II. CHARACTERISTICS AND EXTENT OF THE DISASTER

The aim of this chapter is to assess the effects on the population and the material damages caused by Hurricanes David and Frederick. This evaluation is based essentially on calculations made by the National Planning Office of the Dominican Republic, complemented by information furnished by various governmental organizations and the assessments of the CEPAL group of experts made during a few brief on-site visits and by means of interviews with the victims themselves.

Consequently, it is felt that the following estimates provide an adequate picture of the extent of the losses in human lives and material damages caused by the meteorological phenomena under discussion. Nevertheless, it was not possible to quantify the ecological damage derived from the loss of trees and vegetation, nor their repercussions on the quality of life of the population. This aspect will therefore require special attention in the future.

1. Hurricanes David and Frederick

The Caribbean subregion is frequently affected by tropical storms and hurricanes that cross the Atlantic Ocean in a westerly direction and occasionally produce catastrophic effects during their passage through the Antilles.

In this particular instance, Hurricane David, which formed in mid-August 1979 near the most westerly portion of the coast of Africa, seriously affected the largest islands of the Caribbean. As a further complication, David was closely followed by tropical storm Frederick, which later turned into a hurricane, thus compounding the damage.

According to photographs taken by meteorological satellites, David crossed the 60° meridian on the morning of 29 August in a west-northwest direction and passed over the island of Dominica at midday, leaving a path of death and destruction.[1/] One day later, also at midday, it

1/ David virtually destroyed the capital of Dominica and caused very serious damages to the island's agriculture. It also brought very heavy rains and flooding to Puerto Rico.

/crossed

crossed the 65° meridian with maximum wind speeds of 240 kilometres per hour and steady winds of 120 kilometres per hour within a radius of 80 kilometres around its eye. It continued in the same west-northwest direction at a speed of 22.5 kilometres per hour in the direction of the Dominican Republic. (See map 1).

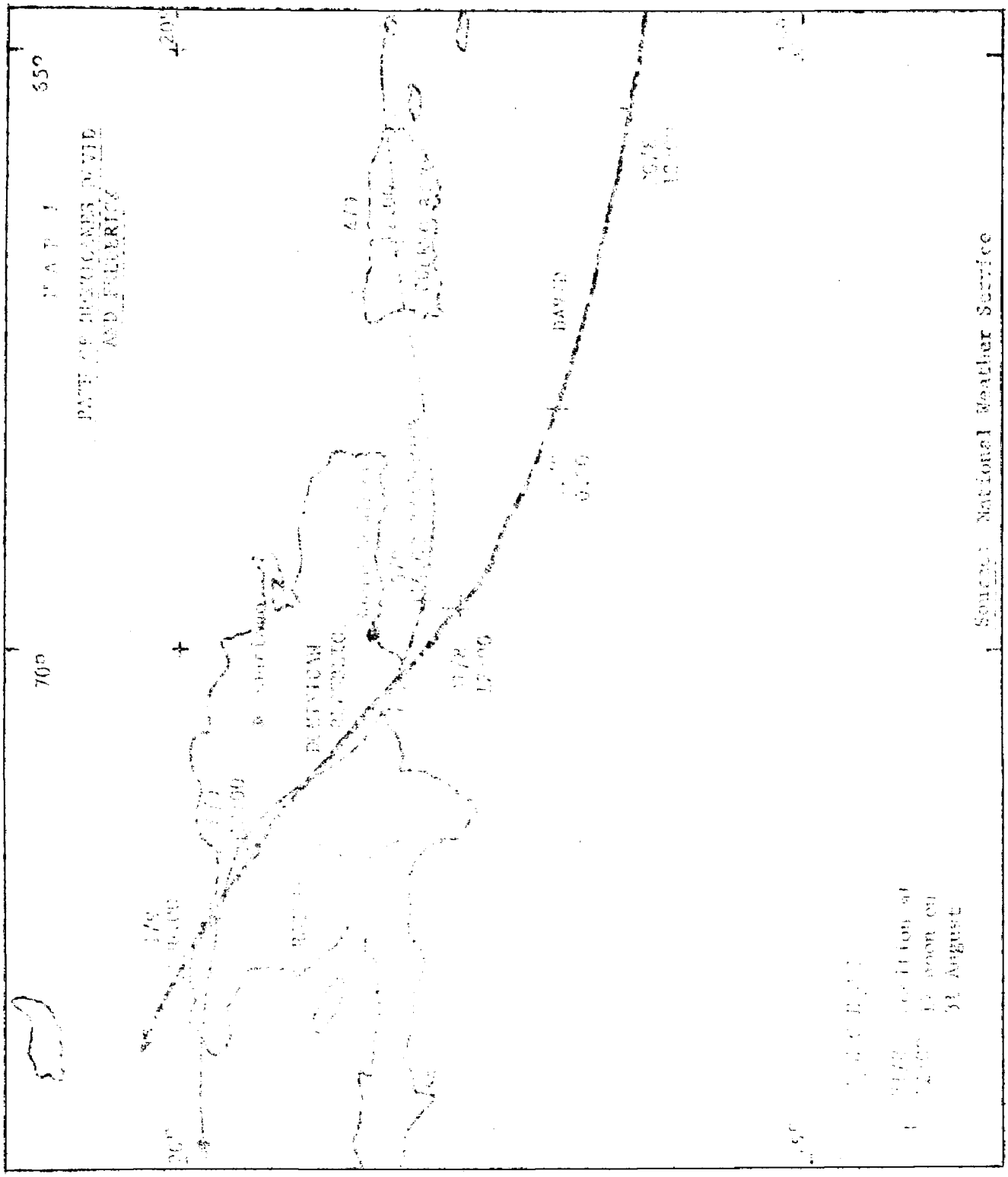
On the afternoon of 31 August, David struck the island on a front 400 kilometres wide. Once over the island, the hurricane lost force upon coming up against the country's central mountain range, and its displacement speed diminished.

David's intense winds toppled trees, buildings and minor infrastructure works and substantially affected dwellings, schools and other buildings, in addition to numerous crops. The heavy surf resulting from the hurricane - with waves more than eight metres high - caused serious damages in some ports. Lastly, the heavy rains - which in some parts of La Vega Province amounted to more than 400 millimetres - caused substantial flooding when many rivers overflowed their banks and directly affected hydroelectric, irrigation and drinking water works, in addition to several highway bridges, extensive cultivated areas in the lowlands, dwellings - particularly those belonging to low-income individuals - and the urban infrastructure as a whole.

By the morning of 1 September, after having crossed the island, David touched the northern coast of Haiti. Its maximum winds had diminished to 145 kilometres per hour and it continued in the direction of Cuba and the United States, where it also caused considerable damage. (See map 1 again.)

Five days later, on the afternoon of 5 September, Hurricane Frederick also struck the Dominican Republic, following a path almost identical to that of David. (See map 1 again.) The winds accompanying this storm were less than 75 kilometres per hour, but the new rainfall - ranged from 250 to 400 millimetres - caused as much or more damage than that inflicted by David. It must be recalled here that as a result of the rainfall left by David, the soil was still saturated with water, so that almost all the new rainfall caused by Hurricane Frederick ran

"Original en mal estado"



down to the rivers. This caused general flooding throughout the country that let to the loss or undermining of bridges and sewerage systems, landslides and other damages to roads and water works, in addition to considerable agricultural and human losses.

It will be easier to grasp the magnitude of these phenomena if it is noted that during the period between 29 August and 7 September alone almost 700 millimetres of rain fell in some areas, approximately half the normal yearly precipitation. It should also be noted that the maximum volume of flow observed in the Yaque del Norte River, for example, amounted to 6,000 m^3 per second, whereas normal flow for the August-September period is approximately 40 m^3 per second.

The greatest damages to housing, infrastructure, services and communications occurred in the provinces of Azua, Peravia, San Cristóbal, the National District and part of La Vega. Serious damage was done to crops and plantations, housing, municipal services and roadway infrastructure in the provinces of Montecristi, Valverde, Rodríguez, Santiago and La Vega. Severe flooding occurred in the provinces of San Juan, Barahona, Valverde, Salcedo, Duarte, Sánchez Ramírez, María Trinidad Sánchez, El Seibo and San Pedro de Macoris.[2/] (See map 2.)

Although David was not the most severe hurricane in recent history, it is considered to be one of the most dangerous in view of its compactness.[3/] Losses in human lives were lower in comparison with others caused by similar occurrences owing to the existence of modern hurricane warning systems and the fact that a relatively efficient system for evacuating the population was able to be put into

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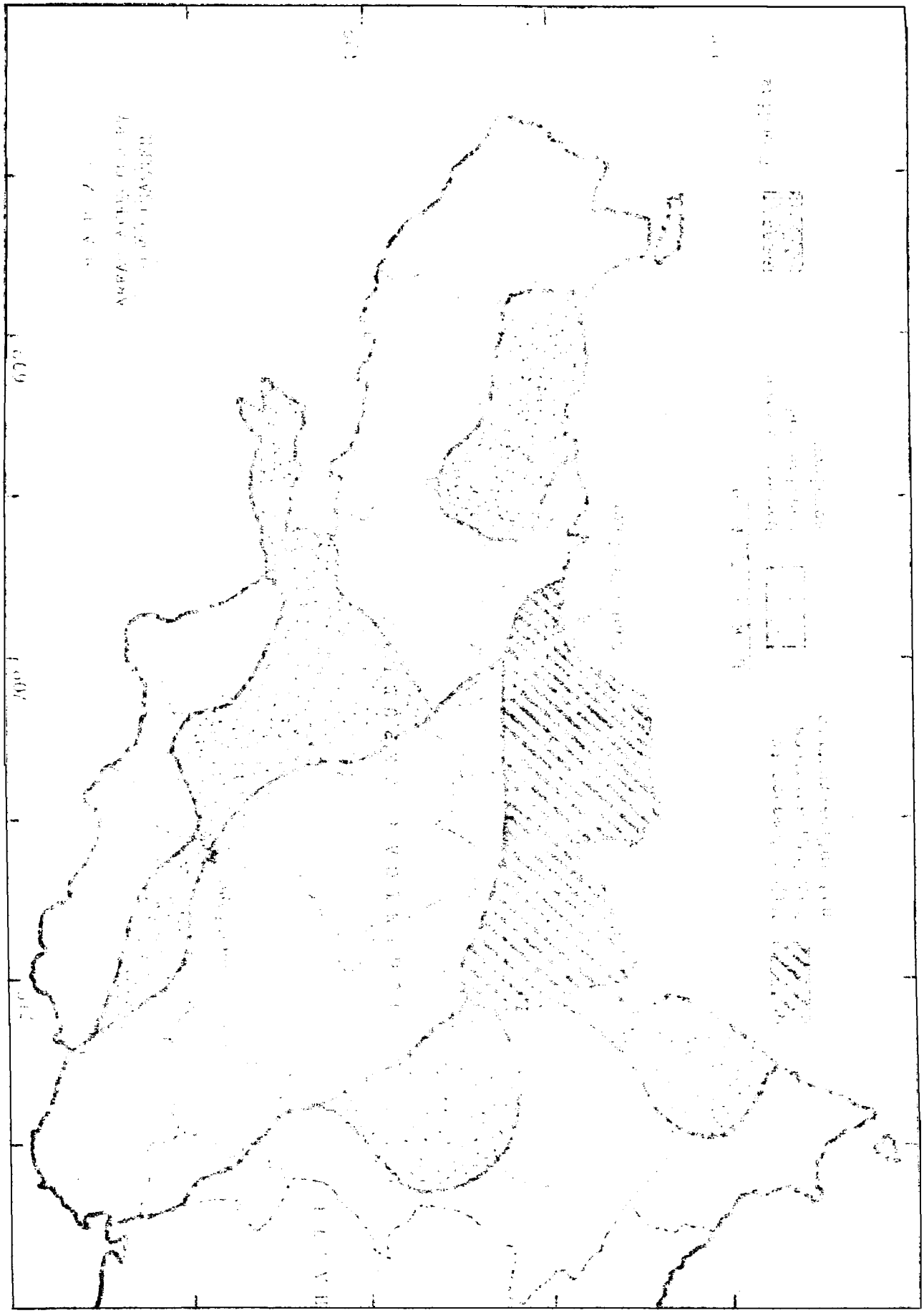
2/ David and Frederick later affected the northern part of Haiti and the eastern part of Cuba, in addition to causing damages on the east coast of the United States in excess of 1,200 million dollars.

3/ The 'great hurricane' of 1780, which caused some 28,000 deaths on several Caribbean islands, is considered the most destructive. Destructive hurricanes also occurred in 1899 (3,000 deaths in Puerto Rico), 1932 (2,500 deaths in Cuba), 1935 (2,000 deaths in Haiti), 1951 (150 deaths and 56 million dollars damage in Jamaica) and 1954 (Hazel: 1,200 deaths and 350 million dollars in damages). In October 1973, Hurricane Flora - considered the second most destructive - killed almost 7,000 persons in the Caribbean subregion and caused material damages of an estimated value of 300 million dollars. In the Dominican Republic it caused 400 deaths and damages in the amount of 60 million dollars. In September 1930 another hurricane struck Santo Domingo, causing some 2.000 deaths and close to 40 million dollars in damages.

/Map 2

"Original en mal estado"



practice

practice. Despite such considerations, and in view of the possibility of a repetition of similar phenomena in the future, it would be wise to consider the implantation of building codes appropriate to such conditions, the further improvement of hurricane watch and warning systems and of civil defence systems as a whole.

2. Effects on the population

Preliminary estimates made by Civil Defence[4/] lead to the conclusion that the loss in human lives may amount to as much as 2,000, a figure that may further increase in view of the fact that three weeks after the disaster, corpses were still being uncovered in flooded areas. As of the time of completion of the present report no complete statistics were available on the number of wounded.

According to information furnished by the same source, David and Frederick affected more than 1.2 million people (23 per cent of the country's total population). The regions hardest hit were the southern and central portions (674,000) and the National District (281,000).

It is estimated that some 125,000 families remained homeless with their dwellings affected in some way or another, and that some 150,000 families evacuated to public shelters, set up mainly in school buildings, to protect themselves from the disaster. The principal shelters were built in the capital city and in San Cristóbal, Baní, Azua and San Juan. Most of the victims were inhabitants of rural areas, where the lowest income groups predominate. Many of these victims partially or totally lost their crops - which for many were subsistence crops - in addition to some of their livestock, their homes, and their domestic and work equipment.

During the week following the disasters, some 18,000 people were assisted in 72 shelters in the National District and another 52,500 in San Cristóbal Province. When this report was being drafted, the number of refugees had diminished, since many - mostly males - were returning to their places of origin to reconstruct their homes and resume their normal work.

4/ A Government organization that provides assistance to the population in disaster situations.

/Some 280,000

Some 280,000 hot meals were distributed in assistance centres during the week of 17 to 22 September. The shortage of gasoline occurring subsequent to the disaster and the damages suffered by the road network are impeding the rapid flow of food rations to shelters distant from the most populated areas, and the loss of many of the crops of products for domestic consumption increases the likelihood that malnutrition and infant mortality will become still more acute.

The incidence of certain diseases increased, such as gastroenteritis, measles and acute respiratory infections; however, so far, there are no official reports of outbreaks of epidemics. Approximately 80,000 doses of TAB vaccine were applied in shelters in which it was not possible to implant proper sanitary measures and in which the population was exposed to special risks, particularly in the southern portion of the country.

3. Over-all assessment of losses to the economy

Material losses to the Dominican economy deriving from the disaster have been estimated at approximately 830 million dollars. In order to grasp the extraordinary magnitude of the catastrophe, these figures should be compared with some of the principal macroeconomic aggregates, as they signify approximately 16 per cent of the current gross national product, 6 per cent of the country's stock of capital, 80 per cent of the total investment in a normal year, more than 120 per cent of 1978 exports and more than 140 per cent of the Central Government's current income.

As may be observed in Table 1, the agricultural sector was the most affected, since it suffered damages in the amount of 345 million dollars, a figure representing more than 40 per cent of the total estimated material losses. As has been mentioned previously, the disaster essentially affected rural areas. This is borne out, on the one hand, by a very substantial loss of already-harvested crops and the vast devastation of agricultural and forest plantations - which restricts the potential for future harvests - and, on the other, by losses in irrigation infrastructure and a very high percentage of loss of poultry. The latter had assumed great significance during the past year as a prime source of meat in view of the drop in pig production occurring in the preceding year due to several epidemics that substantially affected livestock production during that period.

Industry followed agriculture in suffering the most damage caused by the two hurricanes. Losses are estimated at slightly less than 160 million dollars, approximately 20 per cent of the country's total

/Table 1

Table 1

DOMINICAN REPUBLIC: SUMMARY OF MATERIAL DAMAGES

(Millions of dollars)

	Total	Inventories	Losses due to production paralysis	Productive apparatus and constructions	
Total	829	180	252	397	
Agriculture	354a/	132	73	136	Agriculture and forestry plants
				13	Irrigation infrastructure
Industry	158	35	73	50	
Transportation	81	-	-	46	Communication routes
				6	Maritime, air and land fleet
Communications		-	24	5	
Electricity	47	-		47	
Water	5	-		5	
Commerce, finances, government and other services	110	13	82b/	15c/	
Housing	19	-	-	19	
Other service buildings	55	-	-	55	

Source: CEPAL, based on estimates provided by the National Planning Office.

a/ Includes losses of 22 million dollars in the livestock subsector, of which 11 million were in aviculture and one million in fisheries.

b/ Includes 9 million dollars in damages to hotel infrastructure.

c/ Includes an estimate of a 3 million dollar reduction in hotel revenues.

/losses.

losses. These losses include damages to buildings, machinery and equipment, the destruction of raw materials inventories and other inputs, and an estimation of the effects of paralyzation of production.

The material damages of almost 50 million dollars in the electricity sector were also highly significant and will doubtless have very direct repercussions of the country's productive apparatus. The service sectors (commerce, finances, government, etc.) suffered losses in excess of 100 million dollars. Housing losses - in terms of total value - were less significant, although of enormous repercussions since they most affected - as is always the case in similar occurrences - the lowest income groups of the population, who normally reside in very precarious structures whose replacement cost is difficult to estimate. Losses in other types of buildings amounted to more than 50 million dollars.

If material damages are examined as capital losses - whether in machinery and equipment, agricultural and forest plantations, dams and electricity generating equipment, communications routes, irrigation infrastructure or constructions - it will be seen that fixed capital was reduced by almost 400 million dollars. In addition, inventories were reduced by 180 million dollars, and losses due to production paralyzation amounted to some 250 million dollars.

Such material damages will obviously have serious repercussions on the performance of the country's principal macroeconomic aggregates, as will be analysed in greater detail further on.[5/] To this direct negative effect must be added the interruption of the normal dynamics of the productive apparatus, which requires urgent readjustment of economic policies within the short term as a consequence of the emergency the generalized impetus that must be provided to all efforts aimed at reconstruction and attending to the most essential basic needs as swiftly as possible; and the support that general, economic and social reactivation requires through other means.

It has consequently been estimated that the gross national product, which previous to the hurricanes was expected to grow 5.6 per cent in the current year, will actually diminish by 2.6 per cent. In *per capita* terms, this signifies that the disaster will have caused an approximate decrease of 6 per cent in the product level in 1979.

5/ See Chapter III, section 3.

/4. Infrastructure

4. Infrastructure losses

(a) Social infrastructure and the creation of additional demands

(i) Education. In assessing the damages caused by the hurricanes to the educational infrastructure the following considerations were combined: their direct effect on installations; the use of school premises as shelters for the population, both with regard to preventive action and to assistance to victims; and the deficiencies existing before the disaster, particularly in rural areas.[6/] This last element demanded that the cost of repairing the damages and replacing schools be calculated in accordance with the most appropriate standards.

Primary schools suffered the most damages - 85 per cent of all classrooms damages - whereas secondary schools suffered fewer damages since they were generally of better construction. Of the 15,750 primary school classrooms affected, 70 per cent are located in rural areas. If it is taken into account that the average number of classrooms per school is 5.8 in urban centres and 2.2 in rural areas, the percentage of rural schools damaged amounts to 86 per cent of the total.

In urban areas almost all schools suffered fewer damages, since they were used as shelters. In the rural areas, however, the effects of the hurricanes were felt with greater force, so that 7 per cent of the classrooms were totally destroyed, 37 per cent suffered between 20 and 50 per cent damage, and the remainder suffered only slight damage.

6/ In the mid 1970s only 21 per cent of all classrooms used for primary education were solidly constructed and required only maintenance service, 30 per cent were partially deteriorated, needed repairs, and in some cases should have been replaced, and 10 per cent were deficient. See Secretaría de Estado de Educación, Bellas Artes y Cultos, Diagnóstico del sector educativo en la República Dominicana, November 1977.

/A preliminary

A preliminary estimate of the investment required to repair schools has produced a figure of almost 24 million dollars. Of this amount, 37 per cent would be allocated to the most affected rural area,[7/] 27 per cent to the rest of the rural areas, 12 per cent to the cities suffering most damage, 12 per cent to the rest of the country's urban areas, and 12 per cent to secondary schools.[8/]

Of the total cost of repairing the primary schools (20 million dollars), 27 per cent would be allocated to urban areas and 73 per cent to rural areas; and of the investment to be allocated for repairs in the cities, a significant portion would be assigned to classrooms that had received minor damage. In rural areas more than half the investment would be allocated to constructions that were already deteriorated and consequently suffered the effects of the hurricanes all the more, and 38 per cent would be allocated to installations that were in good condition but suffered deterioration through their use as shelters. (See tables 2 and 3.)

It should also be noted that as long as the housing problem remains unsolved, the delay in evacuating the schools being used as shelters will delay reconstruction and consequently affect the student population by postponing the school year that should have started at the beginning of September.[9/]

(ii) Health. The material damages to the health infrastructure were of moderate magnitude and, as in the case of education, were more severe in rural than in urban areas. It is estimated that damage was done to 44 rural clinics and 15 hospitals, whose repair costs will amount to approximately 1.6 million dollars.

7/ The most affected area includes the provinces of Azua, Peravia, San Cristóbal and the National District.

8/ In estimating construction costs of a classroom, the following investments were taken as base figures: 10,900 dollars for secondary schools, 9,100 dollars for urban primary schools, and 7,000 dollars for rural primary schools. Furniture and equipment costs were estimated for all categories at 1,100 dollars each.

9/ During the third week of September the Ministry of Education redoubled its efforts to initiate the school year as soon as possible.

/Table 2

Table 2

DOMINICAN REPUBLIC: TOTAL COST OF REPAIRING DAMAGED CLASSROOMS a/

	Thousands of dollars	Percentage
Total	23,974	100.0
Primary schools	20,992	87.6
Urban portion of the most affected area b/	2,925	12.2
Remainder of the country's urban areas	2,819	11.8
Rural portion of the most affected area	8,875	37.0
Remainder of the country's rural areas	6,373	26.6
Secondary schools	2,982	12.4

Source: Ministry of Education, Fine Arts and Cults.
a/ Damages caused by Hurricane David and tropical storm Frederick.
b/ Includes the provinces of Azua, Peravia, San Cristóbal and the National District.

/Table 3

Table 3

DOMINICAN REPUBLIC: COSTS OF REPAIRING DAMAGED PRIMARY SCHOOL CLASSROOMS a/

	Total		Most affected areas b/		Rest of the country	
	Thousands of dollars	Percentage	Thousands of dollars	Percentage	Thousands of dollars	Percentage
Total	20,992	100.0	11,800	100.0	9,192	100.0
Classrooms in good condition	11,136	53.0	6,064	51.4	5,072	55.2
Repairable classrooms	1,652	7.9	944	8.0	708	7.0
Classrooms in bad condition	8,204	39.1	4,792	40.6	3,412	37.1
Urban areas	5,744	27.4	2,925	24.8	2,819	30.7
Classrooms in good condition	5,294	25.2	2,669	22.6	2,625	28.6
Repairable classrooms	225	1.1	174	1.5	51	0.6
Classrooms in bad condition	225	1.1	82	0.7	143	1.5
Rural areas	15,248	72.6	8,875	75.2	6,373	69.3
Classrooms in good condition	5,842	27.8	3,395	28.8	2,447	26.6
Repairable classrooms	1,427	6.8	770	6.5	657	7.1
Classrooms in bad condition	7,979	38.0	4,710	39.9	3,269	35.6

Source: Ministry of Education, Fine Arts and Cults.
a/ Damages caused by Hurricane David and tropical storm Frederick.
b/ Includes the provinces of Azua, Peravia, San Cristóbal and the National District.

/Nevertheless,

Nevertheless, the emergency situation bore heavily on welfare services owing to the attention demanded by the wounded and other victims of the disaster. Certain deficiencies in environmental sanitation and nutrition became more acute and new demands emerged, especially in the field of epidemiology, as a result of the interruption of drinking water services.

Preliminary estimates indicate that the expenditures required to rehabilitate the health sector will amount to 15.5 million dollars. Of this figure almost 11 per cent would be allocated to reconstruction as such, and the remainder to meet the needs created by the emergency situation. According to time priorities established in accordance with the degree of urgency, pressing demands in the areas of environmental sanitation, epidemiology, nutrition and social welfare services will have to take precedence over the construction of new rural clinics and hospitals (for which an outlay of more than 4.5 million dollars is foreseen), since, although the latter are important as a means of providing for substantial deficiencies, for the time being they must be assigned secondary importance. (See table 4.)

An expenditure of 5.5 million dollars is estimated for environmental sanitation - 36 per cent of the total expenditure - to be allocated almost entirely to the prevention of water-borne diseases transmittable through food and vectors, by strengthening infrastructure for the control of water and excreta. Two important programmes are envisaged: the construction of 60,000 platforms and sheds for latrines, and the drilling of wells to supply drinking water to 500 communities with a population of less than 2,000 persons each. These projects would be financed by the government and by a loan from the United States Agency for International Development (AID). In addition, an attempt would be made to strengthen co-ordination and supervision of the repair work being done on aqueducts that is being carried out by the National Drinking Water and Sewerage Facilities Institute (INAPA) in conjunction with the Ministry of Health.

/Table 4

Table 4

DOMINICAN REPUBLIC: EXPENDITURES FOR REHABILITATING THE HEALTH SECTOR

	Thousands of dollars	Percentage
Total	15,354	
Health services	7,598	49.5
Reconstruction	1,633	10.6
Rural clinics	1,045	
Health institutions	588	
Construction	4,679	30.5
Rural clinics	378	
Health institutions	4,301	
Emergency medication	900	5.9
Acquisition of electric plants	386	2.5
Environmental sanitation	5,513	35.9
Construction of platforms and sheds for latrines	5,160	33.6
Construction of wells for supplying drinking water	210	1.4
Strenthening of co-ordination and supervision of construction and repair of aqueducts	60	0.4
Acquisition of five diesel-type light trucks	50	0.3
Acquisition of five sprinkling machines	30	0.2
Fuels and lubricants	3	-
Epidemiology	601	3.9
Vaccination on the national level	49	0.3
Acquisition of hypodermic needles (4 million)	480	3.1
Acquisition of cotton (3 000 pounds)	2	-
Acquisition of alcohol (3 000 litres)	5	-
Acquisition of 320 portable refrigerators	5	-
Living expenses for vaccination personnel	60	0.4
Health education	12	0.1
Preparation of posters	12	0.1
Nutrition	176	1.1
Increasing the number of beneficiaries covered by the complementary food programme	176	1.1
Social welfare services	11,455	9.5
Family assistance programme	600	3.9
Small loans programme	540	3.5
Milk distribution programme	300	2.0
Living expenses	12	0.1
Fuels and lubricants	3	-

Source: Ministry of Public Health and Social Welfare, information provided by the National Planning Office.

/Compaigns

Campaigns would be carried out to eradicate the vectors of malaria and dengue, diseases that frequently appear in such situations.

Disease control is of a priority nature both with regard to epidemiological surveillance and the implementation of an intensive vaccination campaign[10/] to avoid a massive outbreak of contagious diseases. So far, no epidemic outbreak has occurred despite the existence of conditions favourable to the proliferation of gastroenteritis owing to the previous mentioned interruption of drinking water services.

Ten per cent of the total expenditure would be allocated to social welfare services and nutrition as a means of covering the food shortages prevalent among the affected population, usually consisting of the lowest income groups. These activities would be directed towards increasing the number of beneficiaries included within the complementary food programme and towards carrying out milk distribution programmes for nursing mothers and children, family assistance programmes, and programmes to provide small subsistence loans.

(b) Physical and services infrastructure

(i) Housing. Inasmuch as no inventory of the dwellings destroyed or damaged throughout the country is as yet available, provisional estimates indicate that in the cities of Santo Domingo, San Cristóbal, Haina, Palenque, Yaguate, Daní, Ocoa, Padre de las Casas and Azua, approximately 21 000 dwellings were affected or destroyed, largely inhabited by low-income families. In rural areas approximately 36,000 dwellings were destroyed or damaged which would give a total

10/ The immunization campaign comprises the following vaccination programme: coverage of one million persons in the area most affected by the hurricane with TAB vaccine; coverage of all children less than five years of age with antipoliomyelitis vaccine; coverage of 80 per cent of pregnant women, 40 per cent of minors between 5 and 14 years of age, and 30 per cent of those over 15 years of age with tetanus toxoid vaccine; coverage of all children below the age of five with measles vaccine, and coverage of 70 per cent of children from one to four years of age and 50 per cent of those from five to 14 years of age with BCG vaccine.

/of 57,000

of 57,000 for the entire country. It is estimated that some 350,000 people were left homeless or that their dwellings suffered considerable damage, whereas the dwellings of several hundred thousands had been subjected to minor damage. The cost of repairing or replacing these dwellings on the part of public institutions providing the materials - estimated on the basis of more adequate and better quality units than those destroyed - would amount to 18.9 million dollars.[11/]

(ii) Transportation and communications. Winds, rains and river overflows inflicted extremely severe damage on the transportation and communications infrastructure.

Four principal highways - Duarte, Mella, Las Américas and Sánchez (Ocoa-Azua) - and 18 secondary roads suffered cave-ins, landslides and erosion, and almost 2,100 country roads were subjected to severe erosion. In addition, 50 bridges and sewerage systems were destroyed by floods and 32 affected in their approaches. It is estimated that the cost of repair or replacement of this infrastructure will amount to 44 million dollars.

The urban public road system was also affected by the heavy rains and floods. The cost of repairing damages to pavements and structures is estimated at somewhat more than 5 million dollars.

Telecommunications systems were damaged by winds and floods, particularly with respect to open-air equipment and transmission networks. Extensive areas of the capital and other cities have been left without telephone service, and communication with the interior of the country has been interrupted. In the capital city, damages are being repaired efficiently by CODETEL. It is estimated that it will require three months and expenditures in the range of 5 million dollars to re-establish service completely.

The heavy surf and hurricane-force winds affected the ports of Boca Chica, Santo Domingo, Haina and Puerto Viejo, in addition to causing a certain amount of damage to the international airport. Damages to port

11/ The National Housing Institute (INVI) plans investing approximately 8 million dollars during the remainder of 1979 to reconstruct some 15,000 dwellings and repair 5,600 others.

infrastructure were of a limited nature and will not impede port operations. Repair costs are estimated at close to 2 million dollars.

The land, air and maritime fleets also suffered losses or damages with respect to vehicles, vessels and small aircraft. Replacement costs are estimated at some 6 million dollars.

Total repair of damages and replacement of transportation and communications assets will require an investment of 62 million dollars.

(iii) Energy. The strong winds and the floods caused by the heavy rains severely affected electrical power generation plants, transmission lines and distribution systems. Damages also occurred in the country's only oil refinery and in some crude oil pumping and transportation installations.

In the electrical subsector some units in the Haina River thermoelectric plants were affected (84 MW), as were the Tavera (80 MW), the Valdesía (54 MW) and the Las Damas (7.5 MW) hydroelectric plants. The Jimenoa hydroelectric plant (7.5 MW) was totally destroyed.[12/] The country's installed capacity was thus reduced by almost 42 per cent. The cost of repairing buildings and other structures, in addition to that of repairing generating equipment, is estimated at 16.2 million dollars (see table 5), and it will take one to two months before the plants will be able to operate again. Reconstruction of the Jimenoa hydroelectric plant will take at least two and one-half years.

A total of 270 kilometres of 34,500 and 69,000 volt transmission lines were affected, of which 65 per cent correspond to the southern portion of the country. Approximately 1,200 kilometres of distribution systems were affected, 57 per cent of which are in the southern part of the country and 28 per cent in Santo Domingo and the surrounding area. In both systems breakages in cables and insulators, failures or excessive bending of poles and crossarms, and damage to transformers occurred.

12/ Before the disaster, four thermoelectric plants with an installed capacity of 106 MW were being repaired and receiving maintenance.

/Table 5

Table 5

DOMINICAN REPUBLIC: DAMAGES TO THE ELECTRICAL SUBSECTOR

(Thousands of dollars)

	Total	Labour and materials	Machinery and equipment	Other expenses
Subsector total	34,515	8,317	24,558	1,640
Power plants	16,215	8,317	6,258	1,640
Tavera hydroelectric plant	2,420	-	2,190	230
Valderia hydroelectric plant	2,740	1,250	1,175	315
Jimenoa hydroelectric plant a/	10,000	6,900	2,100	1,000
Río Haina thermoelectric plant	885	34	771	80
Santo Domingo thermoelectric plant	128	116	-	12
Constanza thermoelectric plant (diesel)	39	15	21	3
Ocoa thermoelectric plant (diesel)	3	2	1	-
Transmission lines	6,000	-	6,000	-
69 kV lines, 158 km	4,000	-	4,000	-
34.5 kV lines, 110 km	2,000	-	2,000	-
Distribution systems	8,300	-	8,300	-
Three-phase lines, 12 and 4 kV, 256 km	2,000	-	2,000	-
Single-phase lines, 7.2 and 2.4 kV, 473 km	2,800	-	2,800	-
Secondary systems, 110-120 V, 482 km	3,500	-	3,500	-
Services	4,000	-	4,000	-

Sources: Dominican Electricity Corporation and CEPAL estimates.
a/ Breakdown of these costs is tentative.

/In addition

In addition, many household connections, metres and networks were damaged. It is estimated that repair of these lines and systems will require two to four months' work and an investment of 18.3 million dollars. (See table 5 again.)

Total damages in the electrical subsector thus amount to 34.5 million dollars.[13/]

Although the oil refinery suffered certain infrastructural damages and received only a portion of its accustomed electrical power, it was nevertheless able to operate until it exhausted its supply of crude oil. Unfortunately, it is not operating at the present time for reasons unrelated to the disaster, since the crude oil intakes were damaged during discharge from a tanker. Gasoline and gas oil consequently had to be imported; however, the small volumes that are being delivered to service stations point to a shortage of these products. Difficulties have also been encountered in transporting fuel to the Barahona thermoelectric plant, which operates on gas, owing to roadblocks along the Azua-Barahona highway.

Since the disaster, then, serious limitations in the production and distribution of energy have extensively paralysed both productive activities - particularly industry - and services, especially with regard to drinking water, as will be seen in the following paragraphs.

(iv) Drinking water supply. The water works in Santo Domingo, Santiago and other provincial cities suffered serious damage to headworks and infiltration galleries; flooding of pumping equipment, pumphouses, control panels, electrical equipment and purification plants; erosion and damage of deep wells and propulsion lines; and the bursting of distribution lines. Furthermore, large portions of the country were unable to be supplied with water, since electric power was unavailable to operate the pumping equipment required in a significant number of the country's water systems.

13/ The Dominican Electricity Corporation has budgeted 25.9 million dollars for repairs it will carry out during the rest of the year.

/Two weeks