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GUYANA

SOCIO-ECONOMIC ASSESSMENT OF THE DAMAGES AND LOSSES CAUSED BY THE JANUARY-FEBRUARY 2005 FLOODING¹

In collaboration with the Inter-American Institute for Cooperation on Agriculture (IICA)

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PREFACE

This report was prepared at the request of the Government of Guyana following the torrential rains and subsequent flooding that caused physical damage and economic loss to the country. The consequences of the flooding pose the need, beyond the immediate humanitarian response, for a rapid assessment of the damages (impacts of assets) and losses (effects on economic and social flows) to determine the implications on macroeconomic and fiscal performance and the social and environmental consequences.

The assessment was carried out using the Economic Commission for Latin America and the Caribbean (ECLAC) disaster assessment methodology as elaborated in the Handbook for Estimating the Socio-economic and Environmental Effects of Disasters (ECLAC, 2004, www.eclac.cl/mexico) and the Disaster Assessment Training Manual for Caribbean Small Island Developing States. (ECLAC, 2004, www.eclacpos.org)

This study undertakes a sector-by-sector analysis of damages and losses resulting in its overall assessment. It evaluates the social, economic and environmental effects and proposes guidelines for the country's rehabilitation and reconstruction programme in line with Guyana's poverty reduction and growth strategy. The assessment provides a quantitative estimate to the overall damage and reconstruction costs and its implications on Guyana's macroeconomic performance following the flooding. It also complements other assessments and partial evaluations that have been carried out by national government and non-government institutions and by other international institutions and bilateral and multilateral cooperation agencies.

The methodology makes a distinction between direct damages and indirect damages or losses. The former refers to damage to assets that occur as a direct result of a natural disasters. Assets can be plant and machinery, buildings, other infrastructure such as roads, furniture and other moveable assets, stocks and inventories and losses of livestock and crops ready to be harvested. Indirect losses, or indirect damages under the old terminology, refer to the loss of production of goods and services and to the extra costs that result from the natural disaster. Estimating direct damages is mostly a straightforward process. However, the estimation of indirect losses is often difficult because these become apparent after the disaster, may last for several years and are not always evident when the assessment takes place. The total damage is the sum of the direct damages and the losses.

The methodology also recognized secondary effects. This represents a different view of the assessment since they describe the effects of the disaster on the functioning of the economy and the resulting macroeconomic imbalances arising from the event.

The ECLAC led mission was supported by the United Nations Development Programme (UNDP) and the Inter-American Institute for Cooperation on Agriculture (IICA). The mission comprised:

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The national counterpart team was coordinated by Dr. Coby Frimpong, Policy Advisor and Co-coordinator of the Policy Coordination and Programme Management Unit of the Office of the President. The mission expresses its gratitude and acknowledges that the assessment would not have been possible without the support from that office, the task force that was established in support of the mission, the Guyana Defense Force (GDF) which kindly provided an over flight and the Civil Defense Commission (CDC), which provided the field trip. Special thanks are due to Ms. Amanda Phillips and Mr. Wayne Forbes for their invaluable assistance with logistics.

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ACRONYMS

ATC	Atlantic Tele-Center
ATN	Atlantic Tele-Network
CDC	Civil Defense Commission
CXC	Caribbean Examinations Council
D&I	Drainage and Irrigation
DSL	Digital Subscriber Line
ECLAC	Economic Commission for Latin America and the Caribbean
EDWC	East Demerara Water Conservancy Dam
EHIPC	Enhanced Heavily Indebted Poor Countries
EPA	Environmental Protection Agency
GD	Guyana Datum
GDF	Guyana Defense Force
GS&WC	Georgetown Sewerage and Water Commissioners
GSA	Guyana School of Agriculture
GT&T	Telephone and Telegraph Company Limited
GTC	Guyana Telecommunication Corporation
GUYWA	Guyana Water Authority
GW	Guyana Water Incorporated
HIPC	Highly Indebted Poor Country
ICT	Information and Communications Technology
IDB	Inter-American Development Bank
IICA	Inter-American Institute for Cooperation on Agriculture
ITCZ	Inter Tropical Convergence Zone
JOC	Joint Operations Command
MDGs	Millennium Development Goals
MSWMD	Municipal Solid Waste Management Department
NARI	National Agricultural Research Institute
NDCs	National Democratic Councils
PRS	Poverty Reduction Strategy
UNDP	United Nations Development Programme
USAID/OFDA	United States Agency for International Development/Office of Foreign Disaster Assistance
WFP	World Food Programme
WTP	Water Treatment Plant

I. Description of the event

I.1. Background

Guyana lies between 2° and 8° N, and 57° to 61° W. It is bordered to the east by Suriname, to the south by Brazil, to the west by Venezuela and to the north by the Atlantic Ocean (see Figure 1 below ²). Due to its location, it is subject to Atlantic swells on a year-round basis, heavy seasonal rainfall and high humidity. It experiences two distinct rainy seasons each year. The first, and most marked, occurs between May and July, while the second occurs between November and January.

The country is physically divided into four major ecological zones, the coastal clay belt, the sand belt, the highlands and the interior plains and savannahs. The coastal belt is a low lying zone, consisting of clay deposits, and is typically one to four meters below mean sea level. Because it has been formed partially through the alluvial deposits of the main rivers of the country (Berbice, Mahaica, Demerara and Essequibo Rivers), this zone is a fertile agricultural area.

The second zone is the sand belt, which lies to the south of the coastal belt and which includes some of the intermediate savannahs. The third ecological zone comprises over half of the country's land area. In this zone are to be found tropical forests and extensive mineral deposits, in addition to the vast Rupununi Savannahs, which stretch to Brazil. The fourth zone is that of the highlands, which includes the Pakaraima Mountains.

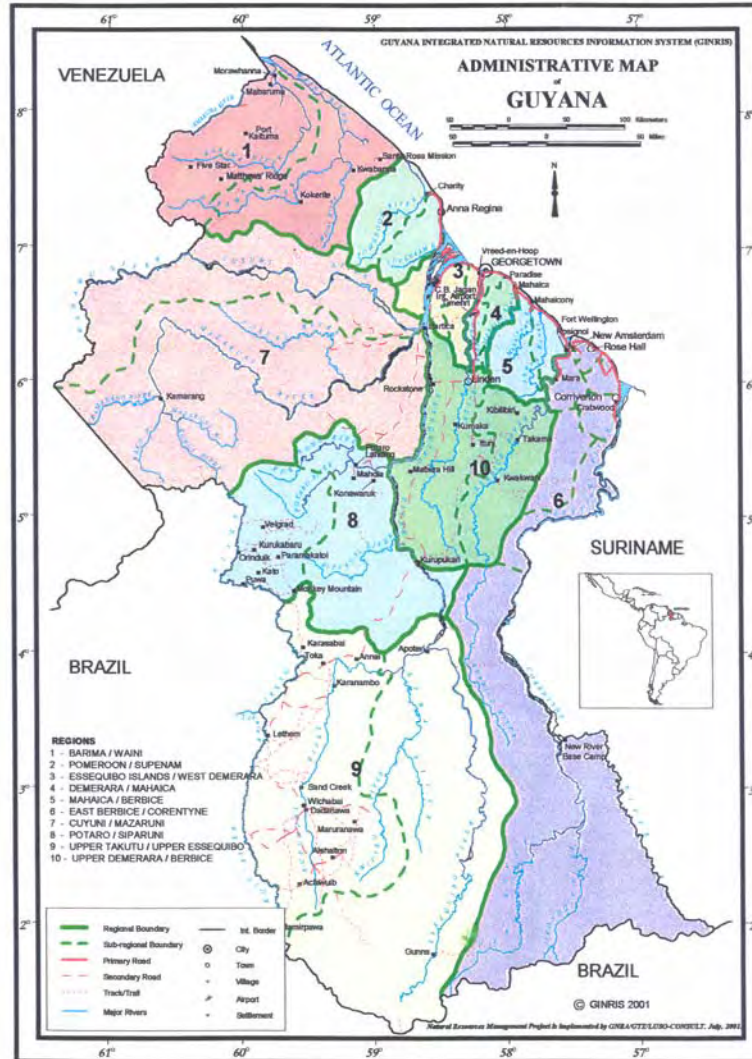
The country is divided into 10 regions, from an administrative perspective, each having varying levels of population and development (Figure 1). The most populous of these is Region 4 (309,059 people), which includes the capital, while the least populated is Region 8 (with 9,211 people). Recent census data estimates the population of Guyana at 742,041. Close to 90% of the country's population live within a relatively narrow strip of land (approximately 25 km wide) which, although it only comprises 5% of the land area, is the administrative, agricultural, commercial and industrial centre of the country.

The combination of agriculture and habitation has been facilitated on this low-lying coastal plain by the presence of a well-designed system of reclaimed lands, drainage and irrigation canals, conservancy dams and seawalls. A cross-section on a north-south plane is shown in Figure 2 below³

² Source - Guyana Integrated Natural Resources Information System.

³ Geotechnical and Hydraulic Assessment of Flooding Danger Caused by the East Demerara Water Conservancy Dam. Nisa Nurmahomed and Olaf van Duin, 2005. UNDAC.

Figure 1
Map of Guyana



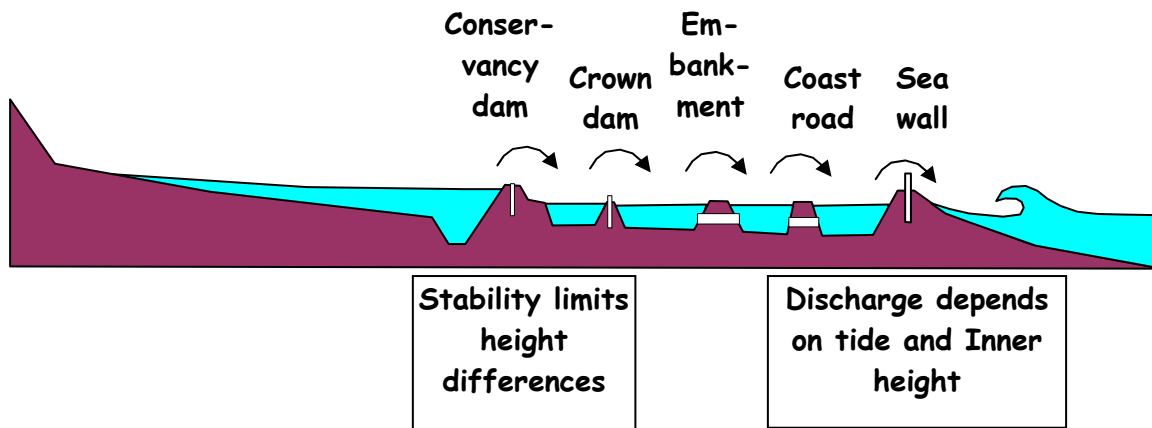


Figure 2 Cross-section through area of main habitation

One of these systems, the East Demerara Water Conservancy Dam, which is located in Region 4, traps surface water flowing to the coast. It was also designed to allow inflow from the Mahaica and Demerara Rivers to the east and west, respectively, during times of high river flow. The capacity of the conservancy is estimated at 100 billion gallons and was originally built in 1818. Outflow from this conservancy was intended to be through a number of canals discharging either to the Mahaica River, the Demerara River, or to the sea. These discharge canals served as the control structures that allowed for management of the water levels behind the conservancy dam. Actual discharge through these canals was controlled by sluice gates. Over time, this system of outflow gates and canals has fallen into disrepair, seriously limiting the ability to appropriately control water levels behind the dam.

In effect, discharge to the Demerara River is now primarily through a structure at the town of Land of Canaan, known as '5 Gates', which is one of four structures that originally facilitated discharge to that river. On the eastern side, there are three operational structures that facilitate discharge to the Mahaica River, although opening of these structures usually results in flooding of towns along this river. In addition to these four functioning discharge structures, there are two canals that discharge directly to the Atlantic Ocean, Shanks and Nebaclis. These canals also require dredging and repairs to culverts and outlet structures, in order to restore them to their former efficiency. Figure 3 below presents a satellite image of the area in question.



Figure 3 **Satellite image of affected area**

North of the Conservancy Dam, a Crown Dam was constructed (see Figure 2 above), primarily to ensure proper retention of irrigation water in the agricultural areas. It is not believed that this structure was built with the intention of being a second line of defense for the coastal areas against flood waters. Working as a part of this overall and complex hydraulic system, is a series of sluice gates, or kokers, and pumping stations, which are to be found along the coastal sea wall, and which serve to ensure the proper drainage of the coastal lands immediately adjacent to the sea. Again, over the years a number of these installations have become derelict and unusable, thereby significantly exacerbating the potential for localized flooding within this zone (see Photos 1 and 2 below). In all, it is estimated that at least six such installations will need to be rehabilitated, in order to regain the utility of this aspect of the drainage system.



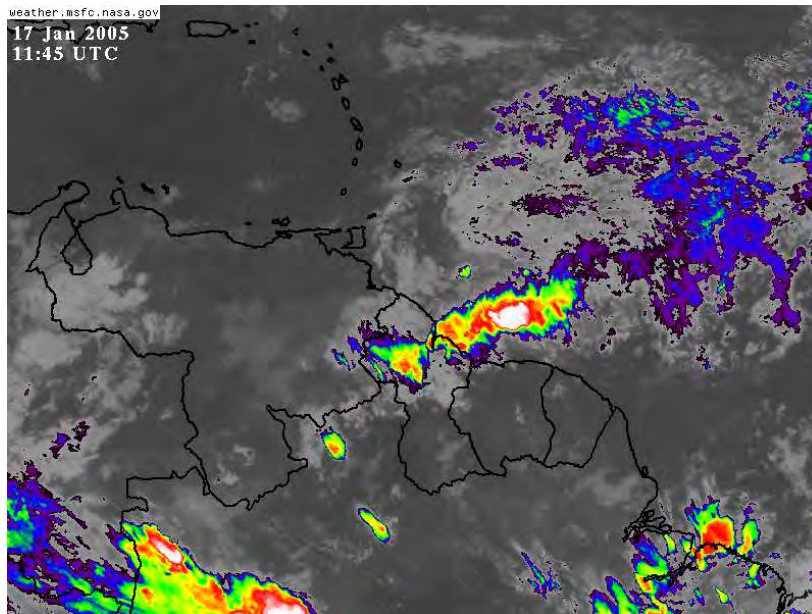
Photos 1 (above) and 2 (below) Derelict Koker and Resultant Ponding in Plaisance



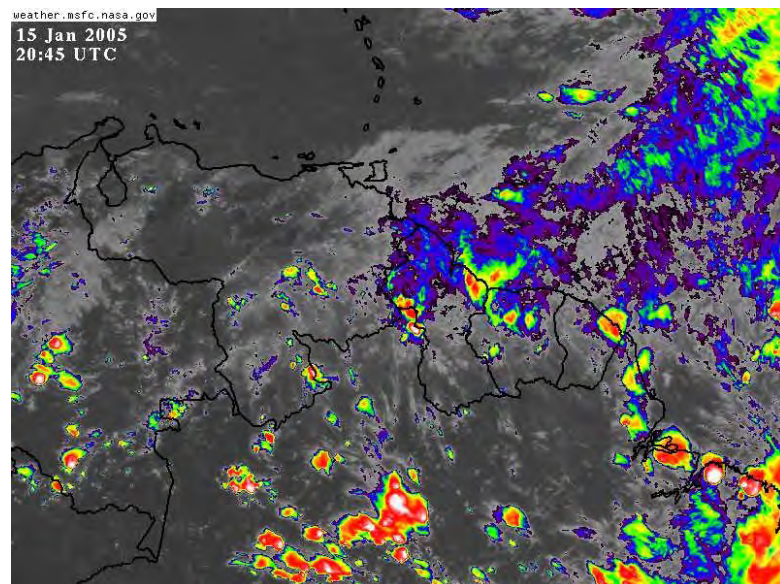
I.2. Description of the event

December 2004 was overall a wet month, with the majority (87%) of the rainfall for that month falling in the last nine days of the month. Most of this rainfall occurred over the coastal areas of Region 1 and along the coast from Georgetown to Albion. These rains were identified as being associated with the Inter-Tropical Convergence Zone (ITCZ) interacting with some low-to mid-level troughs. Moving into January, the period of wetness continued (2-8 January), followed by a dry period from 9–13 January. That initial rainy period in January was observed to be as a result of a low level trough. Both of those wet spells (December and early January) were therefore associated with weather systems that normally affect Guyana.

From 14-22 January, however, the coastal regions of Guyana received some of the heaviest rainfall on record since 1888. These rains were, interestingly, not associated with the usual weather systems affecting Guyana, but rather with influences from the southern hemisphere. This was an anomalous condition, as these southern hemisphere systems usually only exert influence over the southern part of Guyana. This raises the issue of changing weather patterns that must be taken into account when long-term developmental plans are being made. Satellite infra-red images on two of the days of heavy rain are shown in Figures 4 and 5 below.

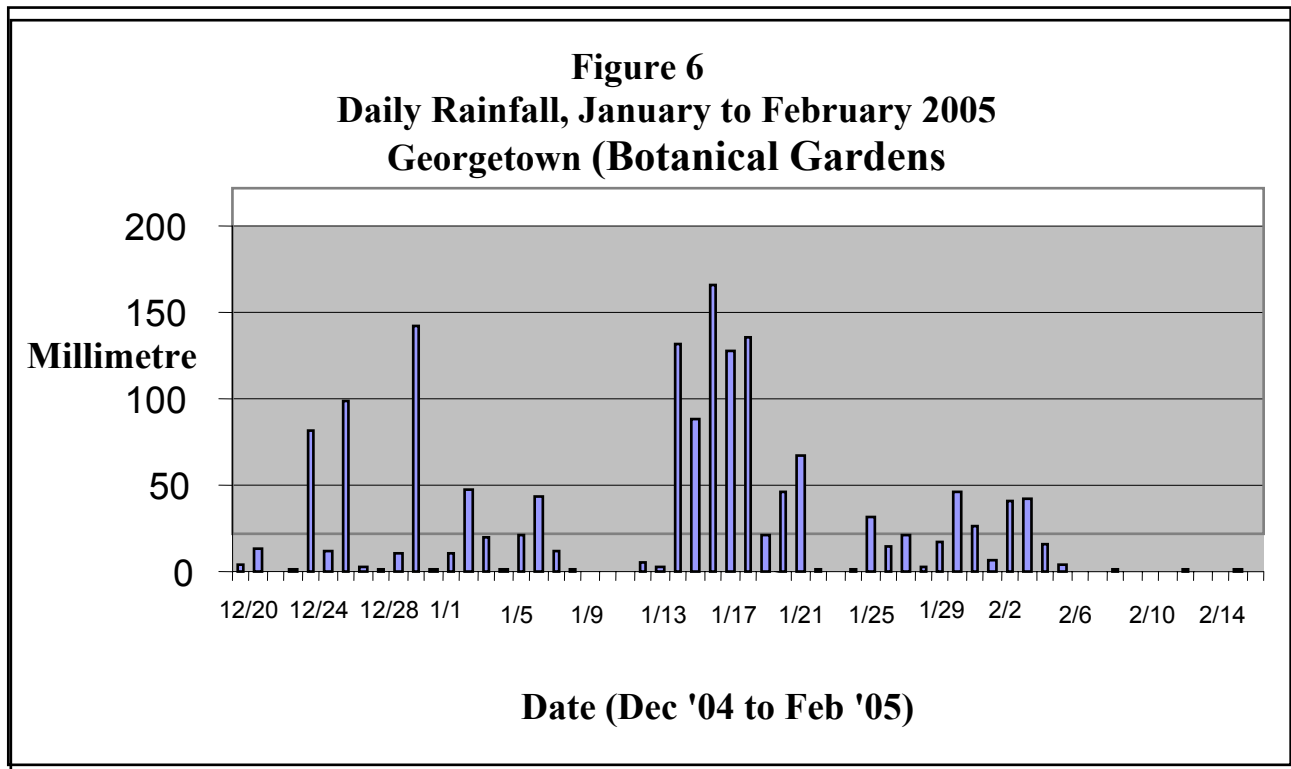


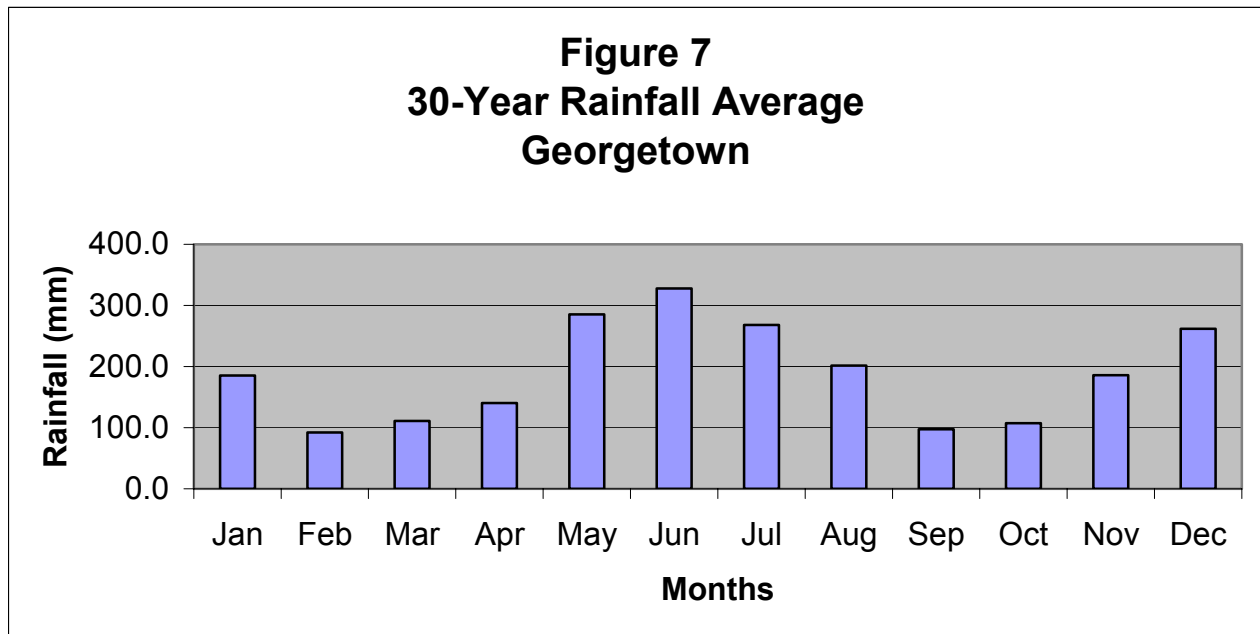
Figures 4 (above) and 5 (below) Satellite Images of Guyana



Weather conditions over Guyana for this period of heavy rainfall were characterized by an unusual flow of winds from the west to the east. This flow interacted with higher level winds to form a zone of instability above the northern part of Guyana. Moisture laden clouds from the Amazonia region were therefore swept by these winds over the coastal areas of Guyana, resulting in excessive rainfall. This rainfall was so intense that it established new records at the Botanical Gardens, Georgetown, for two, three, four and five-day rainfall, all between 14-18 January. In addition, the monthly rainfall for January 2005 has now become the new maximum monthly rainfall record (1108.2 mm or 43.6 in). It should be noted that these records are in reference to the start of record keeping in 1888. Prior to this event, the highest monthly record at this station was for the month of December 1942, when 1022 mm, or 40.2 in. were recorded.

Figure 6 below shows the rainfall data for the Georgetown Botanical Gardens for the period 20 December 2004 to 14 February 2005, while Figure 7 shows the monthly rainfall for January 2005 compared with the 30-year average. January's rainfall at 1108.2 mm was almost six times the 30-year average of 185.2 mm.





The rains that started in December 2004 would have caused saturated ground conditions. This served to worsen the conditions produced by the unusually heavy rainfall that occurred after mid-January. That scenario then resulted in extensive flooding in Regions 3, 4 and 5 from West Demerara to Mahaica and Berbice, an area where over 62% of the nation's population lives (area of flooding in January 2005 shown in Figure 8 below).

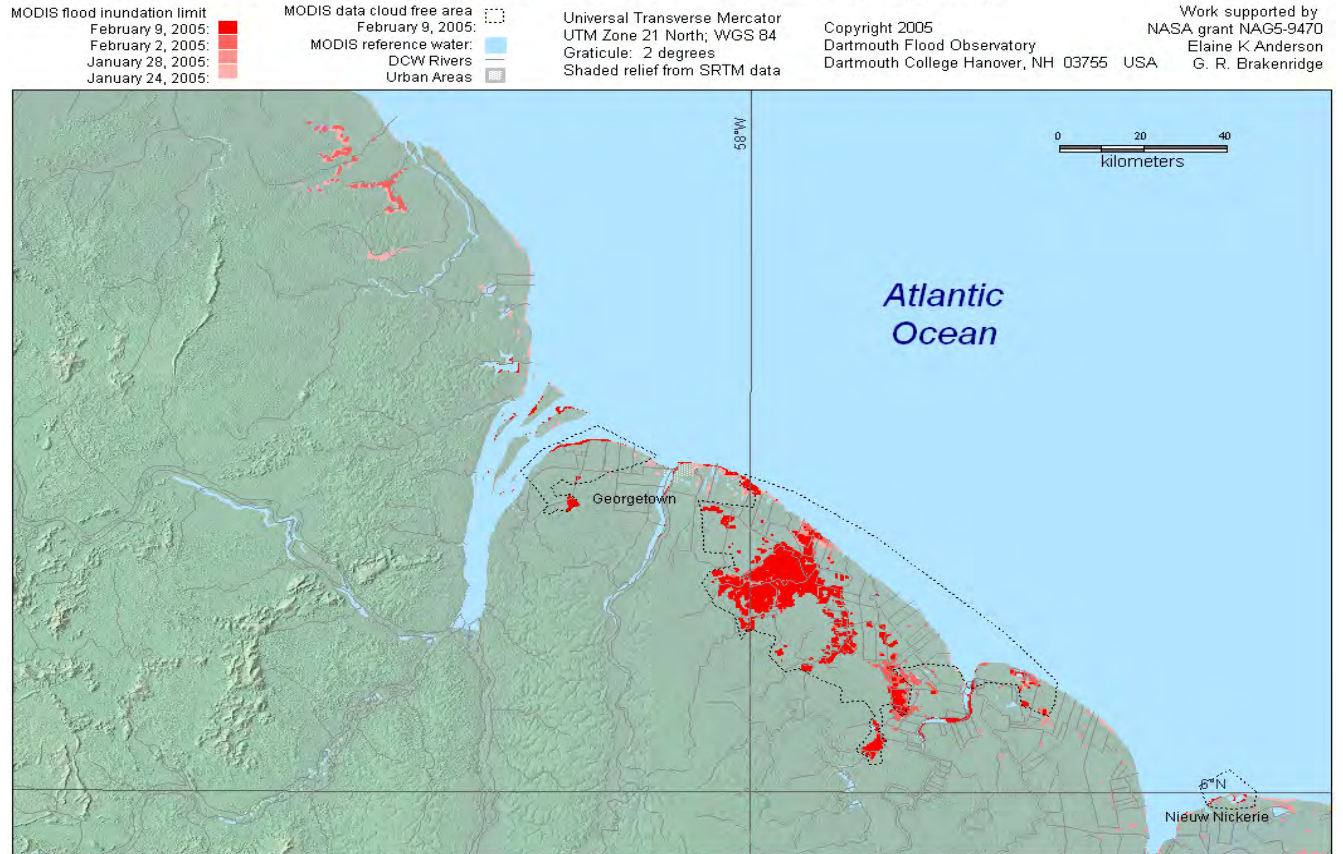
DFO Event # 2005-008 - Guyana - Georgetown Area - Rapid Response Inundation Map


Figure 8 Image of coastal areas showing Flooding zones

In some areas, it was reported that as much as 4-5 ft of standing water was experienced. This produced a severe flood situation for a large number of the affected population, which went on for several days (Table 1).

Table 1	
Duration of flooding in affected areas	
Affected Area	Period Affected
Georgetown (including suburbs)	1 – 3 weeks
East Coast Demerara: Industry to Mahaica	3-5 weeks
Mahaica to Mahaicony	>3 weeks
East Bank Demerara	3-5 days
West Coast / Bank Demerara	1-2 weeks
Vergenoegen to Patentia	
Mahaica River	Still flooded

Source: EPA