

*The creation of vulnerability to natural disaster: Case studies from the Dominican Republic**

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This paper argues that natural disasters are not a category of events which can be separated from the broader issues of development, since economic change can create vulnerability to natural disaster. The analysis of case studies from the Dominican Republic shows how the development of large scale commercialized agricultural production has created such vulnerability by reducing or restricting the resource base of certain sectors of the population. It is suggested that the vulnerable state of a population should be considered as much a cause of natural disaster as the extreme physical phenomena involved. Therefore there is a need both for a broader framework for analysis of disasters and for strategies to reduce such vulnerability to be an integral part of long term development planning.

Keywords: Vulnerability, Dominican Republic, commercial agriculture, cyclone, disaster.

INTRODUCTION

This paper is a preliminary analysis of material gathered during the month of June 1980 through fieldwork in certain communities of Monte Plata, Bayaguana and Sabana Grande de Boyá in the northeastern part of the province of San Christóbal in the Dominican Republic. The aim of the study was to elucidate (through investigation at the local level) aspects of social and economic systems which have a bearing on the vulnerability of rural communities to cyclone, with particular reference to the case of Hurricane David and the tropical storm Frederick, which affected the Republic in August and September of 1979.

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In recent years a small, but significant body of research (see Jeffery, 1980) has shown that social and economic processes can be considered as causes of natural disaster in a similar way to the more obvious physical phenomena. Thus disaster is 'the manifestation of an interaction between extreme physical or natural phenomena and a vulnerable human group.' (Westgate and O'Keefe, 1976, p. 4).

Drought in Africa has been analyzed as the outcome of several inter-related processes in the nature of colonial domination, the introduction of commercial crops and the subsequent marginalization of both traditional agricultural and pastoral societies (Meillassoux, 1974; Ball, 1978; Wisner *et al.*, 1977). The causes of deaths from Hurricane 'Fifi' in the Honduras in 1974 and from floods in Bangladesh have been attributed to a structurally similar situation (Baird *et al.*, 1975, p. 29—31).

Disaster and development are shown to be integrally related in the work cited above. Local level investigation leads to a constant redefinition of disaster and indeed to its dissolution as a category of events separate from a broad range of processes which affect populations. Long term ecological deterioration, for instance, can be traced to socio-economic causes but is not so spectacularly visible (except in extreme cases) as the devastation caused by a hurricane. Nevertheless such gradual deterioration of the resource base of a population implies problems for the future more difficult than those presented in the aftermath of a hurricane. Moreover, the solution of such long term problems may not be given attention by the development agencies and administrators.

The term disaster implies a departure from a normal condition. However, the 'normal' cannot be taken for granted but must be investigated for any given context. In the area studied the relatively mild impact of the hurricane merely exacerbated the usual problems of the area. After the emergency, the publicity and the drama were over, the normal problems of life in these rural communities continued and it is this normal situation which will be discussed in this paper.

The fieldwork in the Dominican Republic was designed to elucidate the recent social and economic history of selected communities, on the hypothesis that populations marginalized[†] as a result of national economic development are likely to be more vulnerable to natural disaster because of their limited control of resources. Such populations are vulnerable in two senses. Firstly, the material conditions of living may include, for instance, inadequate housing located in hazardous areas or agriculture situated in areas vulnerable to extreme natural phenomena. This general

[†]I use the term 'marginalized population' to refer to the restriction or reduction of that population's control of basic resources for livelihood. I am not implying that such a population can be considered to be separate from the wider economy, since, on the contrary, developments in the wider economy may be based on and require such reductions in the resources of sectors of the population and may also depend on that population as a cheap reserve labour force. Thus marginal populations are here considered as an integrated part of the economy.

lack of resources puts a population in a weak position vis-a-vis any kind of crisis. Secondly, the same lack of resources means that a population's ability to recover and return to normal after such a disaster will be reduced and that it will therefore be more dependent on external sources of aid. In this paper I aim to outline the causes of such vulnerability with reference to particular cases from the Dominican Republic.

CRITERIA FOR SELECTION OF THE FIELD LOCATION

The most severely affected areas were not selected for study on the grounds that in those areas, the tremendous impact of the natural phenomena was such that this would have overwhelmed any variation in vulnerability due to socio-economic conditions. It was necessary, therefore, to focus on a mildly affected area where the hypothesis of differential vulnerability due to socio-economic conditions could be tested.

A census of population and damage to housing in the provinces of San Cristóbal and Peravia was carried out after Hurricane David in November 1979 by the Dominican Office of Statistics (ONE, 1979). We used the figures contained in this census to analyse the distribution of housing damage and found certain areas where differences in the percentage of houses damaged did not relate proportionally to the differences in wind speed recorded for those areas by the National Meteorology Office (see Fig. 1). Thus some secciones* further away from high wind speeds were recorded as having higher percentages of damaged housing than some closer to the higher winds. In these cases, it seemed that the distribution of percentages of damaged housing could not be attributed simply to wind speed and this seemed to offer an opportunity for testing the hypothesis of non-physical (that is socio-economic) causes of natural disaster.

The secciones thus isolated for possible fieldwork were San Francisco and Rio Boyá in the municipio of Monte Plata, Trinidad and Cojobal in Bayaguana, and Gonzalo and Payabo in Sabana Grande de Boyá.

In the field, however, it was not possible to use the differentials in percentages of housing damage (as found in the census) as clues to the existence of socio-economic vulnerability for the following reasons: in the first place, the smallest censal unit was the seccion of the municipio, which in fact comprises as many as 25 parajes or hamlets, often differing considerably in terms of their economic basis of livelihood and social composition. Thus, there are often as many differences within secciones as between them. Secondly, local level fieldwork led me to question the validity of the statistic on housing damage as a primary measure of hurricane impact upon a population. Informants fre-

quently commented that housing damage was minimal, but that agriculture suffered considerably. It was clear that in an area mildly affected (and where in the construction of traditional dwellings, there is virtually no development of the division of labour, except by sex) housing damage could be repaired in a matter of days or weeks since local sources of materials were not seriously depleted, whereas the loss of crops meant a significant reduction in a household's resource base for a much longer period of time — months if not years, depending on the nature of the crop.

This local level investigation and discussion indicates that the distribution of agricultural damage may be a statistic more relevant than the distribution of housing damage for the consideration of the local-level impact of hurricane in the rural areas. Data on agricultural damage at the level of the sección were available for Monte Plata only, and there the distribution of damage did not coincide with the distribution of housing damage.

At the same time both kinds of statistics have their limitations, partly because of the affected population's awareness that the information they give may lead to aid (hence a tendency to exaggerate) and partly because of the difficulties of carrying out such a survey in the rural areas, some of which are very isolated. Since the agricultural statistics also do not give the damage as a percentage of the total crop expectations, the impact of the disaster to farmers cannot be assessed.

METHODOLOGY FOR THE LOCAL LEVEL ANALYSIS OF VULNERABILITY

Although, for the reasons outlined above, it was not possible to establish clear and undoubted relationships between the statistics and local level factors, nevertheless an analysis of the area's recent social and economic history and present situation did reveal certain processes which over time have increased the vulnerability of populations to extreme natural phenomena.

A methodology for the investigation of local level vulnerability to natural disaster in rural areas had been developed and tested in a previous case study in Indonesia (Jeffery, 1980). Fieldwork, both in this study and the previous one, was carried out through informal interviews and participant observation in various rural communities. The aim is to elucidate the characteristics of local social and economic systems, in particular the relationship between subsistence production and production for the market and factors related to this, which affect the resource base of the population at both the household and community level. It is considered that populations marginalized through processes which reduce and restrict their economic base for livelihood are likely to be extremely vulnerable to natural disaster.

VULNERABILITY TO FLOODING

Much of the seccion of San Francisco in Monte Plata is low lying land and certain parajes belonging to it suffered severe flooding as a result of Hurricane David and the tropical storm Frederick. Batey Chirino, Batey Yabacao

*The municipio is the unit of local government, which is in turn divided into secciones. Each seccion includes a number of parajes (hamlets). Batey indicates a hamlet founded specifically to house sugar cane workers. The term barrio is used for settlements of both rural townships and larger cities.

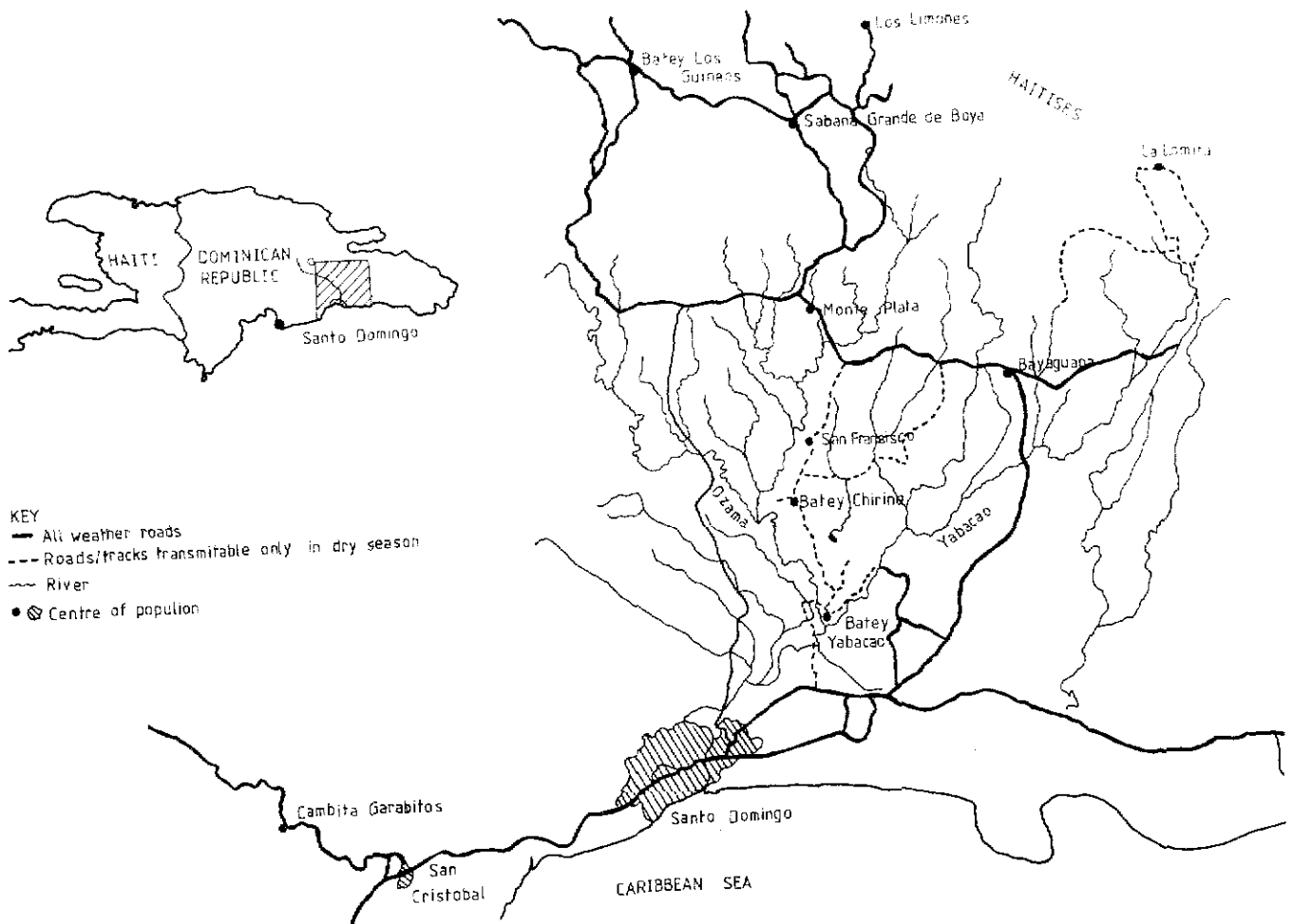


Fig. 1. The fieldwork area in the Dominican Republic.

and La Caguaza are three such affected communities, which are all situated close to the Ozama river or its tributaries.

The causes of flooding are not a simple matter of topography, but lie also in the deforestation that has taken place this century to clear the land for the monocultivation of sugar cane. Batey Yabacao and Batey Chirino were founded by the sugar companies 50 or 60 years ago. However, it seems that the widespread clearing of land did not take place until the 1940s and 1950s in the era of the dictator Trujillo.

Until 1957 La Caguaza, for example, was a community of small scale cultivators, whose production focussed on subsistence crops combined with cocoa, coffee and bananas and the raising of pigs and cattle. Then Trujillo sent in the bulldozers and all the existing crops were destroyed without warning, together with a fairly extensive woodland. Over half of the 22 households of agriculturalists were completely dispossessed and obliged to leave. Some moved to Batey Chirino and others left the area altogether. No compensation was paid, although the land was said to belong to those farming it.

The area in which these three communities are situated is today almost completely treeless and planted to a

considerable extent with sugar cane, much of which is owned by the state. The river banks, without the reinforcement of tree roots, are prone to erosion and are much lower than they were before deforestation. As a result the rivers burst their banks relatively frequently during the rainy season from June to October. Even without a hurricane there is a constant risk of flooding in these months. Many informants were very aware of this erosion and its causes and effects. (One told me that when Hurricane San Zenon struck in 1930 before the deforestation, one could swim to fetch help, using the trees as resting posts, but that this was no longer possible.)

As might be expected from the foregoing, these communities are by no means self-sufficient in food crop cultivation. In recent years, land has been returned to some of the original families of La Caguaza and it is used for subsistence crops, although much of the good soil (tierra negra or 'black soil') is still under sugar cane. Inhabitants of Batey Chirino negotiate with members of neighbouring communities with more agricultural land to obtain plots for subsistence cultivation. Such arrangements are informal and include forms of sharecropping and renting, which may change from year to year. In Batey Yabacao the only land

available for agricultural purposes lies in the flood plain of the river. It is not planted with sugar cane because of the risk of flooding. The inhabitants of Batey Yabacao, with no other land open to them, sow this marginal land in the dry season (November to May) with beans and maize. Some also venture to sow rice in these areas in June, but admit that it is a tremendous risk, because there is no certainty that one will harvest anything, given the risk of flooding from the river at that time.

In the last five years or so a new source of income has opened up for the inhabitants of Batey Yabacao, namely fishing and the sale of shrimps and crayfish to the hotels and restaurants of the capital, Santo Domingo. The impetus for this came from fishermen from the province of Barahona, who began to arrive in the area in search of more lucrative and untapped fishing grounds. They brought with them the nets and wicker traps, which are now also bought or made by the local people. Before the arrival of the Barahonans fishing was done irregularly for domestic consumption only, but now it has become a full time occupation for many men. Intermediaries (from the capital and some of Barahona origin) arrive every morning in small trucks to buy the night's catch. Two men may work with as many as 150 traps between them and earn 20—30 pesos per day, compared with 1—2 pesos labouring on the sugar cane of 3—4 pesos in agricultural wages.

Fishing is thus proving to be a very lucrative activity, but no conservation measures are taken whilst fishing continues all the year round. In addition, weekenders from Santo Domingo sometimes come to fish with dynamite so there is every likelihood that the stocks will become exhausted in a relatively short time, as has already happened in parts of Barahona.

The situation in the parajes of Batey Chirino, Batey Yabacao and La Caguaza is therefore one of vulnerability to flooding consequent on actions taken this century to facilitate the large-scale cultivation of sugar cane. Furthermore, because of the monopolization of most of the land in sugar cane, the local population is forced to cultivate marginal areas where crop yields are uncertain and in the case of Batey Yabacao they are also over-exploiting fishing resources to obtain a living, with obvious implications for the long term conservation of these resources. Basic foodstuffs must be imported into the area from other parts of the republic or from abroad, making the communities dependent on these external sources of supply and more vulnerable to any kind of crisis which might affect that supply.

VULNERABILITY TO EROSION IN THE UPLAND AREAS OF SABANA GRANDE DE BOYA AND BAYAGUANA

The problem of erosion in this area can only be understood by setting it in the historical context of the relationship between subsistence cultivation and the cultivation of commercial crops, such as sugar cane and coffee, within the Dominican Republic as a whole during this century. The fertile and low lying land has become increasingly concentrated into the hands of a minority,

causing migration both to the urban areas and to open up hitherto uncultivated hilly regions. In the area studied this process can be considered in two stages, the first during the Trujillo era 1930—1961 and the second in the post-Trujillo period.

The era of Trujillo 1930—1961

The municipio of Sabana Grande de Boyá was founded in 1949 by Trujillo with the intention of opening up the surrounding area for the large scale cultivation of sugar cane. Prior to this the area had been sparsely populated, scattered settlements of small-scale agriculturists (such as Los Guineos and Gonzalo) coexisting with some larger scale extensive cattle raising. Much of the land was wooded or uncultivated savannah inhabited only by wild pigs and other animals. The small-scale subsistence cultivators exploited only the land that was necessary to meet their needs, using the household labour force.

After 1949 the area changed radically. Bulldozers and tractors were brought in in order to clear not only much of the woodland, but also many of the areas under small-scale cultivation. Little warning was given and no compensation was paid. The inhabitants of Gonzalo, for instance, were completely dispossessed of their land and at least half migrated in search of agricultural land elsewhere while others stayed to work as labourers in the sugar cane. This exodus of small farmers (some of whom moved into the hilly interior) was counterbalanced by the migration into the area of people from all over the Dominican Republic in search of work in the sugar cane and in related services (transport, catering, prostitution, etc.). To this day the town has a reputation for violence and revolt, which members of the neighbouring municipios of Bayaguana and Monte Plata attribute to its being predominantly an unstable community of wage labourers from all parts of the republic.

Bayaguana is a municipio of much longer standing, established in 1606 after the devastation in the north of the country carried out by the colonial Spanish administration, which entailed the removal of whole populations from the north coast in order to prevent smuggling. Thus, the inhabitants of Bayajá and Yaguana were relocated at Bayaguana and those of Monte Criste and Puerto Plata were resettled at Monte Plata. The church in Bayaguana dates from this period.

Bayaguana, during the Trujillo era, was characterized by large scale cattle ranching, which was gradually superceded after about 1937 by the commercial production of rice. This commercial production encroached upon the land base of subsistence producers in various ways. Although Trujillo's bulldozing techniques seem not to have been used, nevertheless private entrepreneurs obtained land through harassment of small-scale producers or sometimes the land was bought. Powerful family enterprises (such as the Jimenez and the Reyes Valdez) also established rice mills to process their produce in the area.

Towards the end of the period, Trujillo also established sawmills in the hilly areas as, for instance, in El Guanito (Bayaguana) and Los Limones (Sabana Grande de Boyá). This seems to have been of some importance for the

eventual colonization of these areas in that after the assassination of Trujillo in 1961, many sawmill workers took over land in the vicinity for agricultural purposes.

The post-Trujillo period 1961 —

The assassination of Trujillo and the years of instability which followed it, including occupation by U.S. forces in 1965, seems to have been the signal for a virtual free-for-all in the occupation of state-owned land. It was at this time that the colonization of the hill areas of Bayaguana and Sabana Grande de Boyá became extensive. The majority of migrants came from the coffee growing areas around the city of San Cristóbal and the municipio of Cambita Garabitos, although some came from the Cibao valley and from the area east of the hills.

Some migrants were landless, but many seemed to have been previously involved in a small-scale coffee production, which was becoming decreasingly profitable because of the low prices for coffee paid locally and partly because of the scarcity of land suitable for food crop cultivation in the area. This meant that the people were obliged to buy their food with their decreasing income from coffee production, and these increasing difficulties in balancing the household budget combined with the possibility of colonization of the hill areas to cause the migration to Bayaguana and Sabana Grande de Boyá. The news of the land available seems to have been spread to a considerable extent through personal contacts and networks.

Extensive deforestation occurred as a result of this migration and in the territory of communities such as La Lomita and La Deseada (Bayaguana) and Los Limones (Sabana Grande de Boyá) there is virtually no virgin forest. Over the 20 years since colonization began, crop yields have dropped by more than one half in some areas.

Official ignorance of the extent of this settlement is demonstrated by a government plan in 1979 to include the area of Los Limones in a national park in the Haitises (the name given to the hills). The boundary line as first drawn would have included land inhabited by over 10,000 people and would have meant their dispossession (once again) in order to create the proposed conservation area. The inhabitants protested and a census was carried out to establish the size of the population. As a result of this the boundary line was redrawn to exclude Los Limones.

THE VULNERABILITY OF URBAN 'SHANTY SETTLEMENTS'

As in the preceding two sections, the problem of the recent rapid growth of urban shanty settlements can only be understood by setting it in a wider context and by looking to the rural areas for the causes of the accelerated rate of migration.

In the 1970s the dispossession of small-scale farmers in fertile areas continued, caused less by dislocation by brute force than by the more subtle pressures of market forces. Land prices rose because of the demand for areas for sugar cane cultivation (in turn due to the high price of sugar internationally, see Table 1) and poorer farmers, unable to

Table 1

| Table 1. Price of sugar at Carribean ports, 1973—1978 | |
|---|-------------------|
| | U.S. cents per lb |
| 1973 | 9.48 |
| 1974 | 29.70 |
| 1975 | 20.43 |
| 1976 | 11.56 |
| 1977 | 8.11 |
| 1978 | 7.82 |

Source: National Institute of Economic and Social Research, 1979.

eke out a subsistence and faced with the rising costs of basic consumer goods, decided to sell up and move to the urban areas in search of what they saw as easier and more lucrative work. In some cases, small farmers with plots of land adjacent to each other, grouped together to sell their land as a large block, thereby making it more attractive to the buyer and hoping to achieve a better price. Some, having sold their land, headed for the hill areas to 'invade' state-owned land, while others migrated to the urban areas.

During the 1970s, therefore, the number of landless grew and this led to the creation of new barrios in Bayaguana and Monte Plata and the additional growth of the already densely populated shanty settlements on marginal land in Santo Domingo. These latter occupy two kinds of land — one is the very low lying land along the river Ozama (an area known as La Cienaga) and the other the areas of very steep ravines at the northern extremity of the city. In the capital, the material most frequently used in housing construction is corrugated iron sheeting and some houses are composed entirely of this, while others have parts of the wall in concrete or wood. Overcrowding is much more of a problem than in the rural townships.

In times of impending hurricane these shanty settlements cause considerable problems for the government, since the inhabitants must be evacuated if heavy loss of life is to be avoided. In May 1980 the ravine settlements in Santo Domingo had to be evacuated because torrential rain threatened to wash the houses into the gulleys. Such regular evacuation, carried out by Civil Defence, is clearly a drain on manpower resources in times of crisis, yet there is a noticeable lack of official action on the causes of problem, which is not tackled at its source (i.e. in the rural areas). The administration deals with the shanty dwellers only at the level of 'preparedness' for a cyclone or other extremes of climate and has not developed any longer term 'preventive' strategies, which could reduce or relocate these marginal settlements, for instance through the provision of urban land and better housing or through increasing opportunities for rural employment.

CONCLUSION

The analysis of these case studies has shown that the

vulnerability of populations to natural disaster can be created by certain social and economic processes, which, in this particular context, are implicit in state and private development of commercial agricultural production at the expense of small-scale producers. Such processes include the concentration of land into larger units for the purposes of mechanization, entailing the dispossession of existing producers either by coercion or by the play of market forces, such as the rise in land prices which (in the context of inflation, rising prices in basic foodstuffs and consumer goods, combined with the small-scale producers' limited access to credit in order to increase their production) encouraged the small producers to sell their land and seek alternative sources of livelihood.

In the cases presented, the commercialization of agriculture (in particular the extension of sugar cane production, sensitive to fluctuations in prices in the world commodity market) has not only entailed widespread deforestation of fertile lowlands but has also forced small-scale agriculturalists into marginal areas either to farm patches of land around the sugar cane or to invade the poorer hill areas (leading to over-farming and erosion). At the same time it has also been the cause of migration to the urban areas and the growth of shanty settlements, which are a drain on public resources in times of extreme environmental hazard.

The implications of this kind of research for policy-making related to disaster are wide-reaching. Since the vulnerable state of populations can be seen to be as much a cause of natural disaster as the physical phenomena, action intended to reduce the impact of extreme natural phenomena should be directed not only to developing preparedness measures (such as hurricane warning systems and evacuation of populations) and to emergency relief, but also towards more long term strategies for the reduction of the vulnerability of populations to natural disaster.

It is in this latter sense that disaster is clearly a development issue. If certain kinds of development can be shown to increase vulnerability by reducing the resource

base of sectors of the population either by removing their control of the means of production or by forcing them to cultivate marginal areas and over-exploit the natural environment, this should be taken into account in future development planning as well as in the administration of aid related to disaster.

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