Exploratory agent-based model to understand migration in Indian Himalaya Region

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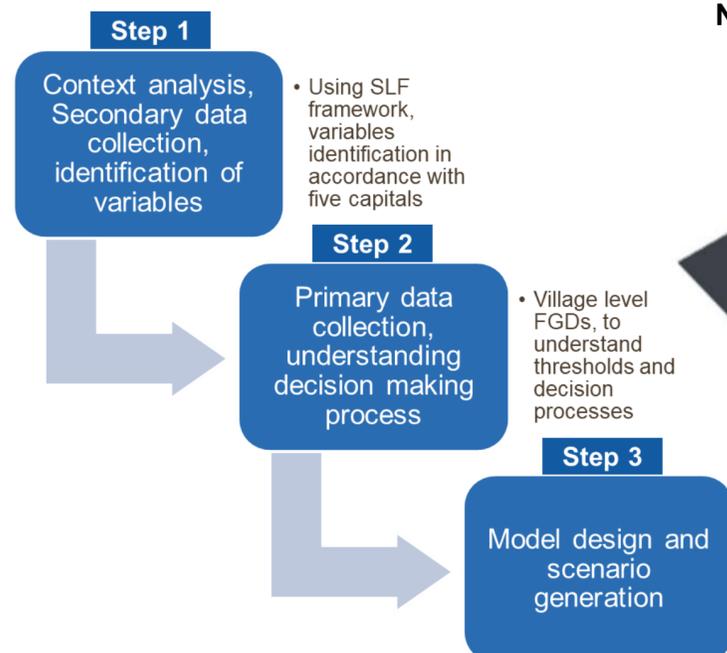Indian Institute of Technology, Roorkee, India
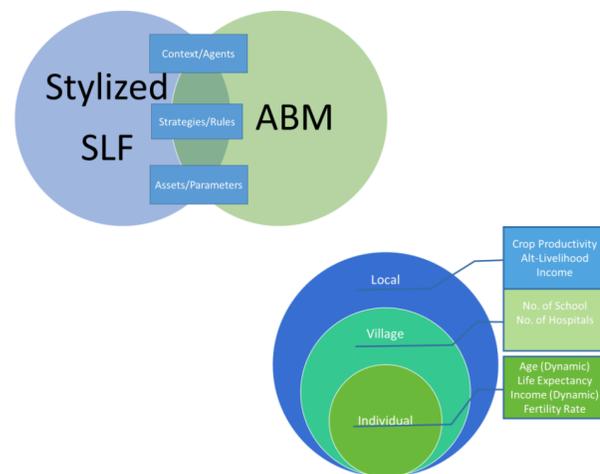
Introduction

Migration is a complex behavioural pattern which is shaped by cross-scale variables and heuristic rules. This article captures the complexity and dynamic behaviour of migration in Tehri Garhwal district of Uttarakhand using agent-based modelling (ABM). Scenarios considering different starting points were developed to understand variables influencing migration. Migration is governed not only by intrinsic factors, but also by extrinsic influences. Exploratory ABM techniques were used to validate the hypothesis assumed to explain migration behaviour in the study area. The results show that migration cannot be steered with policies focused only on economic perspectives.

A. To understand migration in the study area with cross-scale, dynamic variables and cognitive strategies.

B. To create an Agent-Based Model based on the identified variables

C. To generate scenarios to understand emergence with a specific starting point.

Methodology

Step 1

Context analysis, Secondary data collection, identification of variables

• Using SLF framework, variables identification in accordance with five capitals

Step 2

Primary data collection, understanding decision making process

• Village level FGDs, to understand thresholds and decision processes

Step 3

Model design and scenario generation

• ABM was created with Steps 1 and 2 and scenarios were generated

Input Data and Model

| Parameter	Description	Source
Landscape Module Inputs		
Village Boundary	Village boundary digitized to create boundary layer	Patwari Office, Village Map.
Farm Parcel	Farm parcel digitized to represent spatial distribution of farm	Patwari Office, Village Map.
School	Stochastically created on selection of user controlled tab	
Hospital	Stochastically created on selection of user controlled tab	
Agent Module Input		
Number of agents	Number of males in Village : 94	Census 2011
Average Income	Average Agricultural Household Monthly Income : Rs 4701	The NSSO 70th Round (2013)
Average Age	Average age of the male in the village : 60 Years	Census 2011
Fertility Rate	Average children born per female: 2.4	Uttarakhand Health and Family Welfare Society Survey 2011
Life Expectancy	Average age at Death for male in rural area for Uttarakhand: 67 Years	International Institute of population science Report [pdf] <http://iipsindia.org/pdf/05_b_09cchep5.pdf>

NetLOGO Model
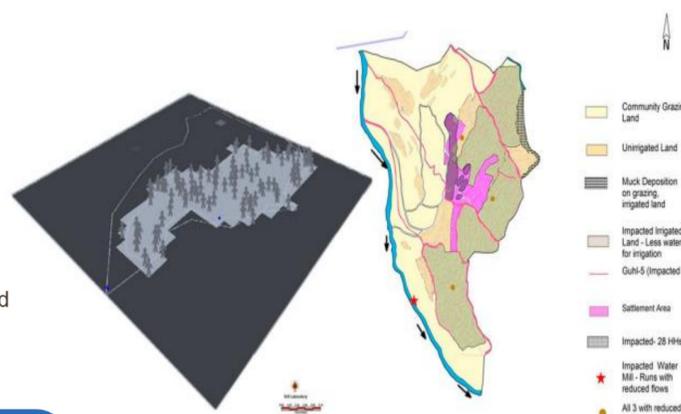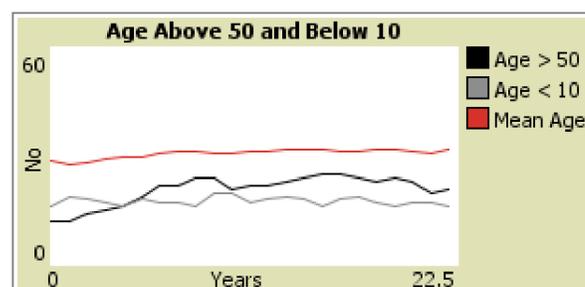

Results

Scenario 1 (worst – case)

No livelihood diversification, Low productivity

No schools, No Hospitals
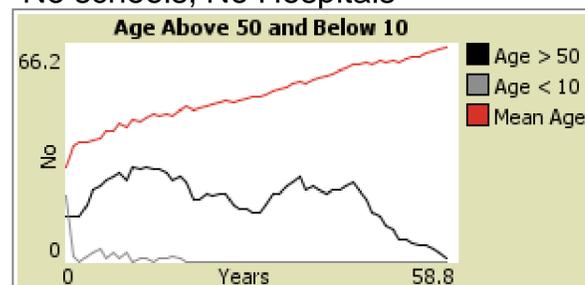
Average age is increasing in the village

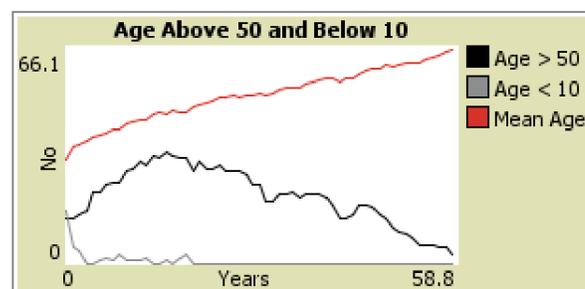Migration of youth and kids.

Scenario 2 (Best Case)

Livelihood diversification/more Income

Improved productivity, 1 School, 1 Hospital

Average Age is almost constant, less migration

Scenario 3 (Livelihood focused)

Livelihood diversification more Income

Low productivity No schools, No Hospital

Ageing population, All the kids have migrated for schooling. Similar to worst case scenario 1. Policy intervention just focusing on Livelihood diversification might not work to restrict migration.

Discussion and Inference

We should not see migration as pure economic or linear phenomena, it is a complex situation.

Services like Health and Education are important criteria in decision making for a household to migrate.

Adaptation interventions should not only focus on Livelihoods but on Well-being,

Migration as a strategy is more acceptable in areas, where there is a history of migration. A slight unfavorable disturbance in the current system might lead to on set of migration.

Identifying such areas might help in planning Adaptation strategies better.

References

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Acknowledgement