

ENVIRONMENTAL MIGRATION AND SUSTAINABLE DEVELOPMENT

—A Case Study of Southwest China

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ABSTRACT: This paper focuses on migration occurrence as a result of environmental degradation and population growth. It briefly reviews previous practices in some less developed countries and then considers the extent to which environmental factors have been and may be significant in initiating migration. A case study of the karst region of southwest China is used to illustrate the phenomenon, including root causes, restrictive factors, nature of the migration, desires of migrants, strategies of response and optional policies. It is argued that a comprehensive approach to the prevention of environmentally caused displacement should be developed.

KEY WORDS: environmental degradation, migration, sustainable development, karst area, southwest China

I. INTRODUCTION

It is generally accepted that the degradation of renewable resources and fragile environments in developing countries is becoming widespread (Southgate, 1990). Population pressure on land has been frequently suggested as one of the major causes of environmental degradation in the Third World. Increased population leads to natural resources depletion and a deterioration in the environment, both of which affect the sustainable development of the region.

Environmental migration may be defined as that because of environmental degradation or natural disaster, the environmental capability and carrying capacity of natural resources in a given region can not support excessive population, some people have to leave their original habitats (or leave voluntarily) to resettle down in a new area with relatively abundant resources to protect themselves from harm and/or to seek a better quality of life. The cause of the migration may be environmental disruption, natural disaster (drought and flood), desertification, land degradation, deforestation, sea level rising due to global warming, pollution or other factors.

Degradation of resources as a major cause of environmental migration has been recognized for some time. Governments have often encouraged poor farmers who faced lack of land and water resources to emigrate to other rich resource areas. Repeated environmental degradation caused by settlers in new areas has not been studied adequately. Migration and environmental concerns interact and impinge upon economic development but the social changes and conflicts are little understood (Hugo, 1996).

Out-migration doesn't represent a real and lasting solution to environmental problems. There is a need to respond to the movement of these people with policies that minimize the negative effects of their migration on the new environment.

II. HISTORY OF ENVIRONMENTAL MIGRATION IN LESS DEVELOPED COUNTRIES

Environmental migration comes about on account of three factors: (a) one region becomes "overloaded" in terms of its population; (b) another region of "unloaded" population where there are rich natural resources, and (c) people are willing to move from (a) to (b). Of these, (a) is the cause of the environmental migration, (b) makes the migration feasible and (c) makes the migration reality.

Most environmental migration is currently occurring in developing countries because of unbalanced regional development and rapid population growth. Population pressure on resources and environment in the out-migration should decrease (as long as the rate of population growth does not increase), but these pressures in new regions will increase. If the activities or industries undertaken in the resettlement areas are not suitable, problems of environmental degradation in new regions may occur. The process of environmental migration in many developing countries has frequently resulted in this phenomenon.

Indonesia is a nation with serious environmental problems. Its population is centralized in some densely populated inner islands of Java Bali and Lombok. It is estimated that Java's natural resources and environment can support 70 million people, but there were over 100 million people in 1986, and the population is increasing by two million per year. The population density is 770 person/ km² which means that 35% of farmers do not have enough land to keep their families. On the other hand, the population density of outer islands of Sumatra, Kalimantan, Sulawesi is sparse(30- 40 person/ km²).

Since 1969, the Indonesian government has been carrying out its *Transmigration* plan and has been encouraging poor farmers who lack adequate land in Java to move to other tropical islands where there are fewer people. Between 1980- 1986 the Transmigration Program supported the movement of more than two million people. At the outset, the hillside land was good and attracted settlers, often using techniques, however, that were not suited to the new environment. As the land became exhausted, they kept on denuding it in order to make a living. This led to natural disasters and to the population reaching saturation point. After several years

of intensive cultivation declining yields forced them to move on again. Out-migration commenced from recently settled areas of the outer islands. Thus, land degradation became both a cause and a consequence of migration (World Resources Institute, 1989).

Northeast Brazil, a region with three million people, accounts for 10 per cent of the area of the whole country. Due to land degradation and erosion, droughts and desertification are very serious. The Amazon region accounts for only 4 per cent of Brazil's population but 40% of the area. The Brazilian government began to carry out migration policies in the 1970s. The building of the road led to destruction of part of the forest. Migrants also destroyed the forests and opened up wasteland by original means. Consequently, in order to provide for their family, migrants had to open up new lands, which led to the elimination of more tropical forests. They were still in poverty. A typical response is for family members to migrate out again or return to Northeast homeland.

The drought in the Northern Plateau of Ethiopia is very serious. The Ethiopian government forced 1.2 million people living in the area to move to the southern regions where people are scarce. These migrants destroyed forests and vegetables in the new areas, leading to serious soil erosion. Migrants brought poverty, therefore, to the village to which they had been relocated.

It is clear from these examples that out-migration does not provide the solution to environmental problems and poverty. How to improve environment and eliminate poverty in the source region and at the same time, ensure that similar problems do not happen in the destination regions, need to be studied.

III. A CASE STUDY: ENVIRONMENTAL MIGRATION AND SUSTAINABLE DEVELOPMENT IN THE KARST REGION OF SOUTHWEST CHINA

As in many other developing countries, unbalanced development and higher population growth exist in some regions of China. Poverty is invariably linked with fragile natural environments as worsening environments can not support increasing population (Pan, 1995). In order to eliminate poverty and to distribute the resources and wealth of the society fairly and reasonably, the Chinese government has spent a lot of money and provided food in poverty areas. Nevertheless, 60 million people still lived below the poverty line in 1996.

A continuation of this situation will be costly and will not solve the problem of poverty in these regions in the long run. Therefore, the central government determined to move about 400 000 poor population who lack land and water resources in the fragile karst mountainous region to a new hilly region where there is a lot of uncultivated land.

1. Causes of Emigration

Northwest Guangxi is located on the southeast slope of the Yunnan-Guizhou Plateau and

comprises an area of 89 500 km². The population is 7.13 million including many minority nationalities. The landforms are karst mountains and hills. The climate is subtropical. Annual rainfall is 1350– 1750 mm. Mean annual temperature is 18– 22 °C.

Karst areas are typically characterized by bare rock, thin soil and scattered cultivated land. Bare karst accounts for 40% of the whole area, slopes of over 25 degrees account for 60% – 80%. As carbonate rocks are rich in calcium and magnesium and have a low content of silicate, the processing of soil formation is very slow. It takes about 2500– 7000 years to form a 1 cm thick layer of soil, which is 10– 20 times longer than other types of rocks. The average thickness of the soil layer is from 20 cm to 60 cm. Only 4% of the land is arable and the average topsoil is 13 cm.

The double-layered surface and subsurface karst structure is responsible for the underdevelopment of the surface water system. Rainfall rapidly penetrates into the ground and forms underground flows. About 60% – 90% of rainfall penetrates underground and can't be utilized efficiently. The average annual depth of flowing surface water is just 450 mm, which is 57% of the average depth in Guangxi Region (795mm).

The special characteristics of the land and water resources result in the slow growth of vegetation, thereby influencing the regional capability of agriculture. According to Zhao (1995) the maximum grain productivity of the region will be 2.47 billion kg in 2010. The population capacity of this region in 2010 will be 6.17 million, which is 990 000 less than in 1990. At the moment there are three million people who do not have enough drinking water.

Futhermore, the area is inhabited by people belonging to the Zhuang, Yao and Maonan nationalities. The region has a relaxed population birth policy, that is, the government policy enables people belonging to a minority nationality in rural areas to have two children. Consequently, the population growth rate was 1.2% in 1990– 1995, higher than elsewhere in China. So the poor people in bare stony mountainous region have a high density (Table 1). According to the calculation in advance (Zhao, 1995), the population growth rate in this region will be 1.1% during 1996– 2010. There will be 8.56 million population in 2010.

Table 1 The percentage of bare karst and population density in some counties of northwest Guangxi

County	Bare karst area (km ²)	Bare karst percentage (% of whole land)	Population density (person/km ²)
Douan	3644	89	152
Dahua	2508	90	146
Jingxi	2365	71	167
Huanjiang	1293	28	72
Tianlin	255	5	39
Xilin	85	3	38

There were 400 000 people living in poverty, each person had less than 0.02 ha of cultivated land in the karst stony mountainous region in 1990. The annual income per person was below US \$ 50. In order to obtain enough food and fuels the inhabitants have exploited the up-

per slopes of the mountains and hills for cultivation which in turn has led to a decline in forestry. Concerted efforts to increase food production through extension have seen some spectacular increases in outputs but often at the expense of the environment. The percentage of the area covered by forest has declined from 30% to 16% during the past 30 years. The rate of soil erosion is 2– 7 times greater than the rate of soil formation. Some land has become sony desert.

2. Possible Destinations

Due to natural, historical and nationality factors, different regions in Guangxi have evolved in different ways. There is a lot of uncultivated land to be exploited in some hilly regions, according to the Guangxi Commission of Agricultural Regionalism Survey (1992). There is over 60 000 ha of wasteland to be exploited in 23 counties of Guangxi region—especially in Huanjiang, Tian'e, Leye, Tianlin and Xilin counties. There is also 20 000 ha of wasteland in Makoudan area of Huanjiang county. These areas are located in Quaternary red soil and rockbind hilly areas, 200– 500 m above sea level. The soil layer is mostly between 60– 150 cm. The percentage of organic matter is 2% – 3%. The dominant vegetation type is pteridophyte and bush.

3. Desires of the Population Living in Poverty

The desire to leave a region, on a permanent basis, in the face of life-threatening environmental disaster is eminently rational and has been an important survival strategy throughout human history.

There are three types of migration, according to the motivation for the migration: (1) “free choice” —people will make their decision by themselves after weighing up the advantages and disadvantages between their homeland and the potential destination; (2) “forced choice” —in order to eliminate poverty and improve the environment, the government decides to move people living in a poverty situation, in this situation, potential migrants have little or no choice; (3) “induced choice” —this is half forced and half free choice. The government promises to provide some supports, such as preferential loan and land policy, to people who are willing to migrate to other areas.

Many factors influences the choice of people living in poverty. In Guangxi region, because of resource degradation and environmental change, increasing number of farmers living in remote bare karst mountains want to move out. According to interviews conducted with 41 families in 1993, 71% expressed a desire to emigrate from their homeland, especially families with well educated young people. Induced migration appears to be the dominant type. Some old people and some Yao nationality living in closed high mountains are unwilling to leave their homeland (Xu, 1996).

4. Factors Affecting Environmental Migration on the Newly Settled Area

4.1 *Poor quality of land resources, difficulty in reclaiming land*

The region of resettlement is a hilly landscape with much wasteland. Although people in the wasteland can have up to 0.4–0.8 ha, this is still a limited amount of land and water resources are scarce. According to a survey carried out in the resettlement area (Wang, 1996) red soil hills in Huanjing Maonans Autonomous County are 200–550 m above sea level and 50–100 m in relative height. The over 25 degrees slope makes 51% of the land and over 35 degrees 17%. The soil layer on the lower slopes is up to 90–160 cm and on the upper slopes is just 50–70 cm. The vegetation cover has already been damaged, most of it is bush and pteridophyte.

The influx of migrants has changed the land use pattern of the area. In the early stages, they did not implement contour-planting measures or other water and soil conservation methods in the plantation fruit trees and sugar cane. As a result soil erosion occurred. Due to the lack of arable land for grain, it is very difficult for farmers to be self-sufficient in grain. Also, because of the increasing need for forest resources and forest lands for various uses such as fuel wood, building materials, planting fruit trees and crop production, the forest land has been cleared indiscriminately, leaving an ecological imbalance in the newly settled areas. This used to happen in some spontaneous migration villages.

4.2 *The quality of human resources*

Due to living in the relatively closed stony mountains, the culture and technology quality of migrants is fairly poor. Their education level are usually primary school or junior middle school, it is not easy to fit in with the needs of the market economy and master the new skills. The mainstay industries are fruit trees, sugarcane and other horticulture vegetable, which require more technology. Some migrants with low-technology level don't know what course to take.

4.3 *Capacity for investment in areas of resettlement*

After migrants come to a new region, they require capital for living and housing. So far, the main source of finance has been anti-poverty investment from governments, as well as a loan from the World Bank to 12 counties. The Chinese government provided every migrant with about 3500 yuan (RMB) (US\$ 430). Most of it was spent on making a requisition for land, building roads and water conservancy projects. The amount of capital available for investment in production is limited. It takes a lot of investment to plant fruit trees, which will not be productive for 5–6 years. In the first two or three years, they build very temporary shabby accommodation. The whole family have to live in simple houses thatched with straw, which does not keep out wind and rain.

4.4 *Small, scattered projects and low levels of production*

Most of the new migration villages are over 30 km away from the nearest county town, making transport difficult. Also the variety in the new production is often very great. There may be four to six fruit tree varieties in one village. Owing to small commodity volume, there is

not enough to be processed on the spot. It is also difficult to build a series of service systems, including storing, processing and selling facilities.

4.5 *Problems of administration and community services*

Migrants coming from poverty villages elsewhere have a lot of difficulties at the beginning. The local government in the relocation region usually don't like to handle the matter. Some new migrants villages are managed by an officer from the areas of emigration. It is very difficult for this person to cooperate harmoniously with the local government in the resettlement area. Some new villages are jointly managed by an emigrant officer and the local government of the destination. It often happens to shift responsibility on to others. New migrants are not coordinated with the local residents in economy, nationality, public security, education and other social relationship. Disputes which may emerge are not solved immediately. For example, some children in the new village were not permitted to attend the local school in the neighborhood and have to go to a primary school three or four kilometers away.

4.6 *Shortage of suitable, long-term land policies and mechanisms*

Both spontaneous migrant and government organized migrants usually to rent and contract land from the local village. The period of renting is between 10 to 50 years. Their constant worry is whether they will be able to retain the land after this time period. They have no long-term ownership of the land but the development of bare hills for agricultural production is a long process.

This uncertainty about ownership may lead to inadequate attention to environmental sustainability. It is an essential requirement for migrants' success that they cultivate in a sustainable fashion. If these problems cannot be solved, it will effect migrants' ongoing inputs and use of technology for improving the land.

4.7 *Lack of models and theory to guide migration*

Organized environmental migration as a means of alleviating poverty in particular regions is a new type of project in China. It is different from general spontaneous migration for seeking a livelihood or reservoir project migration. It is the voluntary mobility of groups of people from areas where there is a lack of natural resources, environment worsening, poverty and excessive labor. Research results on this type of mobility have rarely been reported. There are no documented successful experience or theoretical models to use for reference. A lot of problems—including the environmental capability of migration, direction of mobility, relocation model, process and industries order, management and administration system, ecological reconstruction, community service—need to be resolved from systematic studies of current projects.

5. Strategies of Response

Organized environmental migration in the karst region of southwest China is a new model of population flow. It is designed to help shake off poverty, to aid rural regional development in minority nationality regions and to ensure environmental improvement. The objectives are to

eradicate poverty and to assist integrated development.

The major issues that need to be taken into account in the development of a model for organized migration are outlined below.

5.1 Determining the scale of migration and the development plan

Although there are unused (wasteland) areas in part of Guangxi, the environment is fragile and the resettlement of migrants must be carried out carefully. Excessive numbers of migrants will lead to serious results.

From recent migration practice in Huangjing county, it is clear that the majority of migrants should be young to middle-aged people. Young migrants should account for over 60%. They have higher level of education, are more adaptable and have a greater desire to improve their situation from poverty. Young people are less likely to be tied to traditional ways of thinking and operating.

In the new resettlement village, migration can lead to waste land systems becoming new steady, orderly, highly efficient ecological systems. According to the land structure and its productivity, one family should have at least 3 ha land, including 0.13 ha arable land for grain, 0.2–0.3 ha for sugar cane or other economic crops, 0.3–0.6 ha for orchard or economic forest, at least 30% of land for forestry or grass. In order not to result in new soil erosion, contour cultivation measures should be carried out as soon as possible.

5.2 Setting up sustainable mechanisms of management and administration

Migrants in the karst region of Guangxi have little economic or environmental knowledge. Single families have a low level of ability to bear development capital loan. A useful way of overcoming the problems of single scattered families and inaction in building roads, irrigation works and other public facilities, is to set up a new company which has management and administration functions. The company could organize all families to form a bigger market and provide seeds and young plants, market selling, processing and technological services.

Recently, the Changsha Institute of Agricultural Modernization, the Chinese Academy of Sciences, the Mountainous Region Development Center of Guangxi Province as well as the Huangjing County government jointly set up a 'anti-poverty' company which merges technology, agriculture, industry and trade into an organic whole. The company bought 247 ha of wasteland and relocated 80 families involving 400 migrants from poverty areas. This is an institutional innovation to assist the process of displacement.

5.3 Setting up appropriate forms of land management

The distribution of available land is often scattered and laborers have low-levels of education and limited capital. The low ratio of capital to labor under small scale agriculture is valuable for enabling the recruitment of more labor. Family farms with a small amount of land and several lines of products will have some problems. Perhaps forms of land management which encourage specialized farm activities should be implemented.

Other ways of managing the relationship between new settlers and the land should be considered:

(1) Migrants could become shareholders —farmers could use land as capital. The land share usually should account for less than 20% . The agriculture enterprise will be set up through joint-stock company or joint operation company.

(2) Renting management —translation of the right of land use should be permitted under non-gratuitousness. The combination among land resources, capitals and technological input should be strengthened.

(3) Inviting tenders and contract system. When the land is reclaimed according to the master plan, it should be contracted to manage by some farmers.

(4) Making a requisition of land. Before the land is exploited, the government or development company buy the right of land use for migrants.

5.4 *Relying on sciences and technology progress*

Most migrants had lived in closed mountainous areas before they resettled. Their skill level is very low. In order to undertake sustainable, effective and integrated development in the new area, scientific and technological inputs are required. The choice of location of new settlements, the preparation of a master plan, designing industries, the solution of key problems and other aspects all require the advice of scientists and experts so that the technical content can be enhanced. Governments should encourage the academy and universities to do research on key problems so that sound farming techniques are introduced. Both units and technicians will benefit from the projects.

5.5 *Studying resettlement and the impact on environment, society and economy*

Due to the lack of theory and research, there is not a scientific basis for decision-making, which may result in blindness to potential problems. Resettlement may lead to the same environmental damage as occurred in the source region. For this reason, a task of top priority research projects is as follows:

The carrying capacity, environmental impact, monitoring of displacement project and its regulating technology. In order to renovate degraded ecosystem and prevent new environmental problems, migration impact on environmental change should be monitored. By taking advantage of multiple inputs and large-scale construction, starting from the beginning the high-efficiency, multiple, and sustainable rural migration model should be built via readjusting land use and industrious structure, stipulating exploitable intensity to natural resources .

5.6 *Raising funds for development and enhancing the inputs through various channels*

The cause and effect of the environmental deterioration in southwest China can not be quarantined with this region. Successfully tackling many environmental problems will require a national and global approach, and the key is to eliminate poverty, so that people can have access to the resources to live.

Environmental migration is an important part of China's poverty reduction plan (1994–2000) so the Chinese government should bear responsibility for providing the necessary capital for supporting the basic construction of new villages, especially water, electricity, road, education and other public facilities.

China is a developing country and government funds are inadequate for meeting all development needs. Development capital of international and domestic financial groups, enterprises and companies could be attracted through preferential policies and measures. They could be encouraged to establish economic crops, forests and fruit bases in China to provide raw materials. This not only solves the problem of shortage of capital but also provides a mechanism for handling the selling and processing of products.

IV. CONCLUSION

Environmental degradation in China has usually taken place in fragile environmental areas, but population pressure and the patterns of resource use have accelerated the process. Environmental migration is a logical and common immediate response to environmental degradation and ecological disaster but it is rarely a medium or long-term solution to environmental problems. Out-migration will only represent a real and lasting solution to environmental problems when both the source and the destination areas adopt agriculture practices which ensure sustainability. This needs to be accompanied by lower levels of population growth through substantial and sustained fertility decline. Only through improving education and technology, readjusting industry structure and setting up related new policies and laws can long-term sustainability be achieved.

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