Quality of Life and Migration

Technical Aspects and Results of Social Modeling

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Abstract

The semi-arid North-East of Brazil is one of the most significant problem regions in the world.
Social structures became established in the last century under difficult natural, especially climatic, conditions. These structures do not seem to be very suitable facing appropriate strategies to social and ecological crises in this region. Coping mechanisms developed in this spectrum of problematic natural and social living conditions which are highly questionable in their quality as individual and social solution concepts. This refers first of all to migration activities which no longer being traditional compensatory migration or seasonal labor migration.

This article gives an overview of the main activities of the project Socio-cultural Analyses (SOLAM[1]), especially about (a) the methods to identify the socio-economic and socio-cultural options and restrictions for the improvement of the quality of life, and (b) their integration into a model of the social dynamics of adaptive behavior by integrated modeling. The model results are presented for the present situation and for different scenarios up to the year 2025.

The focus of concern of 'Socio-cultural Analyses' is the description and explanation of the interaction between quality of life and adaptive behavior in the rural areas of North-East Brazil, especially for the federal states Piauí and Ceará. Due to a problem-oriented approach, the set of action strategies to be explained is restricted to migration and direct alternatives, like self-organized enhancement of local life conditions. The superior objective is to evaluate possible future development plans of rural regions in the study area based on scenarios and simulation model results on the basis of differences in quality of life.

The main focus of the recent project period was the development of a space-related migration model based on differences in quality of life and spatial distances. This included (i) the formulation of an integrative concept for quality of life, (ii) the outline of functional relationships, and (iii) interviewing householders in the research area.

1 Introduction

In the face of global climatic changes the semi-arid North-East Brazil is one of the significant problem regions in the world.

In the last century social conditions have developed under difficult natural, especially climatic, conditions which do not seem very suitable to responding with appropriate strategies to the social and ecological crises in this region.

In this spectrum of problematic natural and social living conditions coping mechanisms developed which have become highly questionable in their worth for individual and social solution concepts. This refers first of all to migration processes which no longer being traditional 'compensation' migrations or seasonal labor migrations.

According to these problems the central tasks for the working group Socio-cultural Analyses in the context of WAVES can be formulated as

(1) the description and explanation of the interaction of quality of life and adaptive behavior

and

(2) the development of a space-related migration model based on spatial distances and differences in quality of life.

For the description of the overall WAVES program please look for the overviews of Stahr and Gonzaga in session 1.

2 Method

To reach the goals described above it is necessary to formulate a theory driven actor model reflecting the dynamic interdependence of internal and external states. Different adaptive action strategies have to be implemented in this model to realize feedback functions of behavior on external (e. g. characteristics of the social surrounding) and internal variables (e. g. degree of satisfaction with social relations). The set of the variables used and their interrelations should be derived from theoretical considerations. Survey data are needed to check the validity of the proposed model.

In order to develop a theory based dynamic migration model the structure of the actor model has to be integrated into a space related model of regional dynamics. This procedure allows to calculate aggregated effects of individual decisions.

2.1 Quality of Life as an Integrative Concept

Migration is interpreted as a multidimensional phenomenon. Therefore an integrative concept is needed to connect the different thematic spheres. Possible causes for migration are located in the environmental sphere (lack of natural resources), in the social sphere (missing social support) and in the personal sphere (education). Quality of life integrates of these different phenomenological spheres.

The concept of quality of life indicates the matching between external and internal state variables and serves as a global indicator for the stability of interrelated systems. Furthermore, the structure of WAVES demands the coupling of different types of data sets. On the basis of spatial distributions of natural resources and the availability of infra-structural supply, probabilities of various adaptation strategies should be calculated by the integrated model.

2.2 Development of an adaptive action model

The general concept of the postulated action model can be described in the following steps:

(1) calculation of the fitting of a set of theory guided deduced needs and related possibilities/opportunities to meet them;

(2) selection of different adaptive action strategies with reference to the specified needs and empirically derived competencies;

(3) maximization of positive changes in the satisfaction of needs

A set of needs (existence, security, freedom, flexibility, affiliation) was derived from Max-Neef's works (Max-Neef, 1991) intended to build up a set of human requirements with inter-cultural validity. Furthermore, two resource types were differentiated: infra-structural (medical support, education) and agricultural resources (soil quality, temporal distance to latest drought, water availability).

The set of adaptive action strategies is reduced to migration, innovation and persistence. The theoretical background for the selection of different adaptive action strategies is the protection-motivation theory formulated by

Riptoe & Rogers (1987). It postulates the probability of specific strategies depending simultaneously on the perceived personal ability (the actor's competencies to act (e.g. education) and the perceived situational thread (described by the actual need state and the availability of action resources).

The satisfaction with actual living conditions is the central result of that coping process. The postulation of a general goal to maximize this satisfaction leads to the actor's preference to select those strategies which are supposed to result in an optimal need satisfaction regarding competencies and action resources.

As a first empirical check, a survey with 200 participants was carried out in the two municipalities of Tauá (Ceará) and Picos (Piauí). For this purpose structured interviews were held with family heads to yield data to test the hypotheses outlined above.

One central assumption was that general satisfaction with conditions of life leads to a reduced tendency to migrate. This tendency is represented by the measurement of the individual report of the desire to leave the region.

General satisfaction is measured by two different sets of indicators (judgements) representing different aspects of contentment:
(1) contentment related to social aspects (e.g. living on the countryside, mayor) and
(2) contentment with so-called materialistic aspects (living space, water supply, usable goods).

In the case of migration, social competence influences the probability to leave the region in a way that it is lowering the barriers (e.g. age, education, communication).

In opposite to social competence, materialistic competence (e.g. farmsize, land ownership, personal goods) works against migration tendency.

2.3 MigFlow: central ideas

The conceptualization of migration processes in MigFlow follows the assumption that migration tends to equalize disparities of quality of life because migrants utilize opportunities to improve their living conditions. Therefore migration is affected by opportunities in potential target regions and the competence for overcoming obstacles of moving as well as to benefit from these opportunities for the potential actors.

These findings converge with the theoretical assumptions of "classical migration theory" (Ravenstein, 1885; Lee, 1966):

- The degree of migration inside a given territory varies directly with the diversity of regions included in that territory
- The migration rate between two locations is inversely related to the obstacles for overriding the distance.
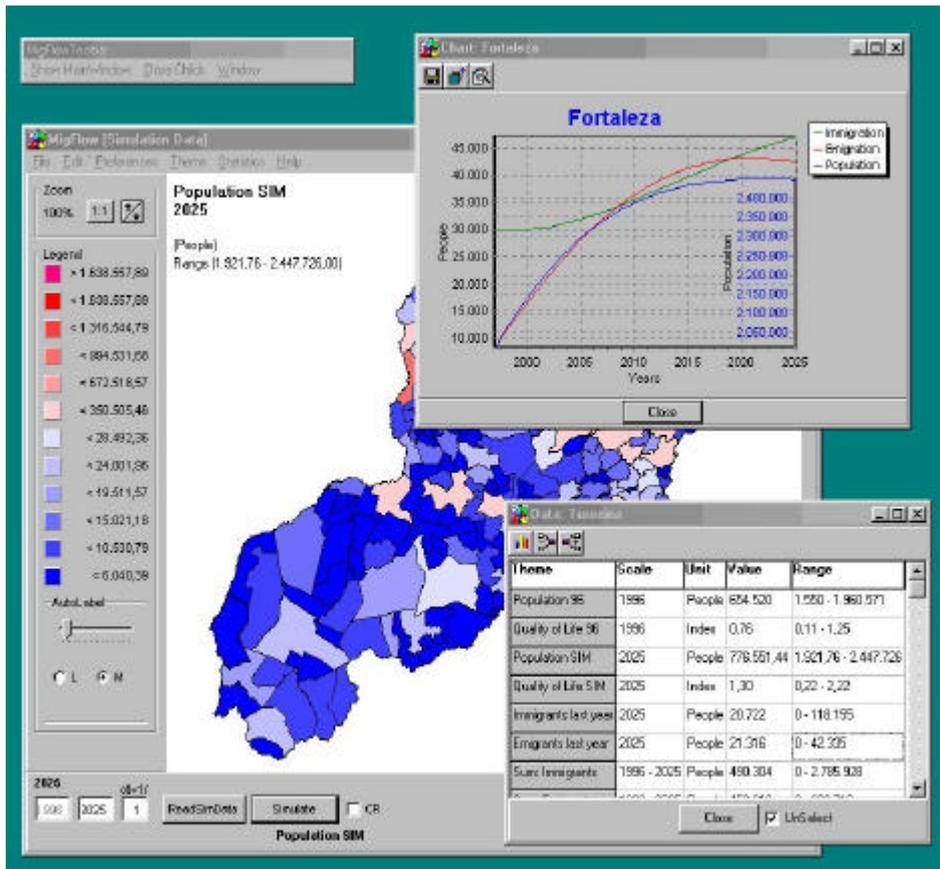
Figure 1: MigFlow: user interface

2.3.1 MigFlow: modules

MigFlow consists of three main modules: *demography*, *quality of life* and *migration*.

The *sub-model demography* calculates the total population for each municipality in cohorts of 5 years based on age specific and sex specific rates of mortality and fertility. The trends for mortality and fertility follow scenario assumptions: We assume a decrease down to 60 % (fertility) 80% (mortality) of 1996 rates in 2025.

Q*uality of life* is modeled as an integrated indicator composed of
- the aggregated *family income* (HDI: PNUD, IPEA, FJP, IBGE, 1998),
- an indicator for *educational infrastructure* (segundo grau upwards) (SOLAM)
- and an indicator for *health infrastructure* (Costs) (SOLAM).

These indicators are dynamized by scenario assumptions (see Figure 2 and Table 1; for the scenario assumptions comp. also Döll et. al. in session 7), but in future the agricultural income development of RASMO model will be taken into account, while the non agricultural income will be estimated by scenarios due to the lack of a macro-economic model.

MigFlow models Ceará and Piauí as a system of interacting spatial cells - the municipalities - with specific properties. The communication with external territories beyond the model boundaries is represented in one virtual cell.
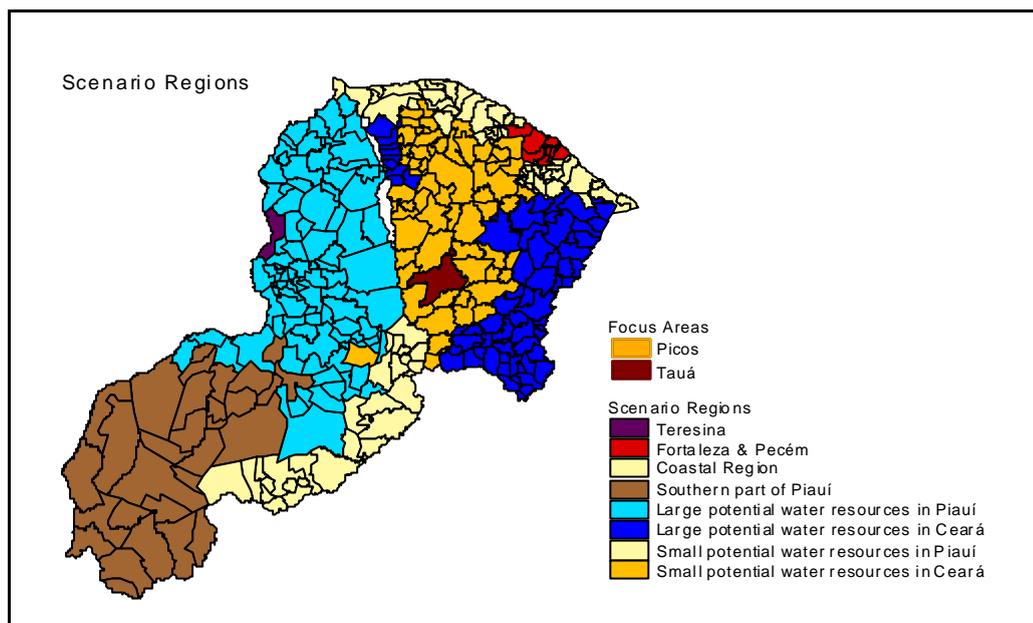
Figure 2: WAVES - Scenario Regions

Scenario Regions	RS A	RS B
Growth Rates of Income Resources		
Brazil	2.50	2.00
Teresina	4.00	3.52
Metropolis Fortaleza and Pecém	4.32	3.52
Coastal region	4.32	3.52
South of Piauí	4.32	3.52
Area of large potential water resources - Piauí	4.32	3.84
Area of large potential water resources - Ceará	4.32	3.84
Area of small potential water resources - Piauí	4.00	3.52
Area of small potential water resources - Ceará	4.00	3.52
Growth Rates of per Capita Health and Education		
Brazil	0.5	0.4
Teresina	0.6	0.5
Metropolis Fortaleza & Pecém	0.6	0.5
Coastal region	0.6	0.5
South of Piauí	0.5	0.5
Area of large potential water resources - Piauí	0.6	0.6
Area of large potential water resources - Ceará	0.6	0.6
Area of small potential water resources - Piauí	0.5	0.5
Area of small potential water resources - Ceará	0.5	0.5

Table 1: Assumptions of the growth rates for the Reference Scenario A (RS A - Coastal boom and cash crop) and the Reference Scenario B (RS B - Decentralization)

The simulation of migration is calculated during the following steps:
- computation of distances of the quality of life between the different spatial cells
- computation of migration costs based on spatial distances between the cells (linear distance based on UTM coordinates)
- computation of potential migration to cells with a higher quality of life: potential profit in the quality of life (cost benefit calculation) multiplied with competence factor and the affected population (households with income less a half Salario Minimo)
- recalculation of migration based on emigration and immigration restriction
- integration of migration in the demographic model.

3   Results

The following figures show preliminary results of the simulation of the globalization scenario.
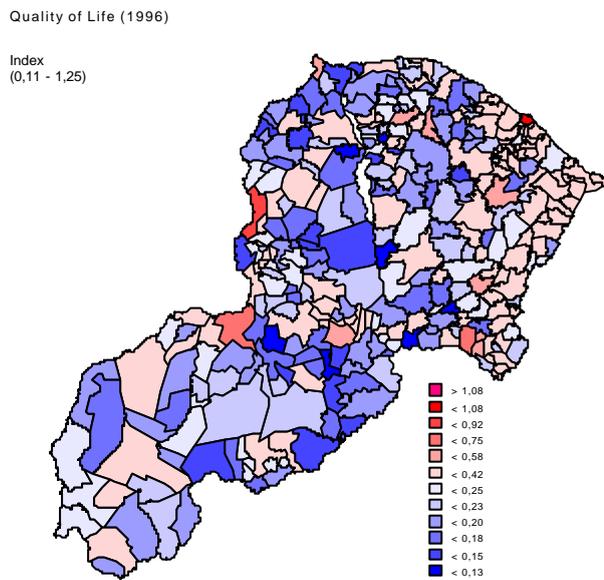Figure 3 and 4 show the differences in quality of life between 1996 and 2025 for the scenario Globalization.

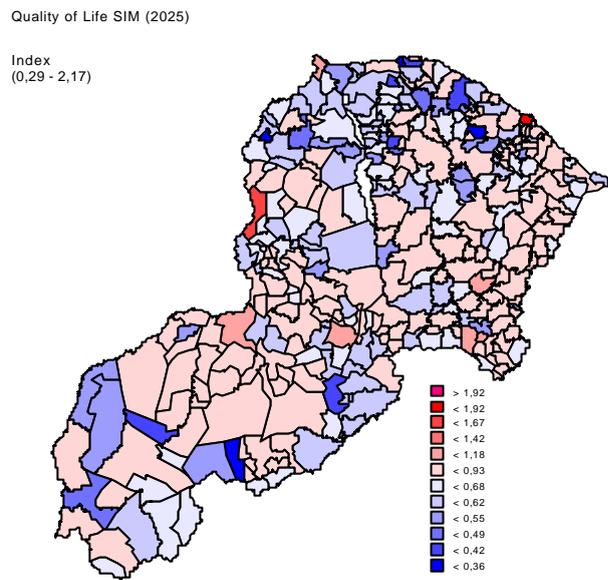**Figure 3: Quality of life - starting value 1996**

Figure 4: Quality of life - results 2025 Scenario A

Figure 5 and 6 show the results for migration with the different scenario assumptions. Positive net migration rates in relation to the population of 1996 are found only for a couple of municipalities, mainly the current urban centers but also in some up coming areas.
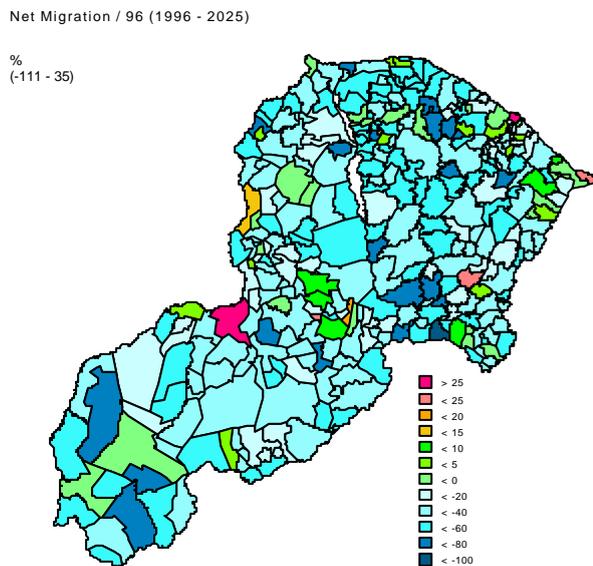

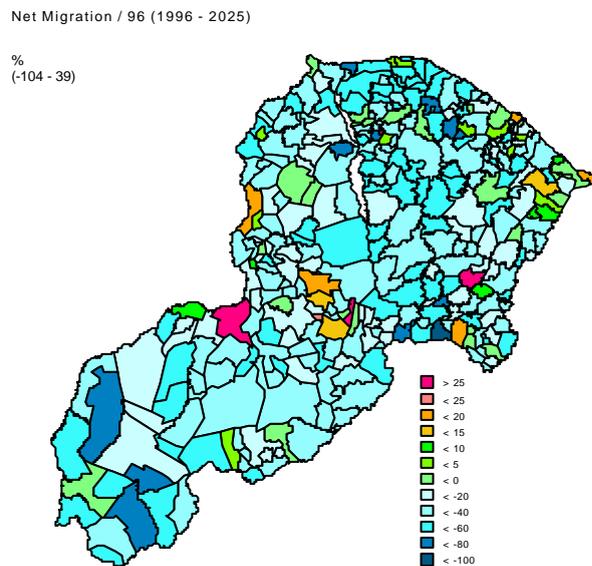**Figure 5: MigFlow: Net migration 1996-2025 Scenario A**

Figure 6: MigFlow: Net migration 1996-2025 Scenario B

Nevertheless the results of the simulation are very hopeful. For the years 1997 to 2000 we have estimations about the development of population on municipality scale from the planing institution of Ceará IPLANCE. In table 2 one can see that the results for the area with low potential water resources are really worst. For the municipality with the largest population - Fortaleza - the results are satisfying.

Scenario Region	Scenario A				Scenario B			
	1997	1998	1999	2000	1997	1998	1999	2000
Metr. Fortaleza & Pecém	-0.49	-0.75	-1.04	-1.35	-0.50	-0.78	-1.10	-1.46
Coastal area	-1.14	-1.81	-2.43	-3.01	-1.14	-1.82	-2.45	-3.04
Area of large pot. water resources	-0.05	0.13	0.28	0.39	-0.05	0.15	0.31	0.44
Area of small pot. water resources	-0.77	-1.23	-1.65	-2.04	-0.76	-1.20	-1.59	-1.94
State Ceará	-0.53	-0.78	-1.03	-1.29	-0.53	-0.78	-1.04	-1.30
Munic. Fortaleza	-0.08	0.05	0.14	0.18	-0.08	0.02	0.07	0.06

Table 2: Compare data of IPLANCE with Simulation A + B of MigFlow (differences in percent)

4   Conclusions

The concept used for migration modeling is proven to be useful. The further development of the model will disaggregate the competencies and preferences by type of actor with inclusion of the age and educational structure. The modeling of the differences of quality of life will then be done on a meso scale, i.e. on socio-economic group level. As far as data are available the concept of social networks will be incorporated. The main further tasks are the improvement of the database and the integration of other model results.

5   References

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6   Acknowledgement

7   Remarks

[1] In the pre-phase of the WAVES-Project the name for the actual subproject was 'Socio-economic and socio-cultural conditions of changes in the land use and Migration in Piauí and Ceará' (SOLAM).