

BACKGROUND NOTES FOR WORKSHOP.

**“Community Planning for Natural Disasters ----
A Case Study of Dominica, West Indies.”**

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Background.

Following the devastation of Hurricane David on the Caribbean island of Dominica in August 1979, and at the request of government officials on the island, the author was granted an unpaid leave of absence from his substantive position to assist in the recovery efforts in progress.

This paper reflects some of the observations and opinions arising from that experience and is part of a larger, more extensive assessment of current disaster exposure, awareness, preparedness and response capabilities of small jurisdictions like Dominica in the face of increasing incidence and virulence of major adverse natural events.

Natural Disasters in Perspective.

Sudden violent or major disruptions to naturally occurring processes are not by themselves disasters. Nature by definition expresses, alters or re-invents itself in ways which result in environmental, ecological or landscape re-adjustments sometimes through a gradual evolutionary process, and sometimes through dramatic, high energy releases. “Disasters” arise only when changes to natural processes are initiated and/or facilitated by human interaction or when nature, in the course of its evolution, adversely impacts on human activities, structures and functions in a significant manner. Consequently, without the presence of human society or activity these can be no “disaster” and “disasters” are necessarily human perceived and/or human impacted events.

The Caribbean Context.

Natural disasters of various kinds or the impacts of natural events on human society are a recurrent phenomena throughout the islands of the Caribbean. The causes

range from earthquakes to volcanic eruptions to hurricanes and include in their impacts torrential rains, landslides, soil slippages, ash depositions, magma flows and fume dispersals, wind blasts and surf surges, as the case may be. The impacts on human activity result in destruction to agricultural crops, homes, businesses, infrastructure, offshore fisheries, natural amenity areas including resort areas. They may result in loss of life or in injury. They may engender threats to community health and safety. They may require major changes to patterns of life and relationships including relocations and may leave in their wake irrecoverable private investments.

The combination of small geographic size and their delicate natural ecosystems, their limited natural resources and slender economic base, their precarious (and in some instances anachronistic) settlement patterns, the prevalence of a low educational level, and relatively undeveloped institutions for the management of natural and human resources all pose challenges in harnessing community effort for responding to disasters when they occur. Current expectations are that there will be

increases in the threats from some natural disasters associated with the threat from climate change because of global warming. Consequently as population of the islands increases and the pace of both locally generated and externally driven development quickens, the potential impacts from such natural disasters become greater in terms of both loss of life and destruction to property and resources.

Traditional responses which have emerged in developed societies of Europe and North America to deal with problems of natural disasters appear to have limited relevance for Caribbean conditions and should therefore be applied with care. Obviously, the factor of geographic size provides greater flexibility in developing avoidance responses. Secondly, the option of engineered solutions provides greater attractiveness in those locations. Thirdly, the tendency to apply risk management and financial insurance set-off against adverse impact is seen as an adequate response. The challenge for the Caribbean is to guard against the wholesale adoption of these practices in considering development proposals by North American and European interests, in particular, within these islands. It should also be emphasized that developed countries have now incorporated strict and exhaustive environmental impact assessments as part and parcel of project approval and construction processes. They have in place the institutional frameworks to demand compliance and to apply sanctions when and where necessary. This is a far cry from the Caribbean. Lastly, they operate within a much more informed society and a subject to a much more investigative and discerning media scrutiny.

An appropriate framework for addressing these issues will come out of case studies such as this. It will borrow from useful foreign experiences but it will be attuned to the geography, economy, financial realities and the social limitations of the islands. In that respect, it is expected that Hurricane David and Dominica will hold some lessons for the adjacent islands. In fact, a critical dimension of this analysis is a consideration of expanding geographical size of each island jurisdiction in order to

increase flexibility, expand resource capability and extend technological reach in anticipating natural events, understanding implications on a regional basis and managing common resources including the societies at risk, in other words, the human ecology of the region.

Responses: Objectives and Strategies.

The period immediately following a natural disaster, especially one as pervasive as Hurricane David on the island of Dominica, affords a rare opportunity for an “outsider” to view clinically the deficiencies revealed and the opportunities presented for addressing both the problem and the need. Some criteria might be established as the basis for considering possible policy responses:

- (a) policies should be comprehensive;
- (b) policies should be consistent;
- (c) policies should be understandable;
- (d) policies should be implementable;
- (e) policies should be capable of being monitored for effectiveness.

Even so, the situation in Dominica was unusual in several respects. The island had just emerged from a period of political turmoil, and at the time of the hurricane event, an interim government composed of an amalgam of representatives from across the political spectrum and civil society, some elements of whom were perceived as vying for personal and political visibility in anticipation of an impending general election. Accordingly, while some leadership individuals exercised individual initiative in accessing overseas assistance, integrative decision-making tended to be slow and disconnected. True, “ad hoc” emergency measures needed to be taken from time to time to address the plight of citizens and severely distressed areas. However at times such decisions worked at cross-purposes. For local and foreign relief personnel, there was no clear dove-tailing of strategies in order to reconcile clearly short-term (disaster relief) efforts within medium term (rehabilitation) programs which in turn might form the platform for a longer term platform for self-sustaining growth.

Similarly, the various personnel involved in the recovery efforts are likely to be easily confused as special purpose bodies or foreign agencies become involved in dealing with particular aspects of the recovery “program”. Many of these functions overlapped ongoing civil service mandates and both administrators and stakeholders in the general public should evidence of confusion because of blurred responsibilities. In response to the hurricane, outside governmental and non-governmental organizations (NGO’s), some well-intentioned, some with questionable agendas responded in a variety of ways. Remembering the context of decision-making, namely, a small and overwhelmed civil service, the absence of an integrative national development strategy/plan, the undercurrent of conflicting political direction, and only an elementary framework for dealing with such emergencies, the seeds of chaos were widespread. This was compounded by

obligations devolving on senior civil servants, in particular, to liaise with representatives of aid missions and agencies without an appropriate context to assess offers of support.

In all of this, a major problem of effective communication continued. It would have helped if there were regular government press releases on the conditions and problems being encountered, how these were being addressed, how citizens might assist in specific recovery efforts, what alternative arrangements were being put in place address the major problems and how resources and assistance might be accessed. Dominica, like most Caribbean islands, suffered from the absence of a tradition of strong grass-roots involvement in community building and development. As a result, little was known of the concerns (even pre-hurricane), perceptions, aspirations and motivations of the masses of the people. The restoration of pre-hurricane conditions might therefore have been contrary to what was considered desirable.

Nevertheless, out of this maelstrom there appears to be emerging an awareness which needs to be nurtured and promoted that operational systems (planning, facilities and personnel) need to be put in place in case of future natural disasters of whatever nature. It needs also to be recognized, that these responses should properly have a significant non-local component. During the period following Hurricane David there have been several regional conferences regarding addressing the issues of hurricane disaster preparedness on a regional basis. Such initiatives need to be partnered on the national and community (municipal/village levels by a resurgent interest in grass-roots organizational planning for emergencies on those levels. It is such a commitment on the part of regional organizations and national governments that the people themselves must be part of the prevention and remedial processes that hopefully will be the greatest legacy of Hurricane David.

Institutional Responses.

A development plan for the island of Dominica had been prepared since 1976. This document outlined a program for the physical, economic, social and infrastructural development of the territory to the year 1990. This plan was primarily a bureaucratic document, created with minimal public consultation and informed input, By August 1979 it had not yet been approved by government despite pious promises to do so. Ironically, though still not yet adopted, this draft document served as the basis for much of the international assistance from aid agencies in looking at the longer term of the country. Unfortunately, this had the effect of taking as a given, certain assumptions that because of the fact of Hurricane David should no longer have been considered a constant and needed to have been revised. At the same time, the availability of soft loans and grants from international and regional lending agencies and governments directed to such critical areas as housing, roads and bridges repair, schools and hospitals re-construction would logically require revisions to the national planning programme on staging and priorities.

Immediately preceding the hurricane, officials of the national planning office were engaged in processing a Town and country Planning Act to guide the location and type of land use and physical development across the country. This effort had apparently received only grudging consent at the political levels in view of some public opposition and suspicion of its regulatory effects. Hurricane David emphasized the urgency of this exercise and the need for its speedy implementation. It should have been obvious that some aspects of the proposed legislation required wider consideration and that measures were needed to address preventative controls towards resource management, erosion control, storm water regulation as a factor in new construction, stream channels and impoundments, slope stabilization and terracing, shoreline modifications and aggregate mining to name a few.

Hurricane David may similarly be responsible for expediting the approval of a National Building Code, under consideration for some time. The tragedy is that by the time this code comes into force, most of the housing stock destroyed by the hurricane will have been replaced to lower quality standards than even existed before. However, the reality is that the strict enforcement of the provisions of the new code would have been burdensome on sections of the island community unable to meet the requirements or to bear the costs associated with the new standards. It is within such a context that government intervention either through subsidy to private developers to improve the safety and quality of renovated housing or a forceful initiative into public low income housing schemes might have been most understandable.

In 1975, A national Parks and Protected Areas Act was enacted which established a national parks system for the island , conserving and managing some 15,900 acres as a wildlife and forestry reserve under strict management guidelines. This commitment to ecological and environmental management was not universally endorsed within the public. Elements within the society argued that valuable development opportunities would be lost. Much if the forest cover within the park system had been severely impacted by Hurricane David, Notwithstanding, the commitment continues and post hurricane inventories and evaluations are continuing in order to determine how much of this valuable national resource might be salvaged.

The institutional responses to Hurricane David have been many and varied. There has need an evident rise in the spirit of co-operation in efforts at rehabilitation. Employer and labor organizations, community and religious organizations, youth groups, service clubs and charitable institutions have all demonstrated a commitment to “rebuild together” as never before. In these challenging times, there has been substantial contribution and support from former island residents residing overseas (Diaspora). However, experience has shown that the recovery assistance program could have been better designed. For example, in some cases assistance to farmers for agricultural purposes went into their more immediate needs such as housing rehabilitation, and that even that which went into agriculture was poorly

monitored. (The same might be said for private insurance payouts which financed emigration of the recipients resulting in considerable leakages of critical investment resources).

Much effort is still required to strengthen the structures and systems, improve the facilities, train the personnel and clarify/define the reporting relationships and procedures necessary for effective disaster preparedness and recovery. At the most basic (local community) level, this design should embrace storm and other disaster

warning mechanisms; shut-down techniques; designation, security and stocking of refuge centers; emergency food and medical stations; evacuation procedures and routes; and, regular community drills. Indeed, disaster response techniques should form a regular part of the curriculum for all schools.

Response-related Programs and Projects.

Hurricane David directly and indirectly generated several projects intended to address the immediate impacts of the storm, and programs intended to hasten the national economic recovery process. A summarized listing of some of the major initiatives is discussed below:

- (a) **Agriculture:** The months immediately following the storm saw an increased reliance on agricultural food imports, especially as the mature and usable crops in the field had been salvaged. The direction of programs was therefore to aid in restitution and increase, where possible) of local food production and restoration of the nations export production capability. This mainly took the form of farming subsidies, repair of agricultural (feeder) roads, rebuilding of damaged agricultural support structures such as packaging sheds, provision of fertilizers at subsidized levels. There was little assessment of the interest, willingness and capacity of the (private) recipients having regard for other financial demands, age etc. There did not seem to be a prioritization of crops or districts of the country which were best suited to be the food sustainability objectives.
- (b) **Industry:** Dominica has a small, relatively unsophisticated industrial sector comprising mainly agricultural processing, whose fortunes are to a large extent dependent on those of agriculture. The promotion of an invigorated Industrial Development Corporation to attract additional investment in manufacturing; to assess new applicants for industrial assistance; to assist in access to funding; and to provide technical support services was a step in the right direction.
- (c) **Physical Infrastructure:** The basic physical infrastructure of the country was seriously impacted by Hurricane David. The island-wide road network was devastated, the integrity of community water supply was compromised, and electricity and telephone services were disrupted. In addition, most hospitals and clinics sustained major damage. Many schools were in need of significant repair. Most government buildings to a greater or lesser extent were

damages and their facilities and records were also damaged or destroyed. Restoration of these and other services were a high priority for the effective functioning of the country. Thanks to the intervention and aid of several countries including, Canada, France, the United States, the United Kingdom and the Venezuelan Republic and a speedy re-investment program by the public utilities concerned, these deficiencies were made good. Various observations are appropriate: (a) Donor countries utilizing their own national contractors and technologies undertook projects to their own specifications resulting in a wide variation in the quality of the resulting (especially road) systems. (b) Some new remedial work such as electricity lines and cables were either simply added to the already confused, impacted grid, which while expeditious, created a challenge for on-going maintenance and repair. (c) Urgent home rebuilding and repair, with minimal regulation with regard to storm water and sanitary sewage disposal created a ticking time-bomb for later health and safety concerns.

- (d) **Settlements:** The national recovery process gave little thought to the rationalization of the existing settlement patterns and the benefit cost of continuing public service delivery to some problem areas. The converse of this issue was the extent to which new and more justifiable settlement areas might be created or old ones expanded in support of a (still un-enunciated) national development program. It had been estimated that 60% of the housing in the southern half of the country was destroyed by the Hurricane. The response of the day was a provision of low interest financial assistance for rebuilding and rehabilitation. There was no minimum standard requirement except what the lending institution might have required to secure their loans. As such, attractive initiatives such as new village communities as part of a planned agricultural resettlement program went unaddressed and a blind eye was turned to the problems posed by some unsustainable coastal communities.

The estimated cost of the required public hurricane program was in the order of \$600 million (EC) dollars. How much was actually expended is difficult to know as much of the work was undertaken by friendly foreign governments under their own costing protocols. Secondly, phases of the recovery are still continuing. Considering the fact that most of the above expenditures relate to restoring disrupted services, (some might argue that) there would be little rationale for a major public discussion of need, priority and staging. Similarly, to the extent that radically new departures might have been proposed, such as agricultural resettlement communities), then some public involvement would have been desirable (and might even have been politically sensitive). Bold initiatives did not occur, and in a real sense, the prevailing atmosphere of crisis has laid the cornerstone of land use, environmental and financial commitments, which the impacted society will have to live with for many years to come (perhaps to its regret).

Resource Allocation Conflicts.

The pace and scale of the relief, rehabilitation and redevelopment effort was facilitated by the presence of non-residential personnel. Given that local staff and their families and properties had been severely affected along with the rest of the population and were equally burdened by the need to attend to issues of food, clothing, medical attention, and shelter, the relief provided by off-shore persons was to some extent welcome. On occasion, local persons familiar with specific problem areas being confronted were co-opted on assignments of varying duration. Staff from the Caribbean region with similar local conditions, as well as technical staff from regional institutions and outside, provided additional support. In this regard, two observations may be relevant:

- (a) The broad-front recovery effort necessitated an expanded bureaucracy beyond the normal capacity of the country. There needed to be a similarly planned process of downscaling as the island reverted to its usual operational levels. This is both an administrative, technical and financing issue of transferring responsibilities, monitoring and maintenance.
- (b) The challenges posed by large injections of grant/loan monies into a stalled economy ran the risk of fuelling local inflation. There was therefore some benefit in foreign financed and implemented redevelopment works with as neutral local effects as possible. However, highly capital-intensive investments resulted in reduced local employment benefits and increased financial outflows. The more labour intensive the projects, in a time of high labour demand among a number of competing programs caused wage escalation and deprived investments of their full benefits. There was no magic formula to be applied and decisions (even those with potential conflicts) had to be made on a case by case basis.

There may be a widely held opinion that following a disaster such as that occasioned by Hurricane David in Dominica that there is an inevitable flight of capital. This may not be the case. True, there may be an atmosphere of gloom and doom as citizens survey the destruction. True, also, that many might choose to leave the local situation, circumstances permitting, whether temporarily or permanently. Except for those decisions of an emergency short term nature, many persons might with good reason choose to allow a lag time until policy decisions are clearer, public infrastructures are in place and the disruptions of the market have been rectified. To the extent that this is true, conditions may be ripe for government to invite private participation in investments and to relieve itself of the financing responsibilities. This may be particularly attractive for public utility operations and similar ventures with interest payments secured by foreign government security. This option requires testing in the future.

The Role and Participation of the Public.

This may perhaps be the most understated aspect of the entire rehabilitation process. The context of “crisis planning” has often been permitted to explain away the need for extensive citizen involvement in public decision-making. As was

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explained in an earlier section, some circumstances intervened to frustrate an organized public opinion and consultation program. This deficiency must be recognized as a limitation on planning for national recovery, and should be built back into the process as quickly as possible either through a general revision of policy proposals coming out of the hurricane experience or through more specific secondary sector or program plans,

Limited meetings and discussions were held with certain sectors of the society, but these tended to be representatives of those groups which were considered perceptive of the problems being encountered, and which were thought capable of proposing reasoned solutions. Alternatively, representatives of the more established organizations were invited in to speak on behalf of their special interests even though it was known that they had not consulted the rank and file of their membership. As a result, decisions and directions based on the views presented had questionable validity and little assurance of committed acceptance. Among groups consulted were:

Representative of industry and Commerce;

Representatives of Agriculture

Representatives of Banking institutions.

There is no record of consultation with the labour organizations or with local insurance representatives or with the building and construction trades for example, all of which were critical players in a recovery program.

Present Status: Accomplishments and Implementation Difficulties

It is in many respects too early to assess the full effectiveness of the recovery effort for several reasons, not least of which is the fact that much of the anticipated funding did not materialize and some revision to strategies and priorities including reallocation of resources was unavoidable. Secondly, where program effectiveness is reckoned in volume of production such as in agriculture, one has to await the maturation of crops from an initial production of ten months (bananas) to in excess of ten years (coconuts). In the more visible private investment sectors such as housing, rehabilitation has been relatively complete with the noticeable exception of any cohesive attention to a low income housing component. Telephone and electricity services have been essentially restored. The ports, airports and roads systems are functional. Efforts are in place in restoring pre-existing educational and health facilities and services.

Thus far, despite the major opportunities presented by the hurricane recovery assistance schemes, no major policy initiatives have been translated into significant on-the-ground developments. There have been no remarkable departures in land use policy or practices occasioned by the experiences from Hurricane David. Approaches to urban settlement and re-development have remained unchanged and even some acknowledged regressive actions (such as the unauthorized and impromptu establishment of a squatter “settlement” on a forbidding steep hillside, has been allowed to remain. These, unfortunately, are the ingredients for a future calamity !

One may speculate on this apparent situation of failure to invest in a prescriptive response. In part, government has not been seen to be a forceful intervenor in public assistance housing schemes., especially those requiring major subsidy. Attention remains focused on repair of government buildings, facilities and services, on road and utilities restoration. Public officials argue that scarce capital must be applied to more urgent social services of health and education. This is inspite of considerable capital accumulation at local financial institutions and significant flight of personal savings and insurance payouts.

This gives credibility to doubts as to whether or not the existing public service has the capacity or the will to break new ground in directing public policy and coordinated private effort towards initiatives and programs on the scale required and with the necessary innovativeness. Where international agencies have raised this issue or might be willing partners, progress will not be made until this deficiency is corrected.

It should also be remembered that the investment levels (public and private) that existed before Hurricane David was the result of many years of incremental decisions. Decisions required to relocate or replace affected infrastructure, plant, machinery, settlements etc in an atmosphere of political uncertainty are not easily made in the current environment. None-the-less, government should proceed to correct earlier errors of poor consultation with the public, by providing some of the services and subsidies resulting from a broad-based consensus. Every encouragement should be given to local capital to come forward particularly in the traditional sectors of agriculture, housing, construction, distribution, trade and commerce and in elements of the tourism sector. Invited foreign investment might be directed to newer emerging sectors of resort tourism, manufacturing, finance and insurance under various criteria that promote local employment, contributory investment, management development and reasonable repatriation of profits.

The Lessons of Experience.

Hurricane David has shown the absolute necessity for effective operational disaster preparedness plans and procedures. The full effectiveness of these measures will require co-ordination among international, regional, national and community levels. Several facets of this co-operation may be highlighted:

- (a) A streamlined system of dissemination of updated weather reports from a central official source with regular updated progress on severity, direction, incidence and expected impacts, including advisories on implementing response measures;**
- (b) Weather and other disaster progress reports must be in easily understandable form in terms of immediacy, threats to health, life and property. (one should bear in mind the educational and comprehension levels of the population);**
- (c) As impending disaster draws near, recording of changing conditions should automatically galvanize pre-arranged responses;**
- (d) To the extent possible, traditional information sources (radio, television, telephone) should be backed by alternative sources and systems and community action centres should have access to independent electricity supplies.**
- (e) Emergency measures should be disaggregated from a regional to a national to a community frame of reference and action. Within this concept, secure depositories of emergency water supplies, shelter, food, sleeping accommodations, clothing, lighting, medical care, vehicles, road clearing equipment etc should be allocated especially during the prime periods of risk.**
- (f) Some potential disaster events will have limited warning times and short reaction/response times. This would be typical of volcanic eruptions and more so, of earthquakes and tsunamis. In such cases, islands with known volcanic activity or communities with high exposure to ocean swells need to have an additional level of protection and response. For example, consideration needs to be given to construction of secure moorings for fishing boats and sea-going craft; design and construction of ecologically-appropriate wave and surge reduction defences etc.**
- (g) This problem is further compounded by the increasing gravitation of major tourism investments to low-lying exposed beachfronts, sometimes constructed with little regard to the risks involved. (Where such risks are written off by insurance arrangements, host islands which have carried the costs of servicing may find themselves repeatedly underwriting inadvisable projects. A new ecologically sensitive calculus is required to address this considerable problem).**
- (h) Within each community and within neighborhoods of larger communities there should be designated shelters capable of securing the at-risk catchment population in reasonable safety. Such shelters will not, of course, be adequate for all potential hazards. However, public buildings might be designed with this multi-functional use in mind and to withstand high threat peaks of rain, windstorm or earthquake tremors.**
- (i) Historical settlement patterns associated with early plantation slavery have resulted in concentration of population on low-lying flood-plains or in the public setbacks along the coastline. These are high exposure**

locations to river flooding in the former case and to wind and storm surges in the latter. Few island jurisdictions have given serious consideration to rationalizing the continuation of this pattern and the options that exist for a more cost-effective arrangement. That issue cannot be long postponed.

- (j) In terms of the broader issue of the positioning of human activity in the way of natural hazards a wide-ranging discussion is necessary to address issues of land use policy. It starts with addressing policies regarding the alienation of crown lands and the conversion of former virgin forests for agricultural use. As more and more these lands are located in upland regions of steeper elevations and higher rainfall, where, how and for what purposes such lands come into active cultivation must be subjected to more intensive ecological review. The associated considerations of arresting surface water flows, facilitation ground water infiltration, instituting managed impoundments both to control river flows as well as a resource for drawdown during periods of low rainfall and to service existing or new settlements are all matters for investigation.
- (k) Within areas under continuing cultivation, water management needs to receive a higher profile in cropping patterns. This problem is being compounded as the average size of land holding is in steady reduction through fragmentation by inheritance or sales for cash liquidity. Average farm size is fast reaching the point where one is forced to question whether a viable modern agricultural system can emerge under such conditions.
- (l) In addressing the issues of settlement expansion and new development including such as might be expedited by improved road and utility servicing, greater regard must be taken of soil type, moisture loading capacity, depth to bedrock, slope and drainage. All of these are critical factors in considering the structural integrity of urban areas, especially in addressing landslide and subsidence.
- (m) Improved road construction technologies, especially that of improved guttering and culverts while reducing the impact of precipitation on the roadways themselves also accelerate the surface drainage flow regime. For coastal settlements at the end of the drainage line, the risks of flash-flooding and/or stream channel overflows become issues of serious importance.
- (n) Within settlements, home construction tends to occur wherever the individual owns a plot of land. Regulatory location requirements are minimal, without regard to spatial requirements for a feasible and functional in-ground sanitary waste disposal system.. Despite the proximity of dwelling units (often without a proper public access roadway), there is little thought given to an integrated storm water run-off system from roof-top leads. As a result homes located down-slope are at the mercy of their up-hill neighbors.
- (o) Continuing research is required into best materials, designs and practices required to attenuate the worst effects of hurricanes, flooding,

earthquakes and similar natural hazards. Considering the critical investments that most families have in their homes and the unavailability of insurance for most, this should be a high priority issue for island governments.

- (p) Experience has shown that there are differing levels of hurricane resistance related to roof-lines and slopes; design of overhangs including verandahs and the manner of their integration into the main structure; design and location of fenestration and venting and the internal air circulation systems; the type and manner of tie-downs; landscaping and site development, building orientation, design of rooftop and pavement runoff including detention ponds and last but by no means, qualification and licensing of master builders.**
- (q) A rising tourism sector and the growth in holiday and retirement homes have placed otherwise “natural” sites under development pressure. Areas with high amenity potential such as scenic views and vistas, properties bordering inland rivers or in heavily treed locations; properties overlooking or on less turbulent sea-sides are increasing attractive to such buyers. Greater sensitivity to the impacts of such developments on the natural landscape and ecosystem is required. Natural disasters are often worsened by the construction of groynes to create boating docks, or by creating sandbars to create placid beaches, or by dredging to create marinas, or by land reclamation to promote seaside developments.**
- (r) Finally, very little is known of the perception of island residents towards the threat from natural disasters and of their receptiveness to the various response mechanisms open to them. The seriousness of the stresses faced by individuals and families in the task of post-disaster reconstruction remains unknown. In an essentially subsistence (low saving), oceanic island setting, the limits of size and the constraints of institutional alternatives appear to oppressive, frustrating the best of individual and communal will. Accordingly, the task of community planning for natural disasters may therefore be as much a socio-psychological challenge as it is an economic, institutional and land use problem.**

POSTSCRIPT.

Since writing the foregoing paper, and on a re-reading of it some twenty (20) years later a number of issues have surfaced which have even more emphasized the urgency of the need for planning for natural disasters as part of a wider national resource, settlement, infrastructure planning and programming agenda. This emphasis is starkly accented in the dilemma which faces policy makers in Dominica (as well as in other Eastern Caribbean jurisdictions to a greater or lesser extent) when seeking to undertake various sector programs or to accommodate major private or public sector projects. Without this nation-wide perspective, best attempts at long term budgeting and financial forecasting, at economic revitalization and at securing vital stabilization is doomed to frustration. Some particularly problematic areas will be highlighted:

- 1. Addressing the issue of a resurgence in export agriculture and moving to a state of food security cannot be divorced from issues of land ownership and fragmentation, rationalizing an effective agricultural roads system or opportunities for creating a solid and stable agricultural community.*
- 2. The problem of allowing the agricultural margin to move to higher and higher elevations and often to poorer soils is not a desirable policy option. At the same time better lands should be made available on better soils and in more accessible areas for serious farmers.*
- 3. The institution of an admirable National Forest system is an admirable achievement and should not be undermined for any reason. Only compatible low intensive uses such as passive recreation should be permitted.*
- 4. An aggressive policy against deforestation, especially within water retention areas must be pursued not only to preserve water source areas for urban uses but as a vital aspect of an ecologically stable area.*
- 5. As more and more roads are constructed across parts of the hinterland, explicit attention must be given to their direct impacts on the areas they traverse as well as the indirect impact due to increased run-off within the lower coastal (an settlement) areas.*
- 6. Noticeably, the rate of non-farm intrusions into formerly predominantly agricultural regions has intensified in recent years, considerably destabilizing the prospects for serious agriculture. This is especially felt in the Woodford Hill, Calibishe, Hampstead areas. If this is to continue or to be rectified, a prompt land use policy to accommodate the conflicting objectives for agriculture and recreational residential uses should be expedited.*
- 7. Despite an abundance of rivers, Dominica is yet to develop an integrated long term plan for use of its fresh water source areas and supplies having regard to sporadic supplies in quality and quantity of potable water to major urban areas. Included in such an assessment must be an acknowledgement that as standards of living increase not only must the water system be extended to un-serviced and under-serviced areas, but the consumption rate per capita is sure to increase.*
- 8. There has been some talk concerning the bulk export of water. While this prospect cannot be dismissed out of hand, its feasibility will depend on the following. The success in developing a vibrant stay-over tourism industry with*

imported developed world water consumption rates as well as the utilization rates for tourism dependent services such as golf courses. Secondly, this assessment ought to be combined with water requirements for a modern, reliable, year-round, stable agriculture food sub-sector supported by an effective irrigation system. Lastly, a successful food sub-sector will give rise to opportunities for food processing---also a high water consumer.

- 9. Reports of water-mining from deep source aquifers are also disturbing. The potential for major ecological disruption difficult if not impossible to rectify demands considerable attention.*
- 10. Precious little attention has been paid to the inter-relation between terrestrial conditions and ecological processes and off-shore marine resources and their impacts. The surrounding seas and oceans continue to be the primary source of protein for the Caribbean yet littoral developments continue to be pursued with minimal care and attention for their impacts on fisheries, whether it be proposals for altering the saline regime of offshore habitats, or deposition of sediment loads in the offshore from stream dredging, sand and gravel mining operations and in the process of shipment.*

These and similar projects, poorly undertaken are likely to be even more severely compromised in the event of a major natural event.

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