

Template/Pro forma for Submission

NMHS-Himalayan Institutional Project Grant

**NMHS-FINAL TECHNICAL REPORT (FTR)**

Demand-Driven Action Research and Demonstrations

<b>NMHS Reference No.:</b>	<b>GBPNI/NMHS – 2018-19/ SG 9/171</b>
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<b>Date of Submission:</b>	1	3	1	0	2	0	2	0
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**PROJECT TITLE (IN CAPITAL)**

**LINKING TOURISM, LOCAL ENVIRONMENT AND WASTE GENERATION IN INDIAN  
HIMALAYAN STATES USING CGE MODEL: CASE-STUDY OF UTTARAKHAND**

**Project Duration: *from* (01.01.2019) *to* (10.04.2020).**

**Submitted to:**

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## NMHS-Final Technical Report (FTR) *template*

### Demand-Driven Action Research Project

DSL: Date of Sanction Letter

2	1	1	2	2	0	1	8
d	d	m	m	y	y	y	y

DPC: Date of Project Completion

1	3	1	0	2	0	2	0
d	d	m	m	y	y	y	y

### Part A: Project Summary Report

#### 1. Project Description

i.	Project Reference No.	GBPNI/NMHS-2018-19/SG 9/ 171					
ii.	Type of Project	Small Grant	X	Medium Grant		Large Grant	
iii.	Project Title	LINKING TOURISM, LOCAL ENVIRONMENT AND WASTE GENERATION IN INDIAN HIMALAYAN STATES USING CGE MODEL: CASE-STUDY OF UTTARAKHAND					
iv.	State under which Project is Sanctioned	Uttarakhand					
v.	Project Sites (IHR States covered) (Maps to be attached)	Uttarakhand, Ladakh					
vi.	Scale of Project Operation	Local	✓	Regional		Pan-Himalayan	
vii.	Total Budget/ Outlay of the Project	Rs. 39,74,920/-					
viii.	Lead Agency	Indian Council for Research on International Economic Relations					
	Principal Investigator (PI)	Dr. Amrita Goldar					
	Co-Principal Investigator (Co-PI)	NA					
ix.	Project Implementing Partners	NA					
	Key Persons / Point of Contacts with Contact Details, Ph. No, E-mail	Mrs. Kavita Sarah Nathan, Secretary, Ph- +91 11 43112489 <a href="mailto:knathan@icrier.res.in">knathan@icrier.res.in</a>					

## 2. Project Outcomes

- 2.1. **Abstract** (not more than 500 words) [it should include background of the study, aim, objectives, methodology, approach, results, conclusion and recommendations).

**Background:** Indian Himalayan Region (IHR) constitutes about 17% of the country's geographical area and is classified as one of the 35 Global Biodiversity Hotspots. The IHR states have always been a major tourist attraction and with the rise in economic activity, the ecologically rich and sensitive IHR region is coming under the threat of environmental degradation. Uttarakhand, an important IHR state, attracts pilgrims and tourists from all around the world. The increased economic activity in the state has resulted in generation of substantial amount of municipal solid waste with only a small proportion undergoing treatment. In the absence of policy safeguards, this would pose a serious problem. The study aimed to provide guidance on state level integrated policy interventions for effective waste management in the state.

**Objectives/ Aim:** The objectives of the project were:

- Understanding the linkages between tourism, local environment and waste generation at state level
- Finding the ideal policy instruments for effective waste management in the state.

**Methodology:** The methodology comprised of the following components:

- Quantification of tourism induced economic activities in the state.
- Development of state-level Input-Output (I-O) model and Social Accounting Matrix (SAM) with tourism and waste as separate sectors. The resulting SAM is a mixed-units model with waste sector in physical units and the remaining sectors in the monetary units.
- Development of a separate model of waste generation and linking it with tourist footfall.
- Construction of computable general equilibrium (CGE) model and formulation of waste management related policy recommendations based on the model results.

**Approach:** The construction of I-O table and SAM for Uttarakhand requires data on sector-wise value of outputs, input structure, estimates of sector wise consumption of all the components of final demands, sector-wise and household-type wise factor earnings, tax revenues and income from abroad. The data has been compiled from National Sample Survey Organisation (NSSO), reports published by State Directorate of Economics and Statistics and Centre for Monitoring Indian Economy (CMIE) survey. In case of unavailability of data, national level figures have been utilized. To include tourism as a separate sector in the I-O and SAM, tourism industry ratios have been calculated based on the methodology suggested in the literature.

A computable general equilibrium (CGE) model has been developed for the state which has been calibrated using the data from the developed SAM. The model development required estimation of consumption and expenditure functions which has been done with the help of NSSO, CMIE and Annual Survey of Industries (ASI) data.

A separate model for waste has also been built. In order to link the waste generation and tourism, NSSO's Domestic Tourism Survey data has been used. However, unavailability of data on waste was a challenge. The team has undertaken field visits to seven districts of Uttarakhand to collect data on waste and learn about ongoing waste management practices in these districts.

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.....

*Results:* One of the most important contribution of the model was the development of a model that could look at the interaction of waste and tourism sectors and see their impact on the state economy. This has been achieved through a CGE model that has been soft-linked with a waste management strategy optimization model for scenario building.

Data on waste generation and treatment costs have been collected for various ULBs that was necessitated by the model. Data on impact of tourist seasons on waste generation has also been collected to understand tourism impacts.

Tourism Multiplier Analysis has been conducted to understand the impact of tourism on the state's employment and value added. Both direct as well as indirect (forward linkages) impacts have been studied using the tourism SAM.

Waste optimization model was built to understand the varying strategies that need to be followed for achieving different objectives such as minimizing treatment costs, minimizing land impacts, and maximizing revenues. The results derived have been used to estimate the costs that would have to be incurred by the state in order to treat the rising waste quantum. This result has been fed into the CGE model that shows the changes in government expenditure required and how it would reverberate around the state economy.

Working Papers 1 and 2 (attached) give details of both the methodology adopted as well as the results achieved.

*Conclusion:* While the aims of the Uttarakhand SWM Action plan are commendable and a lot of efforts are being taken on the ground, more needs to be done. In our report, we have highlighted some of the barriers that exist in making the target of 'Strategy # Zero Waste by 2040' a distant dream. Some of the ameliorative steps in the form of strategies have also been suggested. In addition, their impact has also been quantified using the CGE model

*Recommendations:*

- *Improving the quality of data at the district and thereupon at a ULB level so that planning can be improved.*
- *one technology will not be sufficient to solve the problem. A blend of technologies needs to be thought of based on geography, size and financial viability to minimize land and maximize revenue opportunities.*
- *Greater thrust needs to be placed on recycling. There is an opportunity for tying up with industrial estates located in certain districts such as Udham Singh Nagar, etc.*
- *Cluster-based management systems need to be developed further and maybe tied in with the data collection/management exercise (mentioned earlier), for improved planning.*

## 2.2. Objective-wise Major Achievements

S. No.	Objectives	Major achievements (in bullets points)
1.	To understand the linkages between tourism, local environment and waste generation at state level.	<ul style="list-style-type: none"> <li>• A model has been built that quantifies these linkages.</li> <li>• Two working papers that detail out the methodology have also been prepared.</li> <li>• This would enable the replication of our model for other states in the IHR as well.</li> </ul>
2.	Finding the ideal policy instruments for effective waste management in the state	<ul style="list-style-type: none"> <li>• Different instruments in the form of strategies have been identified. Four scenarios have been created that look into this aspect.</li> </ul>

## 2.3. Outputs in terms of Quantifiable Deliverables\*

S. No.	Quantifiable Deliverables*	Monitoring Indicators*	Quantified Output/ Outcome achieved	Deviations made, if any, & Reason thereof:
1.	Development of 01 new policy impact assessment tool to look into impact of waste management policies on tourism.	Developed Computable General Equilibrium (CGE) model	CGE Model developed that has been soft-linked with a waste management strategy optimisation model	No
2.	Develop Computable General Equilibrium (CGE) model useful for the State Planning Department for diverse purposes to model economic impacts on SDP (State Domestic Products), jobs, etc.	Number of methodologies developed and documented (Nos.)	2 Working papers produced (enclosed) that detail out the methodology adopted.	
3.	Scenario analysis for impact evaluation of different impacts on SDP and jobs etc.	No. of Reports/Research articles/Policy documents prepared and published (Nos.)	Scenario and results incorporated in Working paper 2  Journal articles will be written in the future based on	

			these working papers.	
4.	01 Methodology document/manual on the CGE model, which can be used by other Himalayan region states.	No. of Reports/Research articles/Policy documents prepared and published (Nos.)	-do-	

(\* ) As stated in the Sanction Letter issued by the NMHS-PMU.

#### 2.4. Strategic Steps with respect to Outcomes (in bullets)

S. No.	Particulars	Number/ Brief Details	Remarks/ Attachment
1.	New Methodology developed	3 methodologies have been developed: <ul style="list-style-type: none"> <li>• Methodology to construct state level I-O and SAM is developed with tourism and waste as separate sectors.</li> <li>• Framework of a state CGE with waste and tourism as separate sectors has been developed</li> <li>• Methodology to link waste management strategies and CGE has been developed</li> </ul>	2 Working papers attached
2.	New Models/ Process/ Strategy developed	2 Models developed: <ul style="list-style-type: none"> <li>• Uttarakhand CGE with focus on tourism and waste</li> <li>• Waste management strategy optimisation model</li> </ul>	-do-
3.	New Species identified	- NA	
4.	New Database established	1 database: Waste Generation and treatment details at ULB level	attached
5.	New Patent, if any	NA	
	I. Filed (Indian/ International)		
	II. Granted (Indian/ International)		
	III. Technology Transfer (if any)		
6.	Others (if any)		

### 3. Technological Intervention: NA

S. No.	Type of Intervention	Brief Narration on the interventions	Unit Details (No. of villagers benefited / Area Developed)
1.	Development and deployment of indigenous technology	NA	
2.	Diffusion of High-end Technology in the region	NA	
3.	Induction of New Technology in the region	NA	
4.	Publication of Technological / Process Manuals	NA	
	Others (if any)		

### 4. New Data Generated over the Baseline Data

S. No.	New Data Details	Status of Existing Baseline	Additionality and Utilisation New data
1.	Waste Generated, waste management strategies, management costs, technologies and investments, revenue earned (if any), etc.	2018-19	While data on waste generation is being collected, the other data is not collected and is our contribution to the existing literature.

### 5. Demonstrative Skill Development and Capacity Building/ Manpower Trained

S. No.	Type of Activities	Details with number	Activity Intended for	Participants/Trained			
				SC	ST	Woman	Total
1.	Workshops						
2.	On Field Trainings						
3.	Skill Development						
4.	Academic Supports						
	Others (if any)	<b>Project dissemination webinar- 01</b>	Polycymakers (local, state and national), academics				<b>46</b>



## 6. Linkages with Regional & National Priorities (SDGs, INDC, etc)/ Collaborations

S. No.	Linkages /collaborations	Details	No. of Publications/ Events Held	Beneficiaries
1.	Sustainable Development Goal (SDG)			
2.	Climate Change/INDC targets			
3.	International Commitments			
4.	Bilateral engagements			
5.	National Policies	Swachha Bharat Mission	-	
6.	Others collaborations	Uttarakhand State Pollution Control Board, ULBs, Waste management companies (Ramky, KRL Waste Management, Zero Waste Inc., etc.)	1	

## 7. Project Stakeholders/ Beneficiaries and Impacts

S. No.	Stakeholders	Support Activities	Impacts
1.	Gram Panchayats		
2.	Govt Departments (Agriculture/ Forest )		
3.	Villagers		
4.	SC Community		
5.	ST Community		
6.	Women Group		
	Others (if any)	Uttarakhand State Pollution Control Board, ULBs, Waste management companies (Ramky, KRL Waste Management, Zero Waste Inc., etc.)	<ul style="list-style-type: none"> <li>- Improvements in waste data collection</li> <li>- Development of strategies that are implementable at the local level</li> <li>- Highlights the concerns and barriers faced by ULBs and waste management</li> </ul>

			companies assigned day-to-day activities
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## 8. Financial Summary (Cumulative)

S. No.	Financial Position/Budget Head	Funds Received	Expenditure/ Utilized	% of Total cost
I.	Salaries/Manpower cost	10,57,968.00	22,23,057.00	55.93
II.	Travel	16,65,000.00	5,42,826.00	13.66
III.	Contingencies: Stationery & Printing and Consumable Charges	45,000.00	1,67,597.00	4.22
IV.	Institutional Charges	3,25,260.00	3,61,400.00	9.09
V.	Books, Software and Database Materials	4,84,200.00	6,80,040.00	17.10
	<b>Total</b>	<b>35,77,428.00</b>	<b>39,74,920.00</b>	<b>100</b>

\* Please attach the consolidated and audited Utilization Certificate (UC) and Year wise Statement of Expenditure (SE) separately, *ref. Annexure I.*

## 9. Major Equipment/ Peripherals Procured under the Project\*\* (if any)

S. No.	Name of Equipments	Cost (INR)	Utilisation of the Equipment after project
1.	N/A		
2.			
3.			
4.			
5.			

\*\*Details should be provided in details (*ref Annexure III & IV.*)

## 10. Quantification of Overall Project Progress

S. No.	Parameters	Total (Numeric)	Remarks/ Attachments/ Soft copies of documents
1.	IHR States Covered	2	
2.	Project Site/ Field Stations Developed		
3.	New Methods/ Modeling Developed	2	<i>Working Papers attached</i>
4.	No. of Trainings arranged	0	
5.	No of beneficiaries attended trainings		
6.	Scientific Manpower Developed (Phd/M.Sc./JRF/SRF/ RA):		
7.	SC stakeholders benefited		
8.	ST stakeholders benefited		
9.	Women Empowered		
10.	No of Workshops Arranged along with level of participation	1 ( <i>attended by 46 people</i> )	<i>Screenshots of webinar organised</i>
11.	On field Demonstration Models initiated	.... ( <i>attach maps about location &amp; photos</i> )	
12.	Livelihood Options promoted		
13.	Technical/ Training Manuals prepared	2	<i>Working Papers serving as manuals</i>
14.	Processing Units established	.... ( <i>attach photos</i> )	
15.	No of Species Collected		
16.	New Species identified		
17.	New Database generated (Types):	1	<i>Waste generation, tourism impacts, costs and benefits of waste management activities</i>
	Others (if any)		

## 11. Knowledge Products and Publications:

S. No.	Publication/ Knowledge Products	Number		Total Impact Factor	Remarks/ Enclosures
		National	International		
1.	Journal Research Articles/ Special Issue:				
2.	Book Chapter(s)/ Books:				
3.	Technical Reports				
4.	Training Manual (Skill Development/ Capacity Building)				
5.	Papers presented in Conferences/Seminars				

S. No.	Publication/ Knowledge Products	Number		Total Impact Factor	Remarks/ Enclosures
		National	International		
6.	Policy Drafts/Papers	2		-	2 Working papers (enclosed)
7.	Others:	1			Newspaper article published in Amar Ujjala

\* Please append the list of KPs/ publications (with impact factor and further details) with due Acknowledgement to NMHS.

## 12. Recommendation on Utility of Project Findings, Replicability and Exit Strategy

Particulars	Recommendations
Utility of the Project Findings	Strategies could be used as part of the implementation of the Uttarakhand State Urban Municipal Solid Management Action Plan
Replicability of Project	<p>Lack of land that can be devoted for landfills and tourism related waste generation is a common problem for the IHR. Both the models as well as suggested strategies can be used.</p> <p>However, a model is only as good as the data it is based on. Therefore, fresh efforts would be required to collect the requisite data for other states or even for Uttarakhand at a later date.</p>
Exit Strategy	<p>Please describe the Exit Strategy of the project, self-sustaining and benefitting the stakeholders and local community:</p> <p>During our interactions with the concerned stakeholders in Uttarakhand (UEPPCB, ULBs and waste management companies), we have explained our model to them. We are hopeful that our results will be of use to them for better operationalization of the MSW Action plan.</p>



**(PROJECT PROPONENT/ COORDINATOR)**

**(Amrita Goldar)**



**(HEAD OF THE INSTITUTION)**

**(Rajat Kathuria)**

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**Place:** New Delhi

**Date:** 13/10/2020