Assessment of peri-urban coastal protection options in Paramaribo (Suriname)

General project framework

WWF Guianas - Mangrove Forum

1. Background

Mangroves are well known for the rich ecosystem services they provide at the marine-terrestrial interface: coastal protection, biodiversity, habitat for commercially valuable marine species, sediment capture, wood and NTFPs for coastal communities, ecotourism and as a carbon sink[1]. Despite their global importance, mangroves are being lost rapidly and action is urgently needed to protect them.

Suriname is endowed with large stretches of mangrove forests along its shore line, but the pressure on this critical ecosystem is increasing. The integrity of most mangrove areas is (at least in part) safeguarded through their legal status as Multiple Use Management Areas (MUMA), although the implementation of approved management plans is still lacking. However, one significant area – the large stretch of mangrove forest bordering the northern edge of the capital city Paramaribo and the neighbouring Wanica area (where the majority of the Surinamese population lives) – has no protection status at all. Yet this peri-urban area is possibly one of the most significant forest belts in the country, as it acts as a unique green protective buffer against the impact of climate change (sea level rise, extreme weather events).

Over the past few decades, an increasing part of the mangrove in this area has been cut or degraded due to urbanisation, agriculture and (related) infrastructure (see Appendix). In the national Development Plan 2012-2016, the Government of Suriname recognizes the need for coastal protection in general, but so far, initiatives in this peri-urban area have been limited. In response to localised flooding, where the mangrove has been destroyed, the government has proposed the construction of a dyke as a long-term protective measure.

The entire coastline of Suriname is highly dynamic due to the strong Guiana current that transports sand and mud of the Amazon River in an east to west direction. This creates a natural cycle whereby areas of beach, mudbanks and mangrove are in constant flux. It is unclear what impacts a permanent dyke would have on this natural cycle and therefore on other parts of the

[1] See for a review e.g. UNEP (2013). Mangrove forest cover fading fast. UNEP Global Environmental Alert Service (GEAS), available on www.unep.net/geas

coastline too. In addition, experience from neighbouring Guyana, who constructed a long sea wall, shows that this approach is both highly expensive and also does not mitigate all the threats[2].

Decision making around coastal protection and role of mangroves in north Paramaribo is contingent on a large group of stakeholders: government (including Ministry of Spatial Planning, Land and Forest Management, Ministry of Agriculture, Animal Husbandry and Fishery, Ministry of Natural Resources, Ministry of Public Works and District Commissioner), local inhabitants, farmers, fishermen, NGOs, university and the private sector.

People and companies in the affected areas mostly have legal title to their land. The impact of their actions (e.g. if they destroy the mangroves on their plot) has potential implications much more widely, including the population of Paramaribo who risks greater flood exposure and related higher financial impacts.

In previous years, in response to growing concerns, several civil society initiatives arose to bring mangrove conservation and coastal protection to the attention of policy makers (again). A mangrove forum (local group of `mangrove-stakeholders`) has been created to raise awareness and foster cooperation. The assessment presented here builds on those initiatives to help elaborate well-informed policy making through involvement of all actors.

2. General framework

In August 2015, WWF Guianas has started a project on the identification of coastal protection options (including the conservation and restoration of mangrove) for the capital city Paramaribo and the neighbouring area, with support of the WWF Caribbean Marine Alliance (CMA) and in cooperation with the mangrove forum. In this project, a 3-fold, step-wise approach has been applied, which is explained below as a logical framework.

The overall goal is to inform the (policy) debate on what constitutes the best option for protecting Paramaribo from possible flood events through strengthening protection along the northern shores. This will look at the different land use options within a framework of sound land use planning, together with proposed solutions, such as mangrove protection and restoration, (semi)-permanent dyke construction or a combination of these).

3. Objectives and approach

F irst fase (activity 1.1)

An international expert (*Edward Anthony* of the Aix Marseille University in France) was hired to implement this activity. He compiled relevant information on the importance of mangrove for coastal protection in relation to dyke construction as `hard alternative`. The focus of his work is

2 Anthony, EJ & Gratiot N (2012) Coastal engineering and large-scale mangrove destruction in Guyana, South America: Averting an environmental catastrophe in the making. Ecological Engineering 47, 268– 273

both technical (why soft is a more appropriate solution) and economic (costs of hard solution with expected sort lifespan versus soft solutions).

Quite some information is already available on coastal protection and mangrove, worldwide and regional (e.g. Guyana). On a local level, this info is, however, often scattered in several reports. A data availibility assessment was done, along with the assemblage of a comprehensive bibliography list, which is still growing with the input of the Mangrove Forum.

Second fase (activity 1.2)

As the main purpose of the project is to inform the policy debate, the information compiled should be useful as a communication tool for the government and other stakeholders. It is thus important that the data are presented and summarized in a comprehensive way. A number of fact sheets (*still in draft*) and PowerPoint presentations have been developed and presented to the government and other relevant stakeholders during a seminar on coastal protection and mangrove on the 22nd of October 2015.

Third fase - part 1 (activity 1.3)

To implement the third step, we contracted a spatial analyst expert (*Gregory Verutes*), who visualized relevant information on (impact of) coastal protection options in relation to the importance of mangrove and dyke construction. He developed a web-based (visualization) tool, which is easily accessible and useful for relevant stakeholders, because the underlying data are presented in a comprehensive and interactive way.

The data availibility assessment of phase 1 acted as a baseline for the development of the tool. An important part of the work involved the digitization of data, as available information often lacks a consistent and accessible spatial base. The type of data that was visualized in a spatial and/or descriptive way for the study area included: geography, vegetation (mangrove extent), land use, infrastructure, proposed location of dykes and potential flooding (risk, e.g. for different coastal protection scenarios, see below).

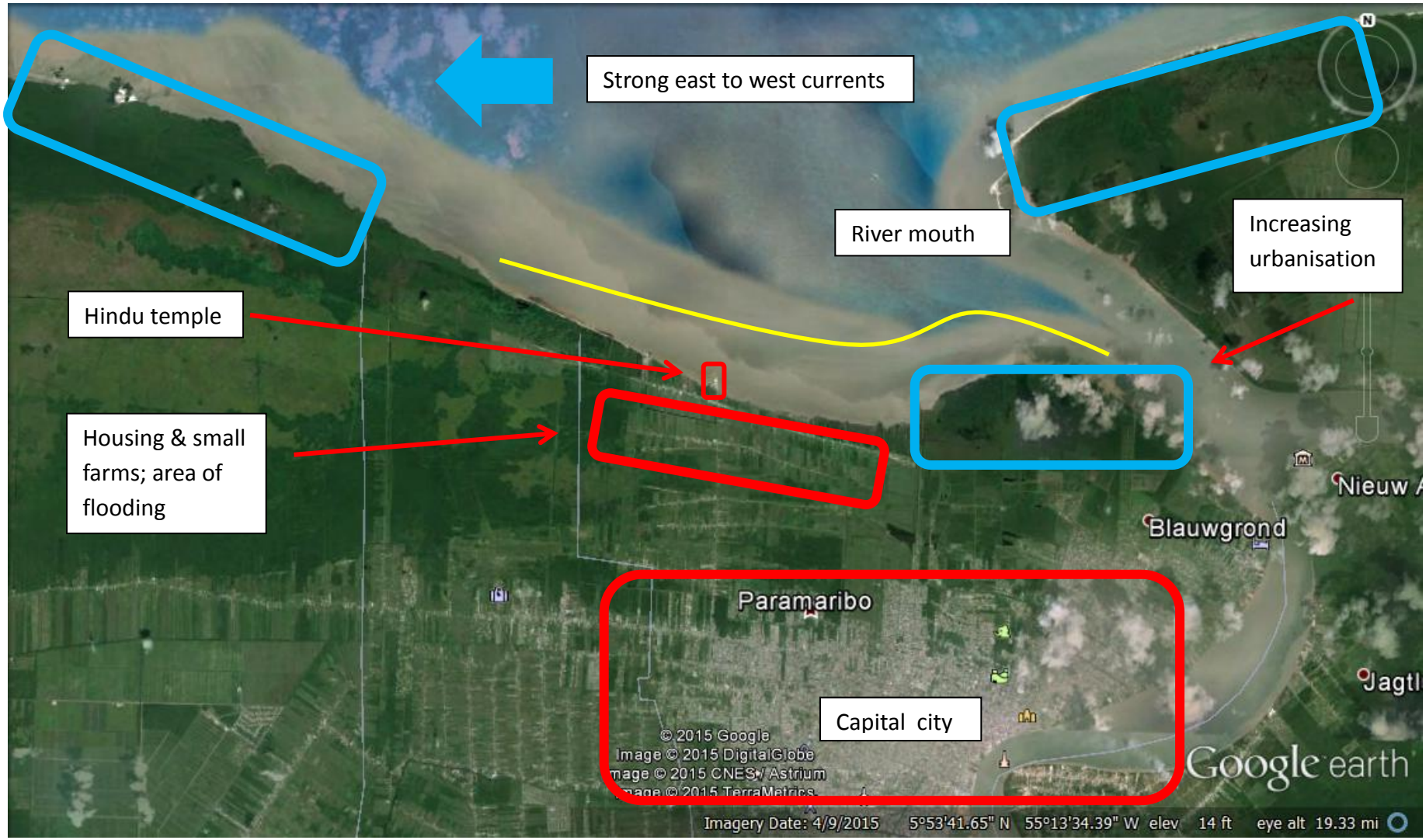
Third fase - part 2 (activity 1.4)

Additional to the previous activity, an expert team of the World Resource Institute (*WRI, Lauretta Burke and Helen Ding,* USA) performed an explorative (e)valuation study of different coastal protection options for the study area related to mangrove and dykes. This includes a cost-benefit analysis in order to support the policy debate with (economic) valuation data. The experts applied the Coastal Capital Toolkit, initially developed by WRI and adapted to the study area for this purpose. A gap analysis was also done to allow for a more in-depth (e)valuation assesment in a follow-up stage of the project. The results of this work are summarized on the online platform, developed under activity 1.3.

4. Logical framework and overview of results

Goal: 1. To inform the governmental and public debate on peri-urban coastal protection options	
Activity	**Results**
1.1. Develop convincing arguments for protecting mangroves through documenting: (1) the value of mangroves (based on desktop analysis and experts` opinion, using existing information; in Suriname, region and globally) (2) short and long term costs and impacts of dykes	• Final report *Edward Anthony* • Pre-final fact sheets in preliminary lay-out; final lay-out will be done in the follow-up phase of the project with support of skilled designer
1.2. Organize round table with key ministries and other stakeholders to: (1) present the case for mangrove protection; (2) obtain commitment to fully explore all coastal protection options; (3) agree on a process for further data collection	• PowerPoint presentations presented during the seminar on coastal protection and mangrove on the 22nd of October 2015
1.3. Develop web-based platform to visualize impacts of coastal protection options with key stakeholders	• Online tool of *Gregory Verutes* available on: *www.geointerest.frih.org/Suriname* This online platform will frequently be updated according to availability of data and new insights. • Short video and PowerPoint presentation to explain and maximize the usefullness of the tool for stakeholders
1.4 Execute technical study to identify and evaluate different coastal protection options, including a (exploratory) cost-benefit analysis , based on the Coastal Capital Toolkit of the World Resource Institute (WRI)	• Pre-final report *Lauretta Burke* and *Helen Ding* (WRI); feedback is being processed to finalize the report in final version

Appendix 1: Situational map



Standing mangrove and swamp areas

Approx. area for proposed dyke construction

Appendix 2: **Green belt of mangrove and swamp forests in the north of Paramaribo, indicating increasing impact of development (situation in January 2011).**