. Annual rainfall is decreasing and changing its rhythm in the State due to climate change which is adversely affecting the interests of farmers. Haridwar received more rainfall than normal while all other districts witnessed less precipitation. This rainfall shortage is more acute in Pithoragarh, Bageshwar, Almora, Champawat and Nainital Districts. Annual rainfall in Uttarakhand has reduced from 1735 mm in 2013 to 1287 mm in 2015. The rain fed area has also declined over the years from 402 thousand acres in 2010 to 368 thousand acres in 2015.

The State will consider assessing the impact of rain deficiency and climate change on horticulture and agriculture production. It also proposes to examine the ways to mitigate their adverse impact. There could be opportunities to use climate change as an advantage also.

4.1.4.9 Policy / Administrative Measures:

Uttarakhand University of Horticulture and Forestry (UUHF) was established in 2011 at Bharsar, District Pauri. It is the 3rd State in the country to set up a separate University for Horticulture and Forestry. The other States are Andhra Pradesh and Himachal Pradesh. Under-Ease of Doing Business, a separate Horticulture Marketing Board has been set up to promote the marketing of horticulture produce and ensure better prices for farmers' produce.

Single window system has been created to expedite sanction/clearance of projects under MSME.

To promote protected cultivation especially among small and marginal farmers and hilly areas, *Mukhyamantri Sanrakshit Kheti Yojana* has been launched during 2011-12 with a provision of 30% additional subsidy from State budget for setting up Green Houses of upto 500 sqm per beneficiary.

Weather Based Crop Insurance cover has been provided to farmers for apple, litchi, mango, malta, peach, tomato, potato, pea, chilli and ginger. Fruit Wine Policy incorporating a number of fiscal incentives has been promulgated to promote fruit based wineries.

State is considering establishment of a concurrent process monitoring system for timely corrective action during implementation and functioning of these schemes in mission mode.

4.1.5 Where Himachal Pradesh has Gained:

Although the productivities of sugarcane, oilseed and spices are much higher in Uttarakhand, Himachal Pradesh leads in horticulture production. In 2017-18 the production of fruits was 6,69,940 MT in Uttarakhand while it was 5,65,310 MT in Himachal Pradesh[5].

Apple fruit needs well organized efficient marketing system which envisages primarily raising profitability of growers and increasing consumer satisfaction, at a reasonable price. It can be improved by increasing operational and pricing efficiency. There are certain organisations in H.P. like Himachal Pradesh Horticultural Produce Marketing and Processing Corporation Limited (HPMC), Himachal Pradesh State Co-operative Marketing and Consumers Federation Limited (HIMFED), National Agricultural Cooperative Marketing Federation of India Limited (NAFED) and Fruit Growers Association, established to prevent post-harvest losses and to carry out efficient marketing.

[5] Agricoop Ministry of Agriculture and farmer welfare
http://agricoop.nic.in/sites/default/files/2017-18-%28Final%29_updt.pdf

Several other measures were also undertaken by the H.P. Government from time to time to revitalize the apple marketing system. It is very dynamic and has evolved through several changes in the past one and half decades. These interventions are in the form of technological up-gradation, improved marketing organisations and market promotion have led to expansion of the market for Himachal apples in the country.

The Department of Agriculture in Himachal Pradesh has reoriented its strategy to lay emphasis on production of high-value crops like off-season vegetables, vegetable seeds, potato, ginger and tea, besides increasing productivity of prime grain crops viz. maize, rice and wheat.

Extension network has been restructured to disseminate the latest farm technology. At present, vegetables worth ₹3500 crores are being produced in the H.P. For commercialization of seed production of temperate vegetables, the private sector is being involved. For sustainable development of agriculture, watershed development approach is emphasised besides soil and water conservation measures. Rainwater harvesting through dams, farm ponds, tanks etc. has been given a high priority so as to store rainwater, recharge groundwater, check soil erosion and for irrigation purposes.

To ensure remunerative returns to the growers, a strong marketing network is being promoted, besides post-harvest handling, grading, packing and value addition. Modernization of Information Technology in agriculture and agribusiness is being emphasized in Himachal Pradesh.

An important role is played by HPMC, Himachal Pradesh Horticultural Produce Marketing and Processing Corporation Ltd, a State Government. It engaged itself in the establishment of pre and post-harvest activities, comprising of a network of mechanically operated packing houses, cold storages, transhipment centres and fruit processing plants, besides a countrywide network of sales offices in the terminal markets, Railways Stations and Airports.

The entire infrastructure of grading/packing houses, pre-cooling and cold storages has been established in rural areas for providing pre and post-harvest facilities to the farmers at their doorstep. Currently, HPMC has emerged as one of the leading and largest organizations for post-harvest handling of horticultural produce in India. Under the auspices of this organization in the past few years, the entire fruit industry has started experiencing a radical change from conventional to modern marketing system. HPMC has contributed substantially to mechanized grading and scientific packing of fruits, substitution of conventional wooden cases by tray-packed telescopic cartons distribution network, introduction of juice dispensing machines and development of a sound base for export of apple and other fruit products. It is a service-oriented organization with a commitment to ensure remunerative returns to the fruit growers and nutritive quality products at a reasonable price to the consumers. HPMC has a robust supply chain and is investing in improving the cold chain infrastructure of the State. The capacity of controlled atmosphere stores will be increased from 3,380 MT to 10,000 MT by 2030 by HPMC while processing plants at Parwanoo and Jarol will also be upgraded up to 2,500 MT.

The corporation is planning to have a hydro cooling facility for cherries which would enhance the shelf life of the fruit and make it reach the distant markets, thereby resulting in better price realization for farmers.

Farm mechanization with special reference to hill agriculture of Himachal Pradesh is given a thrust. A strong research extension interface is directed towards problem oriented research programmes. Research projects are identified and funded in problem areas. Extension reforms through public-private partnership have been done to reduce post-harvest losses in the horticulture sector in Himachal. Agro-processing and value addition has been given a priority in the horticulture sector in Himachal**.** All these efforts have provided an edge to Himachal Pradesh over Uttarakhand in horticulture sector.

Himachal Pradesh offers several incentives to farmers to establish individual orchards. 50% subsidy is made available on the cost of various horticulture inputs. In order to develop garden colonies in compact areas, 75% subsidy on common facilities like fencing, irrigation, and plant protection equipment in addition to 50% subsidy on consumable inputs like plant material, pesticides, micro-nutrients etc. is given. Like-wise, for the establishment of community gardens on village common lands for the benefit of local Scheduled Castes, the following incentives are given.

i. Free fencing of the area having > two ha;
ii. Supply of fruit plants at nominal cost of ₹0.10 per plant for plantation as well as the filling up gaps;
iii. Free supply of top-working material like bud sticks, polythene, etc.
iv. Grant-in-aid at the rate of ₹1500 per acre for inputs required for the maintenance of the garden during the gestation period.
v. Grant at the rate of ₹500 per acre for inputs required for the maintenance of the garden during the gestation period;
vi. If any village comes forward to plant five acres or more of land, one man out of them will be appointed as a Mali-cum-Chowkidar to look after the plantation during gestation period. Wages at the rate of ₹300/- per month shall be granted to such incumbents by the Horticulture Department of Himachal Pradesh.

Consolidation of land holdings (initiated after the enactment of HP State act in 1971) has played an important role in promoting agriculture and horticulture sectors in the H.P. As per records of H.P. revenue dept., till 2008, nearly half of State's agricultural land has been covered under the act.

These initiatives have enabled HP to march ahead to create a brand in the horticulture sector.

Uttarakhand is making vigorous efforts, and fortunately has the required infrastructure in place. There is a need to galvanise all stakeholders in mission mode to match the growth of HP. Some areas for priority interventions are; activation of district demonstration units and horticulture university's field extension units for providing technical support in all aspects of harvesting and strengthening of food processing and marketing networks.

The State has passed it land consolidation act in 2016, presently applicable to hill districts only, which hopefully will pave the way for consolidation of land and growth of primary sector in the State.

4.1.6 Possibilities of Promoting Mango Cultivation in view of Climate Change:

Since vegetable and fruit crops together constituted around 96% of area and production of horticultural crops in Uttarakhand, it would be useful to examine share of individual crops in total area allocation. Mango (19.68%), apple (16.66%) and citrus together occupied around 50% of area under fruit crops in the State during 2010-11. It would be useful to mention that contribution of pear has almost doubled in comparison to area. Peach also showed a higher share in production.

As global warming and climate change is impacting the environment in Uttarakhand, crop patterns need to align with the changing environment. There is shift seen in crop production, and several studies suggest that temperate fruits, mainly apple, peach, pear, plum, apricot and walnut can be grown in the highlands where the agro-climate is more suitable now. However, land demarcation for creation of fruit belts according to altitude is inevitable, so that fragile landscape can be restored and productivity can be enhanced.

The region demarcated in zone "A" category which is up to a height of 1000 meter and comprises of terai, bhabar, irrigated low hills and well as rain fed low hill region are suitable for mango, guava and papaya and the State is capable of producing more than 1000 varieties of mangoes in the plain regions of Uttarakhand like Udham Singh Nagar, Nainital, Dehradun, Haridwar etc.

Arunima variety of mango from Uttarakhand won first prize in Uttar Pradesh mango festival held in Lucknow in 2018.

Mango pulp production, processing, export packing and marketing facilities could be to be set up to secure wider recognition and creating demand for these fruits.

Similarly, citrus fruits have the potential to grow in sub-tropical regions. Potato is an important cash crop grown both in mountainous and plain areas of the State and its productivity is substantial. It can be further intensified by bringing more area under its cultivation.

4.1.7 Floriculture:

India's floriculture industry is growing at a compound annual growth rate of about 30%. Karnataka is number 1 State in floriculture production followed by Tamil Nadu. Floriculture has grown nearly 10 fold in Uttarakhand since the formation of the State. Currently, production of loose flowers is 2073 MT. The State ranks no. 8 in terms of cut flower production. Uttarakhand has varied climatic regions, which support the production of a wide range of flowers. The climate is ideal for growing flowers all-round the year.

Major loose flowers available in the State include rose, marigold, tuberose, etc. Cut flowers include gerbera, carnation, gladiolus, lilium, orchids, etc., Apart from the local market, flowers are sent in cities like Delhi, Meerut, Kanpur, Lucknow and Chandigarh as well. Uttarakhand is also producing 576 KG of lemongrass in a year. In the State, 3746 farmers are growing lemongrass in 660 hectare of land left barren earlier. Potentials of growing aromatic plants are also being explored in the State.

4.1.7.1 Issues and Challenges in Floriculture Sector:

1. Lack of a reliable database on floricultural crops
2. Lack of uniform land tenure system and ownership rights
3. Non-availability of quality seeds and planting materials
4. Necessary inputs like advanced technology, credit and transport facilities, fertilizers, pesticides, farm implements, tools and irrigation are not easily available to the growers at reasonable prices
5. Lack of adequate infrastructure facilities for quick disposal of the produce in the market
6. Floricultural crops have not been included in the overall land use planning
7. Inadequate support to post-harvest management including grading, storage, transportation, marketing and processing
8. Poor extension and training efforts in the sector

Table 4.1.2 Best Practices in Floriculture

S. No	Region	Practice
1.	Western Liguria, Europe	Use of Greenhouses, Polyhouses, Photovoltaics and renewable technology sources for agriculture production
2.	South America and Columbia	Strong export orientation and a commercial organization on the Dutch model. It is the world's second largest exporter of cut flowers after Holland. The most important productions is of carnations (46%) and roses (27%) the main export markets are the USA (77%) and EU (14%)
3.	Meghalaya, India	The Government has come out with a scheme to provide the growers with disease-free planting material, organic/inorganic fertilizers, plant protection chemicals, garden tools and implements for a minimum area of 2000 square meters along with a package of practices for commercial production.
4.	Netherlands	The floriculture cluster, growers collaborate with for example specialized suppliers, trade companies, logistics service providers and of course, the auction, to produce a world-class quality product.
5	Karnataka (India)	Karnataka State Industrial Investment Development Corporation Ltd. has accorded

		industrial status to floriculture. Karnataka Agro Industries Corporation has started floriculture auction centre on the lines of Dutch Model of auction centre. On the recommendation of the 1995 Agricultural Policy, Karnataka amended the land ceiling Act and allowed floricultural units to acquire land of 20 units (108 acres). Flower auction centres are set up by Maharashtra Govt. at Pune and Nasik to eliminate middlemen and ensure remunerative prices.

The State has a vision to expand the area under floriculture from present 1400 ha to 5000 ha by 2030.

Some of the proposed strategies to realise this expansion are.

1. Production of quality floriculture produce and maintenance of its standards with an active participation of research institute and BIS.
2. Infrastructure development including roads for floriculture units, electric supply, water, cold storages at airports, the start of air cargo services and training of customs officials for faster and careful clearance
3. Development of high yielding varieties (HYV) of flowers and ornamental plants for domestic market
4. Pest management at blooming period through indigenous research and knowledge
5. Development of floriculture and establishment of at least one model village of floriculture near urban areas supported with modern sale centres in nearby cities and linkage with APEDA for export.
6. Emphasis on commercialization of flowers like rose, carnation, chrysanthemum, orchid, gladiolus, anthurium, lily, bird of paradise, gerbera, dry flowers, live plants and micro-propagated plants through protected cultivation and creation of other infrastructural facilities.
7. Identification of product/region as intensive floriculture zone along with the availability of large scale planting materials and post-harvest facilities to provide technical and economic support to growers.
8. *In-situ* and *ex-situ* conservation and propagation of nearly 175 endangered species of orchids available in the region.
9. Production of only those cut flowers and other floricultural products, which arein demand especially in the off-season (May to Nov.) or in lean flower producing period in plains
10. Development of viable floriculture cooperatives of growers for smooth procurement of quality planting material and remunerative sale of produce.
11. Promotion of custom seed production and buy-back arrangements for floriculture produce.

4.1.8 Organic Farming:

In order to boost organic farming in Uttarakhand and develop it as a 'fully organic State,' the Centre has provided a grant of ₹1,500 crore for the next three years (2018-21).

The State also plans to introduce two dedicated laws—the Organic Agriculture Bill and the Nursery Management Bill. To promote organic farming, the Government also plans to develop nearly 10,000 organic clusters in the mountain region, under the *Paramparagat Krishi Vikas Yojana*, a centrally-funded scheme. This project will benefit five lakh farmers, which will follow cluster farming model and provide organic seeds, vegetables, myriad fruits, other crops including Basmati rice. Besides these, herbs and medicinal plants would also be promoted. Additionally, there is a plan to develop 500 clusters of high-density apples so that Uttarakhand can match Himachal Pradesh's apple production.

4.1.8.1 Best Practices in Organic Farming:

Table 4.1.3 Best Practices in organic Farming in different countries

S. No	Region	Practices
1.	USA	Pest management on organic farms relies on the 'PAMS' strategy: prevention, avoidance, monitoring and suppression. Organic crop producers use cover crops to protect the soil from wind and water erosion. Soil-conserving practices include the use of cover crops, mulches, conservation tillage, contour plowing, and strip cropping
2.	USA	1. *Organic Farmer and Consumer Protection Act to improve oversight of global organic trade* 2. *Organic Research Act, 2017 to increase USDA Organic Research and Extension initiative to US$50 million annually* 3. *Organic Farmer Access Act - access to expand organic agriculture access to the rural development program*
3.	Japan, China	Aquaponics, Vertical Farming,
4.	USA, Europe	Good Agricultural Practices GAP, Good Harvesting Practices GHP,
5.	USA, Europe, Himachal Pradesh (India)	Nutraceuticals, Organic Tourism

The State Government would soon introduce a project under which an **Integrated Model of Agriculture Village** would be developed. Under that project, each cluster would be equipped with facilities such as cold storage and sorting-grading units etc. These clusters will also be equipped with farm machinery banks so that farmers can use state-of-the-art farm equipment to enhance agricultural productivity.

The Vision 2030 of the State stipulates that area under organic farming will be expanded from 35,000 to 250,000 thousand hectare by 2030 and will be third-party certified to promote exports.

4.1.9 Medicinal Plant Farming:

State Medicinal Plants Board (SMPB), was established on 14 August 2001 under the Chairmanship of Hon'ble Chief Minister. In May 2013, SMPB has been registered as a society and designated as an apex body for overall coordination of activities in medicinal and aromatic plants sector in the State. Presently under SMPB, two separate units are working for the overall development of medicinal and aromatic plants. For medicinal plants related activities, Herbal Research and Development Institute (HRDI), Mandal, Gopeshwar and for aromatic plants, Centre for Aromatic Plants (CAP) Selaqui, Dehradun are working. State Government is providing 50% financial assistance for the cultivation of shortlisted 28 medicinal and aromatic plants. Financial assistance schemes of National Medicinal Plants Board are also being implemented in the State. It has also implemented the Central Sector Scheme for conservation development and sustainable management of medicinal plants.

4.1.9.1 Issues and Challenges:

Due to the current rate of unsustainable harvesting and unregulated trade, several medicinal plants are severely threatened, with the risk of future unavailability or degradation in quality. Although cultivation is playing an increasing role in the supply of MAPs, most will be obtained from a wild collection in the foreseeable future due to a growing preference for natural and organic products. Therefore sustainable management of wild MAPs is the biggest challenge to the State. There is no "Golden Rule' that can be applied universally to ensure conservation and sustainable medicinal plants management because what is defined as conservation and sustainable use will vary with the type of plant, parts used, locality, and other factors depending upon the site and methods and season of extraction.

The State needs to set up a medicinal plants marketing organisation, which in coordination with the SMPB buys medicinal plants directly

from registered growers and collectors, by creating collection centers at strategic locations. It will remove the middlemen from the supply chain and these market linkages can be used to promote standard practices of collection, processing, packaging, storage and value addition of medicinal plants. This sector alone can transform the lives of farmers across the State in addition to horticulture crops of fruits, vegetables and floriculture.

4.1.9.2 Some Relevant Good Practices:

Table 4.1.4 Good Practices in Medicinal Plant Farming in Different Countries

Sr. No.	Region	Good Practices
1.	**USA**	Use of, Aquaponics, Greenhouses, Polyhouses, Photovoltaics and renewable technology sources for agriculture production
2.	**France**	Collection of fresh Arnica plants and flowers by the Swiss pharmaceutical company Weleda, contribute to the favourable population status of the Arnica populations through financing adequate habitat management measures
3.	**Nepal**	Encouraging both wild collection and cultivation of herbs. Establishing "Herbs Zones". Establishing a network of producers, collectors and traders for market management. Conducting research to identify medicinal aromatic oil in plants; and in cases where such identification has already been done, help in their isolation and commercialization. Providing concessions to individuals or groups who would want to produce, process and sell herbs through cultivation. Developing a mechanism to provide international market information to producers, collectors, processors and exporters; and also establishing herbs information centres at national and regional levels
4.	**Meghalaya and Mizoram**	A package of best practices encompassing conservation, cultivation, quality control, standardization, research and development for medicinal plants to improve marketing and performance efficiencies.

In the area of Medicinal and aromatic plants, the vision of the State for the year 2030 is to expand the production of aromatic plants from 625 Ha area under cultivation at present to 16,900 ha by 2030, while the number of farmers engaged in the production of aromatic plants shall increase from 2,000 to 68,600.

4.1.10 Mushroom Cultivation:

Mushroom cultivators in Uttarakhand have literally had a golden harvest. The mushroom industry in the State has witnessed a windfall in production in last four-five years with its output almost doubling during this timespan. Today the State produces 10,000 tonnes of mushrooms annually and also registers cultivation of all three commercially viable mushrooms like button mushroom, dhingri mushroom and milky mushroom.

Table 4.1.5 Variety of Mushroom Cultivation in December 2017

Sr. No	Variety	Production Percentage
1	Button Mushroom	80%
2	Dhingri	12-13%
3	Milky	7-8%

Source:https://www.researchgate.net/publication/322520732_Status_of_mushroom_production_in_India and Times of India 2016

The production of mushrooms is higher in the Garhwal region with approximately 7000 tonnes annually as compared to Kumaon with Dehradun and Haridwar evolving as the hub of mushroom production with many units exporting their mushroom as far as Europe.

Women self-help groups (SHGs) are being provided training on straw-based mushroom cultivation to generate a culture of producing and consuming mushrooms.

Source Pic: http://amritaserve.org/mushroom-cultivation-started-in-Uttarakhand

Women like Divya Rawat and Hresha Verma, who also are experimenting with various varieties of mushroom because of its low investment and having multifarious benefits, are playing an important role in boosting mushroom production.

The State's proximity with other northern States like Delhi, Uttar Pradesh, Haryana fuels demand of mushrooms. Medicinal mushroom farming is also picking up pace as it is rich in digestible protein, zero carbohydrate and fat, make it a perfect diet food for people who are health conscious. Approximately more than 200 farmers from the State are involved in mushroom farming.

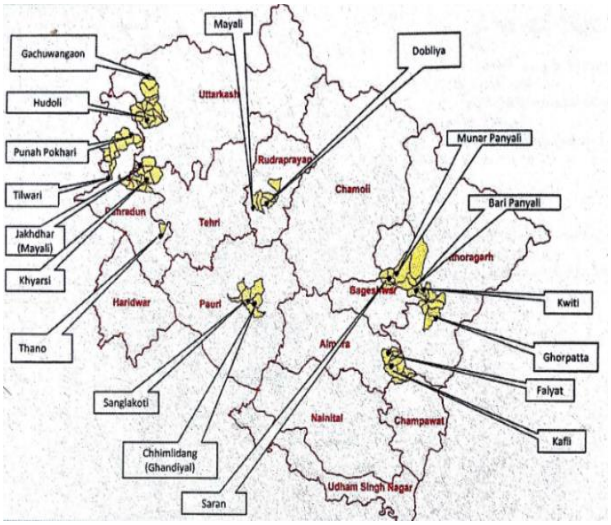
4.1.11 Centrally Sponsored National Mission on Micro Irrigation (NMMI):

The scheme was launched in Uttarakhand in 2011-12 to increase area under improved method of irrigation to provide stimulus to horticultural and agricultural growth. In 2014-15, it was merged as "On-Farm Water Management" under National Mission for Sustainable Agriculture. Under this scheme, assistance is provided for installation of drip and sprinkler systems. Uttarakhand is covered under 'C' category States, in which establishment of the micro irrigation systems is estimated to cost 25% higher than national norm. Subsidy for small and marginal farmers in Uttarakhand is 50% of the cost of the micro irrigation systems borne by the Central Government while for other farmer categories it is 35%. The State Government provides 10% additional subsidy as State's share, which is proposed to be increased to 40% for marginal farmers (only for horticulture crops). All categories of farmers are eligible to avail assistance under this scheme.

4.1.12 Cluster-Based Agriculture Processing in Uttarakhand:

Development of modern infrastructure and common facilities is planned in the State, to encourage entrepreneur groups to set up food processing units based on cluster approach by linking groups of producers/farmers to the processors and markets through well-equipped supply chains with modern infrastructure. Each agro-processing cluster under the scheme is to have two basic components – (1) basic enabling infrastructure such as roads, water supply, power supply, drainage, ETP etc. and (2) core infrastructure/common facilities such as warehouses, cold storages, IQF, tetra pack, sorting, grading etc. Clustering facilitates joint marketing efforts. Large retail chains and marketing companies prefer to subcontract clusters, which are considered advantageous by large buyers due to considerable reduction in transaction costs, improved quality control and standardization.

Figure 1: Agri Cluster Processing MAP Uttarakhand



Source: WMD Gramya Project 2017

4.1.13 Role of NGOs:

NGOs like HARC (Himalayan Action Research Centre), AAROHI, Himmothan Society and Navdanya are playing a vital role

in catalysing horticulture sector in the State. Some of their key interventions include; cluster and cooperative farming, soil testing and related guidance, technical and managerial support, providing quality seeds, backward and forward market linkages etc. Their interventions are closely rooted in the local climatic conditions, topography, culture, resources etc. and heavily focused on empowerment of women.

4.1.14 Ajeevika:

The ministry of rural development's International Agriculture Development Fund (IAFD) sponsored Integrated Livelihood Support Project (ILSP) is being implemented in 44 development blocks of 11 districts of Uttarakhand. 13,500 farmer interest groups have been created so far and out of 1.25 lakh members, 1.06 lakh are women. The 233 federations established to manage and monitor the programme, have approximately 65% women staff.

Ajeevika was started in the year 2012-13 to enhance livelihood of hilly regions of Uttarakhand and to provide market linkages for their agriculture produce. Groups have been created in 2,100 Villages to promote improved agricultural practices, village tourism, handicrafts etc. The groups formed under ILSP project are producing, processing and marketing their products under the brand name of "Hillance". A total 138 farm machinery banks have also been opened in the project districts to support production, processing and sales related financial support.

4.1.15 Marketing Challenges:

Horticulture production and processing can become a boon for the State's prosperity. There is a general increase in the ratio between the output-marketed to output-produced, over the years. However, the marketed surplus may not be finding optimal value because it is monetized at the first available instance, at nearby markets. These markets may not necessarily have sufficient demand from its consumer catchment, to absorb the entire supply. Therefore, the value of goods gets pushed down in the local markets. It is important that besides marketed surplus, the market surplus is also monitored. Farmers should have the ability to direct their supply to markets that are optimal – i.e. have sufficient demand in their catchment, or have ready links to other consumption centres. When the optimal value is not realized, motivation to increase production fades away. In this context, State Government is taking measures related to value chain development, infrastructure creation and identifying the investment required to develop uninterrupted flow of produce from farm to fork. Suitable strategies are being adopted to support pre and post-harvest management practices for aggregation of produce and value addition to target premium markets. In addition to the creation of infrastructure, an enabling environment for storing, processing and marketing also need to be in place. It is planned that demand based horticulture production storage, primary and processing infrastructure is established in designated clusters and organized marketing and distribution system support these clusters. Programmes such as horticulture festival, horticulture and organics tourism circuits are planned to promote Uttarakhand horticulture.

HORTICULTURE - WAY FORWARD

1. Collect soil and horticulture related data of each of the climatic zones of the State and provide information on weather and markets to farmers in real time.
2. Prepare horticulture development plans for each climatic zone based upon empirical data.
3. Implement the plans in mission mode.
4. Identify horticultural crops, medicinal and aromatic plants and flowers suitable to be grown in each of the climatic zones of Uttarakhand.
5. Develop planting material and establish demonstration plots/training centres in each district to propagate the cultivation of selected horticulture crops, MAPs and flowers
6. Train farmers in planting and care of horticultural crops, MAP and flowers; collaborate with education/research institutions to address training requirements.
7. Provide good quality planting material and handhold farmers while they start planting and growing horticultural crops, MAP and flowers; training on good agriculture (GAP) and good horticulture practices (GHP).
8. Handhold growers till their crops are harvested, completing one cycle.
9. Establish backward and forward linkages; strengthen supply chains for growers in each district for timely movement of horticultural produce, MAP and flowers from farm side to markets through tie-ups with large supermarkets, corporations/producers, users of MAPs, exporters and process the same in agri-business hubs.
10. Horticulture/organic/MAPs tourism envisaged as an area for revenue generation and growth.
11. Development of agr-horti food processing units on the lines of Himachal's HPMC, HIMFED.
12. Improving and bridging the gaps in end to end horticulture supply chains in the State to create remunerative market for producers.

B. Tourism

Abstract

This chapter reviews the status and the challenges faced in expansion of tourism sector in Uttarakhand in the context of carrying capacity and programmatic issues such as level of connectivity, status of physical infrastructure facilities, management of solid waste, availability of efficient tour guides, strength of local establishments and integration of local communities in tourism sector, appropriate hotel accommodations, parking and health facilities.

At present, domestic tourists arrival in the State is about 3.5 crore per annum. Of these, 44.2% tourists come for pilgrimage and an equally large number of visitors (43.6%) come for holiday/sightseeing. These numbers are increasing and total tourist inflow in Uttarakhand is expected to reach about 6.7 crore by 2026. State tourism policy proposes to expand tourism in several new geographical areas and add new themes such as water sports, adventure, heli-skiing, eco-tourism, spiritual Yoga, wellness, heritage and culture etc. in the basket of tourist attractions.

Several strategies (planning, branding, and capacity-building) are being used to realise the potential of wellness, spiritual and heritage tourism. Catering to needs of prospective Indian and foreign tourists in forthcoming years (about 6 times of State's current population) will entail substantial expansion in physical infrastructure, building linkages, human resources, marketing and branding, and more significantly coordination amongst concerned line departments also, keeping in view the eco-systems in the State.

4.2.1 Introduction:

Tourism is the fastest growing industry in the State, accounting for the largest contribution to the tertiary sector of the State economy. Besides the religious sites, the State is endowed with rich natural resources - glaciers, rivers, dense forests and intriguing cultural environment, is an ideal destination for adventure, leisure and eco-tourism. The State is home to world known biosphere reserves (Nanda Devi Biosphere Reserve and Asian Wetland Conservation), national parks and heritage sites like Jim Corbett Tiger National Park, Gangotri National Park and Valley of Flowers.

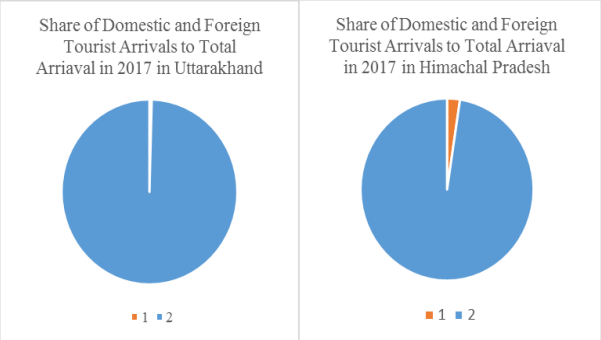
It also has huge potential for adventure tourism in the form of water sports, trekking, skiing, paragliding, camping, angling, mountaineering and rock-climbing. In recent years, spiritual, yoga, wellness, heritage, culture, community based and eco-tourism have also emerged as important attractions.

However, Uttarakhand tourism industry is faced with several challenges on the way to realise its true potential. There are issues like inefficient connectivity at/among destination sites, lack of desired physical infrastructural facilities, inefficient management of solid waste, lack of professional tour guides, trained instructors, scarcity of well managed lodging, lack of integration of local communities in tourism ecosystem, lack of safe, affordable and well run hotel/hostel accommodation for different categories of tourists at all destinations, lack of parking and health facilities and tourism information/facilitation kiosks.

Uttarakhand tourism industry requires a fresh set of comprehensive, concerted and sustained tourism promotion plans, tailored for various tourist segments, themes and destinations. Different tourist destinations possess different potential and appeal to distinct set of tourists. These destinations face different set of challenges too, which require focused attention. For instance, the Chardham tourist sites need a comprehensive management plan to regulate rush spurt of holiday

tourists during the peak season, while the sites of adventure tourism potential confront basic problems of connectivity, accommodation, lack of local establishments and public infrastructure.

Figure 4.2.1: Comparative Share of Domestic and Foreign Tourists in Uttarakhand and Himachal Pradesh



Sours: Author's estimation based on data from State Tourism Dept., Uttarakhand

Against these odds also, State is doing much better in comparison with neighbouring hill State of Himachal Pradesh. Figure.4.2.1 shows that though the share of foreign tourists to total tourist arrivals is higher in HP (2.40%) compared to Uttarakhand (0.41%), it is fast picking up with a growth rate of 26.79% against 4.02% in HP. The number of domestic tourists in Uttarakhand is much larger (345.8 lakh) as compared to H.P. (191.3 lakh). Overall tourism growth rate in Uttarakhand is also much higher (9.27%) compared to H.P. (6.29%).

However, these statistics are no reason to be complicit. There is ample untapped potential and opportunities to be tapped and work to be done to make tourism a growth driver for economic growth on the State.

It is important to note that in comparison to national and two small and comparable States; Kerala and Goa, international tourist arrivals in Uttarakhand as well as in HP are almost insignificant. The country received about 10.04 million foreign tourists during 2017. While for Goa these number were 0.890 million (2017) and for Kerala 1.04 million (2018) as compared to Uttarakhand (0.14 million) in 2017 and HP 0.36 million (2018).

Multiplicity of the best tourist practices and paradigms that were undertaken to attract tourists and develop alternative local tourist destinations in several countries and other regions of India are discussed below.

Global Tourism Trends

Global tourism trends are changing due to consumer behaviour and an emphasis on wellness.

- Wellness tourism is expected to grow more rapidly in the next few years, projecting its growth to be twice as fast as general tourism and reach $919 billion in 2022 from the $639 billion in 2017. From fitness-centric resorts and hotels with holistic spas to natural immersion getaways with Spiritual Wellbeing Programmes.
- Another growing trend is increasingly driven by a location's Instagram-ability. A ever growing number of under 33 year olds consider "Instagrammability" the most important factor in choosing their holiday destination. Whether it is event-driven experiences or beautiful locations that are snapshot-worthy, 2019 sees more social media-inspired tourism. *(Organizing and promoting events is a sure way to attract new/higher paying interest groups- examples are the Jaipur Literary Festival, The Music Festivals in Udaipur/Jodhpur palaces)*
- Travelers are ditching long summer vacations in favor of shorter, more frequent breaks. The rise of several short breaks means more business for local economies, especially when more people opt for staycations in unusual accommodation options. *(Endowed with a wealth of forests, treehouse holidays can emerge as a trend if supported by the Uttarakhand Forest Department).*

4.2.2 Models of Best Practices:

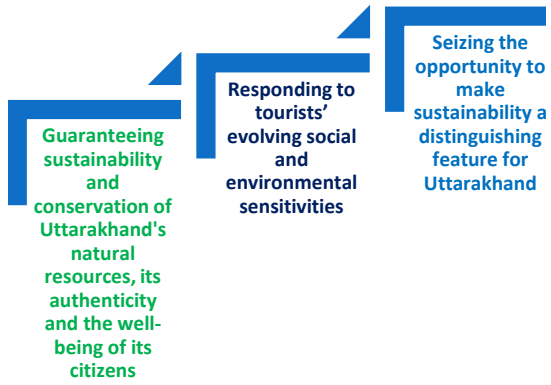
Table 4.2.1 Model of Best Practices

Tourism Practices/State	Initiatives	Impacts
Golf - Jammu and Kashmir, Delhi, Bangalore, Goa and Kolkata	These States have successfully developed vast golf courses. Once developed these golf courses in Uttarakhand, brilliant opportunity to golf enthusiasts will attract golfing sports. Kolkata, Delhi and Bangalore have made great strides in this ways and created various tourism niches for sustenance of golf tourism.	Considered the prized possession of Jammu and Kashmir tourism, the golf course tourism has also been successfully operated and implemented. This theme based adventure sport tourism policy, in Uttarakhand will ensure employability for local stakeholders and work for the professionalization of local actors in adventure tourism industry in any framework that maintains the key principles of sustainable development and responsible tourism in Uttarakhand.
Local Homestay Tourism –Rajasthan, Maharashtra, Kerala	In Kerala, homestay tourists (foreign and national citizens) tour rural villages like Kovalam to observe coir manufacturing, coconut leaf weaving and fish markets. In Wayanad tourists get opportunity to see cascading waterfalls in scenic surrounds, meet oldest natives, caves with petroglyphs and river rafting. Apart from that tourist watch traditional fishing operations by locals. Rajasthan has successfully developed a local homestay tourism channels. Villages have been developed into set tourist destinations that supplement tourist accommodation as guests stay with family and experience local rustic culture.	Most of the locally deprived families in rural areas in Uttarakhand will be empowered enough to move out of poverty and exclusion. All the vulnerable sections will be covered with social protection. Government must move a cleanliness drive, identify existing bottlenecks and infrastructural gaps and promote beautification of the set village destinations for immense tourist attraction.
Culinary Tourism/Finland	Finnish Culinary phenomenon included purest Nordic ingredients; professional and talented chefs, clean water and air, and healthy delight diners. Key to the Finnish food tourism is pure pleasure and pure taste of food. Finnish culinary tourism in internationally renowned now-a-days.	Foreign tourists coming to Uttarakhand, if provided with pure Indian delicious dishes within clean air and safe portable water, definitely will become an ideal place for visitors.

Gujarat	Karnataka	Sikkim
Ecotourism Model in Gujarat through tripartite agreements to develop new destinations and boost eco-tourism, especially wildlife tourism. Dept. of Tourism, Gujarat Govt. jointly with Forest Dept. introduced quality camping sites to boost eco-tourism and attract the private sector. Local Eco-tourism Committees participated in operating these camp sites, which were funded by Tourism Department and implemented, monitored and observed by the Forest Department. Run by Tourism Corporation of Gujarat Ltd. (TCGL). Monitoring tourism activities is by the Forest Dept. for sustainable management	**Adventure Tourism Spot- Jungle Lodges and Resorts** by Karnataka Govt. in 1996, inspired by the Nepali Tiger Tops wildlife resorts. **Tiger Tops** supported Karnataka Govt. to set up wildlife resorts and made them functional and viable for initial few years. Project was a big success as it survived Ecotourism activities, including boarding and lodging. This simple method of jungle resort was replicated at almost 18 wildlife resorts as per varying themes like dam sites, famous heritage sites, wildlife and angling camps. Private participation was fully encouraged in water sports based on revenue distribution model. As per UTD (2017), Jungle Lodges and Restaurant has set up a distinctive brand of premium Ecotourism resorts by providing state of art infrastructure (camping sites, cottages) controlled by skilled professionals from IIFM	**Sikkim Himalayan Homestay Project** for Community Based Tourism was a project by UNESCO to an NGO (ECOSS). Promoted locally-owned tourism through Homestays in Sikkim villages, Selected a chain of four potential villages for designing model-homestays (8 or 10 homestays every village) to ensure equitable, inclusive and participatory community oriented planning and benefits. **Village level Tourism Development Committees** were formed. Training of youth for running homestays after Training Need Assessment. A major amount of the revenues obtained go to the devpt. of the whole enterprise. After three years' period of working with the NGO, most of the local communities in Sikkim run viable homestay on their own.

Strategic Framework of Vision 2030

To promote the Uttarakhand model of sustainable tourism, three critical challenges are to be met:

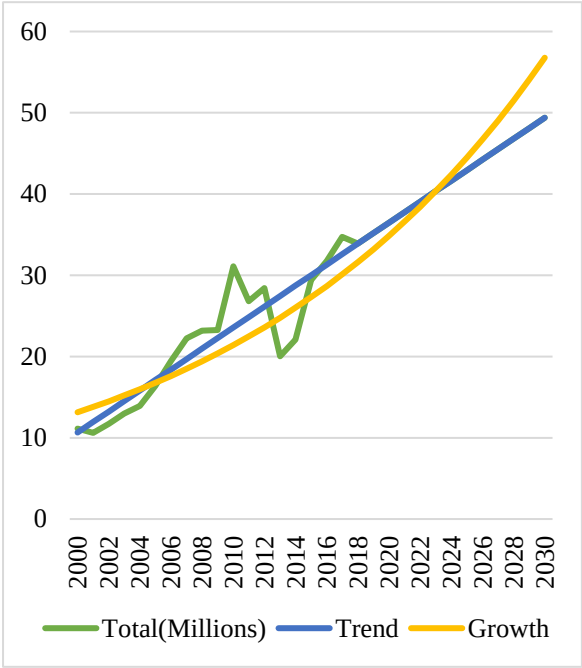


4.2.3 Tourism Vision:

Some of key factors are as follows.

- Tourism sector is accepted as a key growth driver for inclusive social economic progress through its forward and backward linkages, and ability to create employment.
- The vision is to develop Uttarakhand as a comprehensive, world class tourism destination by realizing the untapped potential of sustainable tourism, through the design of innovative tourism products that build on the inherent strengths of the State as a natural destination which can cater to all categories of tourists.
- Tourism Vision 2030 is an ideal strategic roadmap with the key objective of attracting 67 million visitors by 2030. The vision is to provide the world's best infrastructure facilities to tourists, improvise tourism growth in planned manner to keep its repercussions within carrying capacity of host destinations and community.
- To accomplish the goals, the aim is to utilize the collective power of public and private stakeholders and focus on three key objectives: Maintaining market share in existing source markets, growing market share in markets that have been identified with high growth potential and increasing the number of repeat visits.
- Sustainable eco-tourism, planned infrastructural development and adequate water and waste management are key elements for successful achievement of the vision. Aother important component is to overcome the seasonality dimensions of Uttarakhand tourism.
- Equal attention to *every* potential tourist destination in Uttarakhand, beyond customary pilgrimage tourism. These include destinations for adventure, eco/nature tourism, heritage and homestay, culinary and wellness tourism.

Figure 4.2.2 Total Tourist Arrival Projections (in Millions) by 2030



Sours: Author's estimation based on data from State Transport Dept., Uttarakhand

- The vision is also to ensure equitable distribution of tourism revenues and participation of local communities in tourism industry, without disturbing the natural habitats and ecosystems.

- The Tourism Development Authority may focus amongst other thrust areas, on strengthening the home-stay segment through a multi-pronged approach keeping the Scotland model in mind. This approach has the potential to distribute the benefits of tourism directly to residents of the State State as it is felt that most benefits of tourism in the State State till now have bypassed the local communities.

At existing tourism destinations as well at new planned destinations/satellite towns, spatial planning for tourism zones/parks requires professional assistance and stakeholder consultation before any infrastructure plans are approved.

Adequate and appropriate allocation of land for lodging facilities, recreation, parking, eateries, shopping, cultural events, fair grounds, walking areas, traffic free walkways, cable car systems etc. need to be made and necessary infrastructure developed before offering the same for investment by private sector players. This approach will allow the State to rapidly expand its tourism infrastructure while monetising the cost of infrastructure development through sale of plug and play plot concessions to private players

Planning for strengthening the infrastructure at existing and new development locations will factor-in safety from environmental hazards.

4.2.4 Challenges of in Management and Growth of Tourism in Uttarakhand:

Looking at the evolving trends of tourist inflow in the State, domestic tourism is firmly established. A high percentage of domestic tourists are pilgrims visiting the *Chardham* sites. The State has planned to move beyond well-known *Pilgrimage tourism* and actively attract tourist segments such as trekkers, those seeking adventure/sporting activities such as fishing, skiing, paragliding; a taste of rural life, wellness treatments, Yoga etc. To be able to move on this path, the State requires to address the following challenges on priority:

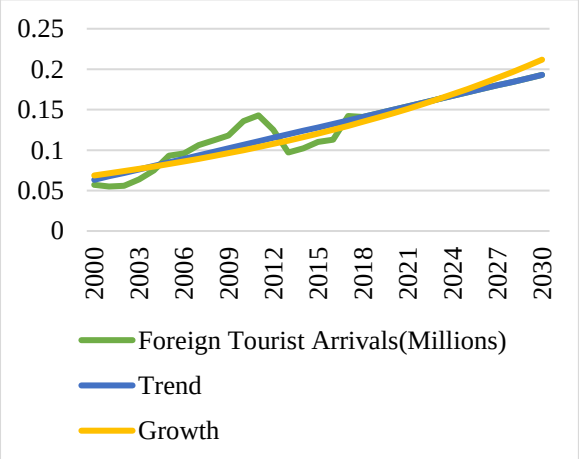
4.2.4.1 Inadequate Connectivity:

Public transport facilities have not caught up with the needs of tourists to offer affordable, secure and comfortable transportation to innumerable scenic spots in Uttarakhand, apart from the Chardham and other prime tourist sites. Opening up new destinations and attracting new tourists segments requires easy, efficient, safe and affordable transportation. The State requires to strengthen transportation through multiple available means to enable tourists to experience the perfect snowy winter, ideal trekking, sport tourism, the natural beauty of Tehri lake, Gangotri, Uttarkashi, Bhatwari, Mukhwa, Harsil, Chopta, DayaraBugyal, Gaumukh, and Bhojbasa.

4.2.4.2 Tourist Infrastructure and Wayside Amenities:

The quality of roads, public conveniences and way side amenities need to be augmented on the key identified routes. Public infrastructure facilities need to be enhanced to cater to the needs of increasing tourist numbers in the peak season. This is an area where sustainable employment opportunities for local communities can be generated and public private partnerships can be successful.

Figure 4.2.3 Foreign Tourist Arrival Projections (in Millions) by 2030



Source: Author's estimation based on data from State Transport Dept., Uttarakhand

4.2.4.3 Peak Season Tourist Rush Management is a challenge that needs to be addressed on urgent basis to prevent protests from local residents.

In April 2018, with massive in-flow of four million pilgrims and tourists leading to massive traffic jams in Haridwar during peak season, local residents demanded opening of Hill bypass road, which the Supreme Court had banned.

Uttarakhand Tourism Authority may devise measures to streamline arrivals and stay durations at pilgramage destinations to a sustainable level. akin to established practice at several pilgrimage destinations like Amarnath in Kashmir.

A cadre of tourist wardens may be established by training and employing local youth to guide, facilitate and regulate the influx in high seasons.

4.2.4.4 Availability of Potable Drinking Water at Every Destination:

Though Uttarakhand State has abundant availability of water reserves such as 17 perennial rivers originating from the Himalayan glaciers and several lakes, scarcity of drinking water has gone up. Asymmetric and unregulated distribution of water adds to the scarcity problem of water in entire Uttarakhand, notably in rural areas where recurrent landslides damage the water channels. In 2018 Government of Uttarakhand planned a long-term solution to tackle the recurring water shortage, mostly in summer, to ensure water supply to every household in the State by 2022.

4.2.4.5 Lack of Solid Waste Management at Tourist Destinations:

According to Central Pollution Control Board, Uttarakhand figures among worst-performing States in terms of processing of solid waste. It has very few solid waste management plants or sanitary landfills in functional order. The population in 92 Urban Local Bodies in the State, produces a mammoth 1406 MT of solid waste daily. In the coming three decades, the solid waste is projected to increase to 2300 MT per day.

Table 4.2.2 Solid Waste Generated in Major Towns of Uttarakhand

Name of District	Name of Town	Municipal Solid waste Generated (Kg/day)	Treatment and Disposed Facility
Dehradun	Mussoorie, Vikasnagar, Rishikesh	18000, 9000, 24000	Dumping
Haridwar	Mangloure	6000	Dumping
Uttarkashi	Uttarkashi	4000	No facility for the disposal of waste
Nainital	Ramnagar, Nainital	3000, 15000	No facility for the disposal of waste
Bageshwar	Bageshwar	1500	Thrown far away from the city
Almora	Almora	10200	Landfilling Composition
Pithoragarh	Pithoragarh	15000	Thrown far away from the city

Source: Urban Development Directorate, Govt. of Uttarakhand (2017): Urban Munipal Solid Waste Management Action Plan for State of Uttarakhand

4.2.4.6 Government's Facilitation Role:

Being a resource-dependent and private sector-dominated industry, with investment decisions linked to return on investment, 'Tourism' is an industrial activity that exerts a series of impacts that are similar to other industrial activities'.[6] In India domestic sector's role in development of tourism industry has increased substantially. Sustainable tourism being an extremely complex endeavour depends largely on a wide range of tangible and intangible determinants such as Government initiatives in financial allocation for tourism infrastructure, Institutions for training and skill development in tourism, promotion and publicity initiatives, Schemes like PRASAD and Swadesh Darshan, well-developed transport facilities and communication.

Intangible factors affecting tourism include conducting regular environment audits at tourist spots, monitoring water supply and its quality, checking the carrying capacity of the entire site, regulating solid wastes and environmental ethics and local community involvement. The State Government needs to grant exemptions to start-ups and industries in the MSME sector to promote

[6] R. Raj and N.D. Morpeth. Pg 6.

tourism and facilitate the visiting tourists as well as local people.

Growth Centres Driven by Homestays and Rural Tourism in a Hub and Spokes Layout

It is proposed to develop carefully selected 20 tourism centric growth centres within 25-30 kms distance from highly frequented tourist destinations in Uttarakhand. These new tourism zones will consist of the hub where tourists will be able to experience rural life, culture, cuisine, performing arts and crafts.

The tourism hubs will consist of homestay options to suit various pockets, a village haat where there will be facilities to shop for locally produced artefacts, clothing, food products, organic fruits and vegetables, flowers, eateries offering local recipes, a performance centre for shows of local music and dance, outlets to sell/rent equipment and gear for trekkers, adventure sports.

These tourism hubs will be connected to the established tourist destination through shuttle bus services and to nearby villages in radius of 15-20 Kms where additional homestays will be available. It is envisaged that with each of the tourism hubs 10-15 villages will be connected each offering 10 guest rooms on their properties/orchards. This will also decongest the bursting at seams popular tourist destinations and take care of the spill over of the seasonal rush.

Ownership and Marketing: Homestay owners and staff, entrepreneurs managing the retail outlets and their staff, eateries, shuttle bus services, performing artists, artisans and managers and guides for adventure sports will become members of a federation which will market the packages and services through dedicated Internet portals, showcasing the region and its multitude of tourism options. Each federation will also tie up with tourism agencies and room reservation players such as Airbnb, TripAdvisor, to market the facilities. This broad ownership of the hub and spokes model will ensure broader distribution of the benefits of tourism amongst the rural communities.

Local start-ups may be preferred in heli-taxi and private cab service and they may be provided exemptions/benefits/subsidy available from GoI.

4.2.4.7 Addressing Infrastructure Gaps:

In recent surveys, it was highlighted that tourism and infrastructural facilities in Uttarakhand particularly Haridwar, Rishikesh and Nainital are fast deteriorating. Other highly frequented destinations in the State also require infrastructural re-development based on careful planning. Currently Uttarakhand lacks good hotels. A global hotel chain plans to invest ₹500 crore to by constructing over 35,000 rooms in several cities/ towns/locations within the State. However, this alone will not be sufficient. Dearth of hotels/hostels in higher altitudes and near scenic locations such as Chopta, needs particulalr attention.

District	Existing Towns Around Which Tourism Hubs Can Be Developed	Potential Tourism Hubs
Almora	Almora	Chaukhutiya, Someshwar, Dwarhat
Bageshwar	Garur	Kapkot, Gwaldam
Chamoli	Joshimath, Gopeshwar	Tharali
Champawat	Lohaghat, Tanakpur	Banbasa
Dehradun	Dehradun, Rishikesh	Chakrata, Raiwala
Haridwar	Haridwar, Roorkee	PiranKaliyar
Nainital	Nainital, Haldwani, Ramnagar	Kaldhungi, Bhowali, Ramgarh
Pauri Garhwal	Pauri, Srinagar	Satpuli, Dugadda
Pithoragarh	Pithoragarh	Berinag, Dharchula, Munsiyari, Didihat
Rudraprayag	Rudraprayag	Ukhimath, Jakholi
Tehri Garhwal	New Tehri	Ghansali, Chamiyala, Narendra Nagar
US Nagar	Rudrapur, Kashipur	Jaspur, Bajpur, Kiccha, Sitarganj
Uttarkashi	Uttarkashi	Chinyalisaur, Barkot, Purola

TOURISM - WAY FORWARD

On the basis of the analysis of the problems and challenges of the Uttarakhand tourism industry, the way forward consists of the following directions:

1. Uttarakhand requires an inclusive, integrated and holistic tourism policy promoting more local meaningful participation and control. Focus on adventure and wellness tourism.
2. Tourism policies in Uttarakhand may promote destination-specific, scheme led infrastructure growth; with due consideration to tourist carrying capacities of the identified destinations.
3. Through Private-Public partnerships, more hospitality training institutes to be invited to set up centres in the State.
4. Lodging facilities to cater to multiple tourist segments may be set up through public private partnerships.
5. The approach to tourism development may become more socially and environmentally considerate, preventing destruction of natural habitats. Sanctity, security and environment to be a unique selling proposition.
6. Convergent action by concerned departments of Uttarakhand government is extremely important if the State is to succeed in reasling its vision. Empowered taskforce may be established to coordinate the implementation of tourism development plans in mission mode.
7. New tourism destinations, focus on establishment and promotion of homestays, use of technology and social media to successfully market the unparelled wonders of Uttarakhand to multiple tourist segments, are some of the suggested initiatives on the way forward.
8. Quota System in Pilgrimage Tourism: Given the existing levels of pollution around pilgrimage sites as in Haridwar, Kedarnath and other sacred spots, Uttarakhand Tourism Authority may devise measures to streamline arrivals and stay durations at each destination to a sustainable level. Management and organization of Uttarakhand pilgrimage tourism, akin to other pilgrimage destinations like Amarnath in Kashmir, may be better managed using planned 'Quota System'. Tourist wardens to guide, facilitate and regulate the influx in high seasons, is a way forward.
9. Potential for Culinary Tourism: Uttarakhand has potential to become a culinary food tourism destination. This requires innovative chefs, restaurants offering local foods, dishes, flavours, dynamic menu, savvy food professionals, adherence to quality standards and hygiene. Uttarakhand Government may actively promote culinary tourism through strategic partnerships and communication.

CHAPTER 5
Growth Enablers - Industries

Every industrial revolution brings along a learning revolution- ***Alexander De Croo***

Abstract:

Uttarakhand's achievement in the industrial sector is the result of political consensus on developmental issues; dynamic, visionary and motivating political and bureaucratic leadership along with general enthusiasm. As a result, the industry sector recorded the highest CAGR of 16.5% in the State during 2004-05 to 2014-15, which is much higher than the National average of 7.2%. The share of secondary sector in the State GDP grew to 49% in 2017-18 from 19.2% in 1999-2000. The share of manufacturing in the total GSDP is relatively better than the India average of the same.

The Index Of Industrial Production (IIP) in Uttarakhand was 155.84 in 2016-17 as compared to 145.92 in the previous year. During 2017-18. Investments worth ₹3551.27 crore have been made in large and mega projects and employment opportunities for 4,659 people have been provided in these projects.

Drugs, pharmaceuticals, biotechnology, mines, minerals, textiles and leather industries are in a comparatively advantageous position due to the availability of related natural resources in the State. Uttarakhand has been successful in providing support to IT firms to operate in the State. In order to address challenges in the agro-processing sector, reforms at policy level are under active consideration. The State has taken several policy measures including the Special Integrated Industrial Development Policy for the hill regions in 2008, the MSME Policy in 2015 and AYUSH Policy in 2018.

The State is home to about 50,400 SMEs, 1,000 Khadi/Gramudyog units and 2,950 factories providing employment to more than 6.3 lakh people. Labour force participation has increased in both rural and urban areas. Worker population ratio has increased in 2017 in both rural and urban areas (from 377 to 488 and 388 to 425 respectively from 2010.

Uttarakhand has been taking big strides on Ease of Doing Business front. Due to extensive efforts, Uttarakhand jumped from Business Reform Action Plan (BRAP) index rank of 23 in 2015 to 09 in 2016. The State achieved 96.13% BRAP score in 2016 as against 13.36% in 2015. This enabled the State to be in leader category as per BRAP score.

Uttarakhand Investors' Summit was organised in October 2018 where 623 MoUs worth ₹1.24 Lakh crores were signed across 12 focus sectors, which include Food Processing, Horticulture and Floriculture, Herbal and Aromatic plants, Tourism and Hospitality, Wellness and AYUSH, Pharmaceuticals, Automobiles, Natural Fibres, IT, Renewable Energy, Biotechnology and Film Shooting.

The State intends a paradigm shift to high end manufacturing. However, large scale investment in digital infrastructure is a pre requisite, besides requirement of physical infrastructure to allow plug and play options as MSMEs will have a larger role to play, to make high end manufacturing feasible with localized smart manufacturing units. This needs developing a digital eco system, establishing common high tech equipment facilities, meeting the skills gaps, inviting PPPs and supporting MSMEs in the process of paradigm shift to high end manufacturing.

The Evolution of Industrialization in Uttarakhand

The revival and growth of traditional industries with the objective of economic growth of mountainous and hill communities was the primary target of the industrial policy of Uttarakhand. This section helps understand and appreciate the tribulations the State had to wade through to reach the present State of industrialization.

5.1 Industrial Policy of 2001:

The first Industrial Policy of the State was announced in the year 2001, but could not attract expected investments due to absence of any major promotional schemes or incentives. The Policy however, helped by identifying industrially potential sectors in the State and emphasizing the need of private sector participation. The policy also resolved to initiate a process of rationalising and simplifying labour laws, rationalising the system of inspections, purchase preference in Government purchases from Small Scale Industries (SSIs) and creation of "Udyog Mitra". It reiterated the State Government's resolve to pursue Government of India to sanction Special Concessional Package to the State. This resulted in the Nainital Declaration of 2002, where, Concessional Industrial Package for Uttarakhand on the pattern of package sanctioned to other special category States was declared by the Union Government in March 2002.

5.2 Industrial Policy of 2003:

After the sanction of Concessional Industrial Package (CIP) by Govt. of India on 7th January, 2003, the State Govt. came out with its Industrial Policy-2003. The fiscal incentives provided under CIP were supplemented by elaborate provisions for creating an investor friendly environment. The policy provided a comprehensive framework for enabling and facilitating investments. The Concessional industrial package provided incentives like, 100% central excise exemption for 10 years on items other than those mentioned in the negative list in the *Concessional Industrial Package*, 100% income tax exemption for first 5 years and 30% for next 5 years for the companies and 25% for others, *Capital Investment Subsidy* @ 15% with a maximum of ₹30 Lakhs, *Central Transport Subsidy* extended till 2007. The State Government also provided certain fiscal incentives like interest subsidy to SSI, assistance for obtaining ISO, patents, CST @ 1%. The *Central Excise Exemption* was the biggest incentive for industries.

Uttarakhand took maximum advantage of the *Concessional Industrial Package* and the performance of the State has been impressive in attracting and facilitating investments. However, a large share of the Concessional Industrial Package was utilised in the 3 plain districts of the State and no major investments could be attracted in the hill districts, due to the limitations of these regions. Tourism, Biotechnology, Aromatic Plants and Medicinal Plant based industries, Floriculture were classified as thrust industries in the Concessional Industrial Package. These sectors were most important for the hill regions of the State.

In order to fulfil the vision of industrial development in the hill regions, the State Government brought out a *Special Integrated Industrial Development Policy* for the hill regions in 2008. Some amendments were made to this policy in 2011. Only the hill regions were included in this policy for attractive fiscal incentives. The region was divided into two categories. Category-A included Pithoragarh, Uttarkashi, Chamoli, Champawat and Rudraprayag and Category-B Pauri Garhwal, Tehri, Almora, Bageshwar and hilly area of district Dehradun. The incentives in category-A were much higher than in category-B. This policy was framed keeping in mind the environmental concerns and hence eligible industries are mainly non-polluting manufacturing industries as classified by the Ministry of Environment and Forests. Tourism, biotechnology industry, protected agriculture and cold storages, petrol and diesel pumping stations and gas storage are eligible activities. Important incentives are; special capital investment subsidy, special interest subsidy, and stamp duty exemption on purchase/lease of land, infrastructure

development subsidy, and reimbursement of VAT.

Uttarakhand performance has been relatively better than of States in the North-East, Himachal Pradesh and Jammu and Kashmir, to whom the Concessional Industrial Package was sanctioned by GoI. Although Uttarakhand was least prepared in terms of industrial infrastructure to invite large investment, it actually attracted much higher investments than any other State. This achievement in industrial sector has been the result of political consensus on developmental issues; dynamic, visionary and motivating political and bureaucratic leadership along with general enthusiasm. As a result, the industry sector recorded the highest CAGR of 16.5% in the State during 2004-05 to 2014-15 (Base year 2004-05 at constant prices), which is much higher national average of 7.2%. The industrial growth of this region before creation of the State was a paltry 1.4% for the period 1993-94 to 1999-2000. The share of secondary sector in the State GDP grew to 39% in 2014-15 from 19.2% in 1999-2000. The share of manufacturing in the total GSDP is relatively better than the India average of the same.

The Index of Industrial Production (IIP) in Uttarakhand was 155.84 (revised estimate) in 2016-17 as compared to 145.92 in the previous year. During 2017-18, investments worth ₹3551.27 crore have been made in large and mega projects and employment opportunities for 4,659 people have been provided. Drugs, pharmaceuticals, biotechnology, mines, minerals, textiles and leather industries are in a comparatively advantageous position due to the availability of related natural resources in the State. Uttarakhand has been successful in providing support and attracting IT firms to operate in the State. In order to address challenges in the agro-processing sector, reforms at policy level are under active consideration.

Efforts are also underway to provide a conducive market environment for MSMEs by addressing lack of credit facilities, skilled labour and regulatory issues.

5.3 Employment Generation:

Availability of employment is a true determinant of growth and development of a State. Against the limited avenues of growth in primary sector, industrial sector is seen as the potential area for absorbing large number of young people seeking jobs. There are 8.9 lakh persons seeking jobs, registered with the employment exchanges in Uttarakhand.

After its formation in the year 2000, the State embarked upon developing industries by offering tax holidays and other incentives. It helped to attract investments as well as developed the services sector resulting in around 50,400 SMEs, 1,000 khadi/gramadyog units and 2,950 factories providing employment to more than 6.3 lakh people. However, after 2014, when the tax holidays and incentives ended, investments started drying up. Hence the requirement of fresh polices aimed at maintaining sustained investment climate.

Key Highlights:

5.3.1 Labour force participation has increased in 2017 both rural and urban areas (from 400 to 474 and 402 to 444 per 1000, respectively), with male and female participation both registering a rise over 2010. Even, though labour force participation has increased from 2010, it is still below the national level average of 548 and 472 per thousand, for rural and urban areas respectively. A similar trend is noted for males and females in Uttarakhand (NSDC, 2017).

5.3.2 Worker population ratio has increased in 2017 in both rural and urban areas (from 377 to 488 and 388 to 425 respectively), with male and female participation both registering a rise over 2010. Even though the worker population ratio has increased from 2010, it is still below the national level average of 529 and 449 for rural and urban areas respectively. The participation rates for both men and women in Uttarakhand are also less than the national averages for men and women (NSDC, 2017).

5.3.3 Unemployment rate for females has increased in 2017 across rural and urban areas

(from 34 to 108 and 83 to 142 respectively) while unemployment rate has decreased for men in both rural and urban areas when compared to 2010. Rural unemployment rates of Uttarakhand fare poorly when compared to the national average with women lagging behind by almost double. On the other hand, urban male and person unemployment rates are better than the national averages of 34 and 50 respectively (NSDC, 2017).

5.3.4 Proportion unemployed for females has increased in 2017 across rural and urban areas (from 7 to 27 and 8 to 21 respectively) and has decreased for men in both rural and urban areas when compared to 2010. Proportion unemployed in rural Uttarakhand is more than the national average while proportion unemployed in urban Uttarakhand is better than the national average for male, female and persons (NSDC, 2017).

5.4 Industrial Development Scheme for Himachal Pradesh and Uttarakhand:

The Government of India has introduced *Industrial Development Scheme* for Himachal Pradesh and Uttarakhand to boost industrialization, effective from 1.04.2017 to 31.03.2022. Under the scheme, all new industrial units and existing industrial units are eligible for substantial expansion in manufacturing and services sectors. Bio-technology firms and hydel power generation units upto 10 MW are also eligible for this scheme. Eligible new industrial units and existing industrial units on their substantial expansion in manufacturing and services sectors, located anywhere in Himachal Pradesh and Uttarakhand will be provided *Central Capital Investment* Incentive for access to credit (CCIIAC) @ 30% of the investment in plant and machinery with an upper limit of ₹5.00 crore.

Against this backdrop, Uttarakhand plans to take proactive steps and strategies for maximum utilization of CCIIAC. However there is a significant paucity of data on the number of industries that have benefited from this scheme and their current status. *A comparative study on impact of CCIIAC on industrial growth of Uttarakhand and Himachal needs to be conducted to guide future strategy*.

With the launch of *Make in India* programme, Uttarakhand Government began to introduce reforms facilitating *Ease of Doing Business* (EoDB) to attract investment at State level. As per *Department of Industrial Policy and Promotion (DIPP)*, Uttarakhand stands at 9th position of EoDB index with a score of 96.13%. The State envisions to create conducive environment to industries by pursuing polices promoting emerging industries, taking measures for easy availability of credit, providing better land clearance policies and establishing forum for redressal of grievances.

5.5 Ease of Doing Business and Policy Intentions:

5.5.1 Ease of Doing Business (EODB):

EoDB strategy not only helps investors in setting up their enterprises in the State, but also encourages entrepreneurship amongst youth. The Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce, Govt. of India embarked upon a reform process for improving business regulatory and facilitating mechanisms across States and started ranking of States in the year 2015. The ranking is done on 98 points agenda on parameters like ease in setting up business, labour compliances, infrastructure availability, finance and tax issues related reforms and ease in existing business. Uttarakhand was ranked 23rd in the first ranking of States. This ranking did not reflect the real business environment in the States because it was based on certain parameters mainly related to creating online service delivery systems.

National Council for Applied Economic Research (NCAER) came out with State Investment Potentials index (N-SIPI in March, 2016). While World Bank ranking is much more procedure and transaction driven, N-SIPI focusses on the policy and structural issues that determine the business environment in any State. This index is

constructed under 5 broad pillars classified under 4 broad categories as being factor driven (labour), efficiency driven (infrastructure), growth driven (economic climate and political stabilities/Government) and perception driven. Uttarakhand stood at 8th position (overall Index in Automobile Sector) in this ranking. It was among the first 5 States in the 'infrastructure' and 'perception' pillars. The State steadily witnessed improvement on various aspects of EoDB.

5.5.2 Uttarakhand`s Achievements:

1. Recognised as an Achiever State by DIPP in its assessment on EoDB
2. 98.10% compliance in reform evidence scorecard
3. 94.24% composite score in reform implementation and feedback
4. Number 1 amongst hill States in India and Number 11 amongst other States
5. 100% achievement under 9 out of 12 reform areas identified by DIPP

5.5.3 Reforms undertaken by the State Government under EODB -2017:

- ✓ Commercial Court setup in Dehradun.
- ✓ Online system has been developed for services by several departments
- ✓ Auto renewal of *Consolidated Consent and Authorization* (CCA) facility has been extended to orange category industries
- ✓ Addition of 40+ investor related services in "The Uttarakhand Enterprise Single Window Facilitation and Clearance Act, 2012"
- ✓ Integration of *Stamps and Registration/Revenue Department /Urban Department* to provide the mutation status to applicants.
- ✓ Rollout of *Revenue Court Management System* and its integration with Bhulekh software of the revenue department.
- ✓ Developed a central inspection system, whereby departments directly report online in the system to enable synchronized inspections and bring transparency.
- ✓ Real time grant of registration and renewal under *Uttarakhand Dookanaur Vanijya Adhistam Adhiniyam, 1962*.
- ✓ Online system for filling of Single integrated Returns under Labour Laws.
- ✓ Mandatory use of E-Step in module to schedule appoints for presentation in SRO offices.
- ✓ Common application form for investor related sectoral incentives applicable in the State.
- ✓ Real time tracking of all the offline applications of different departments in the State.
- ✓ Establishment of *Investor Facilitation Centre* for investment promotion, industrial facilitation, regulatory reforms and obtaining investor feedback.

In addition to the efforts mentioned above, the Government of Uttarakhand is attempting to create a transparent system where investors have access to State policies, rules regulations and regulatory requirements and also doing away with arbitrary discretions.

Uttarakhand has considerable scope to improve its rankings in terms of reducing the time it takes to start a business in Uttarakhand and also ensuring faster enforcement of contracts.

Uttarakhand became successful in implementing "Investor Facilitation Across the Business Life Cycle" through time-bound approvals with provision for penalty and grievance handling as per steps given below (DIPP, 2016):

i. In-Principle Approval: Decisions on Project Proposals within 15 days by State Empowered Committee / District Empowered Committee.
ii. Pre-Establishment: Approvals for pre-establishment services within 15 days.
iii. Pre-Operations: Approvals for pre-Operations services within 30 days.
iv. During Operation: Time-bound approval under the Right to Service Act (> 100 Services covered).

Table 5.5.3.1 Uttarakhand's Performance on Business Reforms Action Plan (BRAP) -2016

Reform Area	Implementation Score (BRAP 2016) (in %)
Access to Information and Transparency Enablers	100.00
Single Window, Online Single Window System	100.00
Availability of Land, Land Allotment, Property Registration – Enablers	80.00
Construction Permit Enablers	93.10
Environmental Registration Enablers	100.00
Labour Regulation Enablers	100.00
Obtaining Electricity/ Water Connection	100.00
Tax Enablers	100.00
Tax Enablers	100.00
Inspection reform enablers	100.00
Commercial Dispute Resolution Enablers	46.15

Source: DIPP (2016)

The comparison of EoDB as per BRAP 2015 and BRAP 2016 between Uttarakhand and Himachal Pradesh is given below.

Table: 5.5.3.2 –BRAP Rankings UK & HP

States	BRAP 2015 Rank	BRAP 2015 Score (%)	BRAP 2016 Rank	BRAP 2016 Score (%)	Jump in Ranking	Difference Score (%)	Category (BRAP 2016)
Uttarakhand	23	13.36	9	96.13	14	82.77	Leaders (90-100)
HP	17	23.95	17	65.48	0	41.53	Acceleration Required (40-70)
India		32		48.93		16.93	

Source: DIPP (2016)

Despite challenges like (i) difficult geographical terrain (ii) land locked area (iii) international borders (iv) connectivity issues (v) small size of the markets (vi) high factors costs (vii) environmental challenges, Uttarakhand jumped from BRAP rank of 23 in 2015 to 09 in 2016. The StateState achieved 96.13% BRAP score in 2016 as against 13.36% in 2015. This enabled the State to be in leaders' category as per BRAP score whereas Himachal Pradesh is in acceleration required category, according to DIPP 2016.

5.5.4 Policy Intentions on Ease of Doing Business:

The Government of Uttarakhand envisions to see beyond the framework of EoDB in the State. Endeavours are in place to ensure multiplication of the flow of fresh investments. It is to be noted that highly industrialized States still have lesser ranking on the EoDB. For instance Maharashtra, a largely industrialized State is ranked at 13, despite having Mumbai-the financial capital of the country- in its territory.

Drawing Lessons from Kazakhstan on EODB:

Central Asian country, Kazakhstan holds key lessons for rest of the world on improving rankings on EoDB index. This country is now on the list of the world's top 30 economies in ease of doing business, according to the World Bank Group's Doing Business 2019 report. In 2018, the country was at 36th place and this year it has moved up to 28th place. It achieved this success by demonstrating a strong commitment towards improvement of conditions to conduct business, by implementing reforms on three indicators - starting a business, trading across borders, and enforcing contracts.

Key Measures Taken by Kazakhstan:

The country reduced the time taken to start a business. It has been made easier by reducing the time required for value added tax registration reducing the time for opening a business in the country from nine to five days.

By introducing an electronic customs declaration system, as well as reducing customs administrative fees, trading across borders has been made easy.

Enforcement of contracts was made easier by making judgments rendered at all levels in commercial cases publicly available. It also published the performance measurement reports. on local commercial courts.

Similar case is with Tamil Nadu, which ranked 15th and this State is also known for its industrialization success.

Hence, the Government of Uttarakhand envisages to take further measures not only to just improve the rankings of EoDB, but also to convert higher ranking into huge investments. Policies are being deliberated to address the underlying factors that drive investment decisions. Uttarakhand has an intrinsic strength of a natural base. In addition to this, emphasis will be laid upon the pre-requisites to create investor friendly climate, which include –road access, links with the ancillary industries, access to finance, availability of skilled and unskilled labour, land availability on rentals etc.

5.6 The State's Initiatives to Promote Industries:

5.6.1 Promotion of Export Oriented Industries:

Exports gained momentum in the State during the last decade due to the policy initiatives of the Government. These policy changes brought a shift in the pattern of production in the State from traditional items to high tech products like electronics, computer and its accessories, tele-communication and processed food. In the recent years, productivity and production of herbal and medicinal plants and their trade in the State has increased remarkably. Measures have been taken to expedite certification to boost exports of agricultural produce. The Union Government has authorised Pantnagar University to certify agricultural produce for exports.

The State is well diversified in terms of export destinations. Its exports go to a vast number of countries and to a number of States within the country.

Talks are under way to increase the export volume. Uttarakhand holds huge potential in AYUSH. The State has made an innovative proposal of setting up Spiritual Economic Zone in the State to draw global attention towards Uttarakhand. The State Govt. had also requested GoI to help in reducing logistics costs, in order to double exports.

The State Govt. is seeking cooperation from the GoI in its proposed projects of export-linked infrastructure development under the Trade Infrastructure for Export Scheme (TIES) with the objective to improve competitiveness of exports by bridging gaps in export infrastructure. Measures like creation of exports specific infrastructure, establishing the first and last mile connectivity for export oriented projects, addressing certification and quality measures come under this scheme.

5.6.1.1 Achievements:

Uttarakhand has been adjudged the best State at the 38th India International Trade Fair, New Delhi, held in November 2018. This event was an opportunity to showcase the products manufactured in the State, particularly of MSME sector, to the domestic and international markets. The State showcased reconstruction work done at Kedarnath, steps taken to boost tourism and promote local products like organic honey.

Uttarakhand's theme at the event was rural MSMEs. Concept of Home Stay scheme initiated by the Department of Tourism, nutraceutical products based on mountain grains, handloom products and handicrafts were displayed at the Uttarakhand pavilion in the fair. The State also showcased its potential to emerge as a premier film shooting destination in the country and its possibilities in the AYUSH and wellness sectors.

5.6.1.2 Policy Intentions for Export Promotion:

The State envisages to address operational, structural and institutional stumbling blocks in the export promotion of Uttarakhand. Some of the policy intentions on this front are as follows.

- Immediate issue related to refund of GST to the exporters is already being discussed with the Union Government and measures will be taken to ensure a speedy refund of the same in the near future.
- A proposal to extend cargo facilities to the mushroom exporters is being considered and this could boost the volume of mushroom exports to a large extent.

- The State envisions to build Common Facility Centres (CFC) with necessary infrastructure to promote exports from the State.
- Given the fact that, agriculture, industry and services sectors constitute nearly 10%, 45% and 40% to State's GDP, the State sees a large potential for increasing export in these sectors especially in agriculture and MSME industries. Measures on this front will be taken to exploit the potential by studying and sorting out the sector specific issues and concerns.
- In view of a large scale demand for the agro-based products like herbs, fruits, frozen tulsi, fruit juices, and jams, handicraft products and wooden items at national level and abroad, the State foresees a greater potential to be exploited on this front. Endeavours are underway to make farmers aware of benefits of organic production.

5.6.2 Single Window Clearance System:

The State Government enacted The Uttarakhand Enterprises Single Window Facilitation and Clearance Act, 2012 [Uttarakhand Act No. 05 of 2013]. The Act was passed to provide necessary time bound licenses, permissions and sanctions to establishment of industry. The Act devolves the power to administer various provisions in the Act to the State Level Empowered Committee (SLEC) and District Level Empowered Committees (DLEC) and these bodies are the final apex authority to grant approvals with their decisions being binding on all departments. The provisions in the Act also have an overriding effect on all other Acts prevalent in the State.

5.6.3 MSME Policy:

Government of Uttarakhand notified its MSME Policy 2015 to attract investments in MSME sector, which was rated as one of the best in the country. The policy aims at utilizing local resources, generating employment opportunities, especially in hilly areas and promoting Self-Employment. Investments worth ₹728.94 crore (3339 units) were made and employment opportunities for 19,547 people were provided till 2017-18.

MSME Sector got an incremental policy attention during last few years. Its high potential of generating employment with comparatively smaller investments, wider geographical spread and self-employment opportunities to youth in large numbers, makes this sector a top priority agenda, particularly in the wake of growth and investments in large sector not resulting in significant employment generation. The MSME sector got a further boost with steady growth of ancillaries and vendor units to setup shop in the State.

MSME has a larger relevance and importance in the State, given its potential to generate employment in the wake of improvement in education, awareness levels, and rising entrepreneurial culture. This makes the MSME sector a large avenue for economic participation of local youth through self-employment as well as increasing job opportunities. Tourism sector is the classic example of how, young local entrepreneurs have started innovative and successful enterprises.

The State MSME policy takes care of regional imbalance and attempts to promote investments in remote and hilly areas by providing attractive and higher incentives for these areas. Apart from manufacturing, many service sector activities have been made eligible for incentives.

5.6.4 Handlooms and Handicrafts:

Tourism and handicrafts development generally go together. Uttarakhand Handloom and Handicrafts Development Council (UHHDC) has created 'Himadri' brand for Uttarakhand craft products. UHHDC is also implementing Integrated Handicraft Development Project of Ministry of Textiles, Govt. of India in 15 blocks of the State. Designers from reputed design institutes are working with artisans and a pool of new products have been developed. This sector generates income for local people, especially women.

5.6.5 The Investment Summit:

In order to showcase Uttarakhand's investment potential and promote investments, Government

of Uttarakhand organized its maiden Destination Uttarakhand Investors Summit on 7th -8th October 2018. This was a hallmark summit that has led to the convergence of more than 4000 thought leaders, business leaders, premier educational institutions and innovators on a single platform to explore investment potential in Uttarakhand. In a run up to this Summit, the State organized several mini-conclaves within the State and roadshows outside the State to ensure maximum outreach, awareness and participation. 623 MoUs worth INR 1.24 Lakh crores were signed across 12 focus sectors, which include Food Processing, Horticulture and Floriculture, Herbal and Aromatic plants, Tourism and Hospitality, Wellness and AYUSH, Pharmaceuticals, Automobiles, Natural Fibres, IT, Renewable Energy, Biotechnology and Film Shooting.

5.7 Performance of Central Government Schemes:

5.7.1 Prime Minister's Employment Generation Programme (PGMEP):

The PMEGP is a Central Sector Scheme funded by the *Ministry of Micro, Small and Medium Enterprises*. The scheme is implemented by Khadi Village Industries Commission (KVIC) in association with *Khadi and Village Industries Board (KVIBs)* and State Governments through *District Industries Centres*. The objective of this programme is to generate employment opportunities through self-employment ventures and to increase wage earning capacity of artisans and contribute to increased growth rate of rural and urban employment. The State has established 1611 units with an assistance of ₹2,877.08 lakhs. These units have generated employment for 12,823 persons.

5.7.2 Start-Up India Initiatives (2017-18):

1. To promote Uttarakhand's Start-up ecosystem, State has assigned Dept. of Industries as the nodal agency.
2. The State has formed a *Start-up Cell* which ensures proper monitoring, documentation and reporting of the progress of the Start-up initiatives being undertaken to promote Uttarakhand as a premier start-up destination in the country.
3. Apart from the Start-up Cell, a *Start-up Council* and *Start-up Task Force* have been constituted. The Start-up Council has recognized 07 start-ups under various sectors such as IT, medical, health, agriculture etc.
4. The Start-up Council has recognized TIDES (IIT Roorkee) and TBI (Graphic Era University) as nodal agencies for scrutiny of Start-ups' recognition and incentive applications.
5. The State has developed an online portal (www.startuputtarakhand.com) to facilitate start-ups in the State and for allowing online application submission, status tracking and downloading of registration certificates.
6. A dedicated start-up support system (call support, email support and physical centre) has been established with competent staff to resolve queries related to start-ups.
7. The Government of Uttarakhand has successfully organized a *Start-up Yatra* and has awarded ₹50,000 for top 10 pitches; the yatra van travelled to various cities of Uttarakhand with the following objectives:
   a. Spreading awareness about *Start-up India* and *Uttarakhand Start-up Policy*.
   b. Opportunity to pitch an idea and get selected for the acceleration programme
   c. For better implementation of the policy and to build and develop a successful start-up ecosystem in the State, Uttarakhand Government has entered into an MOU with 'Invest India'

9- Government of Uttarakhand is trying to set up a strong network of angel investors in order to facilitate start-ups.

10- The State has notified its *Start-up policy 2018* with an aim to provide a platform for

the students emerging from educational institutes to nurture them as entrepreneurs.

11- Under the Start-up Policy, the State provides incentives such as monthly allowance, marketing assistance, stamp duty, SGST etc., for the start-ups recognised by the State.

12- For Incubators set up in the State, capital grant, running expenses and matching grant are provided.

5.8 Uttarakhand AYUSH Policy 2018:

Govt of Uttarakhand has set up dedicated Department of AYUSH in 2010 and has framed 'Uttarakhand AYUSH Policy 2018' with an objective of becoming the preferred AYUSH Treatment and Wellness Destination State.

Known for the natural environment of the Himalayas, Uttarakhand has abundant natural resources of hills and forests. Its agro-climatic conditions support horticulture-based industries and made the State home to more than 175 species of rare medicinal, aromatic and herbal plants (GoU, 2018).

Vision: To make Uttarakhand as the preferred destination State for health care and wellness tourism.

Objectives: To position Uttarakhand as preferred AYUSH wellness destination State on the global map; to establish AYUSH systems of medicine as one of the preferred choice of treatment in health care; to upgrade the existing infrastructure and develop new infrastructure including hospitals and dispensaries; to improve society's health status through concerted policy action in all AYUSH sectors and public health programmes by enabling universal access to AYUSH drugs and services; to create single window clearance for private investments in AYUSH sector; to provide quality AYUSH drugs; to improve production of raw materials for AYUSH drugs. Government shall intervene to enhance the use of AYUSH system in public health care, tribal health care, palliative care, cancer care, maternity care, child care, geriatric care, sports care, communicable and non-communicable diseases and lifestyle disease management (GoU, 2018).

Manufacturing-based AYUSH Projects: This include projects for development of AYUSH drug manufacturing units and Pharmacies by giving AYUSH industry status. Government of Uttarakhahand shahall provide financial assistance (capital incentives, interest subsidies, GST reimbursements, stamp duty exemptions) through Uttarakhahand MSME Policy 2015, Mega Industrial and Investment Policy 2015 and Uttarakhahand Tourism Policy 2018. Department of AYUSH shahall make necessary provisions / financial assistance within their State State budgets (which do not fall in the eligible criteria of Uttarakhand MSME Policy 2015, Mega Industrial and Investment Policy 2015 and Uttarakhand Tourism Policy 2018) (GoU, 2018).

5.9 Role of SIIDCUL in Industrial Development:

SIIDCUL, a Government of Uttarakhand Enterprise, was incorporated as a Limited Company in 2002 (SIIDCUL) with the following objectives:

- Promote industrial development in the State,
- Provide financial assistance in the shape of debt, equity, and venture capital,
- Develop infrastructure,
- Assist private initiatives in Industry and Infrastructure.
- Implement, manage projects and provide specialized financial, consultancy andconstruction,
- Promote industries and develop Industrial Infrastructure

This may be done directly or through special purpose vehicles, joint ventures, assisted companies etc. Besides the State Government, SIIDCUL has equity participation from UBI, OBC and SIDBI. Other banks are also in the process of participating in its equity. The pro-active Government led facilitative environment has led to more than a thousand EOI's with SIIDCUL, which entail an investment of around ₹20,000 Crores (SIIDCUL).

The facilities in Integrated Industrial Estates include; dedicated 220 KV Substation with a string of feeder substations, common effluent treatment plants, 60 mt. roads, all modes of

connectivity, logistic centres, zonal distribution of Industries, residential and commercial areas. Maintenance of these estates is looked after by reputed O&M contractors. Specialized theme parks are also contemplated within these Estates.

Singapore Shows the Way

The tiny island-city state of Singapore offers interesting insights into promoting high end manufacturing, by providing access to high end manufacturing tools to its Small and Medium-sized Enterprises (SMEs). Singapore launched a scheme in September 2018, to connect smaller advanced manufacturing businesses with state-of-the-art Government hardware, along with a brand-new facility to house the technology. High end equipment like robotised 3D scanners and laser powder beds are made available by the Government, to companies looking to build their technical capabilities and train workers in the use of such machines.

This initiative helps the Singapore's SMEs to deepen their innovation capabilities and tap opportunities from advanced manufacturing technologies. Moreover, this scheme helps to bridge the gap for smaller companies who do not yet have the resources to take on advanced manufacturing technologies. The participating SMEs not only get to play with the equipment and receive technical advice, but are able to acquire tools to scale-up and expand their businesses, boosting the country's competitiveness with the potential to change their manufacturing landscape.

5.10 Making a Paradigm Shift to High End Manufacturing: Prospects and Challenges:

There has been a policy discourse on the prospects of the State making a paradigm shift from low end manufacturing to high end manufacturing. At a time when the landscape of the global manufacturing is transforming and heading towards a 'fourth industrial revolution', there appears a great potential for investment in technologies aimed at efficiency and productivity gains. There are domestic factors that amply support this proposition. A huge market that is ever expanding, a large work force and favourable, business friendly Government policies are few factors to count. However, large scale investment in digital infrastructure is a pre requisite, besides requirement of physical infrastructure. MSMEs will have a larger role to play, which makes high end manufacturing feasible with localized smart manufacturing units.

5.10.1 Policy Intentions to Meet the Challenges:

Despite large scope for growth and the opportunity to leap into the next generation of manufacturing, high end manufacturing poses challenges for the State. While the State has expressed policy intentions to address the challenges on the path to transformation to high-tech manufacturing, a bigger challenge is of developing a digital eco system and meeting the skills gaps. Deliberations with key stakeholders to evolve a roadmap of developing a complete eco-system that supports and facilitates high tech manufacturing in the State would be the way forward at this point of time. These deliberations could go a long way in bringing out sustainable solutions to the challenges like covering up the skill gaps, issues related to privacy and data security and the modus operandi of the public private partnership and most importantly the role of MSMEs in the whole process of paradigm shift to high end manufacturing.

5.11 Import and Export Profile of Uttarakhand:

5.11.1 Import Profile:

Uttarakhand, being a hill State, is a relatively closed economy in comparison to the other States, given the region specific constraints, agro-climatic and environmental issues. It is due to these factors, the State has a limited possibility of exporting goods and services barring products and services in which it has comparative advantage. On the other hand, State's

manufacturing sector is not fully developed yet. This has resulted in the State's lack of capacity to fully meet its domestic demand for consumption, giving rise to the need to import from other States. Although it imports from all over the country, few States tend to dominate as the source of imported commodities. Uttar Pradesh, Delhi, Haryana, Maharashtra, Rajasthan, Gujarat, Punjab, Himachal Pradesh and Tamil Nadu are the top ten States that account for roughly 90 percent of imports of Uttarakhand. Commodity wise, Uttar Pradesh dominates as source of food products while Delhi and Maharashtra are prominent in the import of machinery, motor vehicles and other industrial goods.

According to the survey report on import-export of all commodities in Uttarakhand, compiled and submitted by Giri Institute of Development Studies in November 2017, total imports of Uttarakhand account for 80% of its GSDP with a diversified import basket. The relationship between the growth of GSDP and the growth of imports is captured in the coefficient of import elasticity which was found to be 1.31. According to the report, imports have increased from Rs 12,05,813.789 million in 2013-14 to Rs 15,80,682.805 million in 2015-16 showing a compound annual growth rate of 14.49%. During 2014-15 to 2015-16 imports surged by an extremely high rate of 24%. The top ten industries which roughly account for about 80% of the imports are machinery and equipment, motor vehicles, trailers and semi-trailers, rubber, clothing, plastics products, electrical equipment, chemicals and chemical products, basic metals, food products, computer, electronic and optical products.

Commodities being imported into the State have been classified into 25 Industry groups following the NIC Two Digit Classification. The total value of imports was Rs 12,05,813.789 million in the year 2013-14. The highest share (16.39%) of imports in value terms has been found for manufacture of machinery and equipment. The other important industry groups having significant shares in imports are: manufacture of motor vehicles (10.21%), manufacture of rubber and plastic products (10.09%), manufacture of electrical equipment (7.80%), manufacture of chemical and chemical products (7.30%), basic metals (6.54%), other manufactures (6.42%), fabricated metal products (4.61%), food products (4.76%) and manufacture of computers, electronics and optical products (4.70%). These industry groups together constituted about 80% of imports of Uttarakhand in the year 2013-14, indicating that industrial and durable goods form bulk of imports of the State. This is pointer to the possibility of domestic production of some of these products replacing imports. Total value of imports in the year 2014-15 was Rs 12,70,386.238 million clocking a growth rate of 5.35% over the year 2013-14. There have not been many changes in the commodity composition of imports. Bulk of imports are still concentrated in the same commodities as were there in the year 2013-14 (GIDS, 2017).

Some of the industries having a significant share in the total imports also registered high growth rates over the period from 2013-14 to 2014-15 and to 2015-16. These industries are: coke and refined petroleum products (34.96%), chemical & chemical products (28.72%), pharmaceuticals (39.91%), computer, electronic and optical products (50.86%), machinery and equipment (17.28%) and other manufacturing (64.26%). On the other hand, some of the industries with a significant share in the imports also marked negative growth rates. These industries are: other non-metallic mineral products (-10.29%), basic metals (-27.79%), motor vehicles (-24.14%). This shows that the industrial structure of Uttarakhand is changing and evolving (GIDS, 2017).

The State is contemplating policies to reduce its dependence on imports by promoting indigenous industries.

5.11.2 Export Profile:

Exports are indispensable for the growth of the State economy. Growth of exports gained momentum from the State, during the last decade. Government initiatives in the form of subsidies to industries, quality industrial infrastructure and monetary and fiscal benefits as incentives to the investors have played key role in growth of

exports from the State (GIDS, 2017). In 2014-15, Uttarakhand's exports stood at ₹52252.57 Million as compared to ₹30042.56 Million in 2013-14, registering a high jump in exports during this period. Exports to foreign countries increased by 194.83% and to other States by 64.52%. In relation to India, exports from Uttarakhand form a very low value of less than 1%. But this also indicates a high potential of Uttarakhand's economy to boost its exports (GIDS, 2017).

Singapore was Uttarakhand's largest export partner, with an average share of 14.98% in Uttarakhand total export during the last two years. U.S.A was the second largest importer (13.25%), followed by the Nepal and Russia. Destinations of Uttarakhand exports have changed in last five years. However top destination countries for Uttarakhand Exports more or less remained the same in last two years. These top ten countries whose share is more than 60% of total exports from Uttarakhand are: Singapore, USA, Nepal, Russia, South Africa, Bangladesh, Ethiopia, Mexico, UAE, and Nigeria (GIDS, 2017). Asia and Pacific has been the top export region in the last two years with more than 40% average share in total Uttarakhand exports. Africa marginally exceeded North America in terms of value of exports to stand at 2nd position, though both the regions have a share of >25% of total exports from the State. Other major export destinations are Europe (8.54%), Commonwealth of Independent States (7.89%), and Arab States (7.75%), during 2013-14 and 2014-15 (GIDS, 2017).

Within the country, U.P. (18%), Delhi (11%), Haryana (10.8%), Maharashtra (9.5%), Punjab (6.9%), Gujarat (5.4%) and West Bengal (4.5%) were the major export destinations from Uttarakhand during 2013-14 and 2014-15 (GIDS, 2017).

WAY FORWARD

Despite the odds posed by the topographical and environmental factors, Uttarakhand is steadily making strides on the industrialization front. Various measures taken with the aim to improve ease of doing business in the State and promote industrialization, are yielding results and the State is also attracting increasing investments in a variety of segments.

The industry is gradually adjusting to the new indirect tax regime of GST and is now on track and gaining traction, after a brief sluggish spell in the initial days of GST introduction. The new indirect tax regime has brought in transparency and accountability in the system and this would, in the long run prove to be a major booster of investment in the State.

The State is making efforts to address the structural and institutional issues faced by manufacturers and exporters. Endeavours are underway to further improve delivery of services to promote industrial development. While there are new aspirations to make a paradigm shift to high end manufacturing, the Government is also aware of the challenges it poses and is in the process of deliberations and policy designing to overcome them.

The State recognises the importance and need of Information and Communication Technology and Electronics (ICT andE) for further economic growth, better governance and also employment generation and hence brought in the State's IT Policy of 2018.

Continuous efforts are being made to devote resources to further strengthen the existing manufacturing base, given its significance in employment generation and also the contribution it makes to the State's Domestic Product.

Besides manufacturing, other avenues of employment generation are also being actively explored.

While tourism has always been a core area of competence of the State, several aspects of tourism like the spiritual, cultural, adventure tourism, health and leisure tourism all offer new

and large opportunities for investment, development and economic growth.

Information and Technology, health care and skill development holds huge potential in terms of attracting investments and generating employment.

Endeavours are underway in sectors like organic farming, agriculture, horticulture, aromatic and herbal plants, grains and available bio-diversity. Uttarakhand's journey to the present State of industrialization has been illustrious, in comparison to many other small States in the country. Further endeavours will sustain and bolster this growth, bringing economic prosperity to larger populations of the State.

CHAPTER – 6
Status of Infrastructure
Key Driver for Economic Growth of The State

Abstract:

A sound Infrastructure is crucial for economic growth of a country. It comprises of both social infrastructure and economic infrastructure. Economic infrastructure includes energy, water, transport, and digital communications. Infrastructure affects aggregate output in two important ways: (1) It directly contributes to gross domestic product (GDP) as an additional input in the production process, and (2) indirectly, by raising total factor productivity, by reducing transaction and other costs thus allowing a more efficient use of resources. Uttarakhand has developed infrastructure networks in the power and transport area (road & and air transport). Though the State's infrastructure base in these areas has expanded over time, investment levels have fluctuated significantly over time. Public investment in infrastructure needs to increase from its current level to strengthen overall physical infrastructure in the State.

Energy: With an ambitious 'Power for All' vision in a difficult geographical terrain, the Government of Uttarakhand proposes to harness its hydro and renewable energy sources to the optimum level. At present, demand for power in Uttarkahand is around 1500 to 1600 MW per day. Around 52% of the demand is met through imports and rest is generated in the State. As per projections, deficit is likely to be of 10,670MU in 2030.

Renewable Energy (RE) potential of Uttarakhand is 8115 MW (UREDA). It is much more than current demand of 1600 MW. Uttarakhand's Future Electricity Road Map 2030 emphasises on taking full advantage of State's RE potential. It plans to tap its hydro potential through small, mini and micro hydro power projects.

Road Transportation: Importance and unique challenges of road transportation in Uttarakhand are well recognised. Uttarakhand had total road length of 2,841.9 km of national highways in 2017 (NHAI, Govt. of India). However, road length per lakh population is less in the State as compared to Himachal Pradesh. Although in absolute terms it has nearly double the length of roads than Himachal Pradesh. Number of vehicles in the State have increased six fold during 2002-03 to 2016-17. This poses a major challenge to safety, security and management of the road transportation.

Railways: Uttarakhand's topography acts as a barrier in development of railways network in the State. The Government has initiated plans to start monorail services between Dehradun, Haridwar and Rishikesh. Under State Budget 2018-19, an allocation of ₹86 crore (US$ 13.28 million) has been made for development of metro rail. Rishikesh-Karnprayag rail line is expected to be functional by 2024-25.

Air Transport: The State intends to build air transport as a reliable all-weather transport option for the hills. As Uttarkhand grows as preferred tourist and industrial destination, the State Government is focusing on upgrading the Jolly Grant airport as an international airport in coordination with Airports Authority of India. Under the Centre's regional connectivity scheme, clearance has been given for two airports and 14 helipads. The civil aviation component of the UEAP, envisages undertaking up-gradation/ construction of about 37 Helipads, 19 Heliports and 4 Helidroms. Possibilities of setting up an aircraft/helicopter maintenance facility at Jolly Grant are also being explored.

6.1 Energy Sector:

The source mix of power In Uttarakhand is 400 MW from coal based thermal sources, 64 MW from gas based thermal sources and rest 1922 MW from RE sources (GoUK). In the future electricity mix scenario of the State, there are mainly RE sources of electricity with very limited scope for expansion of thermal power, due to coal transportation challenges in the hilly terrain.

There is a huge scope for RE in the State from multiple sources such as solar, biomass, and waste to energy. Present demand for power in Uttarakhand is around 1500 to 1600 MW. Around 52% of the demand is met through imports and rest is generated in the State. The State has estimated solar power potential of 4077 MW while only 275.58 MW (<7%) is realised (UREDA). The State has hydropower potential of 3000 MW through small, mini and micro hydel projects, while present generation is only 210 MW (7%) (UREDA). There was marginal increase of 12% in electricity generation in the State in 2015-16 compared to 2014-15 (DES). Total energy consumption in 2015-16 was 10,298MU (DES) and total production was 4,942.33 MU showing a supply deficit of 52%. Thus, the State requires to tap hydro- small, mini and micro hydel, solar, biomass, and waste to energy to meet its growing demand and reduce dependence on imports.

In Uttarakhand, though RE remains most significant source of power, there is a wide gap between the potential and realisation of RE power as shown in Tables 6.1 and 6.2.

Table 6.1: Potential of Non- Conventional Energy in Uttarakhand

S. No	SOURCE	POTENTIAL
1	Small, Mini and Micro hydel segment (up to 25 MW)	3000 MW
2	Biomass (forestry, crop residues, rice husk, bagasse)	262 MW
3	Biogas (Cattle Dung)	28.80 MW
4	Wind	Not many suitable areas
5	Solar Power Project	4077 MW
6	Geo Thermal	20 MW
7	Waste to Energy	100 MW

Source: UREDA

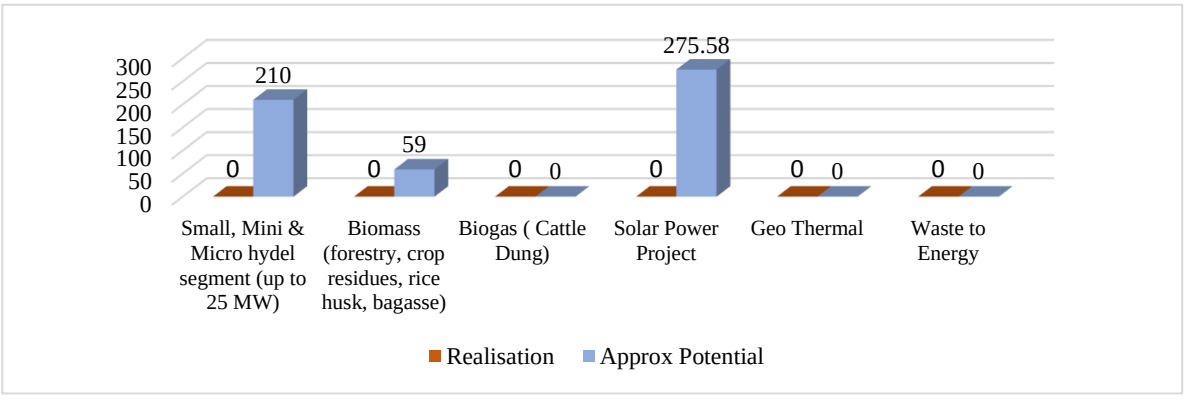
Table 6.2: Renewable Energy Achievements: Grid Connected and Off Grid

Grid Connected Projects		
1	Co-generation based Power Plant	72.60 MW
2	Solar PV plant (Ground Mount and Rooftop)	275.58 MW
3	Small Hydro Power Plants (UJVNL)/UREDA/IPP)	210 MW
Off Grid Projects		
4	Rice Husk and W2E biomass power projects	59 MW
5	Solar decentralised power projects	3.66 MW
6	Micro and Mini Hydro power plants including watermills	5.90 MW

Source: UREDA

The linear growth trend of electricity consumption and production in Uttarakhand is projected upto 2030 based on DES Data (up to

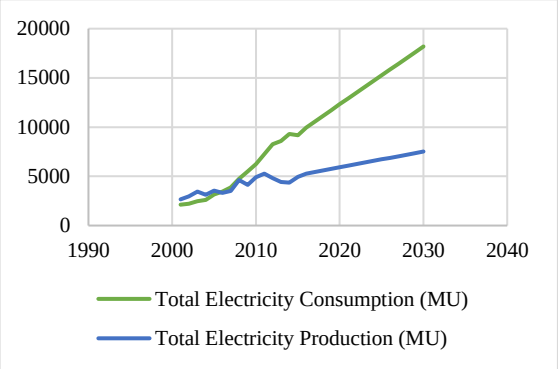
Figure – 6.1 Gap Between Potential and Realisation of RE



Source: UREDA

2015) as shown in the Figure 6.2. Demand supply-gap of 10670.13 MU is apparent in the graph below, which is widening due to surge in consumption. Thus, urgent steps are called for to tap the RE potential of the State to bridge this gap.

Figure 6.2 Electricty Production and Consumption (MU)



Source: Projection based on data by Directorate of Economic and Statistics, Uttarakhand

6.1.1 Prospects for Hydro Power in Uttarakhand:

- Following the declaration of a 130-km stretch of the Bhagirarthi River Valley between Gomukh and Uttarkashi as an eco-sensitive zone by the Ministry Of Environment and Forests (MoEF) in December 2012, and the submission of the B K Chaturvedi Committee report, small hydropower companies in Uttarakhand are facing an uncertain future.Companies affected included State-owned Uttarakhand Jal Vidyut Nigam Ltd (UJVN) and THDC India Ltd. Newly floated subsidiaries of NTPC, GVK and Larsen and Toubro are also adversely affected by the B K Chaturvedi Committee report on hydropower sector.
- Sixty nine hydropower projects with installed capacity of > 9000 MW were under review of this committee. It has recommended that no new hydropower projects be taken up beyond these 69 projects.
- Some of them are now considering diversification into thermal, solar and wind power.
- Hydro power companies also seem to be turning away from Uttarakhand. Due to investment size involved, and lack of support from multiple quarters for the giant projects, Uttarakhand is no longer a favoured destination for big ticket projects. The Government is however trying to attract them by providing tax incentives, single window clearance procedures and many other such facilities.
- Against this backdrop, for sustainable hydropower production in Uttarakhand, the entire approach to hydropower development, from planning to approvals, construction and regulation needs to be reviewed.
- For example, only those projects should be sanctioned that do not cause irreversible/adverse impact on environment.
- Secondly, adequate free flow of water has to be ensured between two consecutive projects on a river, which has multiple projects.

6.1.2 National and International Best Practices in Renewable Energy Sector:

RE potential is one of the State's major advantages. It is estimated at 8115 MW (UREDA) and much more than the State's present demand of 1600 MW. Most significant aspect of renewable energy is that it has zero fuel costs, although tapping it requires more capital investment as compared with conventional power plants. To seize the benefits, the State requires to raise necessary capital and adapt to managing the variability and uncertainty of renewable energy generation. The most important benefits of RE are;, electricity prices are free from volatility and external influence, reduce imports, dramatically reduced pollution and water use.

An assessment of investment requirement in renewable energy generation in the State is required, coupled with determination of investment sources, private and public sector roles, and how private investment in this sector can be stimulated.

The key lessons learned from the major RE projects and best practice in India are summarised here.

Lesson Learned from Best Practices in Renewable Energy Sector	
1	A Comprehensive Policy Framework for RE
2	Willing and Credit-Worthy Buyers (i.e. Discoms) for RE
3	Smoother RE Project Development Environment
4	Updated Grid Planning and Operation
5	Treat RE as a resource of strategic importance for the State
6	Mandate RE as a significant component of the power sector
7	Integrated approach to power sector planning, including generation, transmission and distribution
8	Make buyers indifferent between conventional and RE resources until grid parity is achieved
9	Prioritise small-scale RE plants spread over large area over large- scale/centralized RE sources for reducing the transmission costs

Source: Renewable Electricity Road Map 2030, NITI Aayog, 2015

The most successful States in solar power are Karnataka and Rajasthan, while Himachal Pradesh and neighbouring Bhutan are success stories in hydropower.

6.1.3 Grid Connected Power:

Grid-interactive renewable power projects based on small hydro, solar and biomass are mainly private investment driven, with favourable tariff policy regimes established by State Electricity Regulatory Commission (SERC). Almost all-renewable power capacity addition in Uttarakhand is expected to come through this route.

6.1.4 Solar Power:

The State aims to generate competitively priced solar thermal and solar photovoltaic power. Uttarakhand is endowed with vast solar energy potential of 4077 MW (UREDA) out of which only 275.58 MW is realised. Thus, there is huge scope of harnessing solar power. Both technology routes for conversion of solar radiation into heat and electricity, namely, solar thermal and solar photovoltaics, can effectively be harnessed in Uttarakhand. Solar plants also have ability to generate power on a distributed basis and enable rapid capacity addition with short lead times.

Off-grid decentralized and low-temperature applications will be advantageous from rural electrification perspective and meeting other energy needs for power, heating and cooling in both rural and urban areas, which is a pressing need in Uttarakhand. From an energy security perspective, solar is the most secure of all sources, and it is abundantly available.

6.1.5 Uttarakhand Solar Power Policy:

Government of Uttarakhand has announced its *Solar Power Policy* in 2013, it was further amended in September 2018. UREDA is the designated as Nodal Agency for implementation of Solar Policy. The policy states that solar projects will be selected through tariff based competitive bidding process. Till date, solar power capacity installed in Utttarakhand is 275 MW. Installed capacity needs to be augmented rapidly to achieve solar potential of the State.

One important plan to increase solar power is Suryodaya Swarozgar Yojna for Rooftop Solar Photo Voltaic Systems found to be very successful in the State. Under this scheme, residents in hilly regions of the State have installed *Grid Connected Rooftop Solar Power Plants* of 4/5 KW capacity. About 2000 such solar power plants have been distributed in 11 hill districts. The excess power generated is sold to the DISCOM. The system works on net metering basis. Ninety percent of the cost is provided in the form of *financial assistance*, which includes 70% from MNRE and 20% from State subsidy. This is proving to be highly beneficial for the community.

In 2014-15, MNRE, GoI, announced a special budgetary allocation to install 100,000 solar water pumps per year, under *National Solar Mission (NSM)* in 4 States including Uttarakhand.

However, broader socio-economic impact of this scheme has been limited, primarily due to limited installations. There were three overarching challenges that affected progress and uptake - low awareness amongst key stakeholders, underpowered pumps for the needs, and long application procedures. At the same time, there are environmental concerns related to

indiscriminate extraction of depleting ground water resources, using solar power.

6.1.6 Small Hydro Power:

Small hydro power projects aim to generate competitively priced power through small hydropower stations (up to 25 MW/station capacity).

The estimated potential for power generation in Uttarakhand from such plants is about 3000 MW. Most of the potential is in river-based projects. Such projects are normally economically viable and private sector is showing interest in investing in SHP projects. State small hydro power policy aims to capatilise on this interest, to effectively realise full potential of small l hydro power projects.

6.1.7 Uttarakhand Small Hydro Power Policy:

Government has notified its Policy for Development of Micro and Mini Hydro Power (up to 2 MW) on 31st January 2015. In this category, projects are reserved for Panchayati Raj Institutions. Panchayats would have options to execute the projects on their own or through formation of *Special Purpose Vehicle* (SPV) with eligible entities. UJVNL is the nodal agency for implementation of Small Hydro Power Policy (upto 2 MW), SHP above 2 MW and upto 5 MW. SHP above 5 MW are open to all developers without any reservation/preference. This policy requires active promotion to attract panchayats and other players and effective implementation.

6.1.8 Bio-Power:

Four sets of programmes are being implemented with an aim to generate competitively priced bio-power from agricultural, agro-industrial residues and plantations and urban and industrial wastes. These are:

- Biomass power / bagasse cogeneration
- Non-bagasse cogeneration
- Biomass gasifier
- Urban and Industrial wastes

Biomass power and cogeneration programme is implemented with the main objective of promoting use of available technologies for optimum use of State's biomass resources for power generation. Biomass materials used for power generation include; bagasse, rice husk, straw, cotton stalk, coconut shells, soya husk, de-oiled cakes, coffee waste, jute wastes, groundnut shells, saw dust etc. The technology used in this process is similar to that of a thermal power plants based on coal, except for the boiler.

6.1.9 Cogeneration in Sugar Mills:

Sugar industry has been traditionally practicing cogeneration by using bagasse as a fuel. With the advancement in technology for generation and utilization of steam at high temperature and pressure, sugar industry produces electricity and steam for their own requirements. It can also produce significant surplus electricity for sale to the grid.

Manufacturing capability exists in the State for producing equipment/machinery required for setting up Biomass Projects. Except for some critical control equipment, most of the equipment such as boilers, steam turbines etc. are available from indigenous sources**.**

6.1.10 Promotional Policies:

Besides central financial assistance, fiscal incentives such as 80% accelerated depreciation, concessional import and excise duty, tax holiday for 10 years etc., are available from the Central Government for Biomass power projects. The benefit of concessional custom duty and excise duty exemption are available on equipment required for initial setting up of biomass power projects certified by the Ministry. In addition, State Electricity Regulatory Commissions determine preferential tariffs and Renewable Purchase Standards (RPS).

6.1.11 Off – Grid Power:

Distributed/decentralized renewable power projects using biomass energy, and hydropower and hybrid systems are being established in the country to meet energy requirements of isolated communities and areas, which are not likely to be electrified in near future. This can be easily implemented in Uttarakhand as the State has similar community needs and potential.

Examples of off-grid Renewable Energy / Power Projects:

- Biomass based heat and power projects and industrial waste to-energy projects for meeting captive needs
- Biomass gasifiers for rural and industrial energy applications
- Watermills/micro hydro projects – for meeting electricity requirement of remote villages
- Hybrid Systems - for mechanical and electrical applications, mainly where grid electricity is not available.
- Solar PV Roof-top Systems for abatement of diesel for power generation in urban areas

6.1.12 Challenges Faced by DISCOM (UPCL):

1. UPCL operates in very difficult hilly terrain. Adverse climatic conditions and topography makes maintenance of distribution network challenging.
2. Hydro power generation attains peak in monsoon season and recedes continuously thereafter, consequently, Uttarakhand remains in cyclic energy surplus and energy deficit modes. These variations in generation of hydro power, skews energy availability down the line, which is at times become difficult to manage.
3. There is a need for a comprehensive and well-equipped IT (Information Technology) workforce to take care of ever expanding IT based services profile of UPC. UPCL IT functional requirements are also increasing due to commissioning of SCADA/DMS of Dehradun, upcoming ERP Project, AMR project and future Smart Grid projects.
4. Understaffing of regular manpower, especially JE's/AE's and TG's is posing a major challenge in management of power generation and distribution. At present more than 50% manpower requirement is outsourced.
5. Open access policy has led to shifting of large industrial consumers from UPCL to other sources. This has resulted in revenue loss for UPCL, while UPCL has to bear fixed charges that are non-recoverable.
6. The distribution loss level has declined by 1.51% point to 15.17% in FY 2017-18 over the past year's actual distribution losses.
7. UPCL faces public resistance in laying of LT Ariel bunch cable in theft prone areas.

6.1.13 Challenges of Hydropower Sector in Uttarakhand:

A. Administrative Challenges –

- Land acquisition
- Time consuming land identification, verification, documentation process
- Political interference during construction adding to cost overruns
- Project delays due to disputes over sharing of river waters with neighbouring States

B. Construction Challenges -

- There is dearth of competent contracting agencies having technical, managerial construction and financial resources required for constructing hydroelectric projects

C. Geological Challenges –

- The Himalayan ranges are geologically quite active and Uttarakhand is in the high seismic zone. Therefore, geological surprises cannot be avoided. As a result, assessment and planning is time consuming and costly.

D. Environmental Challenges –

- Almost all the hydro projects are responsible for deforestation
- Due to deforestation, there are possibilities of frequent landslides, erosion and floods

In Uttarakhand, about 45% land is under forests, of which about 15% forest areas are either under National Parks or Sanctuaries/Biospheres. Some of the hydropower project sites are situated in these protected areas, where securing environmental clearances is one of the major challenges in addition to objections from local communities with regard to employment, water rights etc. Some of the projects are multipurpose dam based projects, which attract rehabilitation and resettlement issues.

Government of Uttarakhand has decided to give preference to run-of-the-river projects by even changing the nature of dam-based projects to run-

of-the-river type, having cascade of projects rather than one dam based project.

One good example in this regard is the Kotli Bhel Project (1000 MW) which was earlier a dam based project and now it is three cascade based run-of-the-river project with total estimated capacity of 1045 MW, prepared through NHPC.

6.1.14 Unique Challenges of Small Hydropower Projects in Uttarakhand:

- Power stations are located in remote hilly areas where road linkages are not available
- The small hydro power stations are prone to natural calamities such as flash floods due to cloud bursts, landslides, avalanches causing heavy damage and long shutdowns. road blockages and severe climatic conditions cause difficulty in construction, operation and maintenance.
- Small hydro power stations are normally connected through service lines or weak grid connections prone to damage, therefore disruption incidences cause low generation.
- Inaccessible locations result in delay in availability of necessary technical skill and spares in case of breakdown, leading to prolonged shut downs, heavy expenditure and loss of revenue.
- Some of the commissioned plants have highly sophisticated machines. Without availability of skilled labour in remote areas, difficulties are faced in their operations and maintenance.

Uttarakhand requires a new State **Power Policy** with effective strategies from planning to approvals, construction practices and regulation. The State also requires a strategy for energy conservation.

Implementation of adaptive resilience and mitigation measures proposed in the draft **State Action Plan for Climate Change (SAPCC)** will also create sustainable power developmental opportunities. The State Government plans not to levy entry tax on power generation, transmission equipment and building material for projects. Free transfer of shares will be permitted in the companies allotted projects as per the procedure laid down in this document. The Government has earmark selected project sites for allocation to private developers. It proposes to advertise and invite participation for developing these projects in lots.

Success Factors of Bhutan Model

1	Establishing an institutional and legal framework for improved commercial operation, enhanced managerial efficiencies, better cost recovery and improved quality of service. These reforms facilitate private sector investments in hydropower sector
2	Improved capacity for newly established power sector entities to discharge the mandates assigned to them effectively
3	Increased financial and institutional capacity to implement the rural electrification programs under the 7th and 8th five year plans (15,000 household connections)
4	Providing access to electricity for more remote areas, using both on-grid and off-grid applications
5	Establishing an enabling environment for private sector participation in the hydropower sector
6	Supporting PPPs in the hydropower sector by demonstrating the feasibility of PPP transactions and capacity building of relevant agencies

Source: Asian Development Bank.

6.1.15 Financial Support Required:

The power policy should evidently classify the source, level, and distribution mechanism for financial support for reducing the incremental cost of RE, including generation and integration costs in view of existing subsidized fossil fuel-based generation.

Most importantly, regular, inclusive and analytically sophisticated integrated energy resources planning is called for cost benefit analysis of the electricity sector, including supply-side resources e.g., coal, hydro, gas, nuclear, RE, transmission and distribution networks and their operation. The demand side resources also require evaluation (e.g., energy

efficiency, demand response, etc.). These planning exercises would explicitly and systematically account for various risk factors such as fuel availability, fuel costs, and other possible benefits and costs.

Best practices in RE sector are - support mechanisms for compliance and timely implementation with a strong policy and legislation in place. Emphasis on execution support is very much called for. The government, requires to support compliance with mandatory requirements regarding RE.

Support from GoI is also very critical to promote RE in the State. At present, there are several promotional policies of GoI as noted below. The State could actively utilise these policies where Central funding is available. Some of examples are as follows.

a. Provision of Renewable Purchase Obligation (RPO) under the National Tariff Policy;
b. Notification of the long-term growth trajectory of RPO for solar and non-solar energy for next 3 years from 2016-17, 2017-18 and 2018-19;
c. Development of solar parks and ultra mega solar power projects;
d. Development of power transmission network through green energy corridor project;
e. Making roof top solar plants as a part of housing loan provided by banks;
f. Waiver of inter-state transmission charges and losses;
g. Supporting participatory research and development on various aspects of renewable energy with industries;
h. Financial incentives for off-grid and decentralized renewable energy systems and devices for meeting energy needs for cooking, lighting and productive purposes; and
i. Permitting 100% foreign direct Investment in the sector through automatic route.

6.1.16 Financial Disbursal:

A transparently designed uniform, simple financial support and disbursal mechanism directed at buyers and which offers certainty over a reasonable period could considerably support acceleration of RE growth. The financial support could be distributed through the new intermediary organization that ensures that bulk buyers are indifferent between RE and fossil fuel-based generation.

6.1.17 Low-cost Financing:

If we compare the cost of RE and Non-Renewable technologies, RE technologies, unlike fossil based energy technologies, have high capital costs but very low operating costs spread over 25-30 years. Thus, the cost of finance that is at present ranging from 12–14% in India, forms a significant component of the power tariff from these sources.. Bringing down the rate of interest for RE projects would reduce tariffs and hence scale up demand for RE projects.

6.1.18 RE Grid Integration and Efficient Grid Operation:

In addition to strong policy and legislative framework, there is also a need of supportive implementation environment. Grid interconnection and integration of RE is equally critical in this process.

Internationally, wherever RE accounts for increasingly large shares of power system generation, regular changes to grid design, technology, and its operation have been implemented which allowed successful grid integration, i.e. minimizing or managing the variability and uncertainty aspects of RE.

These strategies can be classified into following sub categories;

(i) Upgrade grid technology; (ii) Centralized RE forecasting mechanisms need to be tightly integrated with system operations; (iii) Upgrade grid operation protocols that are already in place; (iv) Grid Codes; (v) Strengthening Scheduling and Dispatch; (vi) Expand balancing areas and (vii) Promote flexible demand and supply resources

6.1.19 Best Practices Adopted by Uttarakhand Government to promote RE in the State:

Uttarakhand Solar Power Policy 2013, Policy for Development of Micro and Mini Hydro Power (Up to 2 MW), Policy for Development of Small Hydro Power (above 2 MW), Policy for Energy Generation from Pine Litter and Other Biomass – 2018, Uttarakhand Green Energy Cess can be termed as best practices to promote RE. Moreover, important energy conservation programmes of the State such as, UJALA Yojana, ECBC, Gram LED Light Training Programme, MuDSM, PAT, SECF, school awareness programme etc. would be continued as these programmes are proving to be effective.

The projected energy demand and options of saving of upto 25% energy by adopting modern technologies are reflected in tables 6.1.3 and 6.1.4.

Table 6.1.3: Meeting Energy Demand From Proposed Renewable Sources

BY FY	Demand in MU	Renewable Energy Share in MU				% Share
		SHP	Solar	Other (Co-gen, Biomass, W2E)	Total	
2019-20	15027	746	663	322	1731	11.5
2023-24	18266	883	1109	647	2639	14.5
2029-30	24478	1121	1556	1405	4082	16.7

Source: UREDA

Table 6.1.4: Energy Saving in MU

Demand in MU	LED Bulbs	EE Street Lights	Solar Water Heaters	Other DSM	Total	% Share
2019-20	**910**	**29**	**120**	**164**	**1223**	**8.13**
2023-24	As per applicable schemes of GoI and available new technologies					**15**
2029-30	As per applicable schemes of GoI and available new technologies					**25**

Source: UREDA

6.1.20 Pine Litter as a Source of Energy in Uttarakhand:

The amount of pine needles (pinus roxburgii) that is potentially available for use as energy feedstock in the State has been estimated at 1.97 million tonnes (gross). The net annual pine needle yield is estimated at 1.38 million tonnes. An installed capacity of 982 MW can be supported with pine needles as feedstock for supplying electricity in rural areas for five hours a day. In terms of round the clock generation, an installed capacity of 205 MW can be supported by the pine needles as energy feed stocks (Kala, L D and Subbarao, P M V, 2017).

A study on ecological disturbances of pine needle requires to be carried out to improve implementation of the programme and realise its full potential.

Policy for Energy Generation from Pine Litter and Other Biomass – 2018

1. More than 16% (about 4 lakh hectare) of forests in State is covered by Chir Pine trees.
2. 15 Lakh MT pine litter is generated annually in reserve and van panchyat forests (excluding wild life area).
3. Potential of producing over 150 MW of energy annually.
4. Three types of energy projects: Power generation, Biomass briquetting and bio – oil plants.
5. Target: 100 MW power generation and 50 Biomass briquetting and bio – oil plants of maximum 2000 MT per annum capacity by 2030.
6. Benefits: generate decentralized renewable energy, livelihood/revenue generation, reduce forest fire accidents, and fulfil renewable purchase obligation of UPCL.
7. The projects can be developed by societies registered under UP Cooperative Act/Uttarakhand self-reliant Cooperatives, Proprietary/ Partnership/ Pvt.Ltd. firms registered in Uttarakhand, Industries registered in District Industries Offices of Uttarakhand; Joint venture/ consortium firms with community based organization (like Van Panchayat, gram panchayat, self help group etc.) in the identified area.
8. The developer who quotes minimum tariff for sale of electricity shall be selected and the generated energy from the project shall be purchased by UPCL.
9. Several incentives are available such as – treated as an industry, exemption of stamp duty for registration, subsidy from MNRE etc.

Thus for Uttarakhand's Future Electricity Road Map 2030, emphasis is to take full advantage of

State's RE potential over the next few years. Uttarakhand's renewable resources are abundant. To seize the benefits, the State would need to raise necessary capital, and adapt to managing the variability and uncertainty of renewable energy generation.

6.2 Transportation Sector:

A well – knit and coordinated transport plays a vital role in sustained economic growth of a State. Transport routes are the basic arteries of Uttarakhand. Transport system is regarded as the controller of the economy and provides a very important link between production and consumption. The amount of traffic moving in a State is a measure of its progress.

6.2.1 Road and Rail Transport:

Road and rail connectivity are key to ensure development in Uttarakhand. Effective functioning of industries depends on a good transport system. Further, in the hilly region (where rail system is not possible/available), people need a reliable and safe vehicular service.

Construction of the Char Dham all wheather road was launched on December 27, 2016 to improve road connectivity to the four revered Hindu pilgrimage sites Yamunotri, Gangotri, Kedarnath and Badrinath in Uttarakhand. This project will refurbish 900 km of the damaged highways with two lanes, 12 bypass roads, 15 big flyovers, 101 small bridges, 3,596 culverts and two tunnels. The roads will be widened at least 10 metres, and will be strong enough to withstand the harsh climate of the region. The improved highway circuit aims to ease traffic during the Char Dham Yatra, the backbone of Uttarakhand's tourism and economy.

The Pradhan Mantri Gram Sadak Yojana (PMGSY) was launched by the Govt. of India to provide all-weather road connectivity to unconnected habitations. The unit for this programme is a habitation and not a revenue village or a Panchayat. Table 6.2.2 shows the status of Connectivity in Uttarakhand under the PMGSY.

Table 6.2.1: Total and Surfaced Road Length as on 31st March 2015 (Kms)

State	National Highways		State Highways		Other PWD Roads	
	Total	**Surfaced**	**Total**	**Surfaced**	**Total**	**Surfaced**
Uttarakhand	2842	2842	3736	3730	24505	16410
Himachal Pradesh	2466	2466	1466	1466	30686	22356
J&K	2593	2593	131	131	9946	9006
Sikkim	309	309	701	701	1415	697
	Rural Roads		**Urban Roads**		**Project Roads**	
	Total	Surfaced	Total	Surfaced	Total	Surfaced
Uttarakhand	9104	6138	4602	3055	18156	1581
H.P.	16552	12069	2086	1549	2337	98
J&K	13127	8046	1404	1399	11895	574
Sikkim	4780	3890	148	134	97	95

Source : Transport Research Wing, Ministry of Road Transport and Highways, Govt. of Inda

Table 6.2.2: Status of Connectivity in Uttarakhand under the PMGSY

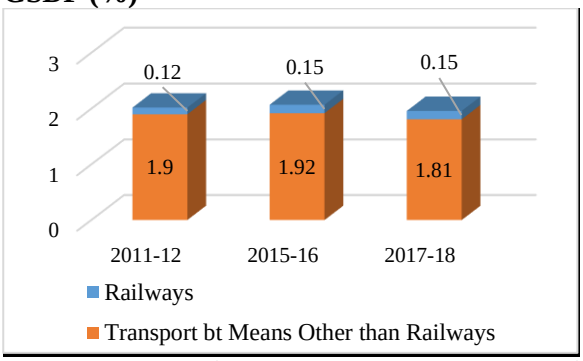
Habitations with Population Range			
Type	1000+	999-500	Grand Total
Total number of Habitations (As on 01-04-2000)	1091	1972	16743
Total number of Connected Habitations (As on 01-04-2000)	935	1249	8047
Total number of Unconnected Habitations (01-04-2000)	156	723	8696
Status of Connectivity of Habitations under State Scheme	26	134	791
Habitations covered by PMGSY: 2018-19 (New Connectivity) as on 14-08-2019as on 14-08-2019	6	54	408
Total Habitations covered (New Connectivity) as on 14-08-2019 Upgradation as on 14-08-2019	130 31	588 43	2491 134
Balance Unconnected Habitations as on 14-08-2019	0	1	5419

Source: Monitoring and Accounting System, PMGSY, MoRD, GoI

6.2.2 Railways and Other Means of Transport in Uttarakhand:

The share of overall transport (which includes railways and other means of transport) is approximately 2% of gross State domestic product (GSDP) during 2011-12 to 2017-18 in the State.

Figure 6.2.1: Share of Transports Modes in GSDP (%)



Source: Directorate of Economics and Statistics, Govt. of Uttarakhand

Figure 6.2.2: Transport Sector Growth (%)

Source: Directorate of Economics and Statistics, Govt. of Uttarakhand

The average growth rate of railways and other means of transport from 2012-13 to 2017-18 are 10.33 and 6.15% respectively. However, there were fluctions in the trend during this period.

6.3 Physical Infrastructure in the State:

Over the years, the State has developed mature and extensive infrastructure networks. However, the level of investment, have fluctuated significantly over time. Public investment in infrastructure should increase from its current level to strengthen the overall physical infrastructure in the State.

6.3.1 Physical Infrastructure – Roads:

Roads are considered as lifelines of economy of State. It also plays a crucial role in social life of its citizens. Uttarakhand had a total of 2,841.9 km of national highways in 2017 (NHAI). An additional 437 km of new roads were constructed during 2017-18. The Central Government is in the process to widen the existing 900-km highway connecting the 4 abodes of Gangotri, Yamunotri, Kedarnath and Badrinath in the Himalayas, at an investment of US$ 1.85 billion. An announcement has also been made about initiation of 70 road projects at a cost of US$ 7.72 billion by 2019.

The State Govt. is continuously planning to develop road transportation as envisaged in SDGs 2030. Under the State Budget of 2018-19, an amount of ₹2,053.92 crore (US$ 317.26 million) was allocated for roads and bridges. In the year 2016-17 the length of the roads in State was 43,762 kms which was more than in Himachal Pradesh. The public works department of the State has constructed 801 kms of roads, especially for vehicle movement, against the target of 800 kms. 12,138 villages are connected with roads till 2018.

6.3.1.1 Challenges in Road Transportation Sector:

In Uttarakhand the main challenge for transport sector is accessibility. There is also the issue of increasing traffic congestion on the roads. Although total road length increased by 72% between 2002-03 and 2016-17, number of vehicles increased five fold in the same period. Vehicle density (Average numbers of vehicles per KM) has increased in the State, from 18 in 2003 to 51 in 2017. Both the issues are important, but the solution is not easy. The accessibility concern is being tackled by connecting more and more villages by roads. However, widening of roads is a slow process, also constrained by topographical challenges.

6.3.1.2 Ecological Challenges in Road Connectivity in Uttarakhand:

Road and rail connectivity in Uttarakhand, poses several ecological challenges. At many places, construction of roads causes irreversible damage to the environment.

Elevated roadways could be a solution to avoid cutting of large number of trees and damaging the wildlife ecosystem.

Introduction of electric and CNG vehicles could be considered in a time bound manner to address environmental pollution concerns.

6.3.2 Physical Infrastructure – Railways:

The hilly terrain of Uttarakhand retards expansion of railways. Uttarakhand has 344.91 km of rail routes. The State is focusing on increasing the share of railways in cargo and passenger transport on existing routes. Initiatives are also underway to start monorails at Dehradun, Haridwar and Rishikesh, linking the 3 cities through a fast track. Under State Budget of 2018-19, an allocation of Rs 86 crore (US$ 13.28 million) has been made for development of metro rail.

Rishikesh-Karnprayag 125 km rail line will be functional by 2024-25. It is a part of Indian Railways' proposed plan to reach as close as possible to Char Dhams. Once completed, it will reduce Rishikesh to Karnaprayag travel time from 7 hours to 2 hours. It will have 16 bridges and 105 km (85% of the project length) inside tunnels. A 15.1 km tunnel, reported to be the country's longest, will be built between Devprayag and Lachmoli on this route.

6.3.3 National and International Best Practices in Roads/Railways Sector:

While cities have become engines of economic development, their transport systems face considerable pressure. Global practices seek to tackle the urban mobility challenge, with a particular emphasis on how Information and Communication Technologies (ICT) can be used to address these issues and improve the productivity of transport infrastructure. Sustainable "smart mobility" systems can help address issues in urban transport system. Some of these can be adopted in the State.

- *Green Transport and ICT:* Transport is at the heart of climate change challenges and solutions. While transport activities are essential for economic and social development, we must mitigate their impact through better land use planning, logistics and use of ICT, as well as a shift from private to more efficient public transportation modes.
- *Development of Corridors and Regional Integration*: Global Practices seek to foster development of high-potential transport and trade corridors through a multi-sectorial approach designed to promote investment-led growth, optimize the use of infrastructure, encourage value added processing, and enhance competitiveness.
- *Road Asset Management and Rural Accessibility:* A modern, well-maintained network of rural and inter-urban roads can bring major development benefits to communities through better access to jobs, markets and services; greater comfort, speed and safety, and lower vehicle operating costs. State can undertake an indepth analysis of its present and future road requirements going upto the remotest village and build the network in a systematic manner.
- *Road Safety:* Road and rail accidents are major concerns in developing countries. The World Bank-managed Global Road Safety Facility, has worked closely with clients to mainstream road safety into all relevant transport projects. It also provides an extensive range of technical assistance and advisory services to help countries make their roads safer.

Way Forward – Road and Rail Transportation

The State Vision is to provide safe, reliable and sustainable road and rail transportation system for all citizens of the State. By 2030, length of pucca roads per lakh population will reach 461.29 km. All villages will have access to all-weather roads by 2030. The transport infrastructure would be made resilient for this purpose and modernised. Loss of life due to road accidents and pollution from vehicles are to be minimised.

Modernising Public Road Transportation, which will continue to be the mainstay of transportation within the State. Besides expanding and strengthening of the roads network and making them all-weather and safe, the way forward is to strengthen the

public road transport system, modernise bus transportation emulating the efficient Bus System operating in Swiss mountains, running buses through PPP mode under strict quality standards, introduce GPS based bus tracking, display of bus schedules in bus stands, LED monitors at bus stops to inform of bus arrivals, monitoring compliance and ticket prices.

Inter-city Connectivity: Exploring the feasibility of elevated toll roads for intercity connectivity in PPP mode, learning from the Chinese experience of constructing such roads in mountain areas without causing irreversible harm to the eco-systems.

Modern City Transportation Systems: A city transport system exists in Dehradun. Modernising and expanding city bus transportation to cover other cities, introduction of electric buses, modernising bus stands, display of bus schedules, timely running of buses, LED display boards for real time bus arrival information, emphasis on driver training, are some ways of easing the life of urban residents in the State.

The railway network too needs to be extended as far as the topography of the region permits. Experts may be commissioned to explore viable options to expand rail network in the State.

Introduction of private trains to connect multiple nodes in the State to NCR, Punjab and Uttar Pradesh in PPP mode, utilising the Indian Railways plans to allow private trains to run on its tracks. Promoting modernisation of train stations under PPP mode scheme of Indian Railways

Automated testing tracks for testing drivers and automated testing lanes for computerised examination centres for vehicles; use of simulators for driver tests and overall strengthening of the transportation system are important strategies for enhancing the transport infrastructure in the State over the next 15 years.

6.3.4 Civil Aviation – Infrastructure:

In the civil aviation sector, at present, the State has 5 runways, whose updated status is as follows.

Table 6.3.4. Length of different Runways

Sl. No	Airstrip/Airport	Runway Length	Runway Width
1	Chinyalisaud, Uttarkashi	1050m	30m
2	Nainisaini, Pithoragarh	1510m	30m
3	Gauchar, Chamoli	1200m	23m
4	Pantnagar Airport, Udhamsingh Nagar	4500 Feet	100 Feet
5	Jollygrant Airport, Dehradun	2140m	45m

The State has two domestic airports: one at Jolly Grant in Dehradun district and another at Pant Nagar in Udham Singh Nagar district. As Uttarakhand is growing as a major tourist and industrial destination, the State intends to build air transport as a reliable all-weather transport option particularly for the hills. Government is also focussing on upgrading Jolly Grant airport as an international airport, in coordination with Airports Authority of India.

Under State Budget 2018-19, an amount of ₹10 crore (US$ 1.54 million) has been allocated for commencement of air services under UDAN scheme. Under the Centre's regional connectivity scheme, clearance has been given for two new airports and 14 helipads.

Work is underway for Naini-Saini airstrip extension, strengthening of runway and peripheral roads . An amount of ₹56,78.21 lakhs has been sanctioned for this purpose.

6.3.4.1 Helipads:

The Uttarakhand Emergency Assistance Project (UEAP) funded by Asian Development Bank (ADB) is intended to finance a series of investments including construction of 60 helipads, heliports and Helidromes with multi-purpose halls/shelters as part of disaster preparedness infrastructure improvement for Civil Aviation Sector in Uttarakhand. These helipad sites are designated to be used for "Temporary Landing Areas" and for "Non-Instrument Day VFR (Visual Flight Rules)"

This project is envisaged to provide better connectivity and enhance rescue, relief, and emergency evacuations mechanism, thereby restoring faith/confidence of tourists and local communities about safe tourism in Uttarakhand. The Civil Aviation component of the UEAP, envisages undertaking up-gradation/ construction of about 37 Helipads, 19 Heliports and 4 Helidromes. The Preparatory Consultant, UCADA, has already worked on Sub-project Appraisal Report (SAR) and Detail Project Reports (DPRs) for 19 helipad sites on priority basis. It includes 12 Helipads and 7 Heliports, to be executed through 3 DPRs/Contract Packages covering 19 locations spread over 9 districts (Chamoli, Rudraprayag, PauriGarhwal, TehriGarhwal, Nainital, Udham Singh Nagar, Almora, Bageshwar, and Champawat). The Government has designated the State Disaster Management Authority (SDMA) as the Executing Agency (EA) for all reconstruction and rehabilitation works under this project. A Project Management Unit (PMU) in SDMA has been setup. A PIU has been constituted at Uttarakhand Civil Aviation Development Authority (UCADA)- the Implementation Agency (IA) to implement/execute all proposed sub-projects in Civil Aviation sector.

6.3.4.2 Few Lessons:

Enhance Access to Remote Areas

There is a great demand for helipads/ helicopters in the earthquake affected mountainous regions.

- **Helipad model of Nepal:** Medical care at high altitude was insufficient in terms of response time, operations, equipment, and medical expertise in Nepal. Helicopter pilots and rescuers are trained to improve the rescue system in the Everest region to undertake rescue missions for tourists, local guides, and porters. Similar practices can to be adopted in Uttarakhand. It can even be expnded to cover air transportation by smaller planes.
- The MOCA/UCADA may identify potential helipads/heliports sites to convert them into small airports, which can handle small aircraft to provide air transport service. This mode of transportation can be used for reliable air connectivity.

6.3.3.3 UDAN Scheme:

UDAN is an ambitious scheme of Govt. of India which aims to expand air transportation to new areas and at an afforadable cost. Private airlines and heli-service companies are very enthusiastic. Already, Pantnagar and Pithoragarh air-link with Dehradun is being established.

Helicopter services are to be started on 14 routes under the UDAN-2 scheme, whose responsibility has been entrusted to Pawan Hans and Heritech Aviation. In future, air services from Dehradun to Chinyalisaud (Uttarkashi) will be provided.

CHAPTER 7
Forests and Climate Change

Abstract

Forest cover in Uttarakhand is fairly large and stable (forest cover between 45.3% and 45.8% of geographical area during 2013-2017 and forest area 71% of total geographical area). A study in 2016 found that of 1284.6 square km forest area sampled, only 43.6% had crown cover more than 40%, and 16.6% had severely degraded condition (<20% crown density) and 39.7% moderately degraded (20-40% crown density). This is a matter of more comprehensive investigation and follow-up action.

Ban on tree cutting needs a review in view of the fact that ***chir-pine*** *forests are expanding at the cost of* ***oak*** *forests. Litter removal policies also need review. Establishment of nurseries to promote plantation of* ***kharsu oak*** *will help local communities in high altitude mountains to carry out economic activities such as sericulture, and extraction of* ***lichens (Jhula).***

The recent study by IIFM in Uttarakhand provides economic estimates for as many as 21 ecosystem services from the forest areas of Uttarakhand. The study findings indicate that the monetary value of benefits emanating from the Uttarakhand forests is approximately ₹95,112 crores annually. This requires proactive representation to the Government of India to access funding for sustaining the eco-system and providing employment to mountain communities for managing eco-system services.

There is a need to study to what extent can spring water be tamed to meet people's needs, the scope of spring shed development and the role of forests in providing water abundance and water quality.

7.1 Introduction:

The Himalayan rivers have been nursing the adjacent plains by providing soil and water for millions of years. That is why human population density as high as around 1000/km^2 is common and there live 580 million people in the Gangetic plains. Being the region from where the Gangetic river system originates, Uttarakhand has special place in ecological framework of the Indian subcontinent.

Environmental issues have been dominating the socio-political scenario of the region, right from the beginning of organized forestry during the British rule. The region provided *sal (Shorearobusta)* and *deodar (Cedrusdeodara)* timber for establishing railway networks in the country during the 19th century (Tucker 1993). Forest rights have often been the issue of people agitation in these mountains. Deforestation in 1960s and 1970s, eventually led to *'Chipko Movement'* and ban on tree cutting above 1000m elevation. In recent years, conflicts between uninterrupted river flows and construction of big dams have led to another form of debates and controversies, often affecting developmental processes in the State. Climate change driven glacier shrinkage, extreme weather events triggering disasters like landslides and flash floods, and drying of water sources, particularly springs are posing new threats and uncertainties in the life of people living in mountainous areas of Uttarakhand.

Issues related to forest biodiversity and human and wildlife conflicts, water and springs, and climate change are central to the life of people in the State. The lack of adequate data on several environmental aspects has affected the developmental plans.

The State and central Governments have now begun to pay attention to data generation on spatial patterns with regard to forest cover, meteorological parameters, forest fires and others, particularly with the development of space and information technologies.

It may be pointed out that Department of Science and Technology and the Ministry of

Environment, Forest and Climate Change (MoEF andCC) of Government of India have recently taken two major initiatives, called National Mission on Sustaining the Himalayan Ecosystem (NMSHE) and National Mission on Himalayan Studies (NMHS) to strengthen scientific data collection on Himalayas. Each Himalayan State, including Uttarakhand has established State Climate Change Cell. However, universities in the State have yet to take advantage of the research grants available with NMSHE and NMHS.

In Uttarakhand, following issues call for priority attention.

- Forest degradation and its consequences, such as species loss and the depletion of forest carbon stock
- Frequent man-made surface fires
- Spread of invasive alien species
- Human wildlife conflicts and their impact on agriculture
- Impact of ban on tree-cutting, and expansion of *chirpine* (*Pinusroxburghii*) into *banj oak* (*Quercusleucotrichophora*) forests
- Treeline Ecotone dynamics and other changes under the influence of global climate change
- Drying of springs and and their impact on household water supply and watersheds
- Conflict between electricity generation and flow of environmental services and energy security
- The need for incorporating ecosystem services flowing from the mountainous regions in national accounting
- Climate change- impact and adaptation
- Migration leading to depopulation in rural areas
- Chaotic urban build up and air pollution
- Sustainable tourism
- Road construction generated erosion and landslides- initiating road ecology.

A committee of MPs which visited several Himalayan States to meet people recently considered human-wildlife conflicts as an important problem. Depopulation of mountain villages is also a matter of great concern to the government. People's perception and escalatiing climate change-driven disasters can cause long lasting scars in the people's mind and lead to their out-migration.

Expansion of *chir* pine into *banj* oak forests, though still a debatable issue dominates people minds temporally when smoke of forest fires chokes our valleys and small human settlements perched on the base of a steep hill slope are affected by increased particulate matters in air for days and weeks.

7.2 Forest Types and Ecological Attributes:

Forests (24,295 km^2) account for 45.4% of geographical area (53,483 km^2) of Uttarakhand (ISFR, 2017). They not only represent the principal land use, but also provide ecological foundation to the State and adjoining plains. *Sal* (*Shorearobusta*) in sub-montane belt, and *banj* oak (*Quercusleucotrichophora*) and c*hir* pine (*Pinusroxburghii*) between 1000-2000 mts elevations are major forest forming species. Conifers like fir (*Abiespindrow*and *A. spectabilis*), spruce (*Piceasmithiana*) and Blue pine (*Pinuswallichiana*) account for much of the subalpine forest belt (2000-3000m). *Kharsu* oak (*Q.semecarpifolia*), is a major broadleaved evergreen species above 2400 m. Himalayan birch (*Betulautilis,* called in Hindi *Bhojpatra*) is a major treeline species (>3000 m). Fir (*Abiesspectabilis*) and *kharsu* oak, and rhododendrons (*Rhododendron campanulatum*) also frequently occur in treelines, particularly those around summits in outer Himalayan ranges (Plate1).

In Uttarakhand, treeline elevation range is quite wide (2601-4366 m), but about 57% fall within a narrow elevation band of 3400-3800 m. A large number of treelines in Uttarakhand are depressed, that is, their elevations are below the elevation of climatic treeline because of grazing and other anthropogenic activities (Latwal et al. 2018).

Plate1. *Rhododendron campanulatum* krummholz beyond the treeline ecotone in Tungnath Alpine meadow (Singh et al. 2018). It is advancing upslope due to climate change, posing a threat to many medicinal plant species of "bugyals" (Alpine meadows).

7.3 Forest Cover and Degradation:

In much of Uttarakhand, evergreen species with one year leaf life span dominate, and include as diverse taxa as *sal*, *chir* pine and oak (Zobel and Singh 1997). In relatively undisturbed forests, biomass generally ranges between 200 t $ha^{-1}yr^{-1}$ and 500 t $ha^{-1}yr^{-1}$, and net primary productivity between 15 and 20 t $ha^{-1}yr^{-1}$(Singh and Singh 1992). These values are on the higher side of the range of values at the global level. Forest Statistics of the State so far have underestimated forest productivity and resources extracted.

Comparison between oak and *chir* pine forests, which share dominance between 1000-2000 m, indicates that while net primary productivity is greater in *chir* pine, forest biomass is much greater in oak forests (up to 500-700 t $ha^{-1}yr^{-1}$). Among all forest types, Oaks have higher root mass, and a greater mycorrhizal association than others. Because of these, soil is deeper and more carbon rich in oak forests than in other forest types. Leaf litter decomposition is about 92% in *sal*, 71% in oaks and 46% in *chir* pine. Because of relatively slow litter decomposition, a *chir* pine forest has a greater fuel load so is more flammable. As for fire-tolerance, *chir* pine is most tolerant, followed by *sal*. The Uttarakhand forests are closer to tropical forests than temperate forests in ecosystem characters (Singh 2014), but are often described as temperate forest above 2000m. Forest management needs to consider this fundamental point.

While forest cover in Uttarakhand is fairly large and stable (between 45.3% and 45.8% of geographical area during 2013-2017, FSI, 2017), about one third of it is open type (Table 7.1). Singh et al. (2016), while studying b*anj* oak (*Q. leucotrichophora*) forest it was found that of 1284.6 km^2 forest area sampled, only 43.6% had crown cover more than 40%, and 16.6% had severely degraded condition (<20% crown density) and 39.7% were moderately degraded (20-40% crown density). While tree density was tolerable in dense forests (301.5-479.03 trees ha^1) total tree basal area was very low, even in them (13.8-19.4 m^2ha^{-1}). It may be pointed out that an old growth forest stand can have up to 80m^2ha^{-1} basal area or more in high elevation areas.

Table 7.1: Forest area (km^2) under different canopy densities in Uttarakhand.

Total Area	Very Dense	Moderately Dense	Open
24,295	4,969	12,884	6442
Percentage of total area	20.4	53.03	26.5

Notes: Very dense=>70% canopy density; moderately dense= <70% & 40% canopy density; & open < 40% canopy density.
Source: ISFR: 2017

Bhattacharjee et al. (2018) have reported that 21% of land in Uttarakhand is severely degraded, and nearly 70% of the State is experiencing some form of functional degradation. These remote-sensing studies emphasize that forest and land degradation is quite extensive in the State. Day-to-day dependence of people on forests for biomass, grazing, burning, landslides and erosion, all have combined to degrade forests and other lands in mountains of Uttarakhand. Until a few decades ago, nearly 8-10 energy units were derived from forests to produce agronomic energy in terms of grain. People depend on forests for firewood to cook food, fodder to feed livestock, and forest litter to prepare manure fertilizers for crop fields. Called as *chronic disturbance*, it has resulted in: denudation of trees, compacted soil with only a limited litter cover, abundance of invasive alien species, depletion of soil carbon, loss of plant species and diminution of ectomycorhizae (Table 7.2.) so important for nutrient supply to trees. Forest

degradation can impair structure and functioning of forest ecosystems in several ways, such as depletion of root mass, soil carbon, litter decomposition, productivity and ectomycorrhizal association (Singh et al. 2018).

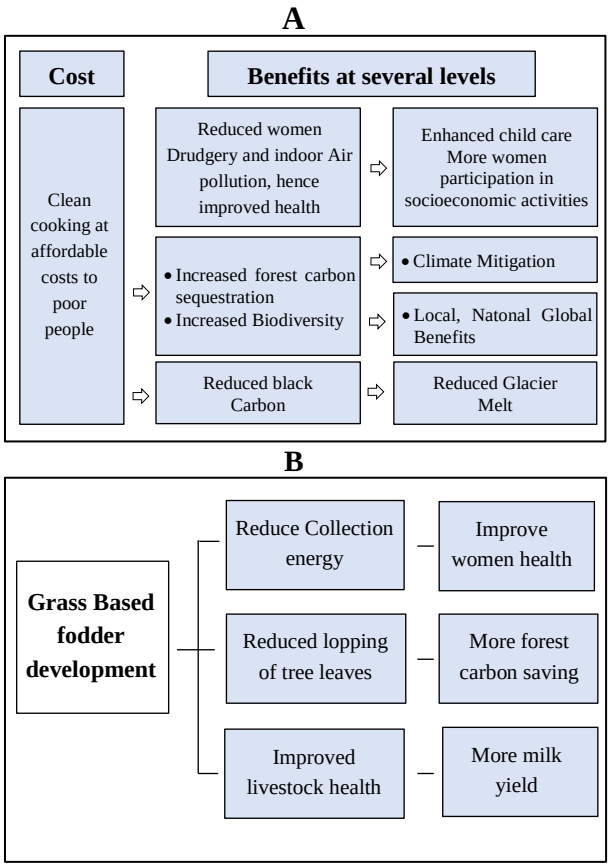
Table 7.2: Structural and Functional Features in Relation to Disturbance Level in *Banj* Oak (*Quercus*) Forests of Kumaun.

	D0	D1	D2
Leaf Area Index ($t\ ha^{-1}\ yr^{-1}$)	2.94	2.11	0.4
Litter fall	6.17	4.30	1.80
Litter decomposition (% weight loss in one year)	77.4	61.1	45.5
Biomass ($t\ ha^{-1}$)	631	564	281
Carbon sequestration ($t\ ha^{-1}yr^{-1}$)	4.02	2.35	0.82
Fine root density <0-20 cm in./m^2	10.77	761	147
Fungal sporocarp (no. in $25m^2$)	6.20	6.26	0.25

Notes: D0 is largely intact forest stand; D1 moderately disturbed and D2 severely degraded forest
Source: Singh et al. 2018

It takes very long time to revive the ecosystem integrity of a degraded forest. It may call for costly bioengineering measures to check further soil loss. Given the importance of oak forests in soil formation and retention of springs, major interventions, such as supply of clean cooking energy to local communities at an affordable cost, development of grass based fodder resource and vermi-cultures require to be accelerated. The gains of these interventions are likely to be several-fold greater than their costs (Fig 7.1). It can be also treated as a kind of payment for promoting ecosystem services.

Figure 7.1: A schematic representation of the benefits of providing clean cooking energy at affordable cost to local people (A); development of grass based fodder to replace low quality tree leaf fodder (B)



7.4 Ban on Tree Cutting and *Chir* Pine Expansion: Why a Review is required:

While the ban on tree cutting in 1980 played a major role in the saving forests, it inadvertently promoted *chir* pine at the expense of *banj* oak, on which local people depend more, and prefer particularly for its superior ecosystem services. Despite the ban of 'whole tree cutting', lopping of oak branches and, grazing and browsing in forests continued, making the oak forests open to invasion by less demanding *chir* pine. Since the prevalence of small frequent fires also continued after the ban, it favoured fire-tolerant *chir* pine.

With the ban on tree cutting, standard silvicultural practices, such as thinning of trees in *chir* forest stands stopped, resulting in the conversion of open pine stands into closed ones with high density of trees (Plate 2). It is to be scientifically determined whether trees in densified stands of *chir* pine are any more fire tolerant or not, or how it is regenerating without getting enough light on the ground.

Spread of *Chir* pine forest in *Banj* Oak Forest is Common

The scale of replacement of oak forests with chir pine forests requires assessment. There is need to undertake research on these aspects before appealing to the court for reviewing the ban on tree cutting. The CAMPA fund could be used to undertake this research, involving competent ecologists. There is a need also for reviewing the policy of commercial removal of chir pine litter. The litter fall is the main source of nutrient return from canopy to soil, and litter is also a habitat and cover for insects and microbes, including mycorrhizae. There is a need to find out the impact of chir pine litter removal on the integrity of ecosystems and its productivity before such a practice is promoted.

Litter removal in banj oak has resulted in seed desiccation and failure of oak regeneration. Measures need to be taken to revive seedling recruitment and regeneration of oaks with adequate research backing.

7.5 Failure of Brown Oak to Regenerate:

From forest stand point, Uttarakhand is a special State as it is the centre of chir pine, banj oak and brown or kharsu oak (*Quercus semecarpifolia*) distributions. Kharsu oak, which goes up to timberline is a major high elevation oak used variously by local people, including sericulture, and extraction of lichens (Jhula). The oak is failing to regenerate over a large area in the region, in which grazing pressure is a prominent factor. The State forest department needs to establish nurseries to promote plantation of kharsu oak. Being a viviparous species (having seeds which can germinate while still on trees), it is vulnerable to climate change.

In brief:

- Deforestation has almost stopped except that resulting from road construction and other similar activities, but forest degradation continues. Steps are required to address degradation, and to monitor the status of plantations raised to compensate for tree cutting for development activities.
- The ban on tree cutting should be reviewed, based on evidence gathered through quality research.
- The ban has favoured *chir* pine, but needs to be estimated, analysed and addressed.
- How pine stands are being affected requires examination, both in view of ban on tree cutting and commercial removal of litter.
- Revive natural seedling recruitment and regeneration of oaks, particularly of Q. semecarpifolia. There is a need to develop its nurseries and promote natural regeneration.

7.6 Valuing Ecosystem Services Flowing From Uttarakhand - Green Bonus:

The degradation of ecosystems has resulted in adverse impact on 60% of ecosystems services globally (MEA 2005). This is a matter of great concern as humans heavily depend on these life-supporting services (Costanza *et al* 1997). As per the recommendations of the 12th and 13th Finance Commissions of the country, grants were

to be transferred to forest-rich States in amounts corresponding to their forest covers. However, funds allocated based on forest cover were not an accurate indicator of ecosystem services flowing from the Himalayan States. If payments are to reflect the true value of the services provided, then these services need both to be measured, and assigned unit values, requiring two separate types of analysis. The necessary biophysical measurements of ecosystem services based on easily verifiable and objective methods remain a problem.

For regions that are the principal providers of ecosystem services often need to curtail or restrict development activities. For example, they may not be allowed to construct a road because it restricts the movements of some charismatic mega-fauna, such as elephants, or a hydropower project is stopped due to its threat to biodiversity. To address these restrictions, alternatives might need to be considered – for example, constructing an elevated railway track on columns that allows elephants to move freely. Such alternatives have additional costs. Hence the Central Government requires to give credit to States, which provide high levels of ecosystem services, in the form of finance or resources required to maintain the integrity of ecosystems while supporting economic growth.

Since the market does not perform money transfer from regions that benefit from ecosystem services to regions, which produce them, the Central Government may perform this function (Singh and Thadani 2013). However, to implement this policy, the Central Government would need suitable methods to compare the ouputs of different ecosystem services of national and international importance.

Mechanisms are needed to determine the type and quantum of payback that people in mountains should receive, and an equitable process of distributing the funds would have to be developed. For example, local communities could be given access to clean cooking energy (benefits in kind). Additionally, there a vast scope for the involvement of the local communities through Van Panchayats/ Biodiversity Management Committees and training them in Taxonomy to develop para-taxonomists and deploying them in field teams to provide ecosystem services such as participatory monitoring, reporting etc. and paying them for their services.

7.7 Identifying Ecosystem Services for Payment:

Three sets of ecosystem services are proposed as the most suitable for determining payment to States. These are forest carbon sequestration, biodiversity-related services, and services that accompany mountain rivers flowing to adjacent plains. The criteria are given in Box 7.1.

Box 7.1: Criteria for selecting ecosystem services for incorporation into national accounting could be as following:

1. Consider only the services of national (e.g., water) and international (e.g., carbon sequestration) significance.
2. Focus on services, which are easily measurable in a reliable and valid way in biophysical terms, and are verifiable independently, e.g. forest carbon sequestration.
3. Use surrogates or proxies where possible that in reality cover a broad range of services, e.g. biodiversity should not be considered an independent service; rather, it is a contributor to several ecosystem goods and services.
4. Thus **species diversity**, because it is precisely measurable, may be considered an indicator of a bundle of relevant biological services including biodiversity. Forest carbon may also be a measure of a variety of other forest variables.

Carbon sequestration is a global service with a national responsibility. Forest carbon is a national and international service (criterion 1), easily measurable (criterion 2) and moreover is a fairly reliable indicator of the several other co-ecosystem services such as forest goods, litter fall and nutrient cycling, hydrologic regulation and protection of soil against erosion.

A large work force is available in the form of local communities in Indian Himalayan States to measure forest carbon through periodic forest

inventories at local level. Following some training, large amounts of data could be collected.

In terms of interventions, which could be used to encourage communities to preserve carbon stocks in their forests: several technological interventions are possible, which not only reduce forest degradation, but also improve livelihoods. For examples, grass-based fodder development can result in decrease in tree leaf cutting for fodder as well as dairy development. Access to clean cooking energy would drastically reduce the use of firewood. These interventions would speed up restoration of degraded forests and enhance their capacity to sequester carbon .

Since forest fires, almost all of which are human induced, are an important degrading agent in these mountain States, the issue of fire also needs to be addressed. Schemes like the 'no-fire bonus' (Tacconi *et al.*, 2010) as applied in Philippines could work in conjunction with other rewards for carbon services

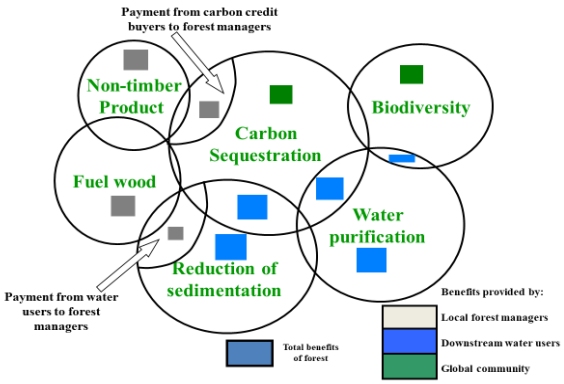
In addition to carbon sequestration in forests, we should also include the carbon stocks in soils, particularly in the Alpine pasture systems. Maintenance of these reserves is important in view of a warming climate.

7.8 Biodiversity Related Services:

We have elected to use species richness as the basic indicator for a range of values relating to biodiversity. For this, we consider the number of plant species in a State, and the presence of old growth forests. While carbon sequestration is a purely global ecosystem service, biodiversity has local, regional and global significance (criterion 1) and also has intergenerational dimension; it can be readily quantified (criterion 2) and it stands as a surrogate for a variety of other biological values (criterion 3). Old growth forest area is taken as a second variable in this area, and the potential asylum value of ecosystems as a third (Figure 7.2.)

Here People's Biodiversity Registers (PBR) could be useful, with the involvement of local communities as ´spotters´. Other organisms could be added, as our knowledge expands. Biodiversity Board has already begun the processes

Figure 7.2: Schematic Representation of flow of Ecosystem services from mountains to plains



Old growth forests make another biodiversity attribute: They store a large amount of carbon, but more importantly they have considerable habitat and regulatory values (criterion 3). Old growth forests have remained neglected in Indian forestry and conservation programmes. By counting the number of trees of above certain stem diameter, one can give an estimate of old growth forests for particular ecosystems (criterion 2).

Asylum value for migrating species under global warming: The Himalayas are the only major geographical area in south Asia where species would be able to escape from warming condition by moving uphill. Under the influence of warming, species would not only migrate toward high altitude areas, they would also show range shift from east to west or west to east.

7.9 River Flow Services:

The expanse of mountain rivers can be used to give an estimate of transport of soil and water to adjacent plains for various economic activities, particularly agriculture. The catchment areas of rivers in adjacent plains and the population that they support would be the criteria for assessing their services to nation. Forest hydrology plays a vital role in regulating water quantity as well as quality of mountain rivers and their contribution to adjoining plain areas. Mountain forests and grasslands purify water and thus limit the

pollution load of water reaching plain areas.

In terms of the flow of services through rivers, Uttarakhand State stands out among the Himalayan States, as the river Ganga which serves India's major northern States viz. UP, Bihar and Bengal originates here.

For valuing the ecosystem services methods given in Singh and Thadani (2013) could be followed. They have focused on weighting i.e., assigning a relative value to the service. In any weighting exercise, a common base is required for comparison between indicators of different types. For example, one cannot directly compare ´tons of carbon with number of species present or ´gallons of water flowing to plains´ because they are measured in different, and to some extent arbitrary units (tones rather than kilos, gallon rather than tones; using a different unit in each case would grossly distort the final value assigned). The measured level of each eco-service first needs to be normalized before weights can be applied.

As concerns opportunity cost, a protected area created at foothills, such as Jim Corbett National Park in Uttarakhand, has a far higher opportunity cost than a biosphere reserve in high mountains, such as Great Himalayan National Park in Himachal Pradesh. Their combined opportunity cost should be in billions of Rupees, when agricultural values of the land is also considered.

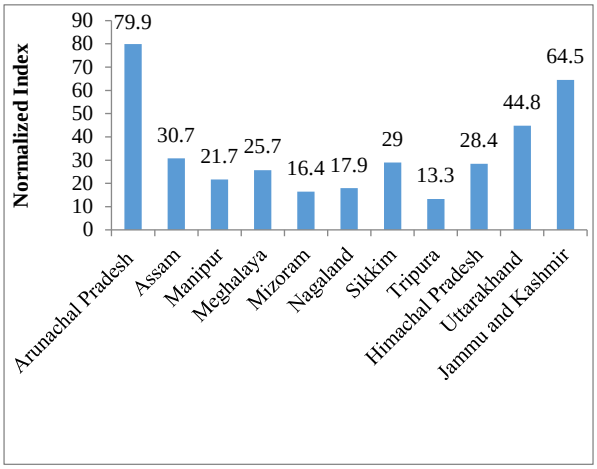
Figure 7.3 gives the sum of normalized indices based on a few ecosystem services of the Himalayan States, namely biodiversity (which we have based on both the number of flowering plant species as well as the number of endemic species), asylum value for migrating species under the influence of global warming which is based on the area of alpine meadows and areas above 3000m in altitude); and carbon services (including carbon stock and carbon sequestration.

The payments to the States would not represent market prices as a market does not operate for ecosystem services. Rather than trying to determine a market value, we propose that the payment should be sufficient to help the State enable people to address issues related to poverty, which exacerbate the degradation of natural resources. An element that we feel is particularly important is access to an appropriate clean cooking energy, such as LPG, biogas, hydroelectricity and solar power in place of fuel wood which is a primitive form of energy and associated with forest degradation, women's drudgery and health issues related both to collection and burning. The advantages of this kind of support are many. The payment could also be used to promote livelihoods with a linkage to conservation. For example, by developing grass based fodder production, the harvest of tree leaves could be reduced. Apart from increasing milk yield, grass fodder would increase forest carbon sequestration and reduce physical stress on women. It could also be used to lengthen the slash and burn cycle or replace it with more economically rewarding activities. A transparent methodology developed and is suggested here to help determine the distribution of funds released by the Indian Government for ecosystem services provided by various mountain States is possible. The methodology can be best described as a work in progress and there is certainly scope for improvement.

Figure 7.3: (A) Normalized Index (unit less) with regard to ecosystem services flowing from Indian Himalayan States.

It is sum of all services (i) carbon services which include carbon stock as well as carbon sequestration by forests; (ii) biodiversity services which include plant species number in a State and endemic species number; and (iii) asylum value, based on area of above 3000 m altitude which supports forest and meadows. Species would migrate there under the influence of climate change.

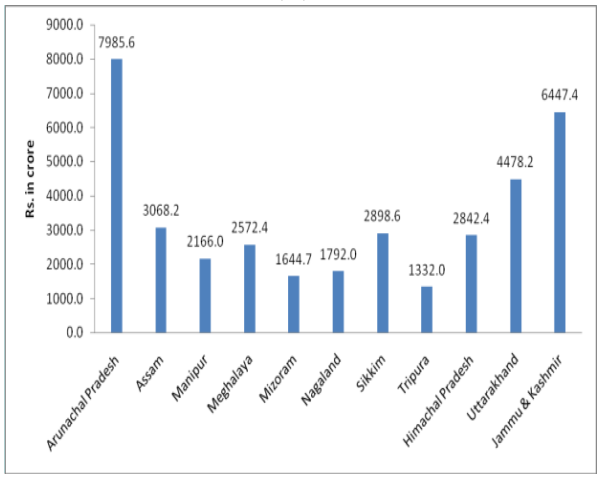
(A)



Source: Singh and Thadani 2013

(B) Using appropriate rate these indices could be converted into money. This would largely depend on the availability of fund at the Central Government level and appreciation of the value of the ecosystem services flowing from the Himalayan states. Since market mechanism are not places, economic values have little value. The arrangement of payment system may need to develop.

(B)



Source: Singh and Thadani 2013

7.10 Valuation of Forest Ecosystem Services – Green Accounting Study of Uttarakhand:

By IIFM Bhopal on behalf of Directorate of Economics and Statistics, Government of Uttarakhand

The study provides economic estimates for as many as 21 ecosystem services from the forest areas of Uttarakhand. The study findings indicate that the monetary value of flow of benefits emanating from the Uttarakhand forests is approximately ₹95,112 crores annually. This is equivalent to an annual flow value of ₹3,88,085 per ha of forest in Uttarakhand. In addition, Uttarakhand forests protect and conserve stock that is valued in the range of ₹14,13,676 crores annually.

Table 7.3: Uttarakhand's Forest Ecosystem Services in Stock and Flow Value Framework (Lower Bound)

Uttarakhand Forest Ecosystem Services (Stock Values)	Economic Value (₹ crores)	Physical Volume
Timber Stock	7,21,101.70	370.65 million m3
Carbon Stock	2,55,725.50	290.33 million tonnes of carbon
Land Value	4,36,849.0	Total forest area 38,139.18 km2
Total Stock Value	**14,13,676.2**	**N.A.**
Uttarakhand Forest Ecosystem Services (Flow Values)	**Economic Value (₹ crores)**	**Physical Volume**
Fuelwood	3,395.20	67,90,469 tonnes/yr
Fodder	7,776.10	2,59,20,296.47 tonnes/year
Timber	1,243.20	6,38,994 m^3/year
Non-Timber Forest Products	303.7	Multiple units
Employment Generation	300	1 crore man days
Carbon Sequestration	1,482.20	61,760.16 tonnes/year
Water Purification	655.7	12,28,22,047.4 m^3/year
Water Provisioning	745.3	40,43,74,400 m^3/year
Gene-Pool Protection	73,386.50	N.A. as based on BT
Sediment Regulation/ Retention	561	2,36,20,000 tonnes of sediments/year
Biological Control	251.7	Benefits Transfer: Rs 660/Ha./Year
Pollination	441.1	Benefits Transfer: Rs 1,800/Ha./Year for tropical forests
Gas Regulation	176.5	Benefits Transfer: Rs 720/Ha./Year for tropical forests
Waste Assimilation	1,764.60	Benefits Transfer: Rs 7,200/Ha./Year for tropical forests
Flood Regulation	1,306.50	Benefits Transfer: Rs 540 crores p.a.. Value adjusted for WPI
Recreation/ Tourism	9.9	3,22,936 tourists
Habitat for Species	892.5	Total forest area 38,139.18 km^2
Nutrient Cycling/Retention	420.9	NPK present in 2,36,20,000 tonnes of sediments/year
Total Flow Value	**₹95,112.60**	**NA**

Sources : IIFM Bhopal / DES

In Brief:

- ✓ The States providing ecosystem services which are of national and international significance should be given due consideration in national accounting.
- ✓ Methods of valuation consider parameters which are measureable on the basis of existing data. Uttarakhand's contribution of ecosystem services, in this respect comes to ₹ 95,112 crores annually.
- ✓ The grants received for providing services could be used to meet additional expenditures to manage and enhance the flow of ecosystem services, such a road on high columns that allow free movements of elephants and other fauna.

7.11 Community Level Institutions Based on Forest and Biodiversity:

Van Panchayats (VPs) of Uttarakhand are widely recognizing grassroots level institutions of participatory management of forests. Subsequent to the creation of the State, VPs were expanded to cover all mountain villages. However, forest sizes distributed to villages were generally too small to generate enough resources to meet community's needs. In a way, many VPs were not active. With decreasing forest and village relationship, VPs as an institution were on decline. The arrival of **Biodiversity Management Committee** (BMC see Box 7.2.) in villages has made the functioning of VPs more uncertain. There is a need to harmonize the varied functioning of village level institutions, or promote one of them.

BMCs can be a potent game changer, provided the institution is main-streamed in governance, and village level capacity to deal with rules, regulations, biodiversity conservation and its management is meaningfully enhanced. Potentially, it can give an enormous power to local communities to regulate biodiversity resources, and generate income by using resources sustainably. However, it calls for a lot of efforts to increase the capacity of local people in a positive way (empowering people). Uttarakhand would give special importance to BMC, as it aligns well with the forest rich State.

Box7.2: Biodiversity Management Committee (BMC) owes it origin to International Convention on Biological Diversity (CBI), to which our country is a signatory. BMC, Biodiversity Board of States and National Biodiversity Authority are the operational agencies at local State and national level, respectively. BMC has a strong legal backing, and its main functions are to document various bio-resources present in BMC area through "People". Each BMC has to develop People Biodiversity Register (PBR), which is supposed to include all groups of organizations. The BMC is also required hao to develop Bio-cultural Community Protocol, which includes ecology, culture and spirituality and, traditional knowledge. Local traditions related the use of bio-resources and others. Users of bio-resources have to take prior consent for commercial use of bio-resources. The BMC will be given share of the benefits one earns on royalty, joint venture, technology transfer and skill development and others.

The rules, regulations and empowerment processes regarding biodiversity management are too sophisticated to be handled by local people alone. A BMC has to depend a lot on taxonomic knowledge, available only with few institutes and universities. We would need to **develop a kind of "para-taxonomists'" team to manage people's biodiversity registers**. At present, the village level institutions are too weak to handle a highly sophisticated system, which heavily draws upon taxonomic knowledge, laws, power, legalities, business management and collaboration skills. However BMC-like institutions, if developed properly, can help in slowing down depopulation in mountains by involving people. They could be converted into modern institutions with capacities to deal with bio-resource conservation, uses and marketing, climate change monitoring and overall management of village resources. As a strategy, BMC formation could begin from treeline Ecotone areas, including Alpine meadows "*Bugyals*", where many medicinal and aromatic

species grow. These are also vulnerable to poaching and changes under the influence of global climate change.

In brief:

Mainstream BMCs in the governance of ecosystem and grassroots level biodiversity resource management.

- Create harmony in village level institutions (viz., Gram Panchayat, Van Panchayat and BMC)
- Create village level taxonomists ("para-taxonomists") service, with recruitment from BMCs. Manage this service as Ecosystem Services, which could be funded by the state from its 'Green Bonus'.
- BMC could be given special importance in Himalayan states, corresponding to rich biodiversity they have.

7.12 Climate Change Impact and Adaptation Measures:

Himalayas, in parts are warming at rates 2-3 times more than global average rate in several areas (Singh et al. 2011; Yao et al. 2012), and Uttarakhand is not any different. The warming would be more (by 0.3°C and 0.7°C) even when global mean temperature rise is restricted to 1.5°C (HIMAP, 2019). As for precipitation, it is on decline in recent decades. A dry winter and pre-monsoon period is another feature of the climate change predictions. However, more comprehensive and rigorous data analyses are required. Data collection, storage and sharing have been inadequate, so far. Giving importance to data management plans in all the spheres is necessary for our modern State.

Though, the State has established a climate change cell, its activities have to be mainstreamed. We need to progress from debate on climate change adaptation and advance in terms of specific programmes and activities to address known challenges.

A brief description of climate change impact, and possible measures to address them, is as follows.

7.13 Glacier and Glacier Related Issues:

In the context of climate change impact, glacier melt, glacial lake formation and glacier lake outbursts (GLOFs), and contribution of glacier melt water to river flows have drawn much attention. All the glaciers that have been studied show shrinkage or retreat, and the glacier lake formations are on increase at present (see Box 7.3). It is difficult to assess the extent that glacier melt is likely to affect river discharges and wether glacier melt would increase with accelerated warming. Glacier melt flow changes only marginally over time, because as glacier melt increases, size of glacier decreases, (Miller et al. 2011).

Box 7.3: Glacier Lakes and Glacier Lake Outburst Floods (GLOFs).

- 1266 glacial lakes (size >500m^2) were identified in Uttarakhand with the help of Landsat images (2011-2013) (Bhambri et al. 2015), covering a total area 7.6 ±0.4km^2.
- Out of them, 809 are supraglacial lakes (with total area 2.0 ±0.1 km^2).
- Compared to this Himachal Pradesh has 229 glacier lakes (Shukla et al. 2018).
- The number is increasing indicating the rapid formation of new lakes.
- In Hindu Kush Himalaya ICIMOD has reported 8790 glacier lakes (Mool et al. 2001).

The other major observation is that the river discharge of Ganga is not likely to drastically reduce due to climate change as the Gangetic system is largely monsoon dominated systems (Box 7.4).

Alford and Armstrong (2010) have estimated (on the basis of Nepalese catchments) that glacier melt accounts for 2-20% with average of 10% to Ganga basin discharge. Immerzeel et al. (2010) estimates, 5.5% from snow and 3.3% from glaciers to the Gangetic water flow. Glacier depletion is likely to affect water availability in villages near glaciers, but its effect on large-scale hydrology in reference to the Gangetic system is likely to be limited. According to World Bank Report, the global climate warming is making

monsoon more unpredictable, and more difficult to deal with its impacts.

Box 7.4: Glacier Melt Contribution to Naturally Generated Discharge in Downstream Areas.	
Basins	
Ganga Basin (Nepalese catchment)	• 2-20% with average 10 (Alford and Armstrong 2010) • 8.7% (snow 5.5% + glacier 3.3%) (Immerzeel et al. 2010)
Indus Basin	34% of total stream flow due to snow melt and 26% from glacier melt
Brahmaputra Basin	Snow and glacier melt water 21.1% of total discharge generated in downstream areas

Apart from glaciers, climate change is likely to impact several other important components in our State such as; springs and lakes, hence drinking water supply, regeneration of important tree species, species shift, and species dynamics in treeline areas (Box 7.5.).

Box 7.5: Some Recent Observations of Glacial Lakes, Landslides, Hot Springs & Snow Cover

- The area of Basudhara a moraine dammed lake, located in the Eastern Kamet glacier at 4690 meters in Niti Valley, Dhauliganga river basin, Chamoli has been continuously increasing since 2001, from 33.6 ha to 60.7 ha in 2017 (~27 ha increase) (NMSHE project report of Wadia Institute, 2018).
- In Uttarakhand, 3303 active landslides have been mapped, with highest number (976) in the Greater Himalayas.
- There are 30 hot springs in UK, compared to 18 each in J&K and HP.
- At Devprayag, Alaknanda river contributes 75% & Bhagirathi 25% to river Ganga water.
- Snow cover is rapidly declining between 2000-2500m, but little change is observed above 4000m

7.14 Climate Change Impact on Water Supply and Tourism:

Drying of springs is widespread in Himalayas, and it might be partly related to the climate warming-induced increase in evapo-transpiration loss. "Niti Ayog" in 2018 has given importance to this issue, as it is the common source of water in much of the Himalayas. Most of mountain towns to a large extent depend on spring water, and in many towns including Mussoorie it has been the only source of water (Table 7.4). Watershed treatment with the help of bioengineering can be used to increase spring flow by 10-20% (Tambe et al. 2012; and Negi and Joshi 2002). The co-benefits of watershed treatment, such as increased biomass, carbon sequestration, and improved water quality could also be added to justify the cost of watershed treatment and a long-term maintenance.

Table 7.4: Water Sources Based on a Survey of 45 Towns/Cities (31 UK, 10 HP, 1 each in Meghalaya, Sikkim, Arunachal and J&K)

Category	No. Towns /Cities	Examples
At least some dependence on water of springs and streams	45	All towns surveyed
Entire dependence on springs and streams	17	Mussorie, Shillong, Gangtok, Itanagar
River water lifting from a distant place along with other sources	7	Manali, Almora, Ranikhet,
Water from river at the bank of which city is located, along with others	10	Bliaspur (HP), Srinagar (Garhwal) Bageshwar, Devprayag,
Stream, spring and ground water	**9**	Palampur, Solan, Berinag,
Lake	2	Srinagar (Kashmir), Nainital

Source : Negi GCS and Varun Joshi (2002) Mountain Research and Development 22(1):29-31. 2002

A water scarcity leads to conflict between the needs of local people and tourists. In Nainital, the lake has enough water for drinking, but not enough to supply drinking water as well as maintaining high lake water level to attract tourists. In Mussorie, Kempty fall is a tourist attraction, and if its water is diverted for drinking purpose, tourism may be adversely affected.

Following points need to be explored and studied before launching new urban/tourism development programmes:

- Are springs more in Himalayas because the young Himalayan mountains are full of rock faults and fractures which distribute spring flows at local scale?
- To what extent can spring water be tamed by bioengineering manipulations to meet people's needs?
- What is the role of forests, particularly Oak forests in its abundance and water quality?
- Does large ectomycorrizal network of Oak forests play an important role in retaining and cleaning water?
- What is the scope of augmenting spring water resources through spring-shed development?

Research is necessary to deal with these questions.

7.15 Regeneration of Tree Species:

In Uttarakhand, trees have three main types of seed-originated regeneration, and all are being affected or likely to be affected by climate change.

Monsoon- synchronized seed germinations- in this, seeds mature and germinate in the beginning of monsoon-e.g., *Sal* (*Shorearobusta*); *Moru* oak (*Quercus floribunda*) and *Kharsu* oak (*Q.semecarpifolia*) Because of climate change, seeds may mature early or monsoon may be delayed, resulting in the disruption of synchronization with monsoon. Since seeds have very short viability (<15 days), they would fail to germinate if monsoon synchronization is broken.

Partially monsoon synchronized seeds of *Q.leucotrichophora* and several other species are recalcitrant, that is they rapidly lose moisture (desiccation sensitive), and can germinate only when seed moisture is high (>30%). Seeds fall during winter season, and remain on ground until temperature becomes favourable and moisture is adequate. Because of increased warming and litter removal, many seeds of *Banj* oak lying on forest flow get desiccated by the time moisture is adequate for germination.

Monsoon Desynchronized Seeds- Seeds of species like *Cedrus deodara* and *Picea smithiana* require snow water to germinate in springs. With snow depletion, seed germination of these species is likely to be adversely affected. Thus the regeneration of almost all major species can be in problem because of climate change. Using proper research schedule, the regeneration process needs to be monitored. It is quite possible to get suitable tree populations in a species in which climate change impact is lower than other populations.

7.16 Treeline Response to Climate Change:

In spite of the highest treelines (the upper elevation limit up to which trees can grow) of the Northern Hemisphere (up to 4900 meters,), Himalayan treelines have not yet been recognized as an important and long regional ecosystem, possibly because of their remoteness. The term is missing in forestry sector (in literature as well as in working plan and practices), though much of the vegetation and species level changes due to climate warming are to occur in treelines. Recent research (under NMHS project of MoEF &CC) have indicated that *temperature lapse rate* (TLR) with rise in elevation in Uttarakhand is low (0.53ºC/100m increase in temperature), which implies that temperature in Sub-alpine and Alpine areas are higher than perceived. Since Himalayan treelines are depressed because of anthropogenic factors, such as grazing and tree cutting, it is bound to move up rapidly with warming.

That it has not moved up yet, suggests the role of grazing and tree cutting. However, livestock grazing practices are on decline.

A major policy decision could be to promote Alpine pastoralism in a regulated way, by linking it to livelihoods. Milk of cows grazing in treeline areas could be branded by informing consumers that it is a product of cows foraging 100 plant species or more in a pristine environment. The Government must play a role in recognizing milk from such areas as special product from remote and clean Himalayan environment.

In brief:

- The immediate requirements are to (i) establish an Interpretation Centre on Himalayan Treelines, (ii) data storage and sharing plan, and (iii) long term data collection based on plots established under NMHS project.
- Some of BMC activities could be linked to this new system.
- Revive Alpine meadow pastoralism, create a milk brand of cows grazing there, package and market the same.
- Alpine meadows can contribute substantially to the meat industry of the State, again branded to recognise the pristine region where the livestock grazes.
- Alpine treelines, and meadows are important as carbon stocks, hence conserve and estimate them, and link them to national accounting and money transfer from Centre to State.

Continuous monitoring of treeline Ecotone is required to detect species accumulation in such areas and eventual species extinction. This is the area where precious medicinal and aromatic species grow, with high percentages of ***endemics. The percentage of endemic species increase from lower to higher elevations.*** The State forest department could support the infrastructure developed under NMHS project and foster further research in the context of climate change.

The several thousand kilometres long treeline Ecotones of the State should be declared a new entity of conservation and management. This is the landscape consisting of several communities, with varying physiognomy (forests of tall trees, patches of small tree species of *Rhododendron* and *Sorbus*, herbs and grasses). The landscapes are now under pressure because of tourism and *Cordyceps* (Keera Jari) collections, and changes in snowfields.

7.17 Taking Advantage of Climate Warming - Expand Mango Orchards :

By cultivating North Indian mangoes like *darshani* and *langra* in mountains, the duration of the availability of these celebrated varieties in market could be prolonged easily by 1-2 months. They can fetch high prices during the off-season. In view of the estimated temperature rise, the cultivation of these mango varieties can be expanded up to 1000-1200 meter elevation. The adjacent plains are famous for their mangoes, and in mountains of Uttarakhand traditionally mango trees are found up to Bageshwar and Srinagar. A concerted effort is required to cultivate and market mangoes. Since apple requires long winter chilling, which is getting reduced because of higher increase in winter temperature, apple cultivation belt is shrunk.

7.18 Transition from Roads as Destructive Factor to Conservation System :

Areas under Right of Ways (ROW) is several million hectares in our country. In mountains, road construction is considered a source of muck dumping in rivers and long-term erosion and landslides. Globally roads are being treated as evolutionary agents; for example, road-inhabiting birds have shorter wings so that they can take off from ground in limited space.

The area under ROW is also being seen as habitat for conservation purposes. Institutes like GB Pant National Institute for Himalayan Environment and Sustainable Development (GBPNIHESD), Botanical Survey of India (BSI), and Zoological Survey of India (ZSI) could provide technical knowledge for converting ROW into linear arboretum, corridors for species movements and nursery strips.

In brief, convert mountain roads from source of degradation to source of ecosystem services.

7.19 Developing Forest Roads on High Columns to Connect Garhwal and Kumaun:

The distance between Dehradun and Haldwani could be shortened by 50-60 kms by constructing a forest road. But it is not permissible on the grounds that the road could adversely affect wild animals. However, a road constructed on 6-7m high columns that allows free animal movements, could pass muster. By shortening the distance between two important stations of Uttarakhand, the saving in terms of carbon emission can be huge and may alone justify transport on a high column road. To keep noise level low, metro trains could be promoted. Coaches of such trains with large windows could also be used for "tree canopy observation". The financial support from the Central Government could be justified on the ground of conservation and supply of ecosystem services the State supplies to the Gangetic Plains.

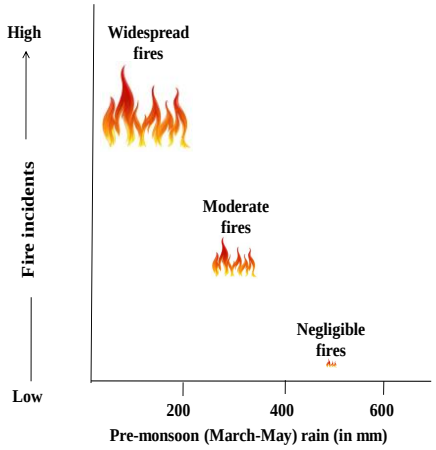
Expense is justified for activities which combine conservation and development.

7.20 Managing Forest Fires

Forest fire in Uttarakhand is largely a problem of Oak-pine zone, where most people live (1000-2000 m) (Singh et al. 2016). The forest fire regime is characterized by frequent surface fires of small size (on an average 1.80–29.58 ha/fire incident) and short duration. The negative aspect of fire in the State are: release of pollutants like black carbon, accelerated erosion of soil and nutrients, forest degradation and deforestation, excessive expansion of Chir pine at the cost of Oaks, wildlife mortality, and drying of soil and forest. Climate change by increasing evapotranspiration loss might have made forests more vulnerable to burning. The comforting aspects are that fires are small and surface type, so they are not stand-changing fires, and by monsoon-end the biomass loss is almost recovered, and they act as deterrent to big fires. heir adverse effect can be reduced to an extent by decreasing the frequency, which is a bit too high. As per the SEPI report during 2016 forest fires affected over 4437 ha of forest area. In 2015, these figures were 701 ha only.

Since fires are man-made, local communities could be a key factor in managing them. Since, pre-monsoon (March to mid-June) drought is the time when most fires generally occur, forecasting of the drought intensity can be used to prepare fire-controlling activities. This is also the time when litter fuel for fire is the highest. The number of fire event increases steeply when April-May is rainless, and drops to almost negligible fire events, when pre-monsoon rain exceeds 200mm (Figure 7.4.).

Figure 7.4: Improved Pre-Monsoon Rain Prediction & Alert System can help fire control.



Incentives to communities for no fire (no smoke in the valley) incident could be used to reduce fires. People should be educated about the harmful effect of black carbon on human health and glacier melt.

Efforts should be made to know what people get by igniting fires. Steps should be taken to make alternative arrangements to meet the needs.

In brief:

- Forest fires are generally surface fires, small and short-lived in UK; they are not stand changing, however, high frequency of such fires is a serious problem.
- Preparation to deal with fire can be improved considerably by putting in place an improved warning system based on rainfall forecast of pre-monsoon months (e.g., high fire frequency if pre-monsoon rain is going to be

less than 200mm).

- People's role in fire control- Incentives for no smoke in a valley may be useful to promote.
- Develop a scheme of prescribed burning with involvement of people to avert big fires.

7.21 Climate Change Justice and Uttarakhand Mountains:

The miseries inflicted by climate change in mountains are many and destabilising: disasters like Kedarnath of June 2013, subsequent landslides, crop failures and food insecurity, and others. They are far more than in cities of plains like Delhi or Mumbai. In contrast, the per capita annual CO_2 emission in mountains is ridiculously low, still below 1.5t CO^2 per person per year, compared to global average of 5-6t, and over 20t in some oil-rich countries.

Issue of Climate Change Justice

Per capita fossil fuel CO_2 emission minus consumption of hydropower generated in Himalayas used by others and forest carbon sequestration

Climate Change Impacts

Higher warming, consequent glacier melt and glacier lake formation

- Intensified pre-monsoon drought, fire, drinking water scarcity
- Kedarnath like excessive rain and disasters
- Increased failure of crops
- Road blocks, and road mortalities and other

In fact at present, the mountainous part of Uttarakhand could be negative fossil fuel CO_2 emitter. Why people who hardly emitted fossil fuel CO2 should be left to suffer most on account of climate change?

In brief, there should be some mechanism in place to transfer money from high CO2 emitters to low-emitters living in mountains, both nationally and internationally.

7.22 Human Wildlife Conflicts:

Human Wildlife Conflict (HWC) is one of the difficult issues of the State. In Pithoragarh 89% people considered that wild animals were one of the major causes of food insecurity (Hussain et al.2018). Snow leopards, common leopards, Himalayan brown bear, Asiatic black bear, *Rhesus macaque* and wild pigs are considered to be most problem causing animals.

In Uttarakhand between 1988 and 2000, 140 persons were killed by leopards, and 93 leopards were killed in retaliation (Chauhan and Goyal, 2000; Sathyakumar et al. 2018). According to another estimate between 2000 and 2018, leopards killed 180 persons and injured 343, and during this period 394 animals died (Hussain et al, 2018).

Black Bear accounted for 28.5% of attacks on human by large mammals between 1991 and 2001 (Chauhan 2004).

As per SEPI report during 2015-16, 43 persons have lost their lives and 170 are injured due to men-animal conflict.

Can we make the relationship positive by so doing, instead of the negative?

We do need to know more about our wildlife: their biology, behaviour, habitat requirement, and evolutionary traits in response to anthropogenic factors. There is a need to identify the hotspots using modern tools like GPS, radio collar and camera. In areas of conflicts modern tools should be used to make humans almost fully safe.

Community engagement and treating their positive role as an ecosystem service: Local communities can be encouraged to develop home stays and tracking network around rare animals, like snow leopards. These are already in practice in some areas of HP and J&K. If local communities earn by enabling tourists to sight wild animals, they would protect them and conserve their habitats. However, this may work only for rare and attractive wild animals.

At present local people are paid compensation when they and their livestock are injured or killed or their crops are damaged. It may be time to pilot basis to pay people regularly because wild animals are being conserved partly on their crop fields and livestock, and they do not kill them despite their losses. This amounts to payment for ecosystem services for supporting

wildlife. In other words, it proposes to replace the existing practice of getting compensation for damages with getting payment for supporting wildlife on crop fields and domestic animals.

Measures like physically separating wildlife by concentrating human settlements to limited number of places and empowering village level organizations like BMCs and VPs to understand and deal with HWC hold potential.

In brief:

- HWC continues to be a difficult problem, with little hope for solution given the constraints. Need to know more about wild animals by local people, so they should be more equipped to deal with them.
- Need to explore the scope of giving local people payment because wild animals use their crop fields-recognizing it an ecosystem service.

7.23 Dealing with Disasters:

The Himalayan region as a whole is disaster-prone. Frequent landslides, earthquakes, cloud bursts, droughts, forest fires, hailstorms, avalanches and flash floods, and Glacier Lake out bursts (GLOFs) keep on destabilising life in mountains. Landslides are common in all parts during monsoon months. Climate change has added to the miseries by increasing the frequency and intensity of extreme weather events. Economic loss, affected area and mortality, due to the increased disaster frequency and intensity in Himalayas have increased about four times from 1980-90 to 2000-2010 (HIMAP, 2018). Uttarakhand has been in centre of such disasters. Climate change seems to aggravate the crisis of forest fires by intensifying pre-monsoon (March to May) droughts as a result of increased evaporation losses. Being the young and rising mountains, Himalayas are vulnerable to disasters even without humans. That is why the share of disasters and miseries they cause has been more in Himalayas than other parts of the country. Soon after its creation, Uttarakhand began to pay attention to problems of disasters, and took some steps to deal with them. However, subsequently the progress slowed down, and disaster issues could not be mainstreamed, even after the rude shock of Kedarnath tragedy of June 2013.

Some of the learning from workshops, seminars and meetings for disaster management in the State are briefly described below:

i. Disasters not only cause physical havoc and instantaneous loss of infrastructure and human and animal mortalities, but also lead to social destruction, such as an increase in the number of widows and orphans resulting in social imbalances in communities. Thus the impact of disasters continues long after their occurrences. Therefore, the affected people need support for several years after actual events.

ii. Disasters are often difficult to predict, however, forecasting can be always improved and made meaningful. State-centric models are required to improve forecasting of disasters, particularly with regard to weather-induced disasters, like cloud bursts, droughts, forest fires and flash floods.

iii. The State scientists should work with institutes like IIT, Delhi where researche on India-centric models on climate change is going on under the DST's National Mission for Sustaining the Himalayan Ecosystem (NMSHE) programme.

iv. Ban on the construction activities at riverbanks or river flood plains, can greatly reduce the disaster losses.

v. Roads are source of landslides and erosions for many years after their construction. By using bioengineering measures, roads cannot be only made safer, but they can also be converted into a system which provides ecosystem services, such as conservation of biodiversity associated with roads. This is a mountain-specific issue of research and planning. Roads are being seen as an evolutionary agent, and a special conservation points.

vi. Regulatory system about roads should improve. For example, all roads may be brought under an overall disaster management monitoring architecture, and forest roads may be treated as alternative roads in the event of main road being rendered un-usable.

vii. Prepare landslide-prone map, using various measures, including indicator tree species like *Alnus nepalensis* (alder). Landslide restoration should be made necessary along the roads and in and around human settlements. We need to develop Himalayas-specific landslide restoration ecology. In cities like Nainital maps showing vulnerability to geological hazards are available. However, gaps between laws and implementations are wide.

viii. Include disaster management in school curriculum.

ix. There is a need to map and monitor glacier lakes, landslides prone areas, and prepare comprehensive reports to have an appropriate plan and management of these kinds of disasters. Wadia Institute has already done substantial work on glacier mapping including those, which pose a threat (which could lead to GLOFs) in Uttarakhand. The institute could be approached to develop strategies to prevent disasters due to GLOFs.

7.24 Earthquakes and Related Disasters:

A summary of the lessons and recommendations from the Workshop on "Lessons from Nepal's Earthquake for the Indian Himalayas and the Gangetic Plains: For Adaptive Planning and Strengthening Resilience" are presented. Many of the recommended actions are applicable to Uttarakhand.

Lessons	Action Recommended
Tourism:	
Tourism is a major victim of disasters. It takes a long time to restore the confidence of tourists. But it opens up new possibilities.	An event disaster gives an opportunity to remodel tourism so that more benefits go to local people. For example, one can explore the scope of increasing people's right over central assets and nature's beauty to enhance their share in the benefits of tourism
Social Inequality:	
In Nepal earthquake more women died than men, and more houses of the poor collapsed than of rich people. Women's trafficking has already become an issue of governance.	Women should be included in central decision making with regard to disasters.
Preparedness	
The Uttarakhand is less prepared than Nepal for earthquake-driven disasters, though it is equally vulnerable. Lack of preparedness for earthquakes may be seen in view of the fact that nearly 9000 people died in the Nepal earthquake, while in Chile far lower (<1000) mortalities occurred following an earthquake of more than 8 magnitude.	A team of experts should be put in place immediately to take a stock of preparedness in Uttarakhand and suggest necessary measures in the direction of preparedness. The scope for reducing a disaster caused mortalities is great.
Earthquakes risk maps are required for detailed planning.	Prepare earthquake risk maps, not only for mountains but also vulnerable areas of the plains where population densities are unusually high such as Gangetic basins; keep on improving them periodically.
Local organizations could not be engaged fully in aid relief.	Local organizations can effectively contribute to provide relief, so they need to be appropriately trained, and encouraged to play their role.
Information System and Media:	
Learning and instructions should be contextualized.	Supply and services need to be worked out in detail, keeping in view customs, culture, and tradition.
More effective information systems than those presently in	These would need to be supported by education and awareness

place are required during disasters to reduce rumours, panic and chaos, and to make relief distribution effective.	programmes.
There is a need for improving the knowledge of seismology to assess risk.	For this global collaboration needs to be expanded and a periodical evaluation system put in place.

7.25 Learning to Live With Disasters:

The State should declare itself a disaster-prone region, and take up necessary steps to enable people to live with disasters. This calls for a certain level of continuous, preparedness to deal with earthquakes, cloudbursts, landslides, GLOFs, forest fires, and climate change. Appropriate grants should be sought from the Central Government keeping in view the disaster vulnerability of the State and ecosystem services that provides to other regions of the country. Special attention should be paid to the greater Himalaya where landslides are far more frequent than in the lesser Himalaya and the Shiwaliks. It is evident from the experience of advanced countries that preparedness can reduce human mortality due to disasters by 70-80%.

- Earthquake resistant buildings should be cost-effective and people should be educated in how to find a safe place in a house or have a plan to exit it in the event of earthquake.
- Strict building codes for all new buildings and training in earthquake-resistant designs for engineers and masons- are required. People should be sensitized about all the existing laws pertaining to building construction, and measures should be taken to enforce them.
- Collaborate with the community to design hazard maps.
- Design a mechanism for coordinated and decentralised relief with a clear command structure.
- Weather forecasting has improved, and measures are taken for "high alerts". Forecasting should be expanded to include forest fires, which are induced by the intensification of pre-monsoon drought under the influence of climatic warming.
- Information network should be strengthened to include forecasting about roadblocks and public alerts about them in advance.

CHAPTER -8
Water Resources

Abstract

As the glaciers continue to recede in the Uttarakhand Himalaya, the formation of moraine dammed lakes and their eventual collapse cannot be ruled out. Due to recession of glaciers the river flows will be impacted but not drastically, as the contribution of the snow and glacial melt to annual flows of rivers is only 30%. However, more systematic studies are required to estimate reliably the quantum of water available from the glaciers. Given the mountain characteristics of the State 'nature based solutions' such as i.e. rainwater harvesting, rejuvenation of critical recharge zones and water efficient technologies are most suited. Digital metering systems, differential pricing system and incentivising individuals/communities for better water use practices are required in urban areas. The demand and supply gap needs to be reassessed especially for the urban areas given that most urban centres in the State are rapidly growing.

Springs are the major source of water in Uttarakhand, hence needs more attention by policy makers and scientists. It is imperative to build technical and institutional capacities of stakeholders for sustaining springs. Success stories from Uttarakhand and other parts of Himalayas are available where spring revival programmes have been implemented, which need up-scaling.

In terms of way forward for development of sustainable water resources of the State, rigorous data, knowledge empowerment and citizen involvement would be the keys as Government alone would not be able to capture all aspects related to water resources. The deficiency in developmental planning and policy analysis with regard to water needs to be addressed on priority. Backed by evidence and data, policy makers, implementers, research intuition and civil society needs to come together to jointly devise strategies, joint plans and working in a concerted manner. Based on the existing information a multipronged strategy for short, medium and long term is provided at the end of the section.

8.1 Introduction:

The number of glaciers in the Himalayan region are estimated to be around 12,000 (Kaul, 1999; ICIMOD, 2001) and the area under glaciers has been estimated to be 33,000 km^2 (Kaul, 1999; Rai and Gurung, 2005). The *Indian Himalayan Glacier System* with 9575 glaciers (Singh et al., 2009), is the third largest glacier system on earth and holds the largest reserves of freshwater in the form of snow and ice outside the polar regions (GSI, 2001). The maximum concentration of glaciers is in NW Himalaya. The length of glaciers varies from 1-72 km and these extend between altitudes ranging from 3700 to 6000 m (GSI 2001).

On an average, water received in form of rainfall amounts to 94.62 BCM, of which 17% is evaporated, 29.5% is absorbed by soil, and 15.4% infiltrates and recharges ground water while 37.5% contributes to the river systems.

The drainage systems of Uttarakhand have been categorised into 6 catchments, viz. the Yamuna Catchment, Bhagirathi Catchment, Alaknanda Catchment, Mandakini Catchment, Pindar Catchment and Kali Catchment and further divided into 26 watersheds, which are divided into 110 SWS and finally into 1,110 MWS. In Uttarakhand there are 31 natural lakes of varying sizes, the total area of which is around 300 hectare (UPACC 2014).

The State, with a rapidly increasing population aims to achieve universal water supply coverage in urban areas by 2030 and in rural areas by 2022. Currently, 68% of households have piped water supply. In urban areas, 78% of households and in rural areas, 64% of households receive piped water supply. Of the total rural population of 7.2 million, 45%, i.e. 3.2 million people

receive less than 40 litres of water per capita per day (lpcd). The duration of water supply varies between three to four hours in pumping schemes and six to eight hours in gravity schemes. The non-revenue water (NRW) supply is estimated to be about 40-50% (World Bank 2017). The increased irrigation demand will be met by minor irrigation till 2025 (Uttarakhand Development Report, 2009) whereas groundwater exploitation in the plain areas will cater to the demand. The gross irrigation requirements projection is given in Table 8.1 and the domestic water supply requirements till 2050 are worked out in Table 8.2.

Table 8.1 Average Gross Irrigation Requirements

Source of Water	Assumed Depth of Irrigation (meters)	
	2025	2050
Ground Water (Gross Irrigation Requirement)	0.51	0.49
Surface Water	0.73	0.61

Table 8.2 Domestic Water Supply Requirements

Sr. No.	Type of Water Supply	2025 (BCM/yr)	2050 (BCM/yr)
1	Urban	0.33	0.57
2.	Rural	0.15	0.31
3	Total	0.48	0.88

Source: (Uttarakhand Development Report 2009) Planning Commission Govt of India New Delhi

Major sources of water in Uttarakhand Include – glaciers, rivers, springs and ground water

8.2 Glaciers in Uttarakhand:

The Uttarakhand Himalaya stretches for about 325 km between Kali Ganga in the east and Tons-Yamuna valley in the west and covers an area of 53,204 km^2. There are 1,439 glaciers in Uttarakhand Himalaya covering a total area of 4,060 km^2. These glaciers have been further sub-divided in the following mountain ranges: Nanda Devi, Dauliganga, Kamet, Gangotri, Satopanth and Bandarpunch Groups. The glacier inventory for Uttarakhand Himalaya using remote sensing techniques was prepared by Wadia Institute of Himalayan Geology and ICIMOD (table 8.3).

Table- 8.3 Glaciers of Uttarakhand (Sah et al., 2005)

Sr. No.	Basin	No. of Glaciers	Area (km^2)	Volume (km^3)
1	Tons	102	162.58	17.43
2	Yamuna	22	10.4	0.45
3	Bhagirathi	374	921.46	129.93
4	Bhilangana	19	112.84	13.48
5	Mandakini	40	81.64	5.98
6	Alaknanda	457	1434.56	170.37
7	Pindari	43	158.99	15.01
8	Ramganga	7	6.74	0.322
9	Goriganga	128	561.35	69.18
10	Dhauliganga	135	373.19	34.6
11	Kutiyanghi	112	236.24	18.64
	Total	1439	4060.04	475.43

Table 8.4 Derived Glacier Parameters (2006) for Upper Bhagirathi and Saraswati/ Alakhnanda Basins

	Study Area	
	Upper Bhagirathi Basin	**Saraswati/ Alaknanda Basin**
Average elevation minimum (m)	4963	5105
Average elevation maximum (m)	6315	5896
Average elevation mean (m)	5629	5490
Average elevation median (m)	5636	5494
Average elevation range (m)	1352	791
Mean slope (°)	24.8	23.3
Debris-covered glacier area (km^2)	72.6 (26.4%)	76.7 (24.6%)
Clean-ice glacier area (km^2)	201.3 (73.4%)	234.8 (75.3%)
Area by Glacier size (km^2)		
<1 km^2	2.8	20.8
1-5 km^2	20.8	45.3
5-10 km^2	1.9	68.6
>10 km^2	228.3	176.7
Total glacierized area (km^2)	274	311.4

Source: Bhambri et al 2011

The glaciers of the Indian Himalayas are spread over different river basins including the Indus, Ganga and Brahmaputra. Inventories of the Himalayan glaciers (Jain 2018) reveal that Alaknanda and the Bhagirathi sub-basin have the largest glaciered area of about 585 km^2. The snow and glacier covered area in the Ganga basin is given in Table 8.4 above.

8.3 Recession of Glaciers in Uttarakhand:

Studies indicate that the rate of recession and volume change are irregular for glaciers across the Himalayan arc. This is attributed to the variations in micro-climate and physiography. In Uttarakhand some glaciers monitored for their mass balance and have been monitored routinely for shifting of snout position of the glaciers as given in table 8.5.

The Gangotri glacier is receding rapidly with the rate of retreat during the period 1962-1991 being about 20 m/yr. The enhanced rate of retreat is attributed to the increased anthropogenic interventions.

Table 8.5: Recession Trends of Some Himalayan Glaciers

S. No.	Name of Glacier	Period of Observation	Period (in years)	Recession (in m)	Average Rate (m/yr)
1	Milam glacier	1848-1996	148	2472	16.70
2	Pindari glacier	1845-1966	121	2840	23.47
3	Gangotri glacier	1935-1996 1996-1999	61 3.5	1,147 76	18.80 22.24
4	Tipra bank Glacier	1960-1987	27	100	3.7
5	Dokriani glacier	1962-1991 1991-2000	29 09	480 164	16.50 18.2
6	Chorabari	1992-1997	05	55	11
7	Shanklup	1881-1957	76	518	06.82
8	Poting	1906-1957	51	262	05.14
9	Dunagiri	1992-1997	05	15	3.00
10	Burphu	1966-1997	31	150	4.84

Source: Nainwal et al., 2008

Figure 8.1: Retreating Gangotri Glacier (Source: NASA Earth Observatory)

8.4 River Flow Regimes:

River systems originating from the Uttarakhand are fed by melting of snow and ice stored in the glaciers' spring discharge and this helps the rivers maintain a healthy level of stream flow all round the year. Snow, glacier melt and springs together with monsoonal precipitation determines the headwater flow regimes of large parts of Uttarakhand, including central and eastern Himalayan tributaries of River Ganga. In areas dominated by winter snowfall, peak glacier runoff contributes to the otherwise low flow conditions, governed by lower precipitation in summer; in areas dominated by the summer monsoon (Uttarakhand Himalaya), peak glacier runoff contributes to the peak river flow in July and August months. The runoff contribution from glacier imbalance is relatively minor in the wetter monsoonal catchments of the Ganges (Immerzeel et al., 2010).

8.5 Glacial Lakes:

In the central and eastern Himalaya, lake growth has been observed in recent decades, with much larger absolute growth rates in the east, while in the drier northwest, total lake area decreased (Xin et al., 2008). The moraine walls that act as dams are structurally weak and unstable and undergo constant changes due to slope failures and slumping and there exists the danger of

catastrophic failure, causing glacial lake outburst floods (GLOFs). These events are characterized by sudden release of huge amount of lake water that rushes along the stream channel downstream in the form of dangerous flood waves. Discharge rates of such floods are typically several thousand cubic meters per second. In Uttarakhand Himalayas there are approximately 118 glacial lakes of varying sizes, the total area of which is around 231 hectare. Therefore, the possibility of the State being affected by GLOF cannot be ruled out.

Box 8.1: Non Glacial Rivers (Case of Kosi River): As a result of changing rainfall patterns, drastic reduction in ground water recharge is noted. Also, several non-glacial rivers in the State are showing a drop in summer season discharge. A case study (Rawat J.S unpublished) indicates that discharge in Kosi river in lesser Himalayan region has declined 16 fold since 1992 (790 1/second in 1992 to only 48 1/second in 2018). Such transformation of perennial to non-perennial river is alarming. **Kosi has lost its flow in many places. Similar evidences are reported for Gagas and Gaula rivers in 'Kumaun'.** Based on a scientific report on Rejuvenation of the Dying Kosi River the Hon'ble Chief Minister has included the Kosi River Rejuvenation Strategy in the State Government action plan 2018-2019 as a dream project of the State. For implementation and management of this dream project the State Government has constituted *"Kosi River Rejuvenation Committee"* and has appointed 14 district level nodal officers (one for each recharge zone of Kosi River) for implementation of GIS based micro-plans for groundwater augmentation to rejuvenate the dying Kosi river – a non-glacial fed river of Dev bhoomi Uttarakhand and the life line of Kausani-Almora-Ramnagar. Such initiatives are timely and need to be implemented with utmost sincerity for water conservation in Uttarakhand.

Source J.S. Rawat Unpublished

Table 8.6: Altitude Range-Wise Distribution of High Alt. Lakes of Garhwal and Kumaon Himalaya

S. N.	District	Altitudinal Variation						Total	
		3000-4000m		4000-5000m		>5000m			
		No. of Lakes	Area in ha	No. of Lakes	Area in ha	No. of Lakes	Area in ha	No. of Lakes	Area in ha
1	Chamoli	26	28	26	63	8	21	60	112
2	Pithoragarh	3	3	20	65	2	8	25	76
3	Rudraprayag	1	2	-	-	-	-	1	2
4	Uttarakashi	10	10	22	31	-	-	32	41
	Total	40	43	68	159	10	29	118	231

Source: National Wet Land Atlas: High Altitude Lakes in India

8.6 Ground Water

Till March 2010, 17,847 hand pumps had been installed in the State. The yield of tube wells in the Shivalik formation, ranges from 50.4 m3 /h to 79.2 m3 /h; in Bhabhar formations the yield is up to 332.4 m^3 ha^{-1} (Table 8.7). In the Tarai belt, the yield of tube wells ranges from 36 m^3 $hectare^{-1}$ to 144 m^3 $hectare^{-1}$. However, there are number of unaccounted private pumps and tube wells used for drinking, commercial and irrigational purposes. Over the years there has been a drastic increase (82%) in the number of government drinking water tubewells and 59% increase in number of hand pumps. Extraction of water from deeper layers (up to 250m) of water is also prevalent as a result of advanced drilling techniques. The State has not yet enacted groundwater legislation for the systematic management of ground water resources.

Table 8.7: Status of Groundwater in Uttarakhand[7]

Dynamic Groundwater Resources	
Annual replenish-able groundwater resource	2.17 BCM
Net annual ground water availability	2.07 BCM
Annual ground water draft	1.05 BCM
Stage of ground water development	51%
Groundwater Development and Management	
Over- exploited	NIL
Critical	1 block
Semi- critical	5 blocks
Ground water user maps	13 districts
Artificial recharge to ground water (AR)	Feasible AR structures: 500 springs, 500 check dams, 500 sub-surface dykes; AR schemes completed during IX Plan: 1
Groundwater Quality Problems	
Contaminants	Nitrate (>45 mg/l)
Districts affected (in part)	Dehradun, Haridwar, Udham Singh Nagar

Source: UAPCC 2014

8.7 Spring Sources:

Relationship of humans with springs in Uttarakhand dates back as long as the civilization itself. Locally known as 'Naula' or 'Dhara' almost 80% of hill population is dependent upon springs either directly or indirectly. Springs have been the lifeline for most of the hill settlements and supporting their ecosystem services and sustaining the communities. They are the primary source to cater to the potable water for drinking, household activities and irrigation for the communities both rural and urban in Indian Himalayan region. Springs are the major groundwater sources in Hill districts[8]. As per NITI Aayog report (2018) there are as many as 6504 villages in western Himalayas that are dependent upon springs for their water supply. In Uttarakhand only 594 villages out of a total of 16,793 have been reported to be dependent on springs for their water supply needs. UNDP has estimated that there are about 2,60,000 springs in the State, which provide 90% of the drinking water sources9. It is reported that half of the perennial springs have already dried up or have become seasonal resulting in acute water shortage for drinking and other domestic purposes across hundreds of Himalayan villages. In Uttarakhand alone, almost 12,000 springs have dried up. There are multiple drivers of Spring depletion i.e. chnageschanges in climate, land cover, land use and seismicity.

Spring water emerges on to the surface naturally and therefore did not receive much attention. This is also evident in *Uttarakhand Water Management and Regulation Act (UWMRA), 2013* as well, where springs have failed to mark their place distinctively. The regulation focuses specifically on 'water' as all surface and sub-surface water accruing from rivers, or any part of a river, stream, lake, natural collection of water in aquifers or natural drainage channel'[10]. *The Uttarakhand State Action Plan on Climate Change (UAPCC, 2014)* does recognize springs as an important source of water for the communities. It advocates, conservation of such *naulas*, *dharas* and other kind of springs (UAPCC, 2014, pg-129). There is limited scientific knowledge on impacts of climate change on water resources. For this UAPCC, proposes to have water database management system in public domain so that different agencies working in various areas of water resources management can upload latest information on the same. **Latest Composite Water Management Index (CWMI, 2018)[11] by NITI Aayog, has ranked Uttarakhand as one of the lowest in performance index of water management, highlighting absence of water policy, lack of water data centre and deficit in rural water supply.** Absence of a dedicated State water policy

[7] UAPCC 2014

[8] Himalayan glaciers, springs and groundwater_ connecting the dots _ The Third Pole

[9] https://www.downtoearth.org.in/news/water/springs-are-flowing-once-again-in-these-uttarakhand-villages-thanks-to-water-champions--61002

[10] Uttarakhand Water Management and Regulation Act (UWMRA), 2013

[11] CWMI 2018 https://www.niti.gov.in/content/composite-water-management-index-june-2018-0

on water management, have made it difficult for the recognition of springs as one of the main sources of water in the State.

8.8 Urban Water:

Urban centres in the State i.e Mussoorie, Dehradun, Pauri, Almora, and Nainital are either suffering from acute water crises or management problems. Extreme precipitation and prolonged period of droughts have wide range of implications on urban water resources in Uttarakhand.

The decline of springs and depletion of lakes in Uttarakhand is not only affected by the processes of changing climate; a major drawback has been the rampant road construction facilitated by blasting of hillsides and deforestation, disturbing the water channels or the recharge zones through which springs and lakes maintain their flows and levels (NITI Aayog 2018).

Urban towns in Uttarakhand have hugely suffered on this account, for example the historic city of **Almora recorded 364 springs (Singh and Sharma 2014) at one point of time is now majority have them have dried up or become seasonal.** Similarly, Nainital and Mussoorie major tourist destinations of Northern India are facing problems with sustainability of recharge zones and the increasing gap between demand and supply respectively. Nainital lake through which approximately 95% of water demand of the town is met receives approximately 53% of the subsurface flow from a 2ha depression (valley fill) upstream of the town called Sukhatal (Dash et al 2008). Over the last 10 years, rampant illegal construction and dumping of debris took place over the valley fill, obstructing the function of the lack through which Nainital lake received a significant amount of subsurface water throughout the year, resulting in constant decline of the lake. A recent survey conducted by the State irrigation department revealed that the water body's depth has shrunk to 17.25 metres due to siltation. Over the last 37 years the Naini lake's depth decreased by 7meters (TOI, 2016). Currently about 18 mld (million litres /day) is pumped from the lake to meet the demands of the 42,775 (Census of India 2011) residents living in Nainital through lake bank filtration, this is far beyond MoUD benchmark of per capita supply of 135 litres per day.

Mussoorie on the other hand is completely supplied with spring water, 20 odd springs providing approximately 7.67 MLD water to the town, whereas the peak season demand is 14.4 MLD (approximately 50% deficit). To tackle the problem the Government approved a plan to pump water from Yamuna. However, such end of the pipe solutions are energy intensive and ecologically undesirable in a fragile Himalayan environment. (Source: Dr Singh and Dr Pandey 2018 in Nautiyal and Dutta)

8.9 Issues and Challenges:

Glaciers	Ground Water	Urban	Rural
Recession of glaciers High altitude lakes are prone to GLOF's	Over extraction of groundwater	Only 1/3 of the urban locations have near adequate water supply	Approximately 20% villages do not have water supply
Discrepancy in glacier melt data	Drying up of springs	Sources of water shifting from urban areas	Traditional sources i.e. dharas and nallas drying up
Long term data missing hence reliable estimates cannot be made	Data on quantity and quality of springs is minimal	End of pipe solution such as lifting of water from distant sources	Road construction/ forest degradation leading to decline in spring discharge
	Depletion of recharge zones due to unscientific development	Lack of metering	Traditional knowledge has not received enough attention
	Lack of groundwater policy	In equitable distribution of water Lack of institutional arrangement	

8.10 Way Forward:

With respect to goal-setting, the emphasis should be on **'knowledge co-production'**, **'translational ecology' and joint consideration of socio-ecological and political contexts to improve decision making.** To improve the water scenario of the State, three stages have been identified – **short, medium and long term.**

Short term (0-1 year)

1. Need assessment based on population projections for drinking water, irrigation, sewage to be conducted.
2. Inadequate data on rainfall and temperature – number of meteorological stations to be increased.
3. Development of block level and urban area water management committees involving experts and stakeholders and bespoke strategies for water conservation to be developed – based on topography and climatic conditions.
4. Developing Climate Adaptive Water Management Practices at Block level.
5. Ground water legislation to be development and implemented.
6. Ground water recharge to be made mandatory for buildings and institutions in plain areas
7. Illegal extraction of ground water to be stopped.
8. Nature based solutions i.e. roof water harvesting, conservation of critical water zones to be encouraged.
9. Incentivizing mechanisms for water conservation at individual and community level.
10. Large scale citizen knowledge empowerment and engagement programs. Creation of open access database.
11. Lifting water from distant river sources should be discouraged, instead nature based solutions should be sought.

Medium Term (0-3 years)

12. Revival of Kosi River through nature based solutions keeping in consideration the project submitted to the Honourable Chief Minister of the State in 2018.
13. Identification of springs/streams and lakes through citizens participation; development of mobile application
14. Demarcation of areas that may get affected by GLOF's, early warning systems and disaster mitigation plans to be developed.
15. Hydrogeological assessments of critical springs to be undertaken, recharge zones to be demarcated and declared as 'no go zones'
16. Spring revival to be undertaken using hydro-geological techniques established by NITI Aayog in consultation with ICIMOD and taking lessons from Dhara Vikas and CHIRAG programmes
17. Training programmes to develop para-hydro-geologists
18. Revival, validation and documentation of traditional knowledge

Long Term (0-5 years)

19. Long term systematic studies on glacial melt and recession required covering major glaciers of the State
20. Hundred percentage metering in urban areas, differential pricing systems and incentivising mechanisms
21. River flow, pollution level monitoring at different stages of major rivers i.e Ganga, Yamuna and its tributaries.

SPRING-SHED DEVELOPMENT

Is gaining momentum in comparison to traditional water shed development programs. There is a paradigm shift to spring-shed development in support of water-shed development since it can address the multi-pronged challenge of revival, conservation and management of springs. Sikkim, another Himalayan state has been successful in implementing spring-shed development through its 'DharaVikas' program instrumental in reviving and maintaining its springs.

Similarly, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu has developed 8-Step methodology for systematic mapping and rejuvenation of springs which addresses demarcation and mapping of springs, interpreting rainfall data, water cycle and ecosystems, hydrogeology, and social, ecological, and governance aspects of spring-shed management.

Comparing the cost-benefit analysis of spring-shed and water-shed development, spring-shed is cheaper to execute and maintain.

CHAPTER – 9
Social Development Sector
9.1 Heath and Wellness

Abstract

As Uttarakhand is endowed with abundance of nature's bounties and a healthy climate, it was natural to expect that its health profile will be worthy. But, it has not been so. It is constrained by several factors, such as difficult terrain, infrastructure and manpower shortage, resource crunch, limited access to technology etc. Some of these were inherited at the time of formation of the State in the year 2000, some have emerged overtime. Though the Govt. has systematically attempted to mitigate these challenges by adopting a health and population policy as early as 2002 (a revised policy in 2013) and, an AYUSH policy in 2018, several gaps remained to be bridged. State's Vision 2030 document has provided a trajectory and a roadmap to bridge these gaps in a systematic manner.

Though, over time, Uttarakhand's broad health indicators like, birth, death, infant mortality rates, maternal mortality ratio have improved a great deal, micro indicators including access to primary and secondary medical care, immunization coverage and malnutrition continue to lag behind. In recent years, the State has witnessed a surge in some communicable (Tuberculosis) and non-communicable diseases (diabetes, HIV/AIDS, hypertension), attributable to life style changes.

It is understood that some new and innovative approaches and systemic reforms are called for to achieve Sustainable Development Goals (SDG) targets and ensure wellness of all people in the State. These include:

- ✓ *Providing benefits of Ayushman Bharat (health insurance) to all citizens,*
- ✓ *Optimal use of technology such as tele-medicine for primary, secondary and tertiary medical care;*
- ✓ *Strengthen and expand secondary medical care through PPP for quality care in existing hospitals, engage pvt. sector to establish new hospitals, particularly in commercially viable hill towns;*
- ✓ *Revamping mobile medical units programme,*
- ✓ *Revamping and strengthening process and outcome monitoring systems;*
- ✓ *Rationalise human resource management processes to overcome shortage of medical manpower in Government health services, particularly of specialist doctors;*
- ✓ *Revamping and strengthening State's training institutions for better management and delivery of quality care;*
- ✓ *Engage with community for health education and health promotion activities and promoting a culture of wellness;*
- ✓ *Strengthen AYUSH services as standalone and as supplement to allopathic medical care.*

Some of the interventions have already begun and some are being planned and will be implemented in due course of time.

Investment Summit 2018 has given impetus to the State's intention to become a hub for wellness tourism and contribute to the State's economy. Some such institutions have already excelled and set the path. State has put required policies and strategies in place. Potential sites for establishing AYUSH grams are being identified. Several private initiatives are being supported to make it a reality.

9.1.1 Introduction:

As Uttarakhand is endowed with abundance of nature's bounties and a healthy climate, it was natural to expect that its health profile will be worthy. However, it has not been so. It is constrained by several factors. The State is primarily a mountainous State with only about 10% of its total geographical area in the plains. At the time of formation (year 2000), most of the health indicators of the State were comparable to national indicators and of States having similar geographical conditions (Himachal Pradesh and Sikkim), but lower than Kerala.

Table 9.1.1: Key Health Indicators of Uttarakhand, Other States and Indiain 2002

Indicators	Uttarakhand	Sikkim	Himachal Pradesh	India	Kerala
IMR	50	49	60	68	14
Birth Rate	20.2	21.8	22.1	25.8	17.9
Death Rate	6.9	5.7	7.2	8.5	6.4
Natural Growth Rate	13.3	16.2	14.9	17.3	11.5

Source: SRS (Vol. 36 No.1 April 2002)

However, within the State, there were wide differences in several health parameters for rural-urban and hills- non-hills residents. For instance, there was a wide divergence in the rural (73) and urban (26) infant mortality rate indicating an uneven pattern of development. Further;

- Rural death rate at 10.3 was more than double of 4.5 in urban areas (*SRS April 2002*).
- Only 21% deliveries were institutional with 42% reported in urban and 16% in rural areas (*Health and Population Policy of Uttaranchal - 2002*).
- Almost 32% of women in Uttarakhand were undernourished as per weight-for height or body mass index, with 46% being anaemic (India - 56%) - (*Health and Population Policy of Uttaranchal - 2002*).
- Low birth weight was a concern; almost 42% of children <3 years of age reported as underweight. Undernourishment was more prevalent in rural areas and in households with low living standards.
- Less than half (41%) of children aged 12-23 months received all the doses of prescribed vaccines i.e., were fully immunized.
- Communicable diseases such as acute respiratory infection, diarrhoea etc. were the leading causes of deaths during infancy and childhood. Prevalence of Tuberculosis was high with a rate of 1225/100,000 in comparison to national average of 544/100,000.

It was obvious that several of these poor indicators, particularly those related to children and women's health and nutrition stemmed from programmatic limitations in the remote and hilly areas.

The foremost challenge before the State at its formation, was to explore ways to make health and other institutions more effective and accessible. With more than half of villages in the hilly region having no road connectivity and transport facilities, ensuring accessibility was the foremost challenge alongside providing sufficient, appropriate and quality health services with limited human and financial resources and inadequate healthcare infrastructure.

Health and Population Policy 2002: In order to address these issues and to tread on the path of development, the State formulated and adopted an integrated and holistic Health and Population Policy in December 2002. Thrust of this policy was to improve access to quality health care. The policy objectives were designated to be achieved by 2010.

The policy followed a life-cycle approach to women's health issues, with special emphasis on safe motherhood. It laid significant emphasis on child health issues including child rights and nutrition. Special focus was given to reduce IMR by implementing critical child survival interventions. Policy interventions were particularly focused on disadvantaged groups such as people living in remote and hilly areas. It also resolved to achieve equity by addressing issues relating to inter-district and gender disparities.

Revised Health and Population Policy 2013: The State made considerable progress in improving several health indicators during first decade of its formation. For example, AHS 2010-11 indicated a dip in its Total Fertility Rate, from 3.3 in 2002 to 2.3, better than the national average of 2.5. Institutional deliveries increased to 50% from a low of 21% in 2002. Yet, challenges remained in many areas. A need was felt to review and reformulate the policy to address gaps and emerging challenges. The 2013 policy had an eight year implementation timeframe, aimed to achieve specific health and population goals in the context of State's overall "Vision – 2020". 2013 Policy was particularly aimed to address inequalities amongst districts, income groups, men and women, and focused on prevalent and emerging health issues. Its objectives also included reduction in the burden of diseases in the State. Further, the new policy aimed at mainstreaming AYUSH and strengthening inter-sectorial convergence.

9.1.2 Key Interventions:

Emergency response ambulance network (EMRI 108) was introduced to cater to the needs of accident cases across the State, which became a boon for pregnant women who lacked transport facilities to reach institutions in time for safe deliveries.

The *Mobile Medical Units* (MMUs), initially piloted in one district, were gradually strengthened and soon every district had two MMUs each, at their disposal.

Interventions like Janani Shishu Swasthya Karyakram (JSSK) for pregnant mothers to reduce out of pocket expenditure, *Rashtriya Bal Swasthya Karyakram (RBSK)* (life cycle approach) for children and *Rashtriya Kishore Swasthya Karyakram (RKSK)* for adolescents were target specific and with dedicated team of doctors and paramedics reaching out to pregnant women, children and adolescents.

Focused interventions like Janani Swasthya Yojana (JSY) promoted institutional deliveries.

Placement of village level functionaries- ASHAs and introduction of transport facilities (Emergency Response Services and Sehat Ki Sawari – Mobile Medical Units) covered unmet programmatic needs.

Inter-sectorial convergence paved way for coordinated efforts by health, ICDS, education, water and sanitation and Panchayati Raj institutions.

The village health and nutrition day helped health and ICDS departments to address malnutrition in a big way.

For a robust review and monitoring of the interventions, State tried to strengthen its monitoring system by introducing HMIS, MCTS (RCH now) and by adopting periodical reviewing systems at State level.

State also brought in several innovative schemes like providing incentives to doctor couples to open hospitals in remote areas, walk-in interviews for selection of doctors, outsourcing of CHC's by roping in private hospitals under PPP mode, and use of telemedicine for diagnostic care.

9.1.3 Outcomes of the Interventions - Patterns and Trends:

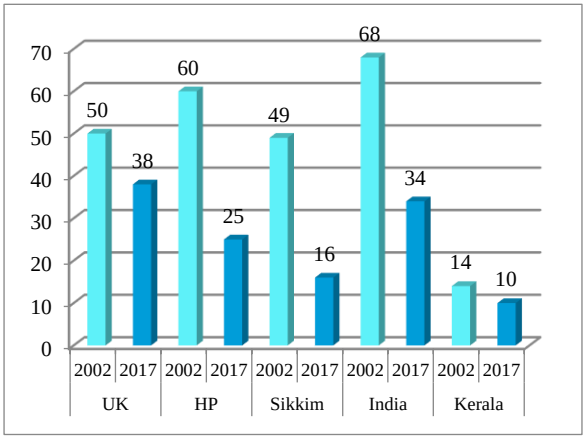
With right intent and efforts in place, broad indicators like Crude Birth Rate (CBR), Total Fertility Rate (TFR), Maternal Mortality Ratio (MMR), Infant Mortality Rate (IMR) and Death rates started registering positive outcomes.

9.1.3.1 RCH Indicators

Analysis of trends in some important RCH indicators particularly IMR during intervening period between two Population Policies (2002 and 2013), shows improvement in most areas, but the pace of change remained relatively slow as compared to States in whose comparison it was placed higher only a few years ago.

A new strategy is called for if IMR is to be brought down to the level desired in SDGs. The State has however, successfully managed to reach replacement level fertility rate (2.1 children).

Figure 9.1.1: Infant Mortality Rate in States of Uttarakhand, Himachal Pradesh, Sikkim, Kerala and India



Source: SRS 2012-2017

Table 9.1.2: Trend of Health Indicators in Uttarakhand from 2005-06 to 2015-16

Indicator	Uttarakhand	
	NFHS 2005-06	NFHS 2015-16
Under 5 Mortality Rate (U5MR)	56	47
Total Fertility Rate (TFR)	2.6	2.1
Sex ratio at birth for children born in the last 5 years	912	888
Institutional births (%)	32.6	68.6
Children Fully Immunized	60.0	57.7

Source: NFHS III (2005-2006), NFHS IV (2015-2016)

Child Sex Ratio - NITI Aayog in its report on theState *of Health in India* (2018) has indicated a large decline in child sex ratio (0-6 years) of the State, which is a cause of concern. NFHS-4 recorded a decline from 912 in 2004-05 to 888 in 2015-16. A recent survey (2018) by the State health department however, shows that the child sex ratio in rural areas ofState is 934 which is closely comparable to NFHS-4 data (924 in 2015-16) for rural areas. A survey by the State State Health Department has reported highest child sex ratio of 1,036 in Bageshwar district, followed by 978 in Nainital and 958 in Rudraprayag. Haridwar lags at the bottom with a child sex ratio of 912. Census 1991, reported child sex ratio of 949 of the State. This had declined to 908 in Census 2001 and went further down to 890 in Census 2011. While the findings of the Health Department survey are heartening, the real challenge in improving child sex ratio lies in the urban areas. In NFHS-4, child sex ratio of urban areas was 817, which seem to have brought down overall sex ratio of the State to 888.

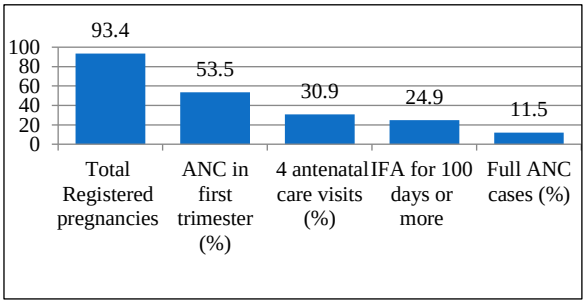
There is a need to examine the reasons for these trends in urban child sex ratio of State. It may consider undertaking an independent study to examine the reasons. Forthcoming NFHS-V (year 2019) may reveal a change in trend in child sex ratio, as reported by the survey conducted by the Health Department.

Immunization: Complete vaccination coverage of children has reportedly dipped in the State. The figure pertaining to first dose of vaccines i.e. of BCG was 92.8% in 2015-16 (NFHS- IV) an improvement from 83.5% in 2005-06 (NFHS-III). The figures for the other vaccines though are not that encouraging. The DPT schedule shows a dip to 79.9%, for measles it was 80.4% and for Hepatitis-B it was 59.4%. An analysis of vaccination programme performance points at the system's inability to ensure necessary follow-up of dropout of cases after first vaccination. State needs to tone up its act to improve upon is full immunization coverage of children to achieve a level of >95%.

Institutional deliveries have more than doubled from a 32.6% in 2005-06 to 68.6% in 2015-16, but it is still far from the desired level to achieve 92% institutional deliveries by 2024.

A sharp decline in coverage of mothers who got full ante-natal care (ANC) (11.5%) in the State in comparison to those who received first ANC check-up in the first trimester, is also a cause of concern.

Figure 9.1.3: Decline in Use of ANC Services from Registration of Pregnancy to Date of delivery as per NFHS IV (2015-16)



Source: NFHS IV (2015-2016) Uttarakhand

The 4th round of NFHS (2015-16) also shows that against total registered pregnant mothers who received mother and child protection card, a decline in the services received during pregnancy period is seen especially in full ANC, IFA consumption.

Disease Prevalence

The State has progressed in terms of bringing down the prevalence of Leprosy and TB in a significant manner. But there are still certain pockets in plain districts (mostly Haridwar and Udham Singh Nagar) that continue to report Leprosy cases. Similarly Tehri, Haridwar and Udham Singh Nagar have reported higher prevalence of TB (*AHS 2010-11*).

Table 9.1.3: Communicable Disease Prevalence Pattern in Uttarakhand

Indicator	Uttarakhand	
	Policy 2002	Policy 2013
Tuberculosis (per lakh)	544	189
Leprosy (per ten thousand)	2.23	0.40

Source: Govt of Uttarakhand-Health & Population Policy 2002 & 2013

Prevalence of Diarrhoea saw an increase from 12.8% in 2005-06 to 17.0% in 2015-16. Only 56% of diarrhoea cases were treated with Oral Rehydration Salts (ORS) provided free by Govt, which is a cause of concern.

On the whole, though State has improved its indicators in relation to communicable diseases, a lot remains to be done on this front.

High proportion of non-communicable diseases in Uttarakhand is also a cause of concern as these are responsible for almost 56% of total disease burden in the State followed by communicable, maternal, neo-natal and nutritional diseases at 32%. According to a report by ICMR, PHFI and IHM, the leading causes for *Disability Adjusted Life Years* (DALYs - expressed as the number of years lost due to ill-health, disability or early death) in Uttarakhand were Ischemic heart diseases (IHD) 7.8%, chronic obstructive pulmonary disease (COPD) 6.8%, diabetes (2.2%), stroke (2.2%), iron deficiency anaemia (2.2%), amongst others.

Malnutrition

Malnutrition (child and maternal) continues to top the list of risk factors that drive most of morbidity in the State. Though in terms of DALY percentage, this risk factor has gone down from 29.2% in 1990 to 13.5% in 2016. The comparative figures of NFHS (III and IV) also confirm that the State has managed to achieve marked improvement in <5 child nutrition status within 10 years (2005-06 to 2015-16).

Table 9.1.4: Nutritional Status of Children from 2005-06 to 2015-16

Nutritional Status of Children	NFHS-IV 2015-16	NFHS-III 2005-06
Children under 5 years who are stunted (height-for-age)	33.5	44.4
Children under 5 years who are underweight (weight-for-age)	26.6	38.0
Children under 5 years who are wasted (weight-for-height)	19.5	18.8
Children under 5 years who are severely wasted (weight-for-height)	9.0	5.3
All women age 15-49 years who are anaemic (%)	54.7	45.2

Source: NFHS III (2005-06, NFHS IV (2015-16)

Prevalence of anaemia among women in reproductive age group also shows an increasing trend. Further, about 20% of women in the age group of 15 to 49 years were reported to have below normal body mass index (BMI) i.e. less than 18.5 kg /m2.

In the area of child feeding practices also, State has not seen desired improvements. Only 27.8% Children under 3 years of age were breastfed within one hour of birth as per NFHS-IV. Only 7.8% of non-breastfeeding and 8.6% of breastfeeding children in the age group of 6 to 23 months were reported to have received adequate diet, leading in high proportion of wasted, stunted and underweight children.

The above mentioned challenges require change at societal level through improvement in nutritional, child bearing and caring practices, using a concerted behavioural change strategy, a sustained campaign and social mobilisation, supported at household level by counselling, using health functionaries and ASHAs who need to acquire requisite skills for this role.

9.1.4 Infrastructure – Institutions and Manpower:

Access to health care in hilly, rural parts of mountain districts is lacking, largely due to poor infrastructure and connectivity (communication, roads, including internet etc.). Given these limitations and small/scattered nature of rural settlements, improving access to healthcare poses a major challenge. Shortage of qualified health functionaries is also a critical gap.

Though the network of sub centres in the State has expanded, gaps in other health infrastructure persist. Uttarakhand Vision 2030 states that there are 2.58 Primary Health Centres available for a population of one lakh, which is half of the national norm of 5/ lakh population.

Table 9.1.5: Health Infrastructure Growth in Uttarakhand from 2002 to 2018

Institution	As on 2002*	As on 2018#	As per IPHS norms
Sub Centre	1525	1897	-
APHCs / BPHCs	(232) 171/ 61	259	417
CHCs	26	85	104
District/Base/ Combined Hospitals	33	64	-

Source: Website, Directorate of Health Services, Uttarakhand

District level infrastructure figures reflect that the gaps are large in plain districts as well.

Table 9.1.6: CHCs, PHCs Required as per Norms

Sl.	Dists	Popn (2011)	Existing CHCs	CHCs as per IPHS norms	Existing PHCs	PHCs as per IPHS norms
1	Haridwar	1,890,422	8	16	29	63
2	Dehradun	1,696,694	7	14	25	57
3	Udham Singh Nagar	1,648,902	6	14	26	55
4	Nainital	954,605	8	12	14	48
5	Pauri Garhwal	687,271	12	9	28	34
6	Almora	622,506	9	8	27	31
7	Tehri Garhwal	618,931	11	8	26	31
8	Pithoragarh	483,439	7	6	17	24
9	Chamoli	391,605	6	5	16	20
10	Uttarkashi	330,086	4	4	12	17
11	Bageshwar	259,898	3	3	15	13
12	Champawat	259,648	2	3	8	13
13	Rudraprayag	242,285	2	3	16	12
	Total	**10,086,292**	**85**	**104**	**259**	**417**

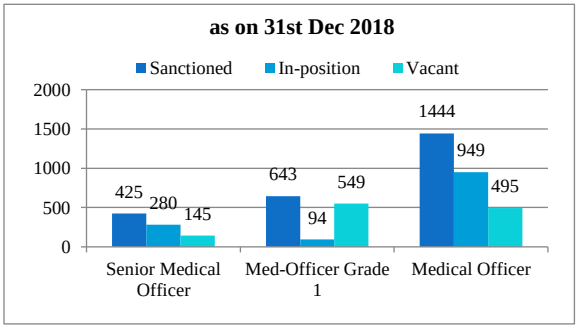
Source: The figures in column 4 and 6 has been taken from Statistical Diary DES and the figures in column 5 and 7 have been calculated on the basis of IPS norms and current population (2011 census)

Himachal Pradesh too had a problem of accessibility in hilly districts, but it is doing much better with 141 beds per 100,000 people compared to 86 beds per 100,000 in Uttarakhand. With 500 PHCs functional in Himachal Pradesh it is well placed in comparison to Uttarakhand which has just half the number (259) of PHCs.

Shortage of Workforce

Shortage of doctors in Government service is the State continue to persist as efforts to attract and retain physicians in hill districts are not very successful. W.H.O. prescribes doctor population ratio of 1:1000. In India the doctor-population ratio is 0.62:1000 (allopathic doctors) implying there's one doctor serving almost 1,613 people. At present total strength of allopathic doctors in Uttarakhand is 1545 out of a total sanctioned 2716 positions, implying that one doctor is available for 6528 people (based on 2011 population). The disparity of doctor-population ratio is worse in hill districts.

Figure: 9.1.3 Status of Medical Officers



Source: Website, Directorate of Health Services, Uttarakhand

Another dimension of this issue is shortage of doctors in specialist category, which has been a major cause of failure to upgrade or convert CHCs into FRUs and 24x7 facilities.

In the short-term, it is advisable to upgrade the skills of ANMs to the level of 'Nurse Practitioners' who will be able to cater to 80% of primary health care needs of rural folk from well-equipped sub health centres. These sub health centres and nurse practitioners may be supported by medical professionals, specialists and diagnostic services through optimal use of tele-medicine.

AYUSH Institutions in the State have been growing since its inception. In 2017-18 more than 40 lakh people in the State benefitted from different services available under AYUSH. To give it a further fillip and make the State a "wellness hub", it has adopted an AYUSH Policy in 2018.

Table- 9.1.7: AYSUH Institutional Growth in the State from 2002 to 2018

Institution	As on 2002*	As on 2018#
Ayurvedic dispensaries	385	544
Homeopathic dispensaries	60	110
Unani dispensaries	3	5
Ayurvedic Hospitals	-	8

Source: State AYUSH Department, Uttarakhand

Uttarakhand Vision 2030 – SDGs

On the issue of health, Uttarakhand Vision 2030 states that good health and well-being will be ensured for all citizens of the State by attaining robust child and maternal health, reduction or elimination of communicable and non-communicable diseases as well as expansion of healthcare services.

The challenges highlighted in the Vision document include;

- Huge unmet gap of doctors and health personnel, especially in hill districts.
- Infrastructure shortage in public health facilities in terms of human resource, bed strength, and number of facilities
- Public health expenditure in Uttarakhand is low at less than 1% of GSDP while the requirement is around 3%.

9.1.5 Critical Gaps:

9.1.5.1 Issues and Challenges of Providing Medical Services in Remote Areas of Uttarakhand:

More than two thirds of population of the State lives in rural areas. A larger proportion resides in the hill districts in scattered and remote villages. More than half of the villages in hills do not have good road connectivity and transport facilities. The problem of accessibility to healthcare for hill communities becomes more acute as several health facilities in their areas are not operational.

The State has introduced **mobile medical units** and experimented with telemedicine in some pockets.

Strengthening of **telemedicine** may prove to be appropriate at primary healthcare level while tele-radiology, tele-cardiology and tele-ICU can be introduced at secondary health care level.

9.1.5.2 Monitoring:

Monitoring of healthcare delivery system in the State is confined more or less to desk review and periodical State level review meetings in which district officials participate and share progress. With few field visits by officials, verification and validation of progress remains neglected.The quality of data being captured in the HMIS is an issue with which State has been struggling since inception. Data collection for RCH is also facing similar problems. Reasons that have surfaced ranged from - dedicated data entry operators of RCH are overloaded with other programmes, to incomplete registration and lack of updation at the ANM level.

9.1.5.3 Community Engagement:

Community participation has been a grey area with State finding it difficult to garner community support for preventive and promotive interventions. Failure to adopt or customize *Gadchiroli, Jamkhed and Pachod* models from elsewhere in India needs to be examined. In times of disasters, the very first responders for initiating rescue and relief operations are locally trained and oriented community members, who have been found to be quite effective. State will do well by promoting and sustaining this programme.

9.1.5.4 Harnessing Herbal, AYUSH system:

With rich and diverse flora available in abundance in different climatic zones, the State has the potential of transforming itself into herbal based wellness hub. There is a vast potential to expand revenue base and create employment opportunities for local communities by promoting the processing, formulations and treatment regimens based on herbs and Ayurveda. The State has paved way (AYUSH Policy 2018) for attracting investors in the wellness sphere.

9.1.5.5 Trends in Life-Style Diseases:

In Uttarakhand, 364 cases of MDR TB cases were recorded in 2016 while only 17 such cases were recorded in 2011. Most non-communicable diseases are associated with faulty lifestyle that often result in raised blood pressure, obesity, diabetes, high blood cholesterol, Ischemic heart disease, coronary heart diseases and haemorrhagic stroke. In addition, deficiency of iron could lead to impaired body functions and result in anaemia. Similarly in the non-communicable category, lifestyle related disorders have seen an upward trend with high incidences of chronic obstructive pulmonary disease, cardio-vascular, HIV/AIDS and road accident cases in the State as reported in the recently published report - *India: Health of the Nation's States — The India State -Level Disease Burden Initiative - 2017.*

KERALA MODEL

In an effort to promote healthcare tourism, leading hospitals in Kerala have formed a consortium to promote the state as a medical value travel destination worldwide. The society, which was formed following the Kerala Health Tourism Summit, with 14 NABH hospitals from across the state, has elected its first set of office-bearers.

The objective of the society is to place Kerala on the global medical value travel map and also promote the state as a healthcare hub in the country by 2020. Kerala, at present, attracts only 5-7% of medical value travel, which is equivalent to $200 million annually.

Kerala has the potential to increase the inflow of medical value tourists to 10–15%. The Society believes that this can be achieved by 2020 with a strong, focused marketing strategy.

At present Kerala has 2 JCI accredited, 2 Australian accredited and 24 NABH accredited hospitals. The Society also works towards the vision of NABH accreditation for all private and public hospitals ensuring maximum inflow of medical value tourists to Kerala.

9.1.6 Way Forward:

9.1.6.1 Wellness Destination – Medical Hub:

AYUSH is still in infancy stage in the State as compared to the progress that other States has made in recent past, with Kerala being the supreme example.

With Uttarakhand cabinet's decision to bring AYUSH and Wellness Centres under the mega industries investment policy in May 2017, scope of improving its industrial, employment and revenue bases, has increased. Immense potential exists of manufacturing and export of Ayurvedic and Alternate medicines.

With AYUSH policy in place with an MSME tag, it is expected that the State will attract private players to partner in its endeavour of developing wellness centres.

Prime Minister of India leading the nation to celebrate 4th International Yoga Day from the greens of Dehradun on 21st of June 2018 was a message to the State to make it a Yoga hub. Individual efforts are on but The State needs to take it forward in a coordinated way.

Herbal Wealth: With different climatic zones in the States, comes a vast range of vegetation, herbs that can be harnessed as part of minor forest produce or can be cultivated by the farmers, processed and marketed by entrepreneurs. The State has all the elements in its favour to become a Wellness/Medical hub with business projected to grow at a CAGR of 30-35% over the next 5 years in India. This will not only attract revenue from outside but will also help in strengthening AYUSH system in the State which can offer choices and treatments to its citizens at primary health care level. This will also reduce the patient load of district, sub district hospitals.

Medical packages combined with leisure activities, fun and fitness can be planned and offered for attracting patients, clients from different parts of the country and abroad. Under wellness based AYUSH projects, State will develop wellness centres, AYUSH grams near major religious towns and on pilgrimage routes in PPP mode. These would promote medical tourism; yoga, naturopathy, panchkarma, spiritual counselling, meditation and Vipasaana. Institutions like Herbal Research Development Institute, Gopeshwar and Centre for Aromatic Plants, Dehradun will have a major role in providing technological inputs and support to the entrepreneurs and investors in this domain.

Telemedicine in Karnataka

Telemedicine facilities were started in association with ISRO in 2004. In the first phase they were started in District hospitals Chamarajanagar, Mandya, Tumkur, Chitradurga, Shimoga, Karwara, Chikmagalur, Gadag and Taulk hospitals at Maddur, Sagara and Yadgir. **Hub centres** (Centres from where expert advice was given were - Jayadeva Institute of Cardiology, ST. John's Medical college Hospital, Narayana Hrudayalaya, NIMHANS at Bangalore and JSS Hospital at Mysore.

During 2008-09, in 2nd Phase Telemedicine centres were started at 10 additional District hospitals. Hub centres were added at Bowring and Lady Curzon hospital, Indira Gandhi Child Health Institute, Institute of Nephro and Urology Centre. From 2010 telemedicine facilities were through Broadband connectivity instead of ISRO.

In 2013-14 with the help of KSWAN connectivity from e-governance department, connectivity was established with all the existing centres along with 4 new hub centres. 34,624 patients were given expert advice through telemedicine during 2013-14.

Taluk and district level hospitals were linked to medical colleges through tele-medicine. Doctors of taluk and district level hospitals could provide good treatment to patients, guided by expert doctors in the medical colleges.

By installing digital software in the high frequency X-ray machines of the taluk and district hospitals, opinion and advice of expert radiologists was made available through tele-radiology.

E-hospital software was implemented in all the hospitals of the state with a view to document and utilize the health information of every patient visiting Government hospitals in the state. This helped in improving of health care administration.

9.1.6.2 Telemedicine:

Technology has the potential of addressing the issue of bridging the distance or addressing the issue of inaccessibility to a great extent. The State

has successfully adopted technologies like telemedicine for linking and providing specialists services to people living in far flung areas, villages and towns in hill regions through a network of Studios and CHCs. With a base (Studio) in Srinagar, the State is providing telemedicine services in few districts like – Almora, Uttarkashi, Nainital etc.

However, the same can be extended for primary healthcare as well and more services like tele-cardiology, tele-radiology can be added to the basket. Karnataka experience could be taken as a model and adapted.

Expert agencies could be engaged in Uttarakhand as system integrators, who would bring together experienced professional teams from the fields of telemedicine, equipment providers, software programme vendors, clinical trainers and medical specialist teams located in super specialty tertiary care medical centres to establish the telemedicine network and manage the same. These system integrators will train the Government health functionaries to seamlessly work remotely with the specialists teams using the telemedicine backbone.

The State may consider optimally deploy available technologies such as:

- **Tele-radiology** will enable health functionaries at any location in the State to send a patient's x-rays and records securely to a qualified radiologist at another location, and get a quick expert opinion on the patient's condition and guidance on treatment protocol.
- **Tele-psychiatry** will enable qualified psychiatrists to provide treatment to patients remotely, expanding access to behavioural health services.
- **Tele-dermatology** will enable health functionaries at any location to store-and-forward patient photos of a rash, a mole, or another skin anomaly, for remote diagnosis. Tele-dermatology enables a health functionary to continue to coordinate a patient's care, and offer a quick answer on whether further examination is needed from a dermatologist.
- ***Tele-ophthalmology*** will enable health functionaries to consult ophthalmologists who would examine patients' eyes, or check-in about treatments from a distance.
- ***Tele-nephrology*** will enable general physicians in PHCs, CHCs or district hospitals to consult a nephrologist about a patient with kidney disease.
- ***Tele-obstetrics*** will enable obstetricians to provide prenatal care from afar. This could mean, for example, recording a baby's heart at one location and forwarding it to an obstetrician for diagnosis at another facility.
- ***Tele-oncology*** will enable general physicians in PHCs, CHCs or district hospitals to consult an oncologist about a patient with cancer offering more accessible and convenient care under guidance of a specialist.
- ***Tele-pathology*** would allow physicians /pathologists in PHCs, CHCs or district hospitals to share pathology at a distance for diagnosis reducing delays in diagnosis and timely start of treatment.
- ***Tele-rehabilitation*** will enable allow medical professionals to deliver rehab services (such as physical therapy) remotely.
- ***Tele-ICU*** *enables a critical care team in an ICU in a first referral unit/district hospital to be guided by specialist* critical care team (intensivists and critical care nurses) at an off-site command centre through a real-time audio, visual and electronic means to provide real-time services to multiple care centres regardless of their locations. Tele-ICU holds great promise in improving the quality of critical care patients and increasing the productivity of intensivists.

9.1.6.3 Quality Care:

As part of World Bank funded UKHSDP project Phase–II, focus is on to improve quality care. This is being ensured by outsourcing a set (cluster) of health institutions at primary and secondary level. Each cluster will have a district hospital and two CHCs. These will be supported by introducing mobile medical units in the catchment area of

these clusters. Initially Tehri cluster out of the three identified (other two being Pauri and Ramnagar Clusters) has been outsourced. The payment mechanism to these outsourced agencies has been linked to the performance evaluation to be done by a third party evaluator. This experiment's success will pave way for more such initiatives in other underserved areas of the State.

9.1.6.4 Work-force:

Open door policy and re-appointing retired doctors on contractual basis is being done to agument the number of doctors at Govt. institutions.. Workforce management policy and systems will be further strengthened to develop and retain well skilled cadres of specialists, medical officers, and of specialist/staff nurses.

As a stop gap arrangement, partnerships with reputed private institutions, medical associations such as IMA and organisations such as Rotary Club within and outside the country will be established under short and medium term plans to bolster availability of specialist doctors in the District Hospitals and FRUs of state through a roster system.

Specialists will be encouraged to relax in the salubrious climes of the state while providing their skills in the well-equipped hospitals, mixing work with pleasure. The state Health Department will take care of their hospitality arrangements during their stay in the state. Specialist panels for each of the Government hospitals, thus developed would bridge the existing gaps.

9.1.6.5 Growth Tracking of Children, Process and Outcome Monitoring:

ASHAs in addition to ANMs and Anganwadi workers are being equipped with palmtops and smart phones to help support the process of capturing authentic and more updated data of beneficiaries, growth tracking of children, healthcare service provision and outcomes in terms of health Status. Mother and child tracking systems (MCTS) is well established. Digitisation of Family Health information of the entire population is underway. All the above are intended to ensure real time information flow to help planners and programme managers to prepare need specific plans and direct timely course corrections.

One more aspect that is very much related to monitoring is verification and validation of data from time to time. This process will either be outsourced as part of third party monitoring or internal robust mechanism will be developed in collaboration with community level institutions.

Concurrent Process Monitoring: *While mid-term or end term evaluations serve an important purpose, the results are available after the programme is over, leaving little scope for course corrections. Concurrent monitoring of programme implementation processes is required to successfully steer a programme to a logical end. Government of India is increasingly engaging independent concurrent process monitoring and documentation agencies to validate the progress and processes of implementation of flagship programmes, providing timely feedback. Uttarakhand may consider a similar approach to bolster NHM programme implementation.*

9.1.6.6 Training:

Major aspect of training is to organize, induction and refresher or CMEs for its medical/para-medical/support staff and health functionaries to ensure skilled delivery of healthcare services as per prescribed programme specific guidelines and standard treatment guidelines.

In relation to training of new ANMs and GNMs, the State has come to a saturation point, when seen from the perspective of sanctioned to in-position ratio. However, the State's training institutes could consider training these frontline workers for other States or enable trained but unemployed ANMs/GNMs to explore possibilities of employment in other States or private institutions. Kerala has shown the path in this area. Trained nurses from its institutions have made their mark in private medical care sector in India and offshore. Exploring these avenues will benefit ANMTC and GNMTC institutions in the

State and will also open new employment avenues for the trained unemployed nurses of the State.

State has been relying on its two Regional Health and Family Welfare Training Centres for its in-house training programmes. In the year 2002, the State mooted an idea of upgrading one of the RHFWTCs at Haldwani, into the State's apex training and research institute - **State Health and Family Welfare Centre**. However, no progress has been made in this respect. In the absence of State's own training facilities, either large sums are spent on sending the staff for training to other States or no training is given at all. The State has the necessary ingredients to become a training hub for other States in the country. It may well consider setting up its own state of art training institute.

Use of Technology could also be enhanced to provide training to the workers at different levels to keep them updated with contemporary medical practices, procedures and developments. Online CME programmes could be established with professional support of concerned medical/nursing associations.

Though, the State had established and operationalized its State Health System Resource Centre (SHSRC), it is more or less non-functional now. For systemic improvement in the State's health system, revival of SHRSC is considered to be a high priority. The provision of expertise in the State HSRC could be acquired through a management contract with a professional agency.

9.1.6.7 Health Insurance – Ayushman Bharat:

In spite of making good progress on many fronts, the healthcare delivery system of the State falls short of providing care to all. It is extremely worrying that many people are pushed into poverty because they are compelled to spend their savings or borrow to meet medical care expenses, especially when it comes to hospitalization. State in the past has implemented various health schemes like Rashtriya Swasthaya Bima Yojana, Mukhyamantri Swasthaya Bima Yojana, and U-Health Card for poor sections of society. The recently launched State Ayushman Bharat is National Health Protection Scheme, which intends to cover over around 5 lakh families in Uttarakhand by providing free medical facilities up to ₹5 lakh per annum for the treatment of critical illnesses. Further expansion of the scheme will cover approximately 18 lakhs families as part of proposed "Atal Ayushman Uttarakhand Yojana". This facility will be provided in State Government hospitals and listed private hospitals on cashless basis. Necessary medical care infrastructure needs to come in place to take care of the inflow of patients under this scheme. Government medical infrastructure needs to be strengthened and private investment in secondary and tertiary medical care actively solicited.

9.1.6.8 Community Participation:

Community participation, one of most crucial link for health education and health promotion component is weak in the State. Though required community based institutions like Village Health and Sanitation Committees (under Panchyati raj system) are in position, but have not been engaged. There is a large and urgent need to orient and channelize them for health education and promotion activities at village level. There are enough success stories to prove their worth.

Likewise, NGOs and civic society organisations (like women's groups/cooperatives) can supplement and compliment the State programmes in a very effective manner. However, State will have walk to them to engage them and use their potential. They will also have a very important role to play in making inter-sectoral convergence successful at grass roots level. Coordination amongst ICDS, Education, Water and Sanitation programme functionaries will be ensured in the process.

9.1.6.9 State Health Funding:

The State is to increase public spending on Health from 0.9% to 2-3% of GSDP as stated in NHM Plans. At present the State's contribution in health was 0.92% of GSDP in 2017-18. The national goal is to achieve the level of 2.5% of GSDP by 2025. In comparison Himachal Pradesh has allocated 6.2% of its total expenditure on health,

which is higher than the average expenditure of 18 other States.

The poor expenditure trend of Uttarakhand has resulted in unspent balance at the end of each FY to be adjusted in the next year's plan. The State loses out on account of poor budget utilisation capacity. Further, with each passing year the pattern of flexible funding or a bottom-up approach of designing and planning is now being taken over by more top-down approach where more and more activities and plans get truncated on the directions of MoHFW.

9.1.6.10 Per Capita Expenditure on Health – 2017:

Total per capita health expenditure in Uttarakhand was ₹4,233/- of which Government spend ₹1534/- while out of pocket per capita health expenditure was ₹2545/-. Per capita health expenditure in Himachal Pradesh during the same period was 7.4% higher at ₹4547/- while its Government per capita expenditure was higher by 31% at ₹2016/- and out of pocket expenditure lower by 10.6% at ₹2274/-. National per capita total health expenditure was ₹3826/-, Government per capita health expenditure was ₹1108/- and out of pocket health expenditure was ₹2394/-

Table 9.1.8: Per Capita Health Expenditure

S. No	State	Total Health Expenditure	Government Health Expenditure	Out of Pocket Health Expenditure
1	**Uttarakhand**	4233	1534	2545
2	Himachal Pradesh	4547	2016	2274
3	Kerala	6801	1208	5023
4	Maharashtra	4502	763	2684
5	Tamil Nadu	4101	1026	2724
6	Gujarat	3060	1040	1626
7	**India**	3826	1108	2394

Source: National Health Accounts Statistics of India – October 2017

9.1.6.11 Private Sector Investment:

One of the strategies that State will adopt is to invite private investors to establish and operate secondary and tertiary care hospitals in the underserved areas of the State. Incentives will be offered as part of package like tax holidays etc. for building and operationalizing these hospitals in identified satellite towns – mostly in underserved regions.

CHCs falling in these catchments areas will be saturated to their full potential to make them functional as full-fledged FRUs. This will entail roping in funds from NHM as well, and rationalization of workforce alongside use of telemedicine. These functional FRUs with specialists in position/specialist support through telemedicine will become part of the telemedicine network of the State.

9.1.6.12 PPP in Health Sector:

The Department of Health had drafted the Public Private Partnership (PPP) policy in 2009 for running diagnostic centres and a similar concessional agreement was drafted later on for outsourcing selected CHCs. Several changes were introduced from time to time, but were not successful. The PPP approach was introduced to address shortage of doctors and also ensure that people were provided adequate healthcare services. Different PPP models were undertaken on pilot basis. Private hospitals were roped in to join hands for providing RCH services to poor families (BPL) in selected districts. In another experiment, management and operationalization of 28 mobile health vans was entrusted to private agencies under PPP arrangements. State decided to outsource CHCs in 12 districts. Of the 12 CHCs that were handed over to the private partners, only five were being run on the PPP mode.

A Model for Public Private Partnerships (PPP) in the State

The State would focus more on creating an enabling environment and capacity of various stakeholders to foster and develop the PPP relationships. Due diligence/feasibility studies would be done before embarking on any PPP initiatives.

The basic premise for PPP projects in healthcare would be patient-centric approach with people at the grassroots level taking part in the decision making as partners. This would improve the success rate of the PPPs as has been seen in the successful PPPs in primary healthcare in West Bengal due to active participation of the powerful Zila Panchayats. Hospital Societies will be facilitated and provided guidelines to enter into PPPs for upgradation of secondary level medical services.

Systemic issues such as development of accountable and performance oriented system, ensuring financial autonomy and decentralization, delegation of authority, building trust and accountability in the system, effective integration, managing discontinuities and fostering true sense of partnership between the State and non-State sector, need urgent attention before launching of PPP projects.

Cost and economic considerations are imperative in undertaking partnership schemes for which the Government may work out the operational cost per unit service. Allocation of funds in the State health budget for innovative schemes would ensure a dedicated fund for the PPPs. User-fee would be utilized locally. Prices may be fixed on the basis of operating cost. The elements of return on investment (RoI) of the private partners would be taken into account. Fee for service models would be explored to bring greater accountability to PPP projects while improving proactive approach to providing good quality preventive and promotive healthcare services in addition to curative medical care services.

There is lack of proper classification in PPPs especially with regard to those Below Poverty Line (BPL) and Above Poverty Line (APL). Cross subsidizing would prevent BPL patients from being excluded from receiving health care.

The State would develop working guidelines based on successful experiences of different States. MOUs/ contract agreements, control mechanisms, monitoring and evaluation would be professionally developed and established.

Quality guidelines would be framed with assistance from professional organizations. These guidelines would form the basis of accreditation as well as of benchmarks and performance-based indicators. There would be proper guidelines for selection of partners based on credibility and documentary evidence and transparent appraisal procedures. Monitoring and evaluation would be strengthened through the PPP cell. Feedback system including social audit and independent process monitoring would be designed to oversee the implementation of PPPs with regulation mechanisms in place. Management Information System (MIS) using latest ICT technologies would become the mandatory management tool for assessing the trends and making assessments about the efficacy of the PPP projects.

The State would come up with specific guidelines for viability gap funding to serve medical education and secondary/tertiary level medical care.

9.2 Education

Abstract

Education apparatus in Uttarakhand has seen remarkable growth in terms of increase in infrastructure and improvement in accessibility to schools during past two decades. This has helped in achieving a nearly 100% enrolment at primary level and an equally high enrolment at secondary level. Uttarakhand is also a schooling hub. Some of the best public schools in the country are located in the State. However, further consolidation is required through improved monitoring of quality of education with pro-active development of necessary processes and use of technology by the Education Department.

Not all the children going to primary or secondary schools progress to higher classes. In Uttarakhand about 10 point decline in enrolment from secondary to senior secondary level and almost 40 point decline from senior secondary to higher education institutions is observed. Similar trends are observed in other States and at national level as well. Generally, most of these dropouts enter the labour force, but without any vocational skills. It makes a strong case for adding vocational skills component in secondary and senior secondary level curriculam (present schooling is not sufficient to equip youth for reasonable employment in either organised or un-organised sectors). This move would also help youth to find employment/entrepreneurial opportunities in their own environment.

Quality of education at junior and secondary education level (in Govt. schools) is an area of concern for the State. As stated in Vision 2030, the State is committed to "Ensure Inclusive and Equitable Quality Education and Promote Lifelong Learning Opportunities for All". To achieve this, the focus is on further improvement in infrastructure, reduction in absenteeism of teaching staff, capacity building of teachers to ensure availability of good teachers working in mission mode, introduction of smart class rooms, expansion of model schools (Navodaya Vidyalaya) etc.

SMART classes have been successfully piloted in many schools and State will scale up these using available ICT solutions. For technology-enabled education, collaboration is being sought with institutions and universities of repute for devising ways to grapple with problems of lack of science labs in remote areas. It is also being realised that monitoring of education delivery requires further strengthening, using new and innovative methods as well as revitalising present assessment processes.

Expansion of private schools and shifting of students from Govt. to private schools though could be seen as expansion of educational facilities, is also a call for Govt. schools to improve performance.

9.2.1 Introduction:

Access to education, regardless of economic status, political nature or religion, has become a universal goal. In India, National Policy on Education 1986 has virtually made the central Government , the principal mover in designing and implementing developmental initiatives in elementary education. Operation Blackboard Scheme (OBS), initiated in 1987-88 has contributed significantly to the development of school education in India. Its objective was to provide essential facilities to primary schools.

Since then several initiatives both by central and State Governments have been taken to see that "no child is left behind". Right to Education Act* (2009) is a bold and ambitious initiative of the Indian Government in this direction.

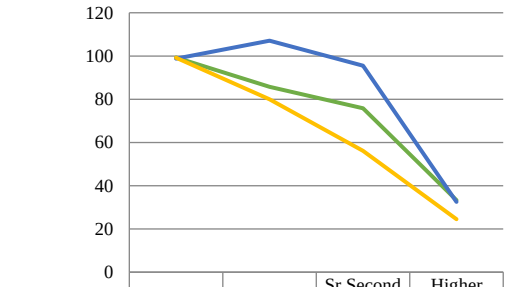
During past few years, the country as well the States has made significant progress in strengthening education infrastructure from primary level onwards. At the end of 2017-18, Uttarakhand had 19,648 primary schools (77.25% in public sector). Student enrolment ratio and the school completion rate at primary level is almost 100.00%.

Table- 9.2.1: Institution Wise Gross Enrolment Ratio– Uttarakhand

Level	2013-14			2014-15			2015-16		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Primary	99.98	101.30	100.60	100.11	101.02	100.54	98.87	99.76	99.29
Secondary	89.26	87.01	88.10	90.99	89.65	90.35	85.71	85.73	85.72
Sr. Secondary	76.29	76.34	76.31	79.82	80.85	80.36	73.36	78.54	75.83
Source: National Institute of Educational Planning and Administration, New Delhi									
Hr. Education	32.7	34.9	33.8	34.9	32.8	33.9	33.6	32.9	33.3
Source: Department of Higher Education, MHRD, Government of India									

The table above reflects a marginal drop of 10 to 15 points in enrolment ratio from primary to secondary and an equal drop from senior to senior secondary level. The decline from senior secondary to higher education institutions is relatively larger. Importantly, gender gap in enrolment ratio at different levels is insignificant. In comparison with Himachal Pradesh and national level data, Uttarakhand has stood the ground, though in Himachal Pradesh enrolment at senior and senior secondary level is marginally higher.

Figure 9.2.1: Comparative Analysis - Institution wise Gross Enrolment Rate (2015-16)



	Primary	Secondary	Sr.Secondary	Higher Education
UK	99.29	85.72	75.83	33.3
HP	98.8	107.08	95.53	32.5
INDIA	99.21	80.01	56.16	24.5

Source: Census of Uttarakhand

Taking secondary education scenario in a standalone mode also reflects a positive scenario.

In Govt. schools, student teacher ratio is reasonably good at 100 to 19.78. **The State is spending about ₹33,000/ per year per student for primary education, which is one of the highest in the country.**

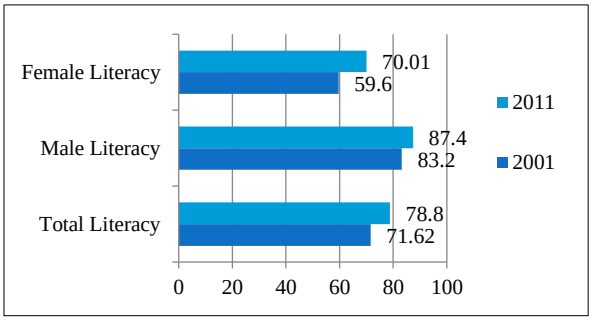
In recent years, the State has also made strong inroads in higher education sector. It now boasts of 31 Universities (Government and private). Some of them are well on the way to make their brand as well.

9.2.2 Critical Areas:

9.2.2.1 Literacy Rate:

A snapshot of the literacy rate suggests significant improvement (between 2001 and 2011) in overall literacy rate of the State. However, in comparison to males, female literacy is lagging behind.

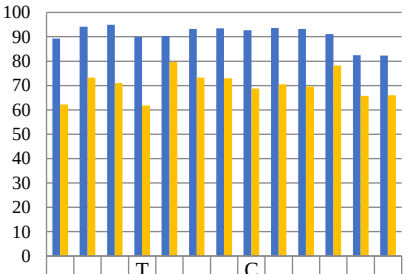
Figure 9.2.2: Literacy Rate – 2001-2011



Source: Census of India 2001 and 2011, Uttarakhand

A district wise comparison between male and female literacy levels suggests that this pattern persist in several hill as well as plain districts.

Figure 9.2.3: District Wise Male and Female Literacy Rate - 2011



	UKI	CHM	RUD	TEHR	DDN	PAU	PTH	CHMP	ALM	BAG	NTL	USN	HRD
Literacy Rate (%) Males	89	94	95	90	90	93	93	93	94	93	91	82	82
Literacy Rate (%) Females	62	73	71	62	80	73	73	69	70	70	78	66	66

Source: Census of India 2011, Uttarakhand

As seen in figure 9.2.3, Dehradun and Nainital have high overall literacy (about 85% each) and low difference (about 11% and 13%, respectively) between male and female literacy. These two districts are known as hubs of quality schooling. Udham Singh Nagar and Haridwar, the two plains districts have low literacy levels and intermediate gender disparities. Hill districts of Tehri (about 28%) and Uttarakashi (about 27%) have alarmingly wide gender gaps in literacy level. It is apparent that in spite of a high literacy regime, the State has pockets of large gender differences in literacy levels.

Legacy of relative backwardness prevailing in these pockets in terms of educational infrastructure and lower priority for female education could be some of the possible explanations for this phenomenon. Importantly, these gaps are being bridged now. There is almost nil gender gap in schooling and educational attainments of younger generation.

9.2.2.2 Infrastructure Facilities:

In general, schools in Uttarakhand have reasonable facilities with regard to building, and furniture for teachers are concerned. A report by U-DISE - School Education in India-2015-16 shows a remarkable improvement in infrastructural facilities in comparison to level at 2010-11 shown in report by Dr. Singh.

Table 9.2.2: Infrastructure Facilities of Schools (% Schools with facilities)

	Primary	Secondary	Hr. Secondary	All Schools	
				2015-16[12]	2010-11[13]
Boys Toilets	97.37	98.52	99.17	97.43	37.7
Girls Toilets#	97.64	97.96	98.31	97.18	50.1
Drinking water	96.63	97.28	98.33	96.43	92.1
Play Ground	55.69	31.91	46.67	57.85	52.0
Library Facility	90.34	74.89	40.00	89.63	-
Ramp^	86.99	67.44	50.00	84.24	45.9
Medical Check-up held last year	78.64	57.02	46.67	76.21	57

 # Girl toilets (includes girls schools and co-eds); ^wherever needed

Source: Census of India 2011, Uttarakhand

A comparison between Uttarakhand, Himachal Pradesh and national level statistics shows that the State lags behind Himachal Pradesh in terms of play grounds and medical check-ups. However, it was doing better than the national average.

Table 9.2.3: Comparative Analysis of School Infrastructure (UK, HP and India) % Schools Having Facilities

Criteria	UK	HP	India
Boys Toilets	97.43	99.70	97.02
Girls Toilets	97.18*	99.82	97.52
Drinking water	96.43	99.86	96.81
Play Ground	57.85	85.75	61.25
Library Facility	89.63	95.70	82.84
Ramp^	84.24	88.93	81.99
Medical Check-up held last year	76.21	90.63	66.99

*** Girl Toilets (includes girls schools and co-eds); ^wherever needed**

Source: School Education in India" U-DISE Report 2015-16, National University of Educational Planning and Administration

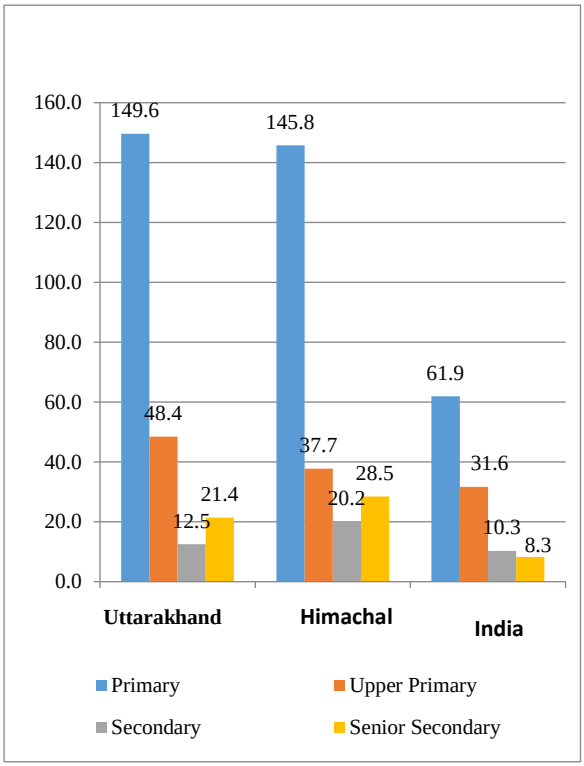
But this data do not reflect availability of

[12]"School Education in India" U-DISE Report 2015-16, National University of Educational Planning and Administration

[13]Decline of Government School Education in Uttarakhand: Vouchers and Other Reforms to Address It by Dr S.P.Singh

computers and smart classrooms, which is the need of the hour.

Figure 9.2.4: Number of Schools per lakh Population 2012-13



Source: Department of Higher Education, Ministry of Human Resource Development and DISE, NUEPA (School Education since 2012-13)

Population – School Ratio:

The Statistical Year Book 2018 of MOSPI, GoI, reveals that in comparison to national figures of 61.9 primary schools for every 100,000 population, Uttarakhand is far better placed at 149.6, almost at par with Himachal Pradesh. But at secondary and senior secondary school level, the State lags behind Himachal Pradesh, though it's better placed when compared with the national average.

9.2.2.3 Availability of Teachers and Pupil-Teacher Ratio in Government Schools

The State is working with fewer teachers than allocated positions. As the table 9.2.4 shows, only about 83% of sanctioned positions of teachers are filled.

Table 9.2.4: Availability of Teachers in Schools and SSA as on 31.03.2016

Sanctioned Posts			Working			% age Working
By State	Under SSA	Total	By State	Under SSA	Total	
35144	10909	46053	32295	6082	38377	83.33

Source: Annual Work Plan and Budget 2016-17

Gap is particularly large for teachers under SSA (Sarva Siksha Abhiyan). There could be challenges related to budget and procedural constraints in filling all the vacant positions. However, in spite of these odds, the State has been able to maintain good *Pupil to Teacher ratio (PTR)*. As per NUEPA, the *PTR* at primary level and upper primary level should be 30:1 and 35:1 respectively. As per Unified District Information System for Education (UDISE), the PTR at national level for primary schools was 23:1 in 2015-16. For Uttarakhand in year 2015-16 it was 18.

Table 9.2.5: Trend in Pupil to Teacher Ratio in Schools / Colleges

Level	2013-14	2014-15	2015-16
Primary	20 (25)	19 (24)	18 (23)
Secondary	17 (26)	18 (27)	16 (27)
Sr. Secondary	34 (41)	32 (38)	25 (37)
Source: National Institute of Educational Planning and Administration, New Delhi			
Higher Education			
University and Colleges	29 (21)	23 (22)	22 (21)
University and its Constituent units	23 (16)	19 (15)	18 (16)

Data Source: Department of Higher Education, MHRD, Government of India

Figures in bracket is (India) for comparison

Table 9.2.5 also shows that not only the State has been able to maintain good PTR at primary level; it is doing well at secondary and higher levels as well. However, there is challenge of maintaining this ratio in hill districts.

Due to difficult living conditions, not many teachers are willing to work in hill regions resulting in chronic shortage or absenteeism of teachers in these areas. This has in a way added to the woes of Education Department struggling to manage teacher's shortage in hilly region.

9.2.2.4 Gender Structure of Teaching Community in Government Schools:

A requirement under Operation Blackboard was that each school should appoint at least one female teacher. It is also important because parents feel greater confidence in sending their daughters to a school which has female teachers. At the State level, percentage of male teachers is about 55% and of female teachers about 45% but in urban schools the female teachers clearly outnumber male teachers (68.4% vs 31.6%). As per a relatively old report (2011) report of NITI Ayyog, in Uttarakhand has 75.69% schools with 2 or more female teachers. At national level this percentage was 75.08%. Though the State is at par with the national status, there is a room for further improvement in this regard.

9.2.2.5 Quality of Education:

Quality of education continues to be an issue of great concern. It is the key to success of students, hence high on the agenda of parents cutting across different strata, class, area, religion. When admitting a child to school, it is the primary concern that governs the choice of school, be it at primary, secondary or higher level institutions. Performance of students in school and after schooling, by far is the most important yardstick in quality domain.

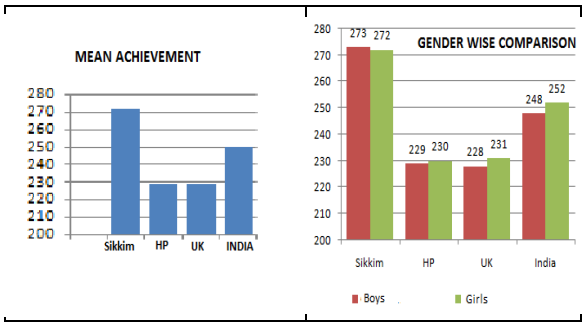
The Annual Status of Education Report – 2017 reveals some disturbing statistics about the performance of youth in the age-group of 14 to 18 in the State. It says that:

- Almost 50% could not do division calculations. A similar %age could not do adding, weighting tasks.
- Almost 27% could not read English sentences.
- 36.3% of them never used computers. 38.9% never used internet.
- 67% could not do proper length measurement and 55% were not apt at applying unitary methods.

One of the factors considered to assess quality of education in the MHRD, GoI publication "Education Statistics at a Glance – 2018", was performance of class X students in four subject viz. English, Mathematics, Science and Social Science. It reveals that in all these subjects, State's performance was at par with Himachal Pradesh but lower than Sikkim and national average.

Within the State, rural-urban gap was noted but gender-wise differences were almost negligible.

Figure 9.2.6: Average and Gender Wise Performance of Class X Students in Uttarakhand, Other States and India



Source : National Achievement Survey (NAS) Class X- 2015, NCERT

It is ironical that in spite of having some of the best schools in the country, performance of class X students in the State could not match the national level, though it fared at par with Himachal Pradesh.

To improve quality of education particularly in rural areas, the State has introduced free and quality education through *Rajiv Gandhi Navodaya Vidyalaya* residential schools. Currently, eight such schools are operational in the State. Similarly, centrally sponsored *Jawahar Navodaya Vidyalayas* have also been initiated.

9.2.2.6 Public Schools v/s Private Schools:

A general perception prevails that private schools are better managed and demonstrate better outcomes. As a result, even though Government schools are affordable and cost much less, parents prefer to send their children to private schools. Private schools have mushroomed in all parts of the State and are giving a tough competition to Government schools. These schools teach in English medium (a craze in rural masses), ensure regular attendance of teachers and closely monitor the growth of students by engaging parents.

Between 2010-11 and 2015-16, student enrolment in Government schools across 20 Indian States, including Uttarakhand fell by 13 million, while private schools acquired 17.5

million new students. This report also reveals that a good percentage of students in urban areas in Uttarakhand prefer private schools in comparison to rural residents (may be options of private schools are not there).

Table 9.2.6: Management-wise Enrolment in Schools (Grade I - XII): 2015-16

	Government Schools			Private Schools		
	Boys	Girls	All	Boys	Girls	All
Uttarakhand	529903	598290	1128193	722355	544459	1266814

Source: National Institute of Educational Planning and Administration, New Delhi Government - Central Government, Department of Education, Local body, Tribal / Social Welfare Private - Private Aided, Private Unaided, Recognized Madrasa, Others

Private schools vary widely in quality and most of them do not inspire us, but they are expanding because other categories of schools are still poor. If student enrolment and intake quality are taken as criteria, the order is: private schools > aided schools > Government schools.

A good example of preference for private schools in Uttarakhand is, in spite of fewer schools, 32% students opted for them whereas in spite of their presence in almost every town, only 54% secondary students preferred Government schools.

Table 9.2.7: A Comparative Analysis of Government and Private Schools in Uttarakhand

Parameters	Government School	Private School
Teacher's absenteeism	High, >30% quite common	Little
Cost of education to students	Nil	Ranges widely from ₹2000/yr to 65,000/yr
Medium of education	Hindi	English
Students performance	Generally low	Low to very high
Students performance adjusted in view of students background	Low	Generally not much different from Government schools to high
Qualification of teachers as per prescribed norms	Regular teachers qualified	A high %age of unqualified teachers
Salary of teachers	On average ₹25,000/month	Generally, 1/3 govt. teachers
Infrastructure: buildings, playing grounds	Inadequate to adequate	Generally low, except for top schools where
		levels are very high
Students number	Declining	Increasing
Teachers: taught ratio	Low to high	Generally low
Proportion of SCs	Higher than in popn.	Much lower than in popn.

Source: The Emptying of Public Schools and Growth of Private Schools in India-2017 by Geeta Gandhi Kingdon

9.2.2.7 Expenditure - Allocation and Release:

The State has released ₹2,632.85 crore for primary and junior education in the financial year 2018-19. Out of this ₹1632.85 crore has been utilized till December 2018. This means that the remaining fund of ₹985.59 is available with the Department for next three months. The budget includes the expenses of offices, new construction, repair and renovation, salary of teachers, sports and other activities. Under Sarva Shiksha Abhiyan (SSA), the State spent ₹414.46 crore in 2016-17 while in 2017-18 it spent more than ₹500.00 crore. Now SSA has been merged with RAMSA. The statement of budget reveals that timely utilization of available funds needs attention.

Table 9.2.8: State-wise Funds Allocated, Released and Expenditure under Sarva Shiksha Abhiyan

FY	Allocation (including State share)	Release of Central Share	Expenditure (incl State Share)	Expenditure as a % of total fund allocation	
				UK	HP
2014-16	51885.58	22880.56	37138.60	71.58	88.40
2015-16	58173.09	22588.4	38131.67	65.55	94.19
2016-17	60826.59	25268.98	42238.11	69.44	71.94

Source: Sarva Shiksha Abhiyan, Deptt of Education, MHRD, GoI

9.2.2.8 Vocationalization of Secondary Education:

As noted above, only one third of students in the State are enrolling in higher educational institutions after completing senior secondary school. They are likely to enter the job market. Incidentally, the present education system/learning at secondary level is not adequate to equip them to get a suitable employment in their homeland or elsewhere. Though it is true that employment opportunities are limited in hills, but in present day context there are ample

economic openings waiting to be used, but the secondary school graduates are not trained and equipped to use these. The missing link is exposure or training in vocational or professional skills relevant to students.

Educational Statistics at a Glance 2018 published by the Department of Education and Literacy, MHRD, GoI shows that not a single institution in the category of secondary education is offering vocational training in Uttarakhand.

Table 9.2.9: Comparative Analysis of Schools Providing Vocational Courses at Senior Secondary level

State/UT	Total Secondary Schools	Schools Offering Pre vocational Courses at Secondary Level	Schools Providing Educational and Vocational Counselling to Students	Providing Both Vocational Courses and Counselling to Students
Uttarakhand	3575	0	0	0
HP	3962	184	200	163
Delhi	2086	143	839	126
Punjab	9298	458	1628	326
Maharashtra	23484	927	3177	668
India	249089	4002	11977	2822

Source : Educational Statistics at a Glance – 2018, MHRD, GoI

As per the State website, although 80 schools have been approved to offer vocational courses (Healthcare, Automobile, Beauty and Wellness, IT/ITI's, Retail, and Travel and Tourism), it has yet to implement the vocational education component. In all, eighty Resource Person positions have been approved under the scheme, but no recruitment has taken place.

It is being realised that instead of standalone, vocational education should be made part of school curriculum from 9th class onwards. This will facilitate natural transition from secondary school to ITIs (for those opting to enter the job market). It will also supplement rural entrepreneurships and micro enterprises. However, it would require integration of vocational teaching modules with secondary curriculum.

9.2.2.9 Higher Education:

One of the reasons for drop in enrolment in higher education institutions is limited number of colleges in hill districts. Only one college – degree/PG is available in the State for a population of 83,334 in comparison to availability of one higher secondary school for a population of 3,077. Secondly, most of these colleges are offering only traditional social science, arts and science subjects which prepare students for jobs in offices having limited openings in the State. These curriculam are just not sufficient to develop employability capability of students. The situation calls for a review of curriculum of secondary school level courses offered in the State against the State's requirement of job skills. Incidentally, nowadays a large number of professional and vocational courses have been developed and are offered by Universities and Colleges across India. State should review these options in the context of its needs.

9.2.2.10 Direct Benefit Transfer to Students - Voucher Scheme:

Of late there is a debate on introducing Voucher Schemes to promote schooling of children. It has been successfully tried in many countries, even in our State also. Two case studies are discussed here.

Case 1

SCHEME : Universal Voucher System
Launched in 1992:

The distinctive feature of the Sweden model is its universality; every child in the 7-19 years age bracket, irrespective of the family income, qualities for a voucher. It introduced a voucher system for primary and secondary education (Grades 1-12) for every child in the 1990s. The regulatory framework in Sweden does not impose many restrictions on who can run/own a school. No prior experience is required to run a school, and for profit schools are accepted entirely. However, over the years since the introduction of the scheme, the regulations on new entrants have increased (Hinnerich and Vlachos 2016). All Swedish schools, whether run by municipalities or by private providers, are funded based on the number of students enrolled. The voucher amount differs from student to student and for each municipality, as each evaluates its cost and budget independently pre-schools are also funded by the municipality. However, they are allowed to charge extra money to cover their costs, unlike compulsory education schools.

IMPACT

13% of students at the compulsory level of education, between Grades 1-10, attend voucher schools. The number of students attending upper secondary schools (Grades 10-12) has increased from 0.5% in 1992 to 25% in 2012. Approximately 85% of upper secondary students are enrolled at for-profit schools, operating as a part of larger school corporations (Hinnerich and Vlachos 2016). There are a variety of observations and research results on the impact of the voucher scheme on students' performance in Sweden. This debate has stemmed from the sharp fall in Sweden's performance in PISA over 2000-12. Given the wide-ranging reforms in the education sector, to single out any one factor for the decline in performance is unfitting. Many reports have pointed out several factors that have contributed to the decline such as poor school discipline, modified teaching methods, replacement of lecturers with "individualized" education. Moreover, the decline is across all socio-economic classes and for all schools. There is no considerable difference in the performance of public and private Schools (OECD 2015). A key research demonstrates that the states with high growth of private schools have manifested improved learning achievement in Municipal schools as a result of increased competition and pressure on these schools. Their search finds no impact of voucher schools on the decline of Sweden's results. It notes that positive results began to manifest only after a few years of the reforms (Bohlmark Lindahl 2015).

Latest Stats (2014)
Students participating 14%
Voucher Schools : 793
Growth in Private Schools from 4% in 2003 to 14% in 2014

Source: School Vouchers: Direct Benefit Transfers in Education
By Centre for Civil Society, New Delhi (2017)

Case 2

A scheme was implemented in Uttarakand and several other States, seeking to enrol out-of-school youth in private schools (where no Govt. school is available). The scheme was operated between 2007-2014. The results were satisfactory.

Other Indian Experiments with Direct Benefit Transfers

CASH TRANSFER	:	ODISHA
SCHOLARSHIP	:	Post-Matric Scholarship Scheme
VOUCHER	:	ANDHRA PRADESH, DELHI, RAJASTHAN, UTTARAKHAND
REIMBURSEMENT	:	Children Education Allowance Free Coaching and Allied Scheme

WHERE: Initiated in Dehradun and later expanded to Nainital and Haridwar in 2008-09

Pahal aimed to impact educational achievements of out-of-school children by enrolling them in private schools. It was introduced in areas with no government schools within a redius of a kilometer. 6-14 years old who have been out-of-school for at least a year, never enrolled, or do not have access to a government school within a radius of 1 kilometer were eligible.

Student identification was done on the basis of household surveys.
Recognised private schools running for at least two years were eligible.

Schools were require to meet the following criteria:

1. Be within a kilometers of urban slums
2. Have adequate infrastructure
3. Be ready to cover all cost over and above the allocated amount
4. Accept annual external/internal assessments to measure learning outcomes.

The scheme provided ₹3,000 per student annually. In return, the school offered textbooks, uniforms, remedial teaching, computer education and other cocurricular activities.

IMPACT

- The scheme featured under "Best Practices" in Sarva Sikhsha Abhiyan (SSA) Evaluation Report 2016.
- Over 2007-09, 1,371 students were enrolled in partnership with 20 schools (Bhattacharyya 2014)

Source: School Vouchers: Direct Benefit Transfers in Education
By Centre for Civil Society, New Delhi (2017)

Learning from these case studies suggests that the Voucher Scheme (at secondary or higher secondary levels) can be taken up on pilot basis covering an entire block/district and upon review of its outcome, programme can be scaled-up in the State.

9.2.2.11 Technical Education:

The State has got fairly large number of polytechnic institutions (123 with 70 in Government sector and 53 in private sector). However, most of the private polytechnics are working below their installed capacity. In spite of adopting several initiatives like virtual learning resources, engagement with PMKVY, E-learning centres, industry interface in curricula, attachment with digital learning programmes etc., these polytechnics have not been able to make much headway. Government could consider a systematic review of the polytechnics and consider options for re-vitalizing these institutions. One of the options is to engage these institutions for vocational education at secondary and senior secondary schools.

Similarly, State has got 28 engineering colleges, 7 in Government and 21 in private sector. However, against the admission capacity of 11,140 students only 1934 students are enrolled in the private engineering colleges. It reflects that the private colleges are not able to sustain. On the surface there are many obvious reasons like lack of demand, quality concerns etc. However, a systematic review could help in identifying means to revitalize these colleges.

9.2.3 Way Forward:

Uttarakhand Government is committed to achieving the SDG- 4 for education i.e., "to ensure inclusive and quality education for all and promote lifelong learning" as stated in its recently released Uttarakhand Vision 2030 document.

During the last few years, sustained efforts are made to implement State and centrally sponsored schemes in schools, as well as higher and technical institutions. New teaching and learning methods are finding place in educational Institutions. Technology based teaching is encouraged both at departmental level and by self-motivated officers and teachers. Issues of regional, gender disparities are closely monitored at different levels.

Education is crucial to achieve and realize the fruit of demographic dividend because an educated and skilled manpower will take the State to next orbit of economic growth. At present State is lagging behind in its preparedness in this regard due to education deficit.

Vocationalization of secondary education and other initiatives discussed here would help in improving the performance of education sector.

Parent Teacher Meeting Initiatives by Delhi Government

"From bad handwriting to poor calculations, improper usage of grammar to lack of concentration, parents of about 16 lakh children studying in Government schools in Delhi were updated about shortcomings of their wards in the first-ever mega parent-teacher meeting. Thousands of parents trooped into Government schools across the Capital on Saturday -30th July 2016 morning, talking to teachers and discussing ways to improve their children's academic performance, the first such exercise in the city.

Many beaming parents said such parent-teacher meetings should become a regular exercise. Some saw their children's report cards and attendance registers for the first time.

Education Minister, behind the parent-teachers association (PTA) meeting in Government run schools, visited several schools himself, in every zone of Delhi and interacted with parents if all was in order and how were parents responding to this initiative

- **In-service training to secondary school teachers** and periodical exposure to newer development to ensure that they are updated on expanding knowledge base, ideas and programmes in the context of schools education. They must also be refreshed or oriented on issues of modern teaching methods, smart classes etc.

- **Creating mechanism for teachers' evaluation by students.** Student's feedback and observations on the performance of teachers is a time tested tool to monitor the performance of teachers in many institutions nationally and internationally. It can be introduced in the State on pilot basis in certain schools.
- **Adoption of E-Based learning and using updated ICT to address the shortage of teachers.** In present day time, E-based computer-aided learning is gaining attraction right from elementary level with availability of competing solutions. State will lag if appropriate initiatives are not taken in right earnest to provide computers in schools, evolve curriculum and provide trained computer teachers at least from upper primary level onwards. Up-graded and interactive information technology could also be used to teach science and other subjects in areas facing shortage of teachers.
- **Smart Class rooms** are being introduced in the State. However, its pace is to be expedited to take students to a level higher and build their competitive edge.
- **All round development of students** in Government schools: There is a need to further strengthen infrastructural facilities like playgrounds, sports material, health check-ups and introduction of Yoga. Schools can also be encouraged and funded to promote student's participation in science competitions, debates, quiz competitions and exhibitions organised by various departments of the State and central Government.
- **Engage Parents to improve performance of students**

  Government schools have not been proactive in engaging parents to periodically review and seek their help to improve student performance. Delhi Government's initiative in this area is a good example.

  Government schools in the State need to activate the provision of parent teachers interaction. Education Dept. could develop the required models, processes and monitoring mechanisms for well organised and regular parent teacher interactions.

- **Involving Local Self-Government and the Communities.**

  The *Shiksha Samittis* under Panchayati Raj Institutions have been constituted to strengthen the working of local schools and provide supportive supervision. However, these samittis have not been very active. These should be activated to strengthen management of the schools, particularly in relation to absenteeism of teachers, performance of students, mid-day meals etc. Samittis could also help in bridging the infrastructure gaps to a large extent. Further, members of samittis could help in intra-sectoral convergence with health, ICDS and other related departments for monitoring of nutrition and health status of the students. Department would consider developing relevant guidelines/procedures and monitoring mechanism to strengthen this component.

  As discussed earlier, vocationalization of schooling from secondary level onwards is a need of hour particularly in a State like Uttarakhand. Provisions are already there but department needs to translate these plans into action in right earnest.

9.3 Migration and Urbanisation

Abstract

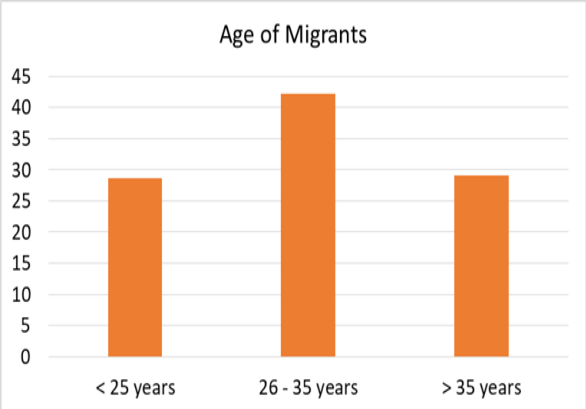
Uttarakhand has historically been an out-migrating state. Young people from the state have been going out for employment in defence forces and other pursuits. Looking at reasons of migration, both push (lack of opportunities for livelihood and higher education) and pull (traditions of working in armed forces, greater economic opportunities in large cities) were at play. Most of these people were lone migrants returning to their roots after completing their work tenure. However, in recent years, a new trend is noted. Rural people are migrating with their families for good and villages are being deserted one after another. These families are settling in nearby towns or other cities where more economic opportunities are available or quality of life is better. It has led to another problem, i.e., unplanned growth of several towns. The meagre civic services in many towns are scratch beyond limits and create chaotic conditions with influx of tourists in summer. The traditional hill stations in the state, Mussoorie and Nainital are also saturated beyond their capacity and grapple with several challenges during the tourist season. It is noted that, most urban areas in the state have grown far beyond the services that their natural ecosystems could provide. In several urban areas due to land scarcity, houses are being constructed everywhere in a unplanned way even on land meant for conserving water, abutting spring pathways, in earthquake prone area and old landslide slopes.

Rapid desertion of villages in several districts has touched an emotional cord and also has implications for socio-cultural fabric of state. As stated in Vision 2030 document, several initiatives are underway to contain the outward tide by creating more employment opportunities, infrastructure facilities including roads, communication etc. One of the key considerations is building satellite towns adjacent to existing large towns and cities (having enough land space and viable ecosystem). These towns will be developed in a planned manner, initially drawing upon the services of mother towns. These are also seen as future growth centres to become hub of economic, education, healthcare, wellness and tourism services. These growth centres are expected to contribute to containing migration and promote systematic urbanisation. The process has begun with approval of Urban Living Lab in Doiwala.

9.3.1 Migration:

Migration has always been an integral part of the demographic dynamics in every nation. It is also viewed as a process of change and development of society. Uttarakhand has traditionally been an out-migrating State. Due to its topography, the State has had limited avenues to engage its youth in gainful employment. Young men from the State have been going out either to join defence forces or pursue other avenues. However, in recent years, this pattern has changed a great deal. Unlike individual migrants in the past, who eventually returned to their native villages after completing service tenures, people have started moving out with their families to settle down in urban areas either in the State or outside. Age pattern of out-migrants also substantiate this phenomenon. As per the recent report on migration by the State Government (2018), nearly 30% out-migrants were in the 35+ age group

Figure 9.3.1: Age Distribution of Migrants

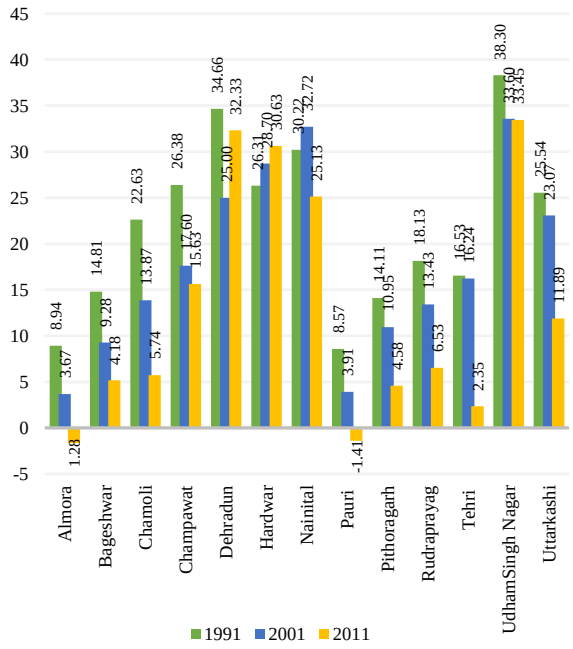


This phenomenon could be linked to aspiration for a better quality of life for family, education of children, greener pastures in far of lands as well as the aggravation of push factors back home. It is a disturbing trend and may have implications for political, socio-economic and cultural fabric of the State. A closer look at this pattern is called for.

9.3.2 Migration Patterns:

The demographic scenario of Uttarakhand had been fairly stable until 1980's. The three vital drivers of population change -fertility, mortality and migration were changing at a slow and steady pace. But from 1990s onwards, there has been a continuous decline in population growth rate, particularly in rural areas (Figure 9.3.2).

Figure 9.3.2: Decadal Population Growth Rates in Uttarakhand (1991 and 2011)

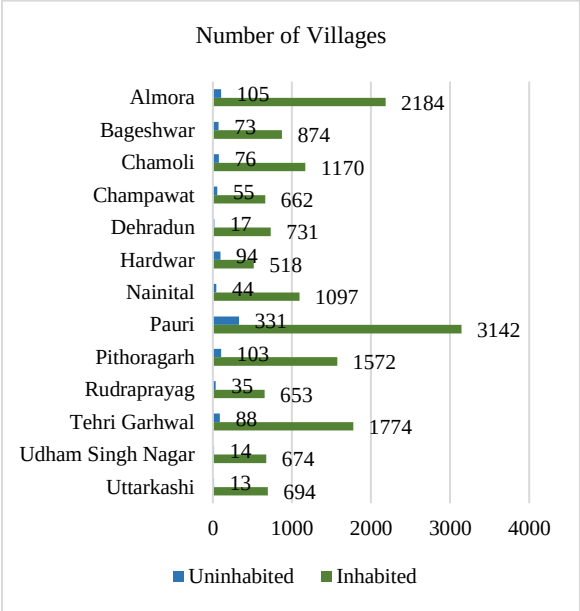


Source: Migration Commmission 2018, Govt of Uttarakhand

While there are a lot of reasons for this decline one of the key factors is the increase in out-migration of the people (Mamgain 2004; GoU 2018). Pauri and Almora districts from the Garhwal and Kumaon regions respectively, have recorded highest levels of rural out-**migration with a negative decadal population change between 2001 to 2011 (Figure 9.3.2).**

According to Census 2011, 1,048 villages from amongst the total 16,793 villages of Uttarakhand, have been left without any inhabitants, and another 405 villages are close to being deserted with only 10 occupants or less

Figure 9.3.3: Number of Inhabited and Uninhabited Villages of Uttarakhand



Source: Census of India 2011

Almora district recorded a negative decadal growth rate of 1.28% between 2001 and 2011. There were 105 uninhabited villages in Almora alone. On the other hand, the number of households in Almora town has increased by 2,732 during the same period.

Similarly, Pauri district in the Garhwal region also recorded a negative growth rate of 1.41% between 2001 and 2011, with 331 uninhabited villages. The most significant decline in household number is seen in Chaubattakhal and Satpuli, with as many as 476 and 237 families leaving the sub-districts between 2001 and 2011, while, Kotdwar town in Pauri district has witnessed unparalleled growth with an increase of 7,307 households. Other hill districts such as Tehri Garhwal, Bageshwar, Pithoragarh, Chamoli, and Rudraprayag also show low decadal population growth rates in the range of 2.3 to 6.5%, as compared to the national average of 17.7% or the State average of 13.1%. In general, the analysis reflects a gradual shift of population from rural hinterland to towns. A large increase in urban population in plain districts such as Dehradun (32%), Hardwar (30%), and Udham Singh Nagar (33%) is also a testimony of this pattern.

9.3.3 Why Outmigration:

The most significant factor contributing to outmigration continues to be 'employment'. According to the report of Uttarakhand Rural Development and Migration Commission (2018), it accounts for more than 50% of the total migration from rural areas. It seems that the livelihood options in rural areas of the State are shrinking or are in transition more rapidly than previously recorded. (Figure 9.3.4).

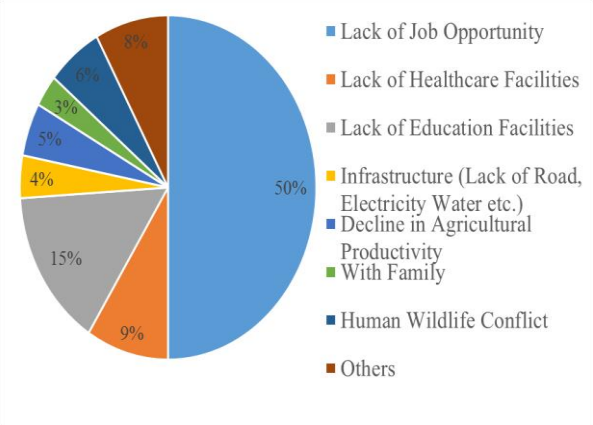


Figure 9.3.4 Reasons for Outmigration

Source: Reported by Uttarakhand Rural Development and Migration Commission

There is also likelihood that the traditional subsistence-based hill economy is unable to match the fast-paced development of fresh opportunities in towns. Increasing connectivity coupled with awareness about livelihood prospects outside the villages, have fuelled the process of livelihood transition, resulting in increased outmigration.

District-wise analysis of the reasons of out-migration may throw some more light on this phenomenon.

Table 9.3.1: District-wise Reasons for Migration From Villages (Gram Panchayats)

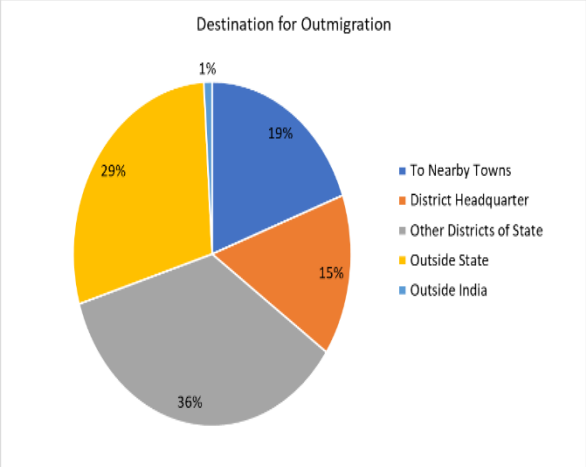
District	Reasons for Migration (in %age)							
	Lack of Job opportunities	Lack of Healthcare facilities	Lack of Education facilities	Lack of Infrastructure	Decline in agricultural productivity	Other Members of Family Left	Human Wildlife Conflict	Others
UKI	41.77	6.04	17.44	2.29	7.14	2.1	4.04	19.17
CHM	49.3	10.83	19.73	4.93	4.73	2.51	3.09	4.87
RUD	52.9	8.64	15.67	4.43	4.27	3.26	5.11	5.72
TEH	52.43	7.84	18.24	3.07	6.17	2.47	4.26	5.52
DDN	56.13	6.33	12.5	1.2	2.08	1.4	1.65	18.7
PAU	52.58	11.26	15.78	3.03	5.35	2.53	6.27	3.21
PTH	42.81	10.13	19.52	4.97	4.66	2.36	4.08	11.48
BAG	41.39	9.09	14.49	4.32	2.18	1.45	3.42	23.65
ALM	47.78	8.61	11.75	3.81	8.37	2.68	10.99	6.02
CHAMP	54.9	6.67	10.24	5.46	6.31	4.3	6.65	5.46
NTL	53.7	7.79	10.37	4.96	4.94	2.1	6.38	9.76
USN	65.63	4.27	3.52	0.6	0.38	5.4	2.6	17.6
HRD	76.6	1.62	2.73	0.05	0.64	1.69	0.82	15.85
Uttarakhand	**50.16**	**8.83**	**15.21**	**3.74**	**5.44**	**2.52**	**5.61**	**8.48**

Source:Rural Development and Migration Commission, Uttarakhand

Two districts which topped the list of out-migrants for employment are Haridwar and Udham Singh Nagar, the plain districts, reflecting that livelihood options are becoming scarcer in rural areas of the in plain districts also. Lack of quality education facilities accounts for 13.2% of out migration. It was particularly large from high-altitude districts of Pithoragarh, Uttarkashi, Tehri and Chamoli. Lack of healthcare facilities is also among one of the key causes leading to migration particularly from hill districts.

Decline in agriculture productivity though cited by a smaller proportion of people (4.4%) would be looked at as a criterion for designing interventions for improving farm productivity and migration trend reversal. Citing reasons like poor infrastructure facilities including road connectivity, lack of electricity and water suggest that desire for a better quality of life is also pushing people from rural hinterlands to the urban areas. Even though more than 6000 km of road network has been created in the State since its inception, a large number of villages still await roads and transportation facilities (Venkatesh 2015). The lack of electricity also limits the scope of expansion of agro-based allied industries and setting up of micro-enterprises. It is important to note that the dimension of man wildlife conflict has become a major factor in inducing people to leave cultivation and look for alternative occupations elsewhere.

Figure 9.3.5: Destination of Outmigration



Destination of migrants also reflects an interesting pattern. Only 29% of the migrants have gone to other States in the country. Most have moved across short distances either to nearby towns or other district headquarter towns in the State.

This report has generated a wealth of data, which can be used to undertake more in-depth analysis of migration particularly from hill districts in relation to local contexts to design relevant interventions.

9.3.4 Urbanization:

Generally, mountain landscapes are treated as natural and rural. This perception persists, despite the fact that urban population growth in the Indian Himalayan States in recent decades has been three times more than the rural growth in population. Perhaps because of this misconception post-independence urban growth in Himalayas has remained unplanned.

Hill stations like Nainital, Mussoorie and Shimla which were established during the British rule were initially well planned. However, due to the rapid increase in population and disregard for regulations, they have now become congested and are in a state of chaos. This increasing trend in the population growth has been on two accounts – firstly, movement of people and families from rural areas to towns and secondly due to the influx of tourists to hill stations which is largely seasonal in nature. This has led to an increased pressure on these towns. There are several problems related to land scarcity, transport and urban construction in the mountainous terrain that are faced by these towns in trying to manage the added pressure of population growth. This is further heightened by both the vertical and horizontal limitations on the buildings.

At the same time, dependence on ecosystem services has been far more prevalent in the mountain cities than in plain areas. For example, using spring water directly without water pipe and collection of firewood from forests is still practiced in the mountains, though the degree varies. However, mountain cities have substantial tourism content that is far beyond their carrying capacity. For example, cities of Nainital and Mussoorie are known more for being a tourist destination rather than for their resident population. Though, these two cities also boast of housing well reputed schools, High Court, University, and other institutes of prominence, yet the tourist's pressure is far beyond their carrying capacity.

Earlier, most of the urban areas in the hills were self-sufficient as they were in sync with the ecosystem and its services. As horses and ponies were the main mode of transport, fossil fuel emissions were almost negligible. With increased population in towns, these areas grew beyond what could be sustained by the natural ecosystem. Therefore to meet these demands, unsustainable and unplanned development started in these areas. For example, to meet the water needs, water started getting pumped out from distant rivers at great energy cost. To cater to the population growth, construction of houses began on the land meant for conserving water, in earthquake prone area, on landslide slopes etc. At the same time, local bodies have insufficient knowledge and are too weak to impose regulations. They also have little capacity and authority to generate their own funds and therefore lack the necessary instruments required to deal with this issue. The State would consider providing the required guidance and support to

the local bodies which would further strengthen their endeavours in addressing urbanisation in Uttarakhand. It also calls for integrating concept of urban management with tourism management for the hill towns of Uttarakhand.

9.3.5 Carrying Capacity of Tourists:

Uttarakhand receives more tourists than any other Indian Himalayan State; approximately 300% of resident population as compared to 185% in Himachal Pradesh, 118% in Sikkim, and 80% in J&K. However it does not manifest itself into a higher GSDP in Uttarakhand. The environmental cost of tourism and its impact on sustainability can be extremely high. For example, Nainital city faces several problems, including the safety of its geological frame and the lake water. Furthermore, costs of managing roads and waste matter are already very high. In fact, mountains which were known for trekking and walking are now choked with vehicles and the air is no longer as clean. Policies could be contemplated around the following questions:

1) Can the benefit of tourism be increased and more equitably distributed?
2) How to disperse tourists in a way that the environment and infrastructure of Nainital and Mussoorie as well as other existing and new towns are not over taxed?
3) Can the natural (wild animals, trees, river flow) - experience be successfully promoted?

9.3.6 Urban Governance:

Large scale migration of people from the rural areas to the urban towns in Uttarakhand, has manifested in the form of unplanned growth and development in these towns. There is an urgent need for these towns to be regulated in an effective way. This would include assessment of vulnerability of settlements to hazards and disasters, installing early warning and alert systems, keep open spaces where people could take shelter during the hours of disaster, provisions for water, sanitation and waste disposal, enforcing building code and zonation, constructing pedestrian zones, limiting vehicular traffic, while improving the capacity building of local bodies to generate funds.

Adjustments in elevation have also become necessary given the rapid climate change. Tourist sites could now be located above 2000 mts due to the effects of global warming. In the British era 2000 meters formed the upper city line in the Himalayan States. In smart Himalayan cities, buildings would not dominate rather they would be hidden among tree canopies and foliage, with humans in touch with bird nests and flight of kites.

A tourist place should have a fine combination of roads and lanes, to maximize walking and trekking. Tourism would see a boost in future due to the increased economic growth in plains. However, there are social factors which are leading to what can be called as “mass tourism” or weekend “mela” in the hill stations.

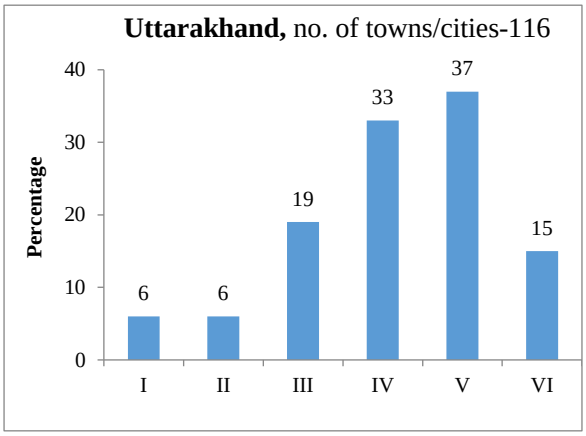
Poor air quality, dull and drab landscapes dominated by concrete jungles, warmer temperatures, and dying rivers in plains have increased the natural gap between plains and mountains, though the latter is also declining.

Tourism is a cultural trait, supported by money and time. Perhaps, now an individual earns much more per hour of work than in the past. To promote sustainable tourism the State should consider revitalising the urban governance scenario in Uttarakhand.

9.3.7 Need to Proactively Plan for Creation of New Cities:

Given the geological vulnerability of Himalayas, the State understands that it is required to play a proactive role for sustainable urbanisation. Policies could be contemplated in this regard while keeping in mind the land scarce nature of the State. The aspects which could be given the highest priority are slope stability and water supply. Using modern space technologies such locations could be identified for building satellite townships.

Figure 9.3.6: Distribution of Different Size Class of Towns in Uttarakhand (Population size-classes: Class I: 100,000 and above; Class II: 50,000 to 99,999; Class III: 20,000 to 49,999; Class IV: 10,000 to 19,999; Class V: 5,000 to 9,999 and Class VI: Less than 5,000 persons).



Source:Source of India 2011 Uttarakhand

Table 9.3.2 Comparison Between Urban Landscape in Hills And Plains of Uttarakhand

Attribute	Hills	Plains	Remarks
Size of Human Population	Generally < 100,000	Generally > 100,000	**In Indian Himalayas only 12 cities have > 100,000 population (4 in UK, Figure. 9.3.6), mostly in foothills**
Climatic variation across cities	Wide – altitude being a major factor	Narrow	**Would require varied strategies to deal with climate change across mountain cities**
Topography and vulnerability to landslides	Highly heterogeneous; slopes very prone to landslides and other mass wasting	Stable, plains with very gentle slopes	**Perched on immature topography, most mountain cities are very vulnerable to landslides**
Dependence on natural ecosystems	High: e.g. on springs and streams for water; on forests for firewood; bird watching, trekking and other nature experiences	Limited to the exploitation of ground water and lifting water from rivers	**In mountains the scope for managing watershed for enhancing ecosystem services is high; it can be a major adaptation strategy**
Areas surrounding urban systems	Largely forested	Largely agricultural	**So pollution is widespread in plains**
Vegetation within towns	Original forest vegetation retained in some e.g. Nainital, Mussoorie	Nothing of original vegetation left; even large trees are missing	**In hill stations like Nainital and Mussoorie even the remains of old growth forests can be seen, they store substantial amounts of carbon and biodiversity**
Weather extremes and other hazards	High	Low	**Precipitation hazard higher in mountains, and might increase further**
Impact of disasters	Heavy and quite lasting on infrastructure and supplies	Relatively low, and short lived	**In mountains repair of damaged infrastructures is costly and cumbersome**
Fossil, energy use	Very low	Moderate to high	**Absence of large commercial areas in mountains**
Alternative routes to cities	Limited, absent in several cities	Multiple access	**It is a severe limitation in mountains, as supplies are difficult to manage**
Winter fog	Rare	For several weeks	**Winter tourism has increased, and scope is large**
Tourism	Common in most cities	Limited to few cities	**Can be further expanded in mountains**
Dependence on external supplies on day to day basis	**High and from distant places**	**Low from distant places**	**In mountains food, medicines, etc. are trans-ported from far off places**

9.3.8 Tackling Migration and Urban Growth Challenge:

Continual outmigration and abandoning of villages in Uttarakhand has a profound impact on the social-political, cultural and ecological landscape of the state. Some of the main threats that the State faces due to outmigration are:

a) Loss of cultural heritage (arts, festivals, language, cuisine, and traditional knowledge amongst others).

b) Loss of traditional agro-biodiversity.

c) Loss of human resource. Entrepreneurial ventures in the State have often failed to be profitable because of lack of skilled personnel.

d) Isolation and abandonment of population that cannot out-migrate due to economic or other concerns (There are a growing number of villages in the State with only old residents)

e) Rapid influx of migrants into urban areas or semi-urban areas which leads to unplanned urban growth putting undue pressure on natural resources.

f) Chronic outmigration often increases the rate of unemployment in urban areas since all those who come to seek employment in towns are unable to get employed.

g) Unsanitary living conditions of poor-migrants in urban areas.

State Vision

- In August 2017, the State Government notified the constitution of the '*Rural Development and Migration Commission*'. The primary objective of the commission is to quantitatively evaluate the extent of out migration from different rural areas of the State and provide a vision for focused development of the rural areas.
- The State Government recognises that it is not possible to entirely stop migration because some part of the population would continue to move towards more developed urban areas, irrespective of livelihood options in the hills. However, forced migration from the hills should be checked through constructive policy backed by livelihood support and other initiatives. Some case studies from other parts of world are worth mentioning here.

Turning ghost villages into hotels: a case of Corippo in Switzerland

The population of Swiss village of Corippo which was once home to 300 people, had dwindled to just 12 inhabitants with a reported average age of 75, and was slowly turning into a ghost town. Similar patterns were seen in rural communities across Europe, which were abandoned by young people due to the lack of opportunities and a preference for city life. However, as a solution to Corippo's declining population a local organisation, the Fondazione Corippo 1975, aimed at turning the abandoned village into a hotel. This was inspired by Italy's "albergodiffuso" (scattered hotel) model that had been used to revive ailing hamlets. The first cottage – the two-bedroom Casa Arcotti – opened over the summer of 2018, and around 30 of the village's 70 buildings were slated for conversion into holiday homes as part of a regeneration plan. This plan to bolster economic opportunities in the village was successful and was later implemented in many European villages. It gives tourists the chance to experience a very particular sojourn in a genuine rural village.

Urbanization in Switzerland

Urbanization of Switzerland is very advanced in spite of the lack of large metropolises in the country. A characteristic feature of the Swiss urban structure is the large number of small and medium sized towns. The largest Swiss town by far is Zürich which has only around 400,000 inhabitants. The country focusses on economical use of the limited land area given that only around 30% of the country is suitable for human habitation and the rest is covered by forests, water bodies, and high mountains.

The key focus of planned urbanization processes in the country is preservation of the landscape by protecting agricultural cultivable land, maintaining and facilitating public access to lakesides and river banks, and conserving natural landscapes and recreational areas. With planned development in peri-urban areas, a number of small townships have emerged in the country over the last decades, which offer facilities at par with their neighbouring urban areas. With this strategy of decentralized development, the old differentiation between urban areas and countryside no longer has any meaning.

9.3.9 Potential Interventions:

Checking Out-migration

In order to check rural outmigration one of the most pressing concerns is to develop meaningful employment strategies in hill areas to ameliorate the problem of underemployment among rural households. Creation of infrastructure facilities such as healthcare and higher education institutions, road connectivity, options for quality life are equally important. Some of the key gaps that often limit the successful implementation of livelihood support policies and schemes are enlisted below.

- *Development of entrepreneurial competence* among local youth is a challenge in hill regions. Most of the population has a tendency to search for wage-based employment, even if it is at abysmally low wages. This tendency to prefer a service based jobs as opposed to business is an inherent part of the social construct and general mindset which needs to be changed. Developing area-based entrepreneurship training programmes, at the high school or the university level can be a way to target young minds and encourage them to pursue alternative livelihood options, based on their interests.
- *Efficient dissemination of information about policies and schemes:* Often information about potential schemes and their benefits is not disseminated efficiently among the local population.
- *Bias in credit flow* has often been observed in the banking sector, which acts as a major deterrent for upcoming entrepreneurial ventures in the hill regions. Most banks prefer to finance only developed plain districts and are hesitant to take risks in the hilly districts. For instance, according to the State Lead Bank Report (2017) for deployment of funds for micro and small industries in Uttarakhand 3900 crores has been deployed in 3 plain districts (Dehradun, Udham Singh Nagar, and Haridwar) as opposed to a total of 1110 crores in the remaining 10 hill districts.

SOS Organics, Uttarakhand

Sharing Organic Solution (SOS) was established 10 years ago in Pant Chitai village, near Almora with a purpose of village-based enterprises which makes natural and organic products. With 18 permanent employees and 100 farmers from whom they buy raw material, all SOS organics products (soaps, natural cosmetics, aromatic herbs, health foods, teas and massage oils) are hand-crafted. In an innovative practice SOS uses nettle for a variety of its products. Being relatively safe from human wildlife conflict, nettle is a readily available resource in the region. Nettle dried is bought at a price of Rs 150 per kg from the farmers. SOS believes in sustainable living and their factory is equipped with rainwater harvesting with a capacity of 180 litres and 70% of the energy demand is met through solar power. SOS Organics is committed to ethical business, natural farming and the preservation of the environment. It took them almost 5 years to reach breakeven point but since then this enterprise has seen astounding appreciation in the market. Today, SOS organics products have reached both the national and international markets.

- Reinventing traditional family-based subsistence agricultural practices by encouraging *land and labour resource consolidation at village or regional level* is extremely important to turn traditional agriculture into a profitable business opportunity, thereby supporting local livelihoods. In that regard, *Chakbandi* i.e., a coalition of scattered private agricultural land on a formal administrative level is the need of the hour. Through land consolidation, the ease of access in farming will increase tremendously and can thereby encourage local residents in practising agriculture on a commercial scale.
- Development of market linkages and supporting the hill entrepreneurs in marketing of products is crucial to sustain business. The State has two mega-food parks (Haridwar and Kashipur), and a number of processing clusters. However a majority of them are located in plain regions.

- Coordination between different Governmental departments is crucial to enable holistic development of hill regions and successful implementation of policies/schemes introduced for livelihood support.

9.3.10 Developing Satellite Towns and Model Hill Towns:

A way to tackle the issue of unplanned urban growth is holistic development of satellite towns around pre-existing urban settlements in both plain and hill districts. Such towns would provide services, amenities, and opportunities at par with developed urban areas and therefore absorb the incoming migrant population in an efficient sustainable manner, without exerting any undue pressure on the existing town's finite natural resources.

Another approach to sustainably manage migrant population and curb outmigration to plain districts is developing 'model' hill towns, which provide good quality basic facilities (education, healthcare, economic, wellness and tourism opportunities) to the local population. Given the fragile nature of the hill landscape and the ecosystem services provided by this region, it is important that these hill towns are developed in a sustainable and environmental friendly manner. Infrastructural development in hill areas that can lead to growth of labour market and increase the number of available job opportunities, thereby encouraging the local residents to stay in their native districts.

Some of the key features of these upcoming satellite and model towns would need to include:

- Availability of quality education facilities (school/university/vocational training)
- Availability of quality healthcare facilities
- Ease of access. Well connected to surrounding villages, town, administrative headquarters, and State capital, Commercial centres
- Good quality road connectivity; modern and affordable transportation
- Economic opportunities: Supporting tourism and other non-farm employment opportunities
- Solid waste management systems

Table 9.4.3: Potential Areas for Sustainable Urban Development in Uttarakhand

District	Existing Towns Around Which Satellite Towns Can Be Developed	Potential Model Towns
Almora	Almora	Chaukhutiya, Someshwar, Dwarhat
Bageshwar	Garur	Kapkot, Gwaldam
Chamoli	Joshimath, Gopeshwar	Tharali
Champawat	Lohaghat, Tanakpur	Banbasa
Dehradun	Dehradun, Rishikesh	Chakrata, Raiwala
Haridwar	Haridwar, Roorkee	PiranKaliyar
Nainital	Nainital, Haldwani, Ramnagar	Kaldhungi, Bhowali, Ramgarh
Pauri Garhwal	Pauri, Srinagar	Satpuli, Dugadda
Pithoragarh	Pithoragarh	Berinag, Dharchula, Munsiyari, Didihat
Rudraprayag	Rudraprayag	Ukhimath, Jakholi
Tehri Garhwal	New Tehri	Ghansali, Chamiyala, Narendra Nagar
US Nagar	Rudrapur, Kashipur	Jaspur, Bajpur, Kiccha, Sitarganj
Uttarkashi	Uttarkashi	Chinyalisaur, Barkot, Purola

Chapter- 10
Uses of Technology

Abstract

An overview of the use of technology, in multiple aspects of a citizen's life and the future uses of technology that are likely to influence how people learn, work, look after their health, live, interact amongst themselves and with the Government, use services provided by the Government and private sector, is provided here. Certain best practices in various spheres, adopted within the country and globally that are applicable to Uttarakhand are described briefly.

Widespread digitisation of public services in Denmark; the transformation of citizens' lives in Balrampur district, Chhattisgarh; digital literacy of a whole village in Telangana as an individual's initiative; a state Government's initiative to bridge the digital divide among rural and urban populations; use of ICT in China in management of rural groundwater; on-site reuse of water resources in San Francisco, USA; adoption of green infrastructure technologies for urban development in the USA; use of Big Data and smart meters to inform consumers of their usage in real time and compare with neighbours as well as provide early warning of breakdowns and anomalies in usage; GIS Based Planning of Urban Services in West Bengal; GIS Based Master Plan Development in Madhya Pradesh; E-Management of Municipal Solid Waste in Pimpri-Chinchwad, Maharashtra; Supporting Pro-Poor Market Development: Computerized Milk Collection Centres in Gujarat; Improving Access to Basic Services: India Healthcare Delivery Project; Improving Access to Government Services in Dhar, Madhya Pradesh; Improving Access to Microfinance in Medak, Andhra Pradesh; Use of Blockchain Technology to Improve Direct Benefit Transfer Mechanism and Beyond; A Blockchain-Based PAHAL System for distribution of LPG gas to consumers; use of technology to disburse pensions in Krishna District of Andhra Pradesh; improving access of target women beneficiaries through use of technology to the benefits of Pradhan Mantri Matru Vandana Yojana (PMMVY); use of automated payment engine to disburse health incentives in Bihar; public grievance addressal system in Vishakhapatnam, Andhra Pradesh; best practices in use of technology for robust complaint management and resolution systems; the future of technological advances in medical care; smart classrooms in villages of Uttarakhand; use of surgical simulation using AI in Medical Education; ICTs and process re-engineering for an efficient Public Distribution System (PDS) in Arunachal Pradesh; use of IT to strengthen the taxation system in Nagaland; wealth from waste model of Gorai in Mumbai; community action for solid waste management in Pammal, Tamil Nadu and solid waste management in mountain areas of Georgia.

Usage of technology in the areas of: Information Technology (IT), Water Resources, Urbanisation, Poverty Alleviation, Direct Benefit Transfer (DBT), Public Grievance Redressal, Health, Education, Citizen Centric Services and Solid Waste Management, are outlined.

Introduction:

A review of efforts to use new technologies to address the major developmental challenges in Uttarakhand, reveals that technology is not reaching its full potential in improving people's lives in the State. New, progressive models are called for that take on board people's use of technology in their daily lives and how innovative technological developments are shared with communities and adopted by them over time.

Uttarakhand aims for transformational change through ubiquitous use of technology in all spheres, to improve quality of life of its residents. In the process, it is reviewing best practices within and outside the country for their applicability to the State and adapt/ improve/ develop appropriate strategies and developmental plans. These are increasingly being operationalized in mission mode. Some relevant best practices in use of technology within Uttarakhand, which are ready for wider replication and those outside the State, are briefly described in this chapter to catalyse discussion followed by selection and prioritization for developmental action in the State.

10.1 Use Of Information And Communication Technology:

Information technology (IT) has the potential to play a transformational role in economic growth and social development. It is an enabling and empowering technology with endless possibilities to strengthen processes, make them more efficient and affordable to the masses.

IT's main benefit is to increase efficiency through economizing resource use. Information that was previously exchanged through face-to-face contact, post, courier, telegram or telephone is instead shared in electronic form via the Internet. Use of IT improves provision of public services, reduces delays in delivery of goods and services, strengthens supply chains and improves accessibility enabling communities even in remotest areas to join the mainstream of development.

Farmers selling their crops and buying inputs, and job seekers are all beneficiaries of Internet-based matching services. Farmers receive weather forecasts, market price quotes, advice on farming practices, and specific training with the use of IT. IT reduces transactions costs for transactions, such as milk delivery by farmers to cooperatives, or microcredit allocation and monitoring.

Governance is an area where IT is having a positive impact. Use of IT in various forms of e-governance, including internal systems as well as citizen interfaces is benefitting communities in the remotest areas of the country, improving their accessibility to Government programmes, markets, services and finance thus positively impacting their growing inclusion in the country's economy.

There are several best practices of ICT for development across the country and globally. Some relevant examples are described here.

Danish Government Launches Wide-Ranging Digital Services Project

The Danish Government has announced a digital project that includes 22 separate initiatives, including an app-based citizens digital platform that can be used to access all publicly held data on Danish citizens.

One of the most prominent of these is a **Digital Healthcare** project that would enable homecare services' recipients to access professional support and communicate directly with medical teams, or specific health specialists, over digital platforms. The objective is to scale-up the use of digital health solutions and platforms to help reduce non-emergency visits to clinics and hospitals and to reduce the number of homecare visits by medical and other healthcare and community service professionals.

Digitisation has major advantages for municipal authorities and public services. It will enable public authorities to better deal with data on living conditions, social security benefits and child benefits. Service users will be able to

access more information on public services and benefits they receive, digitally.

Source: Gerard O'Dwyer, Computer Weekly

Kahani Balrampur Ki

This topic shares the experiences of how e-Governance has transformed lives of citizens in Balrampur district, Chhattisgarh.

Balrampur district is the 26th district of Chhattisgarh State (India) and Balrampur town is the administrative headquarters of this district. It is one of the backward districts in the State. However it has managed to respond to the Digital call of the Nation and transformed itself completely into a Digital district. Now it stands as a Model district for Digital India where every Panchayat office has become multifunctional in delivering services to its citizens. Balrampur district can now be rightly called as Biometricpur district in real terms.

The district administration introduced the e-governance project 'Biometricpur' as part of providing e-services in the entire district. The project was initiated in January 2015. As part of the initiative, village panchayats are being provided online Government schemes and internet facilities through optical cable wire. Most villages of this district now have 24-hour electricity supply.

Due to initiatives taken as part of the Digital India and e-Governance programmes, the Panchayat has become a bank where the MGNREGS payment can be received by the citizens. The Panchayat offers several other citizen services that can now be accessed at the doorstep by the villagers.

Source: CSC e-Governance Services India Limited

One Man's Efforts Makes an Entire Village Digitally Literate

Mr Nivalkar Gajanan, not only transformed his life by learning how to use a PC, but has also shared his digital knowledge to improve the livelihood of 160 farmers, women and children living in a remote Telangana hamlet. In 2010, determined to introduce people in his hometown to the convenience and excitement of using a PC, Gajanan set up a Common Services Centre (CSC). The centre, like others across the country, aims to make e-governance services accessible to the digitally illiterate common folk in non-urban India.

In 2015 the National Digital Literacy Mission inspired Gajanan to start training Government health and education workers on how to use the PC. The sarpanch of Akoli supported Gajanan. In January 2016, Gajanan started enrolling one member from each of the 160 households in the village. In a small room in the Gram Panchayat, he set up four of his own PCs. He even invested in two Wi-Fi hotspots and an LED screen. Next, he divided the villagers into different batches: housewives, children and farm labourers were taught in the morning, farmers were taught in the late evening.

At the end of the course, many villagers were adept at using the PC, a fact that was reflected in the results of their official assessment by the National Digital Literacy Mission, and Akoli was declared Telangana's third 100% digitally literate village. Today, children from the village use the PC at the centre to access free tutorials online, while farmers use them to get tips and suggestions about farming. Computer knowledge has also translated into better employment opportunities for many.

Source: The Better India

e-Gram Vishwagram Project: Gujarat Government Initiative to bridge Digital Divide among Rural and Urban Populations.

Project Infrastructure Setup

E-Gram centres are established in Village Panchayats. They are equipped with VSAT Broadband connected PCs (with Scanner, Printer, UPS, Webcam, VoIP Phone) and provide e-services to rural communities. Village Computer Entrepreneurs (VCEs) works on PPP Model and deliver services through e-Gram Centers.

14,006 eGRAM centres have been established. E-Gram Broadband VSAT connectivity Network is known as PAWAN Network.

Project Technical Support Team: To support the entire ecosystem, Technical Support and Training Service Provider Team (TSTSP) are deployed at Taluka, District and State level.

Village Computer Entrepreneur (VCE): A PPP Model has been adopted on a revenue sharing basis. Local person with minimum Qualification of 10th Pass is the VCE.

e-GRAM Vishwagram Society: e-Gram Vishwagram Society is an SPV for e-Governance activities for Panchayati Raj Institutions.

Role of Government Officials: In each district, District Development Officer is taking lead a e-Gram unit for Project daily monitoring.

Services Enabled in the Project

The e-Services provided are broadly divided in two categories:

Offered G2C Services

- Birth and Death Certificate
- Caste and Income Certificate
- Tax Collection Receipts
- Land Right Records Services (RoR-7/12 & 8A)
- Application Forms of development Schemes
- Electricity Bill Collection
- E Ration Card Coupon
- iKisan - Farmer Registration
- GSPC Bill Collection

B2C Services

- e- Ticketing of Railways, Airlines, Bus
- Utility Bill payments (Tele, Mobile, DTH
- DTP work
- Financial Services

Source: Panchayat Department, Govt. of Gujarat

10.2 Use of Technology in Management of Water Resources:

It is imperative that Uttarakhand fully understands the challenges that water resources are likely to face in the net fifty years and plan to address the same in a well concerted and comprehensive manner.

An important first step is to bring in focus the key issues that must be addressed in the short term and consider how these would evolve with time.

Climate change: while Uttarakhand has been dealing with variable climatic conditions over time, the majority of management approaches have been based on the understanding that the hydrological series was stationary and although there may be variations from time to time, the mean value would remain roughly the same. There is now increasing evidence of longer term trends in hydrological series. Many areas face a drying and warming climate and thus stare at less water availability; Increasing vulnerability to more severe and frequent weather events.

Growing urban demand: The population of urban centres continues to grow and urban areas continue to spread, thus placing greater pressure on water supply systems as well as reducing the availability of arable land, and, in some cases, placing increased pressure on water supply catchments;

Unrestricted extractions: In many areas, there are no management plans or restrictions on water extractions (for example, pumping from rivers and groundwater extractions). These have resulted in less water being available and have in some case led to mining of the resource. The expansion of farm dams in some areas also reduces the supply of water entering river systems;

Land-use change: Clear-felling, expanding plantations and the opening of new areas to agriculture all have impacts on the water resource; unintended events, such as forest and bushfires, can lead to a reduction in the availability of water and water-quality problems. Changes to land use, even within agricultural areas, have implications for both water availability and water use;

Smart Water Management (SWM) seeks to alleviate challenges in the water sector by promoting the coordinated development and management of water, through the integration of ICT products, solutions and systems in order to maximize economic and social welfare without compromising the sustainability of water as a resource or the environment; in other words, adopting a sustainable approach to

water management and consumption through the use of ICTs.

Source: International Telecommunication Union (ITU) and UNESCO

Use of Information and Communication Technology in the Management of Rural Groundwater in China

Some relevant best practices of use of technology for management of water resources are briefly described below:

Facing the grim situation of over-exploitation of groundwater and the formation of groundwater depression cones in the North China Plain, the CPC Central Committee and local Governments have introduced a series of policies in recent years, trying to change this situation. For example, agricultural water-saving technologies have been introduced; agricultural water prices and water rights trading were reformed. Irrigation measuring technology, the foundation of agricultural water price reform and water rights trade, has also been written into national and local policy documents.

The ICard measuring and control system is an advanced and important method for measuring water use. It applies computer and ICard automatic control technology to agricultural irrigation.

The ICard Control System is an intelligent device system that aids water resource management by metering water resources and water resource fees. The system is energy efficient, self-protected and performs multiple functions, including water measurements and fee calculations. The system is based on microcomputer technology, sensing technology and ICard technology to achieve the goal of controlling intelligent motor pumps and maximally prolonging service and the life of the motors. Users can put their pre-paid card close to the ICard Controller to start irrigating crops as needed.

The agricultural ICard well irrigation control system is composed of a well irrigation controller, Radio Frequency (RF) card (ICard), metering instruments (electricity meter and water meter) and a water resource user management platform.

With the ICard, individual water users can be archived and managed. Computers can be linked together the control effort. Each user is given a card with a username and password on it. When using the card, the user needs to prepay water fees on the card, then swipe the card and turn on the system to fetch water. The system automatically does the timing and charging, deducting the correct fees from the card. When the card runs out of money, the system automatically shuts down and the water is stopped.

At present, the ICard control system has been used in agricultural irrigation in parts of Xinjiang, Liaoning, Shandong, Shanxi, Hebei, Inner Mongolia, Tianjin and Beijing. For all electromechanical wells throughout the county, water is fetched by swiping ICards. One card is dedicated to one well or multiple wells. Water consumption is remotely managed and groundwater resources are effectively monitored.

Technologies to Transform Water Resource Management:

On-site Reuse:

Why do toilets and lawns drink the same water humans do? The question is driving the adoption of onsite reuse, which got a big boost last year when San Francisco adopted a city ordinance mandating the technology in all new buildings larger than 250,000 square feet. The idea is to capture water that's been used once, treat it to sub-potable standards, and then reuse it for purposes that don't require drinking-grade water. Aside from toilet flushing and irrigation, that can also include using the stuff to cool a building and avoid using a costly air conditioning unit.

The impact at the single-building level can be huge depending on the type of building and reuse system, the San Francisco Public Utilities Commission (SFPUC) has found reductions of potable water use (http://www.govtech.com/fs/San-Francisco-Looks-to-Spread-Water-Reuse-Systems-Across-State-Country.html) from 50 to 95%. That's spurred interest in spreading the practice.

Green Infrastructure:

Flooding is a big problem for many urban areas. Much of that is because of the shielding effect pavement and asphalt have on the natural landscape. Where rain sinks into the ground, it collects in pools and runs along dirty streets until it finds a gutter or ground. Along the way it can pick up all manner of pollutants, from copper to pathogens, and carry them to nearby rivers (http://www.govtech.com/fs/Capturing-El-Nino-Part-I-The-Tech-That-Harnesses-Storms.html), or lakes where they can wreak environmental havoc. This calls for developers to limit runoff and water pollution when they build new projects.

The concept can be as simple as sloping a grass-covered patch of ground or as expansive as replacing an entire parking lot. By designing for rain water, cities can direct water more quickly to ground and plants that can drink it up and let it sink into the dirt, either slowing the advance of the water to the gutter or preventing it entirely. There's also pervious pavement, which has a loose-packed structure allowing water to seep easily through.

Big Data:

Technology and infrastructure aside, knowledge alone can help people save water. "You go on the [Pacific Gas and Electric] website and you see a graph comparing your household energy use with that of similar households. You can see where you rank in terms of efficiency. Water agencies have been implementing similar reports on the water side and have seen great results. Households that have been receiving these reports comparing their use to their neighbours have achieved 5% more savings during the drought than those households within the same cities that have not received the reports.

Of course, technology and infrastructure can help build knowledge as well. **Smart water meters** can give information on how much water a house is using down to 15-minute increments, which means the customer and the water manager both have a lot more insight into how they might go about reducing water use. A smart meter installation enables agencies to communicate more frequently with customers and catch problems early — for example, leak detection."
Source: Ben Miller

10.3 Urbanisation:

Information Technology has a major role to play in improving efficiencies in delivery of public services and making the process of delivery transparent. The role of information technology (IT) in improving competitiveness of private sector operations is well known.

Evidence is emerging in Indian cities, suggesting that IT can yield similar dividends in the public sector. A number of cities like Hyderabad, Bangalore, Delhi, Ahmedabad, Surat, Mumbai, Kalyan-Dombivli, Pune, Chennai, and Kolkata are using IT to deliver public services such as issuing birth and death certificates, building permits, paying utility bills, accepting applications for passport, etc. online and through citizen civic centres.

10.3.1 Use of GIS:

Geographical Information System (GIS) has emerged as an important instrument in improving operational efficiency in **planning and management of urban infrastructure and services** in India. It integrates hardware and software applications to capture, analyse and display all forms of spatially referenced information of an area, e.g., location, density, surrounding infrastructure, etc.

Since GIS database and other complementary IT technologies will need to be maintained by urban local bodies (ULBs), it is important that they are financially able to do so. Levying and raising user charges will enable ULBs to shoulder the responsibilities assigned to them.

Way Forward:

At present, GIS datasets exist in silos across different ministries/departments and tiers of Government. To assimilate the use of technology in the decision making process at all levels of Government, it is important to synthesize and standardize existing satellite images,

topographical maps into a single database that is regularly updated and can be easily accessed.

Uttarakhand State Spatial Data Infrastructure (USDI) at the State level is entrusted with the responsibility of building, operating and maintaining a State platform for GIS and related activities, including training and capacity building.

Under this program, the Government of Uttarakhand prepares a multi-layered database with information on natural resources, disaster-prone areas, urban and rural infrastructure, land use etc., which the stakeholders at all levels of Government can use and share for informed policy decisions.

With the help of a common database, local Governments for example, would be able to prepare strict guidelines for building plans in seismic zones. A standardised system ensures efficiency in updating of respective information sets since all maps are of the same scale.

GIS Based Planning of Urban Services in West Bengal

GIS was also used to prepare a development plan for Kalyani municipality (part of Kolkata Metropolitan Area) under the DFID project to provide urban services to the poor, in 2007. The Development Plan recommended the opening of health centres for slum dwellers in Kalyani. Since the slums were spread unevenly across the municipality and vacant land was a constraint, GIS was used to determine the optimum location of the health centres.

Source: Tanushree Bhan, ICRIER

GIS Based Master Plan Development in Madhya Pradesh

The Directorate of Town and Country Planning of Bhopal collaborated with Indian Space Research Organisation (ISRO) to prepare a Master Plan 2011 for Indore using GIS and Remote Sensing technologies. At the start of the planning process in 2001, it was estimated that the population to rise to about 27 lakh by 2011. To meet the additional pressure on land, an integrated planning scenario combining physical attributes of the terrain, environmental parameters such as flood-prone regions, air and water quality, and infrastructure facilities was generated on a GIS platform. The final suitability of land for urbanisation was carried out by merging the urban land-use analysis with the environmental sensitivity layer on the GIS.

E-Management of Municipal Solid Waste: Pimpri-Chinchwad

In 2010, Pimpri-Chinchwad Municipal Corporation implemented an IT-enabled programme of solid waste management. GPS-GPRS technologies were used for geographically referencing (or, geocoding) community dustbins on a Google map to arrive at an optimum collection route. A web-based uploaded by the sanitary workers on the server through GPS/GPRS-enabled cell phones. Municipal vehicles were fitted with a GPS tracking device, and the web application alerted the officials if deviations were observed from the specified route. The software generated Management Information System (MIS) reports which were used by the Corporation to record the status of the bins (cleared/un-cleared), number of trips made in a day, attendance of sanitary workers, quantity of waste deposited at the transfer station (through RFID tags on vehicles connected to the central server), etc. on a real-time basis.

10.4 Poverty Alleviation:

As per Sustainable Development Goals 2030 *Attacking Poverty* identifies three priority areas for poverty reduction: increasing opportunity, enhancing empowerment, and improving security. Opportunity makes markets work for the poor and expands poor people's assets. Empowerment makes State institutions work better for poor people and removes social barriers. Security helps poor people manage risk. In light of current experiences in rural India and elsewhere in the developing world, it is apparent that information and communications technology (ICT) can be utilized to support poverty reduction

strategies. The use of ICT applications can enhance poor people's opportunities by improving their access to markets, health and education.

Furthermore, ICT can empower the poor by expanding their use of available Government services, and reduce risks by widening access to microfinance and insurance products.

10.4.1 ICT For Poverty Reduction in Rural India:

Although a large proportion of the rural poor in India are isolated from the information revolution, there are several examples in rural India where ICT is used to contribute to poverty reduction in the areas of opportunity, empowerment, and security. The following case descriptions highlight ICT applications that are attempting to realize the potential of ICT.

OPPORTUNITIES:

Supporting Pro-Poor Market Development: Computerized Milk Collection Centres

Small farmers and artisans living in rural areas typically lack access to information about prices, data on crops, weather conditions, credit facilities, and market opportunities. ICT can remedy such information asymmetries and stimulate poor people's entrepreneurship by better connecting them to markets.

In Gujarat, computerized milk collection centres with integrated electronic weights, electronic fat testing machines, and plastic card readers are ensuring fair prices for farmers who sell milk to dairy cooperatives.

Computerized milk collection centres have increased transparency, and led to faster processing, shorter queues, and immediate payment to farmers. Dairy Information System Kiosk (DISK) software provides relevant information to farmers through a database that contains complete histories of all milch cattle owned by members and a dairy portal.

10.4.2 Improving Access to Basic Services: India Healthcare Delivery Project:

ICT can improve health care delivery to the poor. Telemedicine can diminish the cost and hardship of long distance travel for medical attention and diagnosis, and email and medical list-serves can deliver at minimal cost recent medical findings to health workers lacking research and technological facilities.

Furthermore, ICT can simplify medical data collection, record management, and paper filing. Handheld computers, or Personal Digital Assistants (PDAs), are allowing auxiliary nurse midwives (ANMs) participating in the India Healthcare Delivery project to reduce redundant paperwork and data entry, freeing up time for healthcare delivery to the poor. ANMs shoulder most of the responsibility for healthcare delivery in vast and densely populated rural areas. PDAs are used to facilitate data collection and transmission, potentially saving up to 40% of ANMs' work time. Data entry in paper registers is eliminated and reports are generated automatically.

Under Poshan Abhiyaan programme of Ministry of Women and Child Development, hand held computer devices are being provided to Anganwadi workers in Uttarakhand to record information and upload the same in real time while using the devices as aids in counselling using pre-loaded videos on key thematic issues, which are downloaded as per need.

10.4.3 Empowerment:

Improving Access to Government Services: Gyandoot

ICT can be used by Government agencies to transform relations with citizens and businesses. In India, as in much of the developing world, it is not uncommon for rural villagers to travel long distances to Government district headquarters in order to submit applications, meet officials, obtain copies of public records, or seek information regarding prevailing prices in commodity markets. This involves the loss of a day's income as well as the cost of transportation.

Gyandoot — a Government-owned computer network — has been making Government more accessible to villagers in the poor and drought-prone Dhar district of Madhya Pradesh. Gyandoot attempts to reduce the time and money people spend trying to communicate with public officials and to provide immediate, transparent access to local Government data and documentation. For minimal fees, Intranet kiosks provide caste, income, and domicile certificates, avoiding for villagers the common practice of paying bribes. The kiosks also allow farmers to track crop prices in the region's wholesale markets, enabling them to negotiate better terms. Other services include information on school results and on the names of people included in the below-poverty-line list, and a public complaint line for reporting broken irrigation pumps, unfair prices, absentee teachers, and other problems. Kiosks are run by local operators along commercial lines and are placed in villages located on major roads or holding weekly markets, so that each of them can serve another 25 to 30 villages.

10.4.4 Security:

Improving Access to Microfinance: Smart Cards:

Microfinance - the provision of financial services to low-income clients - is an important tool for poor people to reduce, mitigate, and cope with risk. Computerization, smart cards, and software systems providing loan tracking, financial projections, and branch management information can reduce costs and help microfinance institutions reach clients more efficiently.

Smart cards with an embedded microchip containing information on clients' credit histories are helping SKS, a microfinance institution operating in the Medak district of Andhra Pradesh, to reduce transaction costs. All cash transactions take place at village group meetings and each transaction takes about 90 seconds per person. Much time is spent not only on paperwork but also discussing terms and conditions and counting coins.

10.5 Direct Benefit Transfer:

Direct Benefit Transfer (DBT) is the direct transfer of entitlements or cash into beneficiary bank accounts, replacing in-kind benefits. The emphasis is on delivering benefits directly reduce leakages, increase beneficiary choice, and eliminate intermediaries between the beneficiary and the State. DBT is Government's major reform initiative to re-engineer the existing delivery processes, ensuring better and timely delivery of benefits curbing of pilferage by de-duplication, elimination of ghost beneficiaries using Information and Communication Technology (ICT).

Two thirds of GoI's total welfare spending has transitioned to DBT. Transfers using Aadhaar Payment Bridge System (APBS) increased from 30.9% in July 2016 to 48.1% in July 2017.34

211 schemes of Government of Uttarakhand use DBT out of 452 DBT applicable Schemes, to provide assistance to qualified beneficiaries. In 2018-19 number of beneficiaries recorded was >78,00,000. The amount of assistance provided during the same period was more than ₹1496.38 Crores.

Key implementation considerations of DBT are the following:

1. Identification, enrolment and authentication of beneficiaries;
2. Mode of transfer of benefit suitable to the intended beneficiaries;
3. Most suitable mode for managing the transfer of benefits- directly/through agency;
4. Inter-departmental coordination;
5. Monitoring and evaluation;
6. Grievance redressal;

Use of technology in all the above fields have the potential to strengthen the implementation process, create a pleasant experience for all and at the same time prevent misuse/leakages.

10.5.1 Use of Blockchain Technology to Improve Direct Benefit Transfer Mechanism:

Beyond Blockchain to Use of Distributed Ledger Technology to Prevent Misuse

Several countries such as Estonia and UK are using Distributed Ledger Technology for citizen centric services such as Direct Benefit Transfers, e Governance and improvements in ease of doing business and prevention of misuse of technology for identity theft, impersonation or fraud.

A Blockchain-Based PAHAL System

PAHAL has been a hugely successful DBT programme. However, currently, the beneficiary is required to pay for the cylinder and then the subsidy is paid to her bank account. She then needs to go to an ATM to access her funds.

The token is a digital code that will be sent to the end consumer's mobile phone number. This digital code will be tagged to the Aadhaar number using a mathematical hash function, thereby making every digital code unique to the Aadhaar number. The reconciliation is automated using the blockchain technology as both the Government agency issuing the tokens and the oil companies redeeming the tokens are using the same distributed ledger.

In summary, the benefits are as follows:

1. Multiple banking transactions (from the Government to consumers) are replaced by a handful of transactions (from the Government to oil companies).
2. Tokens are tagged to individual Aadhaar numbers, hence reconciliation is exponentially simplified.
3. All transactions – issuance and redemption of tokens – are stored using the blockchain technology, thereby providing transparency and audibility.

The same concept can be expanded to any DBT system. Exact token features and blockchain features will differ from case to case, but at the heart of it, they remain the same.

Governments like Britain are already experimenting with blockchain-based benefit transfer. In Uttarakhand, due to Aadhaar, we have the opportunity to be a leader in the blockchain space as well. It's time to bring benefit payments to the 21st century and for Uttarakhand to lead that implementation.

Source: Shwetank Verma and Subhajit Mandal

Use of Technology for Disbursement of Pensions – Krishna Dist. Andhra

To ensure timely disbursement of Pensions for providing Social Security to all the poor and vulnerable (particularly the old and infirm) and to support their minimum needs in their lives. The Pension disbursement is happening in the entire Krishna District in all the 49 Blocks, 8 Municipalities and 1 Municipal corporation.

84% of 3.33 lakh pensioners in Krishna District are benefitted. Nearly ₹30.00 Cr is being disbursed. Positioning of Business Correspondents (BCs) has been completed up to 95%.

Biometric Authentication: The Pension amount is provided to the beneficiaries based on their biometric authentication. Each Business Correspondent (BC) is provided with a Finger Print Reader.

State Health Society, Bihar Implements Automated Payment Engine to Disburse Health Incentives

Introduction of PFMS Health Module has eliminated repeated visits required by mothers to collect cheques and receive payments; it has made the accounting and banking reconciliation easier and hence freeing me up from some of my administrative tasks.

*"*In 2013, the State Health Society, Bihar (SHSB), Office of Controller General of Accounts, Ministry of Finance (Public Financial Management System – PFMS) and International Finance Corporation (IFC) initiated a Government to Person Health Payments pilot project in the State of Bihar to digitise the health incentive payments to front line health workers and beneficiaries to enhance accuracy, timeliness and transparency in the processes. Today, under SHSB's leadership the project is implemented across the State digitizing the health incentive payments, having benefited over 340,000 JBSY mother beneficiaries and 75,000 ASHA workers.

10.6 Public Grievance Redressal:

Grievance Redressal is an essential management and governance related measure to address dissatisfaction with services and goods provided by public as well as private sector providers with the primary objective to improve the services continuously. To speed up the process and bring transparency, internet-based approaches used by the Government.

Grievance Redressal mechanism is mandated in Government agencies and departments that are directly involved with serving citizens and organizations. The mechanism uses IT to automate, respond, analyse data to identify and resolve persistent problems, making the workflow inside Government Office visible to citizens.

Grievance Redressal typically covers the following types of complaints:

- Service Unavailability
- Non-Delivery against Commitment
- Excessive Delays
- Injustice concerns (such as over race, caste, sex)
- Staff Misbehaviour
- Malpractice

Prajavani an e-Governance initiative in Visakhapatnam District of Andhra Pradesh

The combined efforts of District Administration and National Informatics Centre (GOI) not only gives citizens an avenue to track the progress on their grievance, but also provides the District Collector an effective tool to monitor the performance of various departments.

- The grievance mechanism is highly useful to those who are living in remote areas of the district to send their complaints across the authorities;
- The petitioner is informed of the officer to whom the complaint is marked and response timeframe;
- Prajavani operators work under the supervision of petition monitoring section at Collectorate. They check daily unmarked petitions and they send to concerned officer within given timeframe. Prajavani operator record disposals in the computer as complaints get resolved.
- The District Collector reviews the District Officers in monthly review meetings.

10.7 Health:

Use of technology in provision of health services in Uttarakhand has considerable potential of bridging the gaps in terms of medical doctors and specialists. Technology can also prevent costly and time consuming travel of citizens from distant villages to diagnostic centres and consultation.

Secondary level medical care in the State can be substantially strengthened at Community Health Centres and 24X7 Primary Health Centres with the existing level of personnel in position through use of technology, adopting a hubs and spokes model and wherever required, entering into public private partnerships. Referral system can improve with the use of technology, allowing instant consultation amongst specialist teams to plan medical procedures without having to be present at any one location.

Primary health care can be strengthened to manage 75% of all maternal and child health care requirements at Sub-health centres with the help of ANMs trained in the use of technology and following standard treatment guidelines and using essential drugs for the essential drugs list.

Technology is available off the shelf for creation of robust tele-medicine, tele-radiology, tele-cardiology and tele-ICU systems in the State. These systems can be operationalised within low gestation periods of 2-3 months. Implementation process primarily involves training of personnel in use of technology and prescribed treatment protocols coupled with installation of necessary equipment and broadband connectivity.

ICT can play a big role to improve the quality of counselling by frontline workers of women and their family members, by providing them with smart phones loaded with edutainment videos as standard content. Content can change and evolve as per changing behaviour and requirements of communities. Content can also be sent on the

mobile phones of the beneficiaries to bolster the campaigns and remind them of the prescribed regimen for IFA tablets, DOTS therapy for TB/Leprosy treatment etc.

Technology can also play a big role to improve monitoring of the large workforce of the health department, bringing higher levels of accountability and process monitoring by introducing IT based work allocation/scheduling and reporting using their mobile phones. Technology use can also reduce the time and effort spent on maintaining paper based records by the frontline workers, freeing them for patient interaction and service provision.

Maintenance of patient medical records using cloud computing making them available to the medical personnel on demand can improve and expedite medical care of Uttarakhand citizens and help to track patients for better follow up during and post treatment.

Some best practices in use of technology in medical care are described below:

10.7.1 Ways Technology Is Changing Healthcare:

*Streamlined Lab Testing***:** The lab testing process could be changing very soon, due to newly designed methods to conduct tests with micro-samples of blood, one-thousandth the size of a typical blood draw."

Cloud-based data and software: New applications assist healthcare providers be able to refer to specialists who in turn can assist thousands of patients and providers who are in search of specialist advice and guidance.

The future of healthcare is shaping up mainly through digital technologies, such as artificial intelligence, VR/AR, 3D-printing, robotics or nanotechnology.

In medicine and healthcare, digital technology could help transform unsustainable healthcare systems into sustainable ones, equalize the relationship between medical professionals and patients, provide cheaper, faster and more effective solutions.

Artificial intelligence: Artificial intelligence has the potential to redesign healthcare completely. AI algorithms are able to mine medical records, design treatment plans or create drugs way faster than any current actor on the healthcare palette including any medical professional.

Virtual reality: Virtual reality is changing the lives of patients and physicians alike. It is possible to watch operations as if one wields the scalpel.

Sources: The Medical Futurist; Scoop.it Inc

10.8 Education:

Schools use a variety of ICT tools to communicate, create, disseminate, store, and manage information. In some countries, ICT has also become integral to the teaching-learning interaction, seen in replacement of chalkboards with interactive digital whiteboards, using students' personal smartphones or other devices for learning during class time, and the "flipped classroom" model where students watch lectures at home on the computer and use classroom time for more interactive exercises.

When teachers are digitally literate and trained to use ICT, these approaches can lead to higher order thinking skills, provide creative and individualized options for students to express their understandings, and leave students better prepared to deal with ongoing technological change in society and the workplace.

10.8.1 Issues:

Digital culture and digital literacy: Computer technologies and other aspects of digital culture have changed the ways people live, work, play, and learn, impacting the construction and distribution of knowledge and power around the world.

Digital literacy—the skills of searching for, discerning, and producing information, has become an important aspect component of curriculum frameworks.

In many countries, digital literacy is being built through the incorporation of information and communication technology (ICT) into schools.

Some common educational applications of ICT include:

O*ne laptop per child:* Less expensive laptops have been designed for use in school on a 1:1 basis with features like lower power consumption, a low cost operating system, and special re-programming.

- *Tablets:* Tablets (small personal computers with a touch screen), allow input without a keyboard or mouse. Inexpensive learning software ("apps") can be downloaded onto tablets, making them a versatile tool for learning.
- *Interactive White Boards or Smart Boards*: Interactive white boards allow projected computer images to be displayed, manipulated, dragged, clicked, or copied.
- *E-readers*: E-readers are electronic devices that can hold hundreds of books in digital form, and they are increasingly utilized in the delivery of reading material.
- *Flipped Classrooms:* The flipped classroom model, involving lecture and practice at home via computer-guided instruction and interactive learning activities in class, can allow for an expanded curriculum.
- *ICT and Teacher Professional Development*: Teachers need specific professional development opportunities in order to increase their ability to use ICT for formative learning assessments, individualized instruction, accessing online resources, and for fostering student interaction and collaboration.

10.8.2 Right To Read:

The RightToRead Program is an initiative to take technology-enabled reading to millions in Government Schools across India and globally. The goal of the RightToRead program is to significantly enhance students' English Reading and Comprehension skills.

In 2015, the RightToRead Programme was implemented across 8 States of India. The Program covered One Million students across 4889 Government and aided schools in 8 States. EnglishHelper deployed its reading and comprehension solution, ReadToMe software in these schools.

RightToRead has been implemented in 170 American India Foundation supported schools of Uttarakhand in the Academic year 2017-18. The schools are located in the three districts of Almora, Dehradun and Pauri Garhwal. Students and teachers are providing strong endorsement for the programme.

The Government of Maharashtra has recently approved the implementation of RightToRead in 65,000 schools in the State. The RightToRead Program is presently operational in 262 districts across 27 States and 3 Union Territories of India.

10.8.3 Medical Education:

Surgery Simulation: Robotic Surgery Simulator (RoSS) allows real-world views of surgeries while eliminating the need for a live environment to train aspiring surgeons. It gives these medical professionals the space to experiment in a simulated environment, rather than risking making mistakes on real patients.

10.9 Citizen Centric Services:

Delivering services to its citizens is central to Government agencies' functions. Paying taxes, renewing trading and driving licenses, availing benefits are the most frequent interactions of citizens with their Government.

Citizens today expect more transparent, accessible, and responsive services from their Governments. These expectations are on the rise. Many Governments have made efforts to

improve service delivery through online portals, but public expectations exceed the capacities of these portals and back-end staff.

Citizens continue to be dissatisfied by the confusing websites/portals and the find it difficult to negotiate their way through the multiple query system, experiencing the need to speak with someone knowledgeable before their question is answered or their request is addressed. Due to the lack of competent personnel and capacities to manage and resolve the grievances of its citizens, Governments face declining citizen satisfaction and eroding public trust.

Governments continue to design and deliver services based on their own requirements and processes instead of the needs of the people they serve. But some Government agencies—including at the local, State, and federal levels—have successfully implemented a customer-centric approach to service design and delivery.

Arun e-PDS: ICTs and process re-engineering for an efficient Public Distribution System (PDS) in Arunachal Pradesh

The practical challenges of implementing the Public Distribution System (PDS) in Arunachal Pradesh led to the conceptualisation of the Arun e-PDS initiative to improve delivery through process re-engineering and use of Information and Communication Technologies (ICTs).

A number of issues plagued the PDS, including problems in accurate targeting and segmentation of APL / BPL beneficiaries; pilferage of PDS commodities, pilferage at every node of supply chain; wastage of food grain, inaccessibility and the problems of bogus ration cards.

Many regions in the hill State are hard to access. In absence of a civil supplies corporation, the State procures grains through wholesalers. Food grain is delivered to FPSs by vans or head-load.

Arun e-PDS was conceptualised in 2008 as a simple, accountable and efficient intervention of technology for streamlining the public distribution system in Arunachal Pradesh.

The process re-engineering aspect saw an innovative, system generated, coupon system with the following features:

1. The e-PDS system operates on a novel, non-replicable coupon system
2. 12 coupons are issued (one for each month) to the beneficiaries at the time of issuance/renewal of ration cards
3. These are submitted to the FPS by the beneficiary, one for each month, at the time of purchasing his/her ration quota
4. FPS owners, in turn, submit the collected coupons to the e-PDS counter (DFCS office) to get allocation for the next month
5. The system automatically generates monthly sub-allocation order on the basis of the coupons submitted by the FPS dealer

The ICT component of the scheme has four aspects. The first step is the Ration Card Management that includes both the Issuance and Modification processes. It has two aspects:

1. Central database, which is accessible to relevant officials to review pending requests
2. Automatic printing of cards, which reduces manual intervention
3. This is followed by supply chain management, which is achieved through the issuance of system generated coupons which are non-replicable.

Due to digitisation of information, key data and reports are accessible instantly, which help in providing real-time information to all stakeholders over the internet.

Source: Department of Food and Civil Supplies, Arunachal Pradesh

Reforming Taxation System of Nagaland Through "Taxsoft" Nagaland:

There were several challenges of tax collection in Nagaland, such as - no major industry, economy is largely agro based, consumers mostly dependent on goods imported from other States and weak IT connectivity. The department collected about Rs 325 crores as revenue for the State in 2014-15, which contributed ~ 60% of State's internal revenue, VAT and Sales Tax being major components, ~ 10000 registered

dealers collect tax on behalf of the Government and remit it. In the manual tax collection system, there was lack of controls/monitoring left scope for evasion Taxsoft" is one of the pioneering e-Governance initiatives in the State. Its components are:

e- Registration

- Mandatory online registration
- Traders no longer have to visit Tax offices for registration.
- Issue of certificates also made online
- Application status can be tracked
- Confirmation of registration through SMS with allotted TIN
- PAN- Permanent Account Number for Income Tax purposes also made mandatory for registration under VAT- groundwork for GST

e- Returns

- All traders can file returns electronically
- Mandatory for tax payers with turnover above ₹40 lakhs per annum
- Auto calculation of tax and interest inbuilt into the system
- Provision for filing revised returns
- Auto generated SMS alert sent when return is due
- Payment process time and effort drastically reduced
- SMS alert with BURN on successful transaction
- Reconciliation process is done in real time

e- Waybill

- Now, all transaction details captured online
- Can be verified from anywhere
- Quick transit at check posts

Taxsoft' Highlights

- Web Based Application
- Security and Authentication – Unique User IDs and Passwords are provided to Dealers and Officials to manage and operate their accounts

10.10 Solid Waste Management:

Solid Waste Management (SWM) is among the basic essential services and municipal authorities are charged with the responsibility to keep urban centres clean. Almost all municipal authorities have some form of waste collection but fall short on citizen awareness regarding waste reduction and segregation and safe waste disposal. Most municipal authorities deposit solid waste at dump yards within or outside their respective cities in open spaces.

The key to efficient waste management is to ensure proper segregation of waste at source and to ensure that the waste goes through different streams of recycling and resource recovery. Then reduced final residue is then deposited scientifically in sanitary landfills. Sanitary landfills are the ultimate means of disposal for unutilised municipal solid waste from waste processing facilities and other types of inorganic waste that cannot be reused or recycled.

There has been technological advancement for processing, treatment and disposal of solid waste. Energy-from-waste is a crucial element of SWM because it reduces the volume of waste from disposal also helps in converting the waste into renewable energy and organic manure.

Installation of waste-to-compost and bio-methanation plants would reduce the load of landfill sites. Bio-methanation is a solution for processing biodegradable waste which remains underexploited.

The concept of common waste treatment facility is being widely promoted and accepted as it uses waste as a resource by either using it as a co-fuel or co-raw material in manufacturing processes. This has led to rise of Public Private Partnership (PPP) models in waste management which has opened doors for doing business in waste management.

Many mountain regions including Uttarakhand are experiencing a growing solid waste problem, from ever-expanding urban sprawls and cities, increasing consumption patterns, existing and past mining operations, tourism activities and practices of illegal dumping. Steepness, remoteness, prevailing socio-economic conditions, and vulnerability to natural hazards, makes waste management in mountains more challenging than in lowland areas. Gravity and river flow can also enlarge the footprint of mountain waste to a thousand kilometers or more downstream. Inadequate treatment or disposal of waste in mountains not only creates risks for ecosystems and human health in mountain

regions, but also for downstream areas. There are many options available to prevent and manage waste in mountain environments, in ways that protect mountain ecosystems and people, and prevent problems from migrating downstream.

Wealth from Waste – An Example of GORAI from Mumbai, Maharashtra

Not very long ago, nearly 1200 tonnes of garbage was being dumped daily at the open dumping grounds in Gorai. The site had been used for this purpose since 1972, and had become a huge public health hazard. Thanks to an innovative public-private partnership led by the Municipal Corporation of Greater Mumbai (MCGM), the scientific closure of the dumpsite at Gorai has transformed this waste, accumulated over several decades, into wealth.

Sanitary landfills are large and deep underground pits into which the residual waste is put in between scientifically layered geo-textile material and high density polyethylene sheets to ensure complete and airtight closure. The onsite conversion of methane gas is carried out using flaring systems, and the area is developed so as to provide a green cover over the dumpsite.

MCGM earns carbon credits for the capture and combustion of methane (landfill gas) from Gorai, and the transaction is one of the largest carbon advance transactions in the Clean Development Mechanism (CDM). A tonne of methane is equivalent to 21 tonnes of carbon in its global warming potential. The leachate is collected and transported off-site to Versova where the municipal corporation operates a sewerage treatment plant. Gorai is the first dumpsite closure project in India to be registered at the United Nations Framework Convention on Climate Change (UNFCCC).

Source: Isher Judge Ahluwalia, ICRIER

PAMMAL Cuts its Waste: Community at Work

Pammal is a small town in Kancheepuram district of the State of Tamil Nadu, with resident population of 85,000, which became a municipality in 2005. Pammal suffered from garbage, put out by households, rotting in unattended dustbins, and spilling over on to the streets and pavements. The town has no underground sewerage system and has open storm water drains on both sides of the roads/lanes.

A group of middle-class women in Pammal decided to take charge of their physical surroundings. They decided to buy a cycle rickshaw for collecting garbage from the 260 households in their ward for delivery at the roadside dustbins, and charged the households Rs 10 per month for the service. When residents living near these dustbins objected, the group decided to minimise waste by recycling a major part of it. They started segregating kitchen waste from the rest and used the former to make compost.

In 1994, they formed a Self-Help Group (SHG) and received some land as donation so that their composting work could expand. With a loan of Rs 40,000 from a bank, they put up a vermicomposting shed and began the process of converting waste into wealth.

The transition from a Self-Help Group to a Non-Government Organisation was made in 2006 when they registered as Exnora Green Pammal (EGP), an Indian non-Government organisation. The town panchayat gave them 1.1 acre land.

The kitchen waste is converted into vermi-compost (organic manure), charcoal briquettes and biogas. The compost is packed as "EXORCO" brand and sold to farmers in the nearby villages. It fetches good price because of its good quality resulting from the use of segregated waste. Dry leaves are converted into charcoal briquettes and sold. Thin plastics (carry bags and water pouches) are sent for recycling and converted into handbags, office files, wall hangings, etc.

Source: Isher Judge Ahluwalia, ICRIER

10.9.3 Mini-Transfer Stations for Solid Waste in Georgia's Mountain Villages

Georgia's mountain regions have seen a rising problem of solid waste over recent years, mainly due to increasing population levels, growing tourism, and a rise in living standards. In the municipality of Mestia (the main town in the mountainous Upper Svaneti region), the Government-owned Solid Waste Management Company has set up a transfer station for municipal solid waste from the town and surrounding villages in the region. The plan is for the waste, once processed, to be transported to Zugdidi, 130 km away.

The challenging for the municipal authority is the burden posed on the municipal budget as a result of the high costs associated to waste management in mountain regions and a general lack of capacity. The situation in the more remote mountain villages is even more challenging, where there are practically no waste containers, and collection and removal of the waste is either ill-organized or absent at all. The conditions of the roads in these places is rather poor, making it impossible for the waste trucks to reach certain villages during the bad weather conditions.

One cost-effective approach for villages, is setting-up of a series of mini transfer stations in these more remote villages, using existing means and input from the local communities. These stations provide temporary storage for a period of between 3 to 6 months (depending on the size of the community and amount of waste generated), after which the municipal services collect the waste and transport to the main transfer station in Mestia.

Each station includes a waste segregation/ separation area, allowing for the sorting of recyclable materials. Primary processing equipment, such as balers or compactors, are installed within, allowing the recyclable materials to be pressed – which has the benefit of reducing the volume and increasing available space, and making it more attractive for recycling companies to purchase. Such installations are easy to operate after a short training.

Way Forward

1. Civic bodies have to redraw long term vision in solid waste management and rework their strategies as per changing lifestyles.
2. They should reinvent garbage management in cities so that we can process waste and not landfill it (with adequate provisioning in processing and recycling).
3. To do this, households and institutions must segregate their waste at source so that it could be managed as a resource.
4. Compost pits should be constructed in every locality to process organic waste.
5. Community participation has a direct bearing on efficient waste management.
6. Recovery of e-waste is abysmally low, we need to encourage recycling of e-waste on a very large scale level so that problem of e-waste disposal is contained.
7. 16 cities and towns of Uttarakhand along the Ganga have been identified for solid waste management by the Central and state Government to manage solid waste estimated at 306 MT per day.

Chapter- 11

New Areas of Development in Uttarakhand

Abstract

For Uttarakhand to maintain if not exceed the growth rate of its economy, provide the skills and opportunities for gainful employment to all its people and ensure good quality of life for them, it is essential that it develops a vision, puts in place strategies necessary for it to keep pace with the emerging trends and technologies and deploy those suitable, thus using these new areas of development as building blocks of Uttarakhand of the future.

Areas identified as new areas of development of the state are – Artificial Intelligence to propel its educated youth to secure higher paying jobs at the cutting edge of technological transformation; acquisition of skills for all sectors of growth in rural and urban areas, in horticulture, medicinal and aromatic plants, floriculture, tourism services, ICT and bio-technology.

While Uttarakhand grows its economy and urbanisation increases, it needs to manage its waste, be it solid or liquid waste, hazardous or bio-medical waste. It needs to expedite implementation of waste management plans in urban and rural areas as well as tourist hotspots.

Urbanisation is a reality and the state needs a radical and well thought out approach to its urbanisation keeping in view its topographical challenges and care for the protection of its environment. The concept of distributing an decongesting urban areas bursting at their seams through growth centres and satellite towns strategically located is one answer.

This strategy would also stem the migratory flow to the plains and urban areas and provide gainful employment opportunities to its unemployed youth.

Introduction:

New and upcoming areas for Uttarakhand development to catapult the State to the top rung in the country in terms of human and economic development, providing gainful opportunities to its citizens to live a happy and prosperous life; providing the ecosystems to attract talent and facilitate enterprises and start-ups to take root and prosper, driving the rise of Uttarakhand in the national ranks in 'ease of doing business' as well as 'ease of living'.

With focus on development areas of the future, Uttarakhand Government is adopting a set of strategies to provide a conducive investment and work environment for entrepreneurs from within and outside the State to establish their manufacturing and service facilities, provide them with good living conditions in the pristine environment of the State, supported by necessary infrastructure, connectivity and all the necessary ingredients for a good work life balance.

A number of Growth Centres have been established and rapid progress is being made to establish more such centres in the State based on local agri-produce, and forests.. State has accorded industry status to wellness and Ayurveda centres, adventure and sporting activities such rafting, camping, surfing, hang gliding etc.

Satellite Towns – New Age Uttarakhand: In addition to the on-going thrust on establishing Growth Centres, the State plans for rapid and sustainable growth of employment opportunities through promotion of *Satellite Towns*, specialising in fields appropriate to their location, harnessing their natural habitats to establish Uttarakhand's new growth drivers.

The State Government intends to select strategically located sites across the State to be developed as satellite towns. Each of these satellite towns would ideally have an anchor area of specialisation such as:

- Agro based food processing, health foods and supplements, agro-waste based products and agro bio-technology – multiple growth centres;
- Herbal products and extracts, pharmaceuticals, medicinal bio-technology, nutraceuticals and biologicals – multiple growth centres;
- Aromatic oils, perfumery, cosmetics, beauty and personal care products;
- Tourism – multiple growth centres for winter sports, adventure, culture, art and craft;
- Information technology, artificial intelligence, machine learning, robotics, radars, electronics – software development, ICT based services, IT hardware, telecom, mobile telephony, wearables, internet-of-things;
- Textiles, handloom, handicrafts, furnishings, flooring, product design, ;
- Wellness and rejuvenation (e.g. Ananda), rehabilitation and post trauma recovery – multiple growth centres;
- Medical tourism, restorative therapies, hospices, terminally ill patient care, retiree home and care complexes (e.g. Antara) – multiple growth centres;
- Packaging materials (agricultural based, glass, plastics) and waste recycling –maybe at least in two regions, one each in Kumaon and Garhwal regions;

Development of World Class Educational, Research and Training Institutions in Uttarakhand:

Universities/colleges/vocational training centres in these satellite towns will be strengthened as centres of excellence for higher learning and research, to support the respective specialised areas. Existing resource base of Central and State institutions will be harnessed for this purpose.

Additional educational and skills development capacities would be added to existing institutions and new institutions would be established to meet the requirements of technically competent workforce at various levels of skills.

As a stop gap arrangement, tie-ups would be forged with centres of excellence across the country in respective fields, to provide necessary guidance and faculty/trainers to the local institutions.

Wellness, Cultural, Arts, Recreation, Shopping, and Tourism Hubs:

The satellite towns would be developed as centres of wellness, culture, arts, recreation, shopping and tourism activities and be provided the necessary eco-system for ease of living. Entrepreneurs from Uttarakhand and from outside the State would be invited and facilitated to establish their enterprises. National institutions and private players in respective fields will be invited to set up their Uttarakhand centres. Tie-up with international institutions will be forged to invest in these towns.

Spatial Layout and Planning of Satellite Towns:

Each satellite town will be planned to merge with the natural habitat, provide spaces for living, recreation, education, sports, community activities, medical care, markets, hotels, hostels, cycle tracks, pedestrian ways, public utilities and well-designed public spaces. The approach will be to make each satellite town a "*Smart Town*" in true sense, where residents live and work in joyful surroundings.

Care will be taken to minimize the distance between living and work spaces for the residents. Eco-friendly transportation facilities; optimal use of renewable energy sources, solid and liquid waste management, good water management practices and maintaining the ecology and environment of the habitat will be key aspects in the planning and development of the satellite towns.

Spatial planning will take into account the risk factor due to natural disasters such as landslides, flooding, cloudbursts etc. Building codes for the satellite towns will keep the seismic nature of the habitat in mind.

New Areas of Development:

Given below is an overview of selected new areas of development that Uttarakhand Government intends to pursue to create opportunities for enterprises and employment to catapult the State into the forefront of economic and social progress in the country.

11.1 Artificial Intelligence (AI):

Concept:

Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction. Particular applications of AI include expert systems, speech recognition and machine vision.

11.1.1 Some Examples of AI technology are described briefly to clarify the concept:

AI is incorporated into a variety of different types of technology. Seven examples are:

Automation: What makes a system or process function automatically? For example, robotic process automation (RPA) can be programmed to perform high-volume, repeatable tasks that humans normally performed.

Machine learning: The science of getting a computer to act without programming.

Deep learning is a subset of machine learning that, in very simple terms, can be thought of as the automation of predictive analytics.

Machine Vision: The science of allowing computers to see. This technology captures and analyzes visual information using a camera, analog-to-digital conversion and digital signal processing.

Natural language processing (NLP): The processing of human -- and not computer -- language by a computer programme. One of the older and best known examples of NLP is spam detection, which looks at the subject line and the text of an email and decides if it's junk. Current approaches to NLP are based on machine learning. NLP tasks include text translation, sentiment analysis and speech recognition.

Robotics: A field of engineering focused on the design and manufacturing of robots. Robots are often used to perform tasks that are difficult for humans to perform or perform consistently. They are used in assembly lines for car production or by space agencies to move large objects in space.

11.1.2 Status Of Artificial Inteligence:

From 2019 and beyond, increasingly more people from varying backgrounds would participate in building, developing and applying AI in production of goods and services. New production streams would emerge rapidly and whole set of new industries would come up.

AI usage will see a phenomenal rise, creating apps, translating data and algorithms to provide solutions in day to day life. Linguists, data scientists, UX experts, cognitive programmers would see a mushrooming demand.

Entire socioeconomic system is entering a phase of accelerating transformation: markets, businesses, education, Government, social welfare and employment models will be severely impacted.

11.1.3 Scope of Incorporating AI In Uttarakhand:

In the interim budget tabled in Indian Parliament on 1st February 2019, announcement of a national AI programme has been made and a national AI centres and portal is envisaged to be established. According to an estimate in a study by Accenture, AI has the potential to add $957 billion, or 15% of current gross value added, to India's economy by 2035

Highly skilled professionals will be in growing demand to *oversee*/*manage*/*coordinate* the *training of complex Artificial Intelligence systems*; to *ensure their integrity, security, objectivity* and *proper use.* There will be a stream of new business opportunities empowering a culture of entrepreneurship, creativeness and innovation.

Currently there are about 400 start-ups in India working on AI and machine learning domains.

More than $500 million dollars is invested in India's AI sector in 2018. It has grown from $150 million in 2016. With an ample pool of STEM talent and with growing population of youngsters, India will be banking on AI for its economic growth. Uttarakhand would actively solicit and nurture AI developers to set up their base in the State and would offer them specially designed work and living environment.

Artificial intelligence has made its way into a number of areas. Some examples are:

Healthcare. The biggest advances are on improving patient outcomes and reducing costs. Companies are applying machine learning to make better and faster diagnoses than humans. One of the best known healthcare technologies is IBM Watson. It understands natural language and is capable of responding to questions asked of it. The system mines patient data and other available data sources to form a hypothesis, which it then presents with a confidence scoring schema.

Business. Robotic process automation is being applied to highly repetitive tasks normally performed by humans. Machine learning algorithms are being integrated into analytics and CRM platforms to uncover information on how to better serve customers. Chatbots have been incorporated into websites to provide immediate service to customers. Automation of job positions has also become a talking point among academics and IT analysts.

Education. AI can automate grading, giving educators more time. AI can assess students and adapt to their needs, helping them work at their own pace. AI tutors can provide additional support to students, ensuring they stay on track. AI could change where and how students learn, perhaps even replacing some teachers.

Finance Management. AI in personal finance applications, such as mint or turbo tax, is disrupting financial institutions. Applications such as these collect personal data and provide financial advice. Other programs, such as IBM Watson, have been applied to the process of buying a home. Today, software performs much of the trading in equity markets.

Law. The discovery process, sifting through of documents, in law is often overwhelming for humans. Automating this process is a more efficient use of time. Startups are also building question-and-answer computer assistants that can sift programmed-to-answer questions by examining the taxonomy and ontology associated with a database.

Manufacturing. This is an area that has been at the forefront of incorporating robots into the workflow. Industrial robots used to perform single tasks and were separated from human workers, but as the technology advanced that changed.

Policing and Criminal Investigation. Uttarakhand police is using ABHED, a predictive and smart policing system using machine vision and deep learning techniques to identify suspects/criminals in real time while routine checking, examining CCTV footage.

11.2 Skills Development

In order to exceed the annual economic growth rate of 7.1% in economy over the next decade and achieve a 50% increase in real per capita income, the State would adopt a well-designed set of strategies for development of skills of its workforce and their gainful employment to fuel the envisaged growth.

It calls for a review of existing skilling programmes against the projected needs in different sectors. It will also examine the efficacy of existing programme in meeting the present and future needs. Using this review, the State proposes to role out an improvised model of skill building with active use of modern technogies, and inputs from central agencies as well as industries.

Skill development programmes will be integrated with formal education in existing high schools of the State by introduction of vocational training in areas, which are relevant in local context.

Investing in education and the right skills needed to propel the industry forward will be key to AI's growth. Right place to begin is in schools to build a pool of talent for the future. ***Uttarakhand would be able to join the AI mainstream through*** *addition of AI, IoT, Machine Learning and other subjects in its curriculum of B.Tech programmes.*

Companies such as Google, Intel and Microsoft offer short term training programs to computer program developers for upskilling in AI programming. The state would encourage and support training centres to offer such short term training programmes.

Educational *companies are offering* ***UG programs specializing in Artificial Intelligence*** *domain through various universities in India. Uttarakhand would harness these resources for its educational institutions as well as use these for upskilling of the working IT professionals in the state, through specially designed courses and teaching schedules tailored to suit their needs.*

Skilling shall also be integrated with higher education by introducing vocational courses in colleges aligned with courses at school level, which shall provide seamless horizontal and vertical mobility to ITIs, Polytechnics and engineering courses and other higher competence courses.

11.2.1 Integration of Multiple Skill Development Programmes:

There are a host of skill development schemes and initiatives being implemented under Skill India, 19 Central Government ministries and 44 skill development schemes under them. These would be coordinated by the Department of Skill Development to optimally utilise the provisions in a well concerted manner.

11.2.2 Integrated Database and Skill Management Information System:

- A comprehensive database and skill management portal will be developed that will capture the data of all the potential trainees, trained personnel and their placement.
- This database will contain the details of all training institutions, facilities, faculty, their qualifications and experience, types of courses, training calendars, number of trainees enrolled, tie-ups with employers, record of placements etc.
- The portal will reflect an updated status of skill requirements of employers in the organized sector in the State giving district wise status.
- It portal will host a market place for employers to post their openings and for trained personnel to post their CVs to enable matching of requirement with availability, thus building a conducive environment for skill development and employment in the State.

Way Forward – Skills Development

The strategy of the Uttarakhand Department of Skill Development is focused on capacity building of target population in the State based on flexible demand driven approach so that it can translate the vision of the policy into reality.

To address the demand of future skills in Uttarakhand and the country, the following key strategic interventions have been identified for implementation.

Short Term

- Up gradation and up scaling of Government ITIs/Polytechnics.

Mid Term

- Development of skill development curricula and course content in partnership with respective manufacturing and service sector employers in Government and private sectors through State Sector Skill Councils.
- Faculty development of trainers in association with centres of excellence and institutions located within the State/Country as well as through forging of associations with international institutions for capacity developing faculty exchange agreements.

- Outcome focused training programmes linked to job creation.
- Due importance to professional assessment and certification of courses and trainees. Participation of employer groups and State Sector Skill Councils in the process.
- Establish comprehensive IT portal for effective data management.
- Promotion of benefits of being self-employed or an entrepreneur.
- Partnerships with quality private sector entities for skilling.
- Close supportive supervision and concurrent process monitoring of the performance of skill centers across the State.

Long Term

- Encourage colleges and universities to start entrepreneurship courses.
- Establish state-of-the-art skill development centres in each of the growth centres and planned satellite towns of the State to support growth of industries, services and enterprises.
- Market linkages with local arts and crafts, processing of agriculture, horticulture, animal husbandry and forest produce.
- Tracking of performance and options for future up-skilling.
- Develop Skill Training Promotion Centers in rural areas.
- Provide post placement services.

11.3 Biotechnology:

Vision: Realizing the importance of bio-technology (BT) sector in general, the vision of Uttarakhand is to deploy, use, exploit and leverage biotechnology as an effective tool for catalysing accelerated economic growth by sustainably harnessing and converting its bio-wealth into economic wealth on one hand and preserving the same on the other.

Status: Home to a variety of flora and fauna and rare species of plants and animals, Uttarakhand has a natural advantage in the BT sector. The Government is actively working towards making Uttarakhand a biotechnology hub, adopting the following strategies:

- Conserving the rich Biodiversity of Uttarakhand.
- Leveraging the existing knowledge base regarding Plant Biotechnology, within Uttarakhand, to enable farmers' access to competitive strains whether in the ambit of crops, fruits, flowers, herbs or vegetables, etc.
- Promoting and building teaching, research and development institutions enabling them to conduct applied research, innovate and develop the State's human resources in the field. There are a number of premier institutes in the State known for their work in the area of BT, which will be partnered with to promote growth of BT research and applications.
- Promoting establishment of BT industries in the State by actively spreading awareness of the investment opportunities in Biotechnology and allied sectors, in the State. The state has accorded industry status to the units coming under this sector (policy provisions applicable to the IT sector are applicable to this sector) and aims to establish an internationally competitive business infrastructure and environment for developing this industry.
- Promoting scientific use of the vast wealth of herbal and medicinal plants in the State for promotion of pharmaceutical and nutraceutical industries.
- Utilising the IPR regime to ensure the future.

Several areas of the State economy will benefit from the biotechnology led innovations and research such as agriculture, floriculture and horticulture, medicinal and aromatic plants and forestry sector, soil fertility management, microbial products, traditional fermented foods and beverages, vaccine production, animal health including reproduction and nutrition, aquaculture, human health and welfare including balanced nutrition, as well as gene pool conservation and utilization and the cleaner environment.

Establishment of a Biotechnology Park and a state-of-the-art Research and Development Institute are in progress.

11.3.1 New Initiatives in Uttarakhand:

In order to promote tissue culture oriented crops of kiwis, cashew nuts, bananas and flowers, a joint venture between Uttarakhand Horticulture Department and Uttarakhand Council for Biotechnology (UCB) has been established.

Four Agri Export Zones for (i) Litchi, (ii) Medicinal and Aromatic Plants, (iii) Basmati Rice, and (iv) Floriculture have been set up in Uttaranchal

UCB established a high tech web portal with international visibility to attract biotech/biopharma industries in Uttarakhand and operates an environmental biotechnology laboratory for the continuous monitoring of the climate in the line of biotechnology.

In order to develop smart kits for rapid detection of disease in plants, humans and animals, a molecular diagnostic and biosensor research laboratory has been established.

An environmental biotechnology laboratory is in the offing.

Way Forward

Mapping the rich Bio-diversity and creating exhaustive/ extensive transparent databases.

Documentation of diversity of rich flora, including a large number of rare medicinal and aromatic plants, including agro-biodiversity by building physical databases and systematic genetic fingerprinting and other biochemical profiling of selected bio resources, their registration and patenting.

Intensify R&D Work in Biotechnology, Upgrade R&D Infrastructure, Promote Human Resource Development.

R&D work in the potential areas of biotechnology for commercial exploitation. For this, besides improving infrastructure facilities in the R&D institutes, international collaboration with advanced laboratories will be encouraged to further train the scientists in the modern areas of biotechnology, keeping specific needs of Uttarakhand in mind.

- Establishment of Information Technology Park to harness the benefits of Bioinformatics.
- Upscaling and upgrading of the existing teaching facilities within the State. Collaborative and co-operative research facilities as well as academic activities with other institutions within and outside the country. Promotion of private sector based academic institutions which are imparting educational skills as related to various fields of Biotechnology.

Biotechnology Industry in the State:

In the last few years, a number of biotechnology industries have come up in the private sector in Uttarakhand. The State Government is actively promoting fresh investment by biotech companies supported by the existence of strong R&D institutions in the State, which provide an added advantage to develop technologies for the industries depending upon their requirement. The State Government undertakes to provide the following facilities/terms to the companies desirous of establishing BT units in the State:

- BT Units including related R&D Units will enjoy the status of industry and will be eligible for incentives and concessions as provided for the relevant category/class of industry in the Industrial Policy of the State. BT units are treated as Priority Sector Industry.
- Govt. of Uttarakhand leases orchards for development
- Fast track clearance route for FDI
- Depreciation allowance on plant and machinery set up based on indigenous technology
- 125% weighed tax deduction on R&D expenditure
- 3 years excise duty waiver on patented products
- 100% rebate on own R&D expenditure
- 125% rebate if research is contracted in public funded R&D institutions
- Joint R&D projects are provided with special fiscal benefits.

11.4 Solid Waste Management:

Vision: The vision for Swachh Uttarakhand in line with the Swachh Bharat Mission is to ensure hygienic, clean and litter free environment across the State, where waste is treated as a resource, managed in environmentally sustainable manner and zero waste reaches landfills by 2040.

This vision can be accomplished by guiding all ULBs and Gram Panchayats to adopt suitable measures for waste minimisation at source with an emphasis on the principles of 4Rs, comprising Reduce, Reuse, Recycle and Recover; with proper systems of segregation, collection, transportation, processing, treatment and disposal.

Status: *The status of solid waste management in the State is encapsulated below (*Source Aug 2017 report of Urban Development Directorate, Dehradun*):*

- Average current Waste Per Capita MSW Generation in the State (Urban, Floating Population and Rural combined) = 500gms/day
- Average current Waste Per Capita MSW Generation in urban areas in the State = 300gms/day
- Average ULB's Current Municipal Solid Waste Generation (tons / day) including Urban Agglomerations = 915MTPD
- Average Floating Population waste generation is 75 gms/day = 1135 MTPD; annual floating population is 3 times the State population
- Current daily lifting and dumping of MSW at dumpsites is approximately 50% of waste generated
- Suitable Land sites for developing landfills and setting compost processing facility is almost 42% short of its requirement by 2041.
- Of the 92 ULBs and urban agglomerations, financial assistance has been provided to 29 ULBs to establish solid waste management systems and infrastructure. Rest of the ULBs are managing municipal waste from funds available under 14th finance commission and ULB's own resources. Same is the case with the GPs. 35 ULBs had bylaws to collect user charges for door step waste collection while rest 57 did not have any user charges.
- 29 ULBs were yet to identify land to implement their SWM plans/projects.

11.4.1 Challenges:

The State faces several challenges in management of solid waste.

- The awareness level among the ULB officials, Gram Panchayats and public about the waste management is also not adequate
- Lack of continuous funding to ULBs and GPs for sustainable SWM
- The staff, tools and infrastructures that are required in compliance with the SWM rules, 2016 at ULB and GP level are inadequate, need urgent attention
- Lack of inter-departmental coordination, makes identification of suitable land difficult in compliance of legal requirements.
- Lack of waste management infrastructure for other wastes are also a threat, which is getting mixed with municipal waste and which has to be diverted from a dumpsite
- Lack of transparency, expertise & inefficiency in handling & disposal of solid wastes.
- Insufficient cost recovery by collecting user charges.

11.4.2 Strategic Priorities:

The State Government has laid out certain goals, plans and strategies to overcome the challenges in compliance with the Solid Waste Management Rules, 2016 as briefly described below:

Priority # 1: To ensure completion of sanctioned projects through regular monitoring and evaluation at district and State level..

Priority # 2: Ensure that the required land is acquired and required environmental clearances are obtained prior to the commencement of the projects..

Priority # 3: Ensure that the DPRs and land acquisition along with Environmental Clearance

for Phase – III projects is completed before June, 2020 so that they are completed by June, 2021.

Priority # 4: Simultaneously undertake awareness campaigns with dedicated IEC activities in all 3 Phases.

Priority # 5: Undertake capacity building programmes for ULBs and initiate supportive legislations for effective handling and scientific disposal of MSW and the practices of 4R's.

11.4.3 Strategies:

To achieve the above priorities, the following strategies are proposed:

- ✓ Promote reduce, reuse and recycling, followed by material recovery and energy recovery.
- ✓ Waste segregation at source to be made mandatory as per the SWM Rules, 2016.
- ✓ Promote decentralized waste management to decrease pressure on land requirements for future waste management.
- ✓ Maximize reuse, recycling and material recovery
- ✓ Centralized resource recovery from the waste stream post collection through proven waste processing technologies.
- ✓ Promote Reuse and recycling through extended producer responsibility and through producers of packaging material.
- ✓ Diversion of Construction Debris to another site for future application; no C andD waste shall be mixed with general municipal waste.
- ✓ Recovery of O and M expenses through user charges.
- ✓ Implement disposal bans on materials that limit opportunities to achieve reuse, recycling or energy recovery.
- ✓ Expand the monitoring and enforcement of disposal bans; effective communication.
- ✓ Investigate financial and regulatory barriers preventing reuse of materials
- ✓ Developing a Community Education and outreach services plan to solicit Public Inputs
- ✓ Rigorous IEC activities in all the ULBs to create community awareness regarding effective waste management
- ✓ Providing necessary infrastructure, tools and equipment to all ULBs for effective SWM management
- ✓ Capacity building of ULBs, Governance Roles and Responsibilities
- ✓ State to provide technical and administrative support to the ULBs.
- ✓ Defining the role and responsibilities of stakeholders at State level, formulation of a State Level Committee and quarterly review.
- ✓ Stringent Monitoring in the field to ensure effective compliance of operations.
- ✓ Strict implementation of supporting acts and rules like – Plastic Waste (Management and Handling) Rules, 2016; Biomedical Waste (Management and Handling) Rules, 2016; Construction and Demolition Waste Management Rules, 2016; E-Waste Management and Handling Rules 2016; Hazardous Waste Management and Handling Rules 2016; Environment Protection Act
- ✓ Notifying of the supporting bills/ legislation to fill the gap, if there are any like – Anti Littering and Anti Spitting Bill;
- ✓ Waste research and audits at frequent intervals, to introduce newer technologies which are ecologically and economically viable and ease to operate.
- ✓ Integration of informal sector in waste management as required by the SWM Rules 2016.

11.5 Sunrise Focus Areas

11.5.1 Chemical Free Agricultural Practice of Zero Budget Natural Farming (ZBNF):

Andhra Pradesh is pushing for a chemical-free agricultural practice of zero budget natural farming (ZBNF), which it plans to scale up from about 160,000 farmers currently to six million by 2024.

Soil fertility and soil organic matter is restored by pursuing ZBNF. Less water is required under ZBNF and it is a climate-friendly system of agriculture.

Apart from the UN Environment, the Azim Premji Philanthropic Initiative (APPI) announced a grant of ₹ one billion (₹100 crore) in support of the scheme and the NITI Aayog and international banking group BNP Paribas have also shown interest. The Food and Agriculture Organisation of the UN (FAO) is also giving AP approximately ₹10 million ($150,000) for capacity building for the purpose of ZBNF.

Sustainable India Finance Facility (SIFF) – a partnership facilitated by the United Nations Environment and the World Agroforestry Centre are assisting in mobilizing funds.

11.5.2 Community Based Groundwater Management:

The Andhra Pradesh Farmer Managed Groundwater System (APFAMGS) is a partnership with farmers to implement Demand Side Groundwater Management. In seven drought prone districts of Andhra Pradesh - thousands of farmers in 638 habitations have taken the lead to reduce exploitation of groundwater.

The project undertook extensive training of farmers (Farmer Water Schools) and (FAO 2010). Reversal of a large scale decline of this resource cannot be reversed by individual action. APFAMGS Project is an enabling intervention to manage groundwater overdraft through voluntary self-regulation. Established a hydrological monitoring system (Rainfall Data, Observation Wells, Ground Water Level Data) to facilitate an annual, participatory exercise of community decision making. Efficient water use practices such as mulching, bunding, improved irrigation practices, and large-scale promotion of water saving devices have been implemented by farmers.

11.5.3 Vision Management Unit – Andhra Pradesh:

The Vision Management Unit is a team under the Planning Department, Government of Andhra Pradesh that comprises of professionals with wide range of knowledge and expertise, working together on data analytics and policy, performance indicators, best practices and global benchmarking studies to prepare comprehensive strategies to achieve the ambitious targets that the Government of Andhra Pradesh has set for itself in order to deliver on its promise of building a happy, inclusive, competitive and innovation-driven society.

11.5.4 Telangana Academy for Skill and Knowledge:

Telangana Academy for Skill and Knowledge (TASK) is an initiative of the State Government of Telangana. TASK was established in 2014 for skilling youth and Creating Synergy between institutions of Government, Industry and Academia with the objective of improving quality, relevance, access and Outreach of training. It also facilitates entrepreneurial abilities and enhances industry linkages.

11.5.5 The Telangana State Innovation Cell (TSIC):

TSIC was set up in 2017 under the State Innovation Policy with a three-fold mandate.

- To promote the culture of Innovation and Entrepreneurship in the State.
- To promote Innovation in Government departments/organizations.
- To build a culture of Innovation from the school stage.

The Innovation Cell is headed by the Chief Innovation Officer. The team works towards nurturing young talent, foster Innovation and Entrepreneurship in the State.

11.5.6 Land Pooling - Innovative Initiative for Development Andhra Pradesh:

Implementing Agency: Capital Region Development Authority. Year of launch 2015.

The Government of Andhra Pradesh has put forward an innovative idea of involving farmers in the building of the new capital city Amaravathi. This has paved the way for Voluntary Land Pooling for the proposed capital city.

Voluntary Land Pooling is a process in which the farmers in the noticed Capital Development Authority Region (CRDA) join hands with the Government by voluntarily offering their farm lands to CRDA, accepting the developed plots in return.

Nearly 33,000 acres of land was voluntarily pooled by small and medium farmers for a public cause. The entire exercise of land pooling for the brand new capital was completed in 3 months. However, the administration was careful in ensuring that the farmers of jareebu lands, who harvested three crops a year, did not feel their loss in comparison with dry-land farmers. The lands with irrigation facility spread across 10 river front villages have been given a better package. This is one of the best practices of Government of Andhra Pradesh that successfully converted 'a problem into a solution.'

Chapter- 12
Putting Strategies Into Practice

Best of intentions, strategies and plans do not come to fruition largely due to lack of robust implementation structures, organisational issues, programmatic gaps and close monitoring.

In order to realise the Vision 2030 of The State of Uttarakhand in mission mode, the following broad components/stages are suggested:

12.1 Identification of Stakeholder Groups:

Identification of stakeholders and groups who would directly or indirectly be involved in the implementation the strategies and plans for each thematic area, at the very start will enable them to be invited to participate, be informed of the strategic directions that are planned, their tactical suggestions invited and taken on board and ownership of the plans developed at the onset. Stakeholders will be from the Government, concerned departments, private sector, professional associations, academic/research institutions, NGOs, financial institutions, development agencies and regulatory bodies.

12.2 Dissemination of Goals and Strategies to Stakeholders:

Dissemination of strategies and plans to the stakeholders and inviting their suggestions is highly useful at the start so that varying viewpoints can be taken into consideration in the planning stage itself. This also builds ownership of stakeholder groups and develops a positive atmosphere of participative action and team work.

12.3 Constitution of Empowered Task Forces To Spearhead Each Thematic Area:

Each thematic area requires an empowered tasks force of programme planners, managers, technical experts, and other selected stakeholders depending on their envisaged role in steering the implementation process. Each task force should draw its authority from the State Cabinet and report progress quarterly to the Steering Committee chaired by The Chief Secretary. Six monthly progress may be reviewed by State Cabinet.

12.4 Road Map – Setting Short, Medium and Long Term Priorities and Milestones:

The task forces may set short, medium and long term priorities and develop thematic road maps to operationalise agreed strategies. Each strategic intervention should specify milestones and time frame to achieve the same.

12.5 Annual Action Plans with Measurable Indicators, Assigned Responsibilities and Time Frames for Each Stage:

Preparation of annual action plans need to follow detailing sequential flow of activities with specific time frames and responsibility assignment to designated programme managers/experts. Measurable indicators for processes and outputs are to be detailed with indication of frequency of measurement of these. Process and output monitoring processes and responsibilities require to be specified. Reporting protocols may be detailed.

12.6 Preparation of Budget Estimates:

Each annual action plan requires detailed budget estimation based upon realistic and validated figures supported by quotes taken from service providers and vendors with the help of experts in the task forces.

12.7 Securing Resources:

Annual action plans once prepared will bring out resource requirements in terms of funds and personnel. These need to be secured before initiating implementation process. Resources could be from Central Government, State Budget, Development Partners, Development Bank, CSR Funds of Corporate Houses, Development Bonds, Financial Institutions and Philanthropic Societies and Donors.

Establishing "The Uttarakhand Environment Services Trust" may be a way forward to garner non-traditional financial resources for environmental protection and deployment of hill

communities in environmental protection and regenerative work.

12.8 Developing Systemic and Stakeholder Capacities/Capabilities:

A review of existing systemic policies, guidelines and norms need review in each thematic areas and in concerned Government Departments to remove bottlenecks and create "Ease of Programme Implementation" protocols and regime in the State. Procurement processes and contracting procedures may need to be strengthened and programme personnel made professionally adept at using the same seamlessly in given time frame. Delays in procurement and due to poorly drafted specifications/terms of reference and deliverables need to be prevented through professional support.

12.9 Putting Plans into Action:

Launch of new initiatives requires close and intensive support and supervision till the programmes are up and running. The task forces need to give due attention to this phase so that the new systems and strategies are established in the shortest possible time. This phase is a on-the-job learning and training phase and should be treated as such to build a robust foundation for the programmes to show their potential. Any short-cut or lack of attention during this phase, results in costly delays/lack of progress/wastage of resources/absence of expected outcomes.

12.10 Stewardship – Monitoring, Timely Feedback and Course Corrections:

The designated empowered tasks forces need to provide timely and regular stewardship support to the programme managers so that hurdles in start-up phase are overcome without disturbing the programme time frame. The task forces need to promote convergent action amongst concerned departments to build programmatic synergies. When necessary timely corrective action by the empowered tasks forces can save a programme from becoming a non-starter.

References

Forests and Climate Change

- Alford D and R Armstrong (2010) Role of glaciers in stream flow from Nepal Himalaya. *The Cryosphere Discuss*. 4: 469–494.
- Bhambri R, M Mehta, DP Dobhal, AK Gupta (2015) GLACIER LAKE INVENTORY OF UTTARAKHAND. Editor: Dr Kishor Kumar, Editorial Assistance: Sh Rambir Kaushik Wadia Institute of Himalayan Geology, Dehradun 248001, India.
- Bhattacharjee A, RS Rawal, GCS Negi, R Joshi, S Sharma, DS Rawat, NM Ishwar, JS Rawat, PR Sinha, L Jia and J Merten (2018) Assessing landscape restoration opportunities for Uttarakhand, India. New Delhi, India: IUCN. Xii+85pp.
- Charoo SA, LK Sharma and S Sathyakumar (2009) Asiatic Black Bear- Human conflicts around Dachigam National Park, Kashmir. Technical Report, Wildlife Institute of India, Dehradun. 51pp.
- Chauhan DS and SP Goyal (2000) A study on distribution, relative abundance and food habits of leopard (*Pantherapardus*) in Garhwal Himalayas. Report of the Wildlife Institute of India, Dehradun.
- Chauhan NPS (2004) Black bear-Human conflicts in Garhwal and Kumaon hills Uttaranchal, India. Poster presentation at the 15th International Conference on Bear Research & Management. San Diego, California, USA, 8-13 February 2004 (Abstract).
- Costanza R, R d'Arge, R de Groot, S Farberk, M Grasso, B Hannon, K Limburg, S Naeem, RV O'Neil, J Paruelo, RG Raskin, P Suttonkk and M van den Belt (1997) The value of the world's ecosystem services and natural capital. *Nature* 387:253-260.
- Hussain A, GS Rawat, SS Kumar and BS Adhikari (2018) People's perception on human-wildlife conflict in a part of Kailash Scared Landscape-India and strategies for mitigation. *Indian Forester* 144(10):996-999.
- Immerzeel WW, LPH Van Beek, and MFP Bierkens (2010) Climate change will affect the Asian water towers. *Science* 328(5984):1382–1385.
- Intergovernmental Panel on Climate Change (IPCC) (2003) Good Practice Guidance for LULUCF. IPCC, c/o Institute for Global Environmental Strategies, Japan.
- Jackson RM and R Wangchuk (2001) Linking snow leopard conservation and people-wildlife conflict resolution: grassroots measures to protect the endangered snow leopard from herder retribution. *Endangered Species Update,* 18, 138-141.
- Latwal A, P Sah and S Sharma (2018) A cartographic representation of a timberline, treeline and woody vegetation around a Central Himalayan summit using remote sensing method. Tropical Ecology 59(2): 177–186.
- Millennium Ecosystem Assessment (MEA) (2005) Ecosystems &Human Well-being: Synthesis. Island Press, Washington.
- Miller JM, Warnaars T, Rees HG, Young G, Shrestha AB, Collins DC. (2011) What is the Evidence About Glacier Shrinkage Across the Himalayas? DFID technical report 201642.
- Mool PK, D Wangda, SR Bajracharya, K Kunzang, DR Gurung and Joshi SP (2001) Inventory of Glaciers, Glacial Lakes and Glacial Lake Outburst Floods, ICIMOD, Kathmandu, Nepal.
- Negi GCS and Varun Joshi (2002) Drinking Water Issues and Development of Spring Sanctuaries in a Mountain Watershed in the Indian Himalaya. *Mountain Research and Development* 22(1):29-31. 2002.
- Sathyakumar S, T Bhattacharya, K Mondal, D Naha and VB Mathur (2018) Human-Wildlife Interaction (Conflicts) in the Indian Himalayan Region: current scenario and the path ahead. Proceedings of National Conference on Hill Agriculture in Perspective. Directorate of Experiment Station, G.B. Pant University of Agriculture and Technology, Pantnagar. Pp 121-137.

- Singh G, Padalia H, Rai ID, Bharti RR &Rawat GS (2016) Spatial extent and conservation status of Banj oak (*Quercusleucotrichophora* A. Camus) forests in Uttarakhand, Western Himalaya. Tropical Ecology 57(2): 255-262.
- Singh JS and Singh SP (1992) Forests of Himalaya, Structure, Functioning & Impact of Man. GyanodayaPrakashan, Nainital.
- Singh RD, Gumber S, Tewari P, Singh SP (2016) Nature of forest fires in Uttarakhand: frequency, size and seasonal patterns in relation to pre-monsoonal environment. *Current Science* 111 (2): 398-403.
- Singh SP (2014) Attributes of Himalayan Forest Ecosystems: They are not Temperate Forests. *Proc Indian NatnSciAcad* 80 (2):221-233.
- Singh SP and R Thadani (2013) Valuing ecosystem services flowing from the Indian Himalayan States for incorporation into national accounting. In: M Lowman S Devy T Ganesh editors. Treetops at Risk: Challenges of Global Canopy Ecology and Conservation. New York, NY: Springer, pp 423–434.
- Singh SP, A Pandey and V Singh (2018) Nature and extent of forest degradation in Central Himalayas. Springer (Accepted).
- Singh SP, IB Khadka, B Karky E Sharma (2011) Climate Change in the Hindu Kush–Himalayan. The State of Current Knowledge. Kathmandu, Nepal: International Centre for Integrated Mountain Development.
- Skutsch M (Editor) (2011) Community Forest Monitoring for the Carbon Market: Opportunities under REDD. Earthscan 188p.
- Skutsch MM, McCall MK and Karky B, Zahabu E and Peters-Guraiz G (2009) Case studies on measuring & assessing forest degradation: community measurement of carbon stock change for REDD, FAO, 2009. Forest resources assessment working paper 156.
- Tacconi L, S Mahanty and H Suich (2010) Payments for environmental services, Forest Conservation and Climate change: Livelihoods in the REDD? Edward Elger Publishing Ltd. UK and USA.
- Tambe S, G Kharel, ML Arrawatia, H Kulkarni, K Mahamuni, and AK Ganeriwala (2012) Reviving dying springs: Climate change adaptation experiments from the Sikkim Himalaya. *Mountain Research and Development* 32(1):62–72.
- Tucker RP (1993) Forests of Western Himalayas and the British Colonial System (1815- 1914). In: Indian Forestry: A Perspective (ed. A.S. Rawat), pp. 163-192. Indus Publishing House, Delhi.
- Yao T, L Thompson, W Yang, W Yu, Y Gao, X Guo, X Yang, K Duan, H Zhao, B Xu, J Pu, A Lu, Y Xiang, DB Kattel, and D Joswiak (2012) Different glacier status with atmospheric circulations in Tibetan Plateau & surroundings. *Nature Climate Change* 2:663–667
- Zobel DB and Singh SP (1997) Forests of the Himalaya: Their contribution to ecological generalizations. Bio Science 47:735-745.

Infrastructure

- Statistical Abstract Uttarakhand (2015-16): Directorate of Economics and Statistics, GoUK
- Human Development Report of Uttarakhand (2018): Directorate of Economics and Statistics, Department of Planning, Government of Uttarakhand.
- NITI Aayog (2015): Report on India's Renewable Road Map 2030.
- 24 X 7 Power for all Uttarakhand, A Joint Initiative of GoI & GoUK, CRISIL.
- Uttarakhand Vision 2030 (2018): Directorate of Economics and Statistics, GoUK
- Hand Book on Civil Aviation Statistics 2016-17
- ' http://dgca.nic.in/pub/Handbook_2016-17.pdf. Accessed April 25, 2018.
- National Civil Aviation Policy 2016
- http://www.civilaviation.gov.in/sites/default/files/Final_NCAP_2016_15-06-2016-2_1.pdf. Accessed April 25, 2018.
- IATA and Oxford Economics, "The Importance of Air Travel to India".
- http://www.iata.org/publications/economics/Reports/voa-country-reports/2016/ap-india-2017.pdf. Accessed April 25, 2018.
- Invest India, Aviation Sector Overview
- https://www.investindia.gov.in/sector/aviation. Accessed April 25, 2018.ibi https://www.ibef.org/download/Aviation_Report_Feb_20183.pdf.
- Hand Book on Civil Aviation Statistics 2016-17
- ' http://dgca.nic.in/pub/Handbook_2016-17.pdf. Accessed April 26, 2018. Ibid.
- Aviation Sector: Status Check and Roadmap." Accessed April 27, 2018.http://www.advayalegal.com/articles/article-october,-2014-(edition-of-infrastructure-today-magazine).pdf.
- Hindu Business Line, April 14, 2014. "Indian Aviation grounded by High Taxes." Accessed 27.04.2018.
- https://www.thehindubusinessline.com/economy/India-aviation-grounded-by-high-taxes-IATA-chief/article20727740.ece.
- National Civil Aviation Policy, 2016. Ministry of Civil Aviation. Accessed April 27, 2018 http://www.civilaviation.gov.in/sites/default/files/Final_*NCAP_2016_15-06-2016-2_1*.pdf.

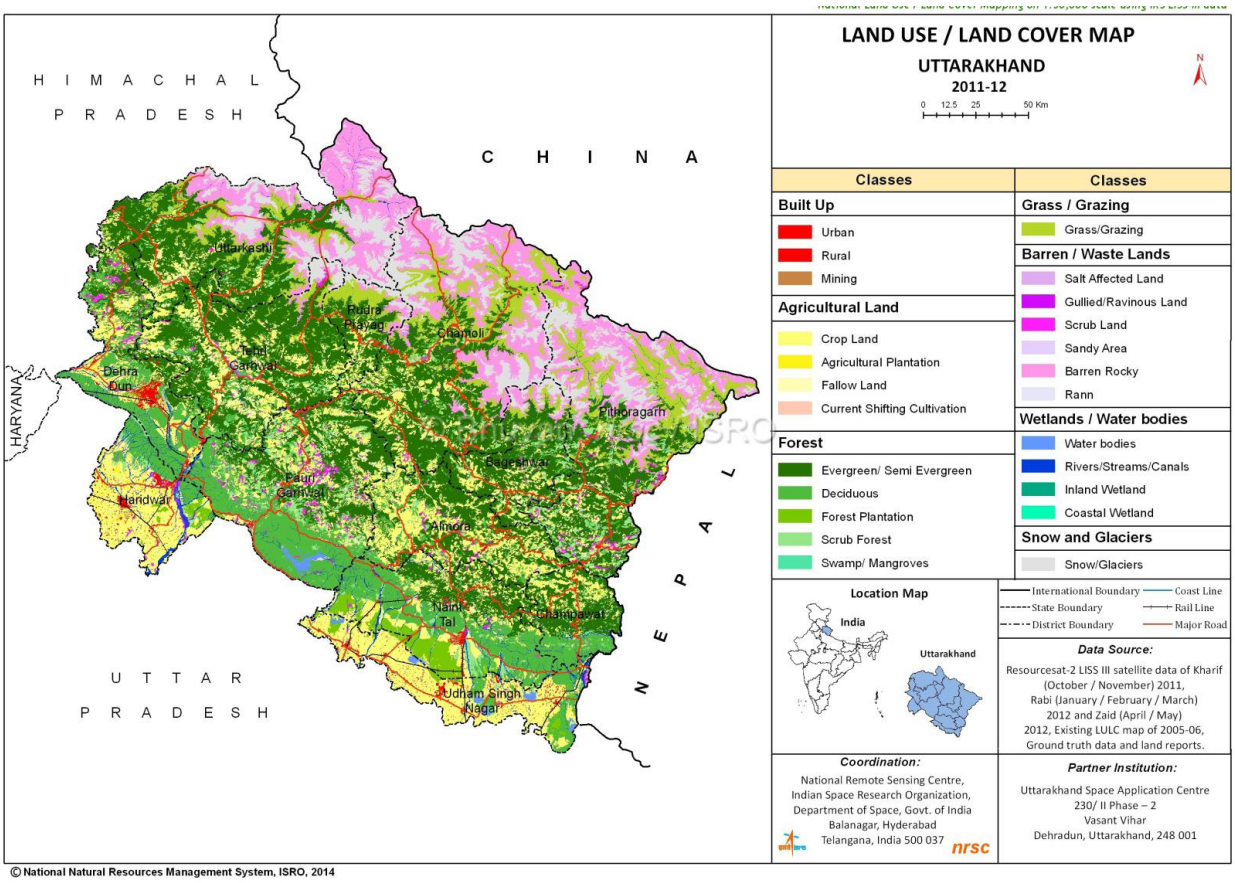
Water

- Dash R. R, Grischek, T. Kumar P. Mehrotra, I. (2008) Lake bank filtration at Nainital, India: Water-quality Evaluation.
- Dobhal, D. P., Gergan, J. T., and Thayyen, R. J. (2004) Recession and morphogeometrical changes 25 of Dokriani glacier (1962–1995), Gharwal Himalaya, India, *Current Science* India, 86(5), 692–696
- GSI Special Publication No. 53. Proceedings (2001): Symposium on Snow, Ice, Glaciers- A Himalayan Perspective.
- ICIMOD (2001) Inventory of Glaciers, glacial Lakes and Glacial Lake outburst Floods, monitoring and early warning system in the Hindu Kush-Himalayan region, Nepal,(UNEP/RC-AP)/ICIMOD, Kathmandu,
- Immerzeel, W. W., van Beek, L. P., and Bierkens, M. F. (2010) Climate change will affect the Asian water towers *Science* 328, 1382 –1385.
- IPCC, Kundzewicz, Z. W., Mata, L. J., Arnell, N. W., Do¨ ll, P., Kabat, P., Jime´nez, B., Miller, K. A., Oki, T., Sen, Z., and Shiklomanov, I. A. (2007a) Freshwater Resources and their Management, in: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, edited by: Parry, M. L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J., and Hanson,C. E., Cambridge University Press, Cambridge, UK, 173–210,
- IPCC, Rosenzweig, C., Casassa, G., Karoly, D. J., Imeson, A., Liu, C., Menzel, A., Rawlins, S., Root, T. L., Seguin, B., Tryjanowski, P. (2007b) Assessment of Observed Changes and Responses in Natural and Managed Systems, in: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, edited by: Parry, M. L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J., and Hanson, C. E., Cambridge University Press, Cambridge, UK, 79–131.
- Kaser, G., Grosshauser, M. and Marzeion, B. (2010): Contribution potential of glaciers to water availability in different climate regimes. *Proc. Natl Acad. Sci. USA (PNAS)*, **107**(47), *Proceedings of the National Academy of Sciences*, U.S.A. 107, 20 223- 20 227
- Kaul, M.K. (1999) Inventory of the Himalayan Glaciers: Geological Survey of India Special Publication No. 34, 165 p.
- Kumar, R., Areendran, G., and Rao, P. (2009). Witnessing Change: Glaciers in the Indian Himalayas, World Wide Fund for Nature and Birla Institute of Technology
- Kumar, V., Singh, P., and Singh, V. (2007) Snow and glacier melt contribution in the Beas River at Pandoh Dam, Himachal Pradesh, India, *Hydrology. Science Journal*, 52(2), 376–388.
- Lang, T. J., and Barros, A. P. (2004) Winter storms in Central Himalayas, *Journal of the Meteorological Society* of *Japan*., 82(3), 829–844.
- Mani, A. (1981) The climate of the Himalaya, in: The Himalaya – Aspects of change, edited by: Lall, J. S. and Moddie, A. D., Oxford University press, Delhi, 3–15.
- Nainwal, H. C., Negi, B. D. S., Chaudhary, M., Sajwan K. S. and Gaurav, A. (2008) Temporal changes in rate of recession: Evidences from Satopanth and Bhagirath Kharak glaciers, Uttarakhand, using Total Station Survey. *Current Science*, 94 (5).
- Negi GCS, Joshi V. 1996. Geohydrology of springs in a mountain watershed: The need for problem solving research. Current Science 71(10):772–776.
- Negi GCS, Joshi V. 2004. Rainfall and spring discharge patterns in two small drainage catchments in the Western Himalayan Mountains, India. Environmentalist 24:19–2
- Rai RN, Singh KA, Solanki RC. 1998. A case study of water flows of some hill springs of Sikkim. Indian Journal of Soil Conservation 16(1):52–56.
- Rees, H. G. and Collins, D. N. (2006) Regional differences in response of flow in glacier-fed Himalayan rivers to climatic warming. *Hydrological Processes*. 20, 2157–2169

- Sah, M., G. Philip, P. Mool, and S. Bajracharaya. 2005. Inventory of Glaciers and Glacial Lakes and Identification of Glacial Lake Outbursts of Floods (GLOFs) Affected by Global Warming in the Himalayan Region. Dehradun, India: Wadia Institute of Himalayan Geology.
- Sandeep Tambe, Ghanashyam Kharel, M. L. Arrawatia, Himanshu Kulkarni, Kaustubh Mahamuni, and Anil K. Ganeriwala 2012 Reviving Dying Springs: Climate Change Adaptation Experiments From the Sikkim Himalaya Mountain Research and Development, 32(1):62-72.
- Singh and Sharma, 2014 Urbanisation challenges in Himalayan region in context of climate change adaptation and disaster risk management. – Background paper
- Singh V and Pandey A 2018 Climate and Development a Dignostic assessment since formulation of Uttarakhand In Nautiyal RR and Dutta R. Development Dynamics of Uttarakhand State Vol (I) Kalpraz Publications
- Singh, P. and Jain, S.K. (2002): Snow and glacier melt in the Satluj River at Bakhra Dam in the Western Himalayan region, *Hydrological Sciences Journal*, 47, 93–106.
- Tambe S, Arrawatia ML, Bhutia NT, Swaroop B. 2011. Rapid, cost effective and high resolution assessment of climate-related vulnerability of rural communities of Sikkim Himalaya, India. Current Science 101(2):165–173
- Thayyen, R. J., and Gergan, J. T. (2010): Role of glaciers in watershed hydrology: ―Himalayan catchment perspective, The Cryosphere Discussions.
- TOI 2016, Naini lake's depth decreased by 7m in last 37 yrs http://timesofindia.indiatimes.com/articleshow/54487749.cms?utm_source=contentofinterest &utm_medium=text&utm_campaign=cppst
- TOI 2016, 1200 Springs Dry up in Uttarakhand. https://timesofindia.indiatimes.com/city/dehradun/12000-springs-dry-up-in-Uttarakhand/articleshow/52873485.cms
- UAPCC 2014, Uttarakhand Action Plan on Climate Change, Government of Uttarakhand.
- Valdiya KS, Bartarya SK. 1989. Diminishing discharges of mountain springs in a part of Kumaun Himalaya. Current Science 58(8):417–426.
- Valdiya KS, Bartarya SK. 1991. Hydrological studies of springs in the catchment of the Gaula River, Kumaun Lesser Himalaya, India. Mountain Research and Development 11(3):239–258.
- Vaux, H.J., Balk, Jr., D., Cook, E.R., Gleick, P., Lau, W.K.-M., Levy, M., Malone, E.L. McDonald, R. , Shindell, D., Thompson, L.G., Wescoat Jr., J.L., and Williams, M.W.(2012) Himalayan Glaciers: Climate Change, Water Resources, and Water Security. National Academies Press.
- Vohra, C. P. (1981) Himalayan Glaciers, in: The Himalaya: Aspects of change, edited by: Lall, J. S. and Moddie, A. D., Oxford University press, Delhi, 138–151.
- World Bank 2017 Program Appraisal document , Republic of India for Uttarakhand Water supply Program for Peri-Urban areas http://documents.worldbank.org/curated/en/805281515294024143/pdf/Uttarakhand-WSP-PAD-12142017-SM-12142017.pdf

Migration

- Bhandari, G. and Chinappa-Reddy, B.V. (2015). Impact of Out-Migration on Agriculture and Women Work Load: An Economic Analysis of Hilly Regions of Uttarakhand, India. *Indian Journal of Agricultural Economics* 70(3):395–404.
- Census of India (2011). Census of India. . censusindia.gov.in.
- GoU (2018). *Uttarakhand Migration Commission Report*. Pauri Garhwal: Rural Devpt. & Migration Commission of Uttarakhand.
- Grunawalt, P. (2012). *Why are Cities the Only Place for Dreams? Outmigration of Youths from Rural Uttarakhand*. [Independent Study Project]. Vermont, USA: Sustainable Development and Social Change Program, School for International Training.
- Mamgain, R.P. (2004). *Employment, migration and livelihoods in the Hill Economy of Uttaranchal*. [Doctoral Thesis]. New Delhi;
- Mamgain, R.P. (2007). *Growth, Poverty, and Employement in Uttarakhand*. Institute of Human Development.
- Mamgain, R.P. and Reddy, D.N. (2015). *Outmigration from Hill Region of Uttarakhand: Magnitude, Challenges and Policy Options*. Hyderabad: NIRD and Panchayati Raj.
- Manhas, D.S. and Negi, R.S. (2016). Demographic Aspects Of Hill Rural Out-Migrants: A Study Of Garhwal District, Uttarakhand (India). IJIR&AS 3(10):224–226.
- Negi, R.S. and Manhas, D.S. (2015). Hill Rural Out-Migrant's kinship with their native place: A study of District Garhwal (Uttarakhand), India. IRJI&M 1(5):19–25.
- Sati, V. (2016). Patterns and Implications of Rural-Urban Migration in the Uttarakhand Himalaya, India. *Annals of Natural Sciences* 2(1):26–37.



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DIRECTORATE OF ECONOMICS AND STATISTICS,

Government of Uttarakhand

100/06, Neshvilla Road, Gate No. 4, Dehradun, Uttarakhand

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