Appendices
Overview

<table>
<thead>
<tr>
<th>App.1</th>
<th>Framework of the Research</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>App.2</td>
<td>List of Policies, drafted 2010-2012</td>
<td>48</td>
</tr>
<tr>
<td>App.3</td>
<td>Strategic Goals and Priority Actions</td>
<td>49</td>
</tr>
<tr>
<td>App.4</td>
<td>Summaries of Previous Plans BCC</td>
<td>50</td>
</tr>
<tr>
<td>App.5</td>
<td>Structure Metropolitan Government</td>
<td>51</td>
</tr>
<tr>
<td>App.6</td>
<td>Maps</td>
<td>52</td>
</tr>
<tr>
<td>1.</td>
<td>Barisal City and Barisal District</td>
<td>53</td>
</tr>
<tr>
<td>2.</td>
<td>Wards &amp; Condition of Embankments</td>
<td>54</td>
</tr>
<tr>
<td>3.</td>
<td>Main drainage canals (khals)</td>
<td>55</td>
</tr>
<tr>
<td>4.</td>
<td>Poor Settlement</td>
<td>56</td>
</tr>
<tr>
<td>5.</td>
<td>Ward 5, Informal Settlement</td>
<td>57</td>
</tr>
<tr>
<td>6.</td>
<td>Major Modal Transfer Stations, planned Growth Centers, Master Plan</td>
<td>58</td>
</tr>
<tr>
<td>7.</td>
<td>Ecological sensitive areas and ponds</td>
<td>59</td>
</tr>
<tr>
<td>8.</td>
<td>Road Hierarchy</td>
<td>60</td>
</tr>
<tr>
<td>9.</td>
<td>Digital Elevation Model</td>
<td>61</td>
</tr>
<tr>
<td>10.</td>
<td>Coastal Polders of Bangladesh</td>
<td>62</td>
</tr>
<tr>
<td>11.</td>
<td>Overtopping of Coastal Polders in Bangladesh</td>
<td>62</td>
</tr>
<tr>
<td>12.</td>
<td>Cyclone Shelter</td>
<td>63</td>
</tr>
<tr>
<td>App.7</td>
<td>Goals and Actions HFA</td>
<td>64</td>
</tr>
<tr>
<td>App.8</td>
<td>Intermediate Assessment Framework</td>
<td>65</td>
</tr>
<tr>
<td>App.9</td>
<td>Final Assessment Framework</td>
<td>74</td>
</tr>
<tr>
<td>App.10</td>
<td>Log Frame</td>
<td>79</td>
</tr>
</tbody>
</table>
App.1 Framework of the Research

Investigation of source material
The research is based on secondary data analysis. Scholarly literature is available online, especially development programs provide documents which are valuable input for this research. The findings of the desk research are described below connected to the different knowledge sectors.

Desk Research
Local Policies
The first part of the desk research covered existing literature on climate change, urban flooding and policies in BCC. Some of the platforms used were World Bank and the Asian Development Bank, Science Direct and Google search results. Conversations with experts from Ecorys and Twynstra Gudde helped to understand what is happening on the ground. Literature on the efficiency of local policies for disaster and flood management could not be found. Appendix 1 shows the search plan including search terms, sources and remarks to the literature. From the desk research it became clear that the Master Plan Barisal 2010 is available in English and will be used as the main source.

National Policies
Evaluation of national policies are available due to disaster risk reduction (DRR) and CCA programs, from different, mainly international platforms like the United Nations (UN). Key policy documents on national level are available in English. A short policy review on DRR can be conducted several policy assessments, furthermore the self-assessment of progress in DRR connected to the Hyogo Framework for Action 2005-2015 will be used. Other documents concerning CCA and development strategies are available as well.

Typology for measures to reduce vulnerability to floods and cyclones
Guides on (urban) flood management are available from reliable sources online, the same applies for disaster risk reduction. The guides and literature on the Multilayer Safety Concept will be used to design the typology for this specific case, floods and cyclones and to find a structure in order to facilitate an integrated approach.

Area Analysis
The project area, will be analyzed considering socio-economics, climate and precipitation, flood pattern, drivers of change, history and culture, governance structures and stakeholder. Maps will be used to understand and analyze the project area. Due to the fact that Ecorys is working for a client and the results are not public, maps produced by the consortium and internal information will only help for my understanding of the area, while it cannot be used for the research report. There is little information on the project area online. Extensive maps are presented in the Master Plan Barisal 2010 which will be used for the area analysis.

New physical measures
The development of the physical measures will be drafted mid of April 2015 by Ecorys and Witteveen+Bos. They will be included in an abstract form in the analysis in order to retrieve possible non-physical measures from the typology.

Framework
The outline of the research in three steps and connected to the knowledge areas is displayed in figure 2. Further explanation is provided below considering procedure and demarcations of the research.
The typology is an integral concept and will consist of the key measures for flood and disaster management. The goal of this step is not to construct a comprehensive collection of specific measures, but to distinguish different measures and understand [1] the scale of intervention and [2] the concept of supplementing each other cross-sectoral. The typology will be validated by using different examples of flood and disaster management frameworks. The typology will be presented at a meeting of the consortium: experts from Ecorys, from Witteveen+Bos and from Twynstra Gudde as well as local working experts. The feedback will be included in the research report.

This typology will be combined with three types of information: [1] the specific preconditions in BCC inherent in location and history, [2] existing national and local frameworks or plans on DRR and CCA and [3], the physical measures brought forward from Ecorys and Witteveen+Bos.

[1] The analysis of project area is limited to existing literature, data collection or the visit of BCC is due to limited time not possible. Due to the final product of this research - a recommendation of non-structural measures which are to a big extent public policies or programs - a literature review is the most suitable research method.

[2] A literature review will display existing policies and current plans. From there, if possible, gaps will be identified. Secondly the identification of problems in implementation of the policies might lead to understanding of effectiveness and efficiency of the analyzed policies. Due to the limited time the policy on the national level can only be reviewed briefly.

On a local level the Master Plan Barisal 2010 is an important source. The local problems of BCC are described. A brief desk research showed that other sources of information are not available, therefore the review of local policies will most likely be based on the Master Plan Barisal. Conclusions on effectiveness and efficiency can only be assumed.

[3] The physical measures for flood and disaster management are planned to be available by the mid of April from Witteveen+Bos. At this moment it is not clear if there will be different alternatives and how many. Due to a difference in time scales between this research and the BCC project of Ecorys the physical measures will not be finalized in time. However there will be a strong understanding of the possible solutions and clear directions.
concerning the physical measures. Another reason for the abstract description of the physical measure is confidentiality.

The result is a short-list of non-structural measures for flood and disaster management\(^1\) for the project area. The identified non-physical measures will be explained using project examples and recommendation for a suitable implementation strategy. The method to retrieve the recommendations from the underlying analysis can be shown in a simple formula:

\[ A - B = C. \]

Phase A introduces possible key measures, B introduces preconditions and restraints, which will exclude some of the measures. To visualize the results and the procedure to reach C a table will be used called the appraisal structure, the indicators used for the assessment will be justified and explained in the report. The result, recommendations on non-structural measures and project examples will be discussed with experts. The results of the interviews will be added to the research. Due to the limited time it is not possible to validate the recommendations in a more sophisticated way.
App.2 List of Policies, drafted 2010-2012

source: GoB/HFA, 2013

1. Bangladesh Perspective Plan (Vision 2021),
4. Standing Orders on Disaster (SOD) 2010
9. Industrial Policy, 2010
12. Land Zoning Act (Draft), 2012
13. Brick Production Act (draft), 2012
14. Haor Master Plan, 2012-2032
15. Energy Conservation Act, 2010
16. The Gas Act, 2010
22. Forest Transit Rule, 2011
26. Disaster Management Act, 2012
27. Forest (Amendment) Act, 2012
28. Bangladesh REDD+ Readiness Roadmap, 2012 (under preparation)
29. Coastal Zone policy 2012
30. Health Policy 2011
31. Environment Policy 2011
32. Draft Agricultural Master Plan for coastal Zone 2012
33. Bangladesh Water Act - 2012
34. National Sustainable Development Strategy (NSDS) 2011
35. Cyclone Shelter Construction Maintenance and Management Policy 2011
App.3 Strategic Goals and Priority Actions

Source: HFA (UNISDR, 2013)

**Strategic Goals:**

1. Integrating disaster risk considerations more effectively with sustainable development policies, planning and programming at all levels, emphasizing disaster prevention, mitigation, preparedness and vulnerability reduction;

2. Developing and strengthening institutions, mechanisms and capacities, particularly in communities, that can contribute systematically to improving resilience to hazards;

3. Incorporating risk reduction approaches systematically in designing and implementing programs for emergency preparedness, response and recovery, including programs for rebuilding affected communities

**Priorities for Action:**

1. Ensuring that DRR is a national and local priority, with a strong institutional basis;
2. Identifying, assessing and monitoring disaster risks and enhancing early warning systems;
3. Using knowledge and education to build a culture of safety and resilience at all levels;
4. Reducing underlying disaster risk factors, whether social, economic, environmental or land use;
5. Strengthening disaster preparedness to promote effective response at all levels.

Each action priority supports at least one strategic goal.
App.4  Summaries of Previous Plans BCC

Source: Structure Plan, 2010

Barisal District Town – Outline Plan 1980-2000
The first plan for Barisal was drafted by the Urban Development Directorate (UDD) in Dhaka. The plan assessed housing and facilities for a projected population and possible public and private sector development. An inventory of land uses was drawn up and public authority projects were identified.

Barisal Master Plan 1990-2010
The Local Government Engineering Department was responsible for the second Master Plan, the topics were the town center, sub-centers and neighborhood units, urban services, infrastructure, recreation and large establishments.

The ‘Secondary Towns Infrastructure Development Project-II 1993’ focused on formulation of needs for infrastructure upgrading and institutional strengthening. The ‘Secondary Towns Drainage Improvement Project 1995’ predicted the need of an increase of the drainage capacity in Barisal.
App.5 Structure Metropolitan Government
Sources:

Map 1-3, 6-8, Master Plan 2010 (Structure Plan 2010)

Map 4, 5 Atlas of Poor Settlements in Barisal City Corporation (CUS, 2011)

Map 14-16 Bangladesh: Economics of Adaptation to Climate Change (World Bank, 2010)

The maps have been modified by the author for better readability of the legends.
1. Barisal City and Barisal District
2. Wards & Condition of Embankments
3. Main drainage canals (khals)
4. Poor Settlement

Types of Settlement

- Extremely Poor Settlement
- Very Poor Settlement
- Moderately Poor Settlement
- Marginally Poor Settlement
- Single Household (Poor)
- Vacant Land
5. Ward 5, Informal Settlement
6. Major Modal Transfer Stations, planned Growth Centers, Master Plan
7. Ecological sensitive areas and ponds
8. Road Hierarchy
9. Digital Elevation Model
10. Coastal Polders of Bangladesh

11. Overtopping of Coastal Polders in Bangladesh

Left: Baseline Scenario
- Brown: Not affected polders
- Purple: Affected polders

Right: Climate Change Scenario for 2050
- 15 more polders will be overtopped
  (embankment crest height < than inundation height)
12. Cyclone Shelter
App.7  Goals and Actions HFA

Source: UNISDR, 2013

Strategic Goals:

1. Integrating disaster risk considerations more effectively with sustainable development policies, planning and programming at all levels, emphasizing disaster prevention, mitigation, preparedness and vulnerability reduction;
2. Developing and strengthening institutions, mechanisms and capacities, particularly in communities, that can contribute systematically to improving resilience to hazards;
3. Incorporating risk reduction approaches systematically in designing and implementing programs for emergency preparedness, response and recovery, including programs for rebuilding affected communities

Priorities for Action:

1. Ensuring that DRR is a national and local priority, with a strong institutional basis;
2. Identifying, assessing and monitoring disaster risks and enhancing early warning systems;
3. Using knowledge and education to build a culture of safety and resilience at all levels;
4. Reducing underlying disaster risk factors, whether social, economic, environmental or land use;
5. Strengthening disaster preparedness to promote effective response at all levels.

Each action priority supports at least one strategic goal.
App.8 Intermediate Assessment Framework

What does it affect in a negative way, and what does it result in?

Rule 1: if there are two or more objectives mentioned in one sentence either the more important aspect is chosen or, if this is not possible the sentence is used for several measures.
Rule 2: In order to preserve the meaning of the sentence it is added in brackets behind the sentence if removed from the cluster.
Rule 3: problem areas are added in order to group sentences for the summary, they are marked orange
Rule 4: If certain aspects are of minor importance or do not add valuable information they are listed and neglected in summary, highlighted in grey.

Regulations and Policy Framework

MAINSTREAMING CCA/DRR (measure example from literature)
125. One of the major constraints of integrating DRR in post-disaster activities and recovery programming is the absence of an agreed guideline for the integration of DRR and CCA at the national level. (Double)
42. Lack of technical knowledge of key actors at both the national and local levels to utilize the resources allocated for DRR due to weak understanding of the policies and procedures.
34. Many actors at the local level are not aware of either of these regulatory documents or the roles and responsibilities of various actors. The monitoring mechanisms at local level are insufficient, as the Local level development plans are not fully designed to integrate risk management. There is still a need to raise awareness at the local level on DRR policies, as these have not been well communicated to all stakeholders.
40. utilization of local development funds in the risk reduction process without proper risk assessment. investment in the present category of disasters with limited consideration of future possible risk factors.

During post-disaster activities there are no guidelines in order to implement DRR/CCA [125]. There is a lack of awareness on regulatory document, roles and responsibilities on DRR on the local level, development plans are not designed to integrate risk management [34], there is no risk assessment and future possible risk is not considered [40]. Funding for DRR is not utilized correctly due to lack of knowledge, technical and considering policies/procedures. [42]

URBAN PLANNING

Building Codes
111. Remoteness of construction sites and locations (DRR in economic activities).
112. Limited number and availability of qualified contractors.
113. Scarcity of construction materials.
114. Scarcity of good quality water for constructions.
Planning and management of human settlements incorporate disaster risk reduction elements, including enforcement of building codes.
117. A lack of skilled human resources to monitor and enforce the codes of the relevant departments has remained the main constraint during the reporting period.
118. A universal design considering potential hazards needs to be incorporated into Bangladesh National Building Code (BNBC).
119. There is a strong requirement for more investment in urban areas.
120. People in the urban areas are not aware of building code and it is also not well known by other stakeholders such as local authorities and representatives of local governments.
121. Awareness raising initiatives are required for land owners, building owners, and private sector real estate groups.
123. LGED engineers and education departments’ engineering/planning division require further training on safe construction principles for schools, hospitals, religious and other key institutional infrastructure.

Master Planning/Land use Planning:
122. Currently, the level of exposure to hazards is not considered during site selection for schools, hospitals, religious, or institutional buildings.
Procedures are in place to assess the disaster risk impacts of major development projects, especially infrastructure.
130. Gaps in coordination among stakeholders remain a challenge.
131. The information on cost-benefit analysis is not easily accessible and there is limited research on the environmental impacts of development projects at the national and local levels.
132. Prior to the construction of various key institutions, such as schools and hospitals, risk analysis and long-term cost-benefit analysis are not conducted.
133. A specific guideline and policy need to be developed and operationalized in all major cities and urban areas, as well as in hazard prone and vulnerable areas of the country to assess the environmental impacts of development projects and their cost-benefit.

SOCIAL DEVELOPMENT POLICIES (Measure Example retrieved from HFA Self-Assessment)
Social development policies and plans are being implemented to reduce the vulnerability of populations most at risk.
102. Safety net programs have played a key role in enabling vulnerable groups to cope with disasters by reducing the poverty level of the poorest segments of the population. However, resource mobilization, coordination, local ownership, and strategic direction are key constraints.
103. The initiatives need to be scaled up to cover other vulnerable groups living in hazard-prone areas, especially those frequently hit by climate change induced disasters.
104. There is growing need to ensure the inclusion of vulnerable groups (women, persons with disabilities, and minority groups) in social safety net and cash transfer programs.
105. GoB safety net programs assisting persons with disabilities need greater emphasis in the planning process to enhance the coping capacity of these most vulnerable persons.
106. The GoB also needs to make safety net programs more inclusive.
107. Target areas for these programs need to be considered not only by population size, but also vulnerability to hazards.
108. Monitoring is required for NGO cash transfer programs to ensure that the cash is used appropriately.
109. The GoB needs to monitor social safety net programs closely.
8. Vulnerable communities’ livelihood risks need to be assessed and mitigation plans need to be developed.

PROTECTING/UTILIZING ECO SYSTEM SERVICES
96. The key challenges to protecting and restoring regulatory ecosystem services are the availability of internal and external resources, the limited capacity of relevant institutions, and the high cost of environmentally-friendly household energy such as solar energy. Most households in energy-vulnerable areas are too poor to afford such technology, even if it were available. The main challenge of the bio-gas technology is the high construction and set-up costs. The set-up cost for each biogas plant is BDT 30,000-50,000.00 (approximately USD 375-625), which is not affordable for poor people.
97. Natural resource management has not been integrated into DRM initiatives at the local level.
98. A collaborative mechanism to coordinate institutional capacity-building inputs including technology, human resources, and financial resources is needed.
100. The GoB and NGOs must invest greater effort into translating national policies into action.

DATA MANAGEMENT (Risk Assessment & Information on Previous Disasters)
14. There is limited acknowledgement of grassroots level local damage reports at central level.
15. The absence of a uniform style and the different formats of databases creates gap in the data base. Sometimes, improper assessment hampers the ability to prepare an accurate analysis of the actual losses and damage scenario.

46. Lack of understanding of how to mainstream CRA and URA in all development planning process from the local to national level.

53. Though CRA is being conducted at the local level, there is still a need to strengthen the linkages between the ADP and the CRA/Risk Reduction Action Plan (RRAP) process.

54. CRA currently being conducted in a small number of areas and not being implemented in a consistent fashion throughout all districts.

55. The GoB should encourage local government bodies to incorporate the recommendations of the CRA into the ADP and the union five-year plan.

56. Although the GoB has developed a standard CRA and RRAP guideline, other guidelines and processes continue to be used.

67. Inaccessibility to and ineffectiveness of information sharing from the local to national levels. (Information on disasters)

13. The lack of a system to maintain the damage databases at the local level.

Capacity Building
....esp. resource allocation (for CC&DRR), anti-corruption

... problems for capacity building considers

RESEARCH & INNOVATION

81. Despite a number of studies on DRR-CCA, processes and systems for the dissemination of research outputs have not been well established at the national level. There is limited capacity to disseminate research findings to different stakeholders and communities.

82. In most projects, limited human resources are allocated to research, communications, and documentation functions.

83. There is a strong need to incorporate DRR into research activities.

85. More research focused on DRR at the community level is needed.

86. The GoB and NGOs need to increase support for research on the cost effectiveness of DRR initiatives.

87. There is a need to enhance coordination among research institutes for the dissemination and sharing of research findings and knowledge of DRR-CCA.

88. There is also a strong need to increase coordination between development partners and private sectors to fund empirical and participatory action researches at the local and national levels through academia and civil society groups.

GAPS IN KNOWLEDGE & APPRAISEL IN INSTITUTIONS

61. There needs to be a greater focus on Gender and inclusion.

79. Gender and DRR perspectives need to be adequately addressed in all curricula and training modules of government and non-government agencies.

REDUCE POLLUTION

X

INSTITUTIONAL CAPACITIES & RESOURCE ALLOCATION

38. Due to limited knowledge regarding preparation of project documents, timely approval of budgets for NGOs remained a key challenge in DRR project implement.

36. There is a strong need to explore potential public-private partnerships for DRR.
37. Funding under Corporate Social Responsibility (CSR), private sectors need to be used to build resilience of the community and institutions.

41. Lack of coordination between government agencies to ensure the best utilization of available resources

50. More coordination is needed between the GoB and NGOs at the local level for effective utilization of the funds available for DRR-CCA projects.

51. Transparency is needed during the resource allocation process at the national and district level, considering vulnerability and risk (also 52).

99. More DRR and CCA projects are required to raise awareness and build the capacity of communities (Environmental Protection).

110. Limited resources remain a main constraint; in addition, there is also a shortage of economic studies on Cost-Benefit Analysis (CBA) at the local level.

57. The General Economics Division (GED) of the Ministry of Planning needs to incorporate CCA and DRR issues into its annual plans.

Communication and Coordination

... problems for communication and coordination considers

75. A large number of children, women, elderly and persons with disabilities who are not registered at educational institutes or schools cannot be reached by the structured curriculum and training program.

84. A range a research publications that target audiences of both the general population and technical experts need to be made available.

PARTNERSHIPS & COOPERATIONS

62. The involvement and participation of the private and corporate sectors needs to be explored (national multi-sectoral platform).

PARTICIPATION & STAKEHOLDER INVOLVEMENT

DMCs

44. Weak mechanisms to support a bottom up risk identification and planning approach.

48. Key challenges remain to promote a decentralized decision making process; to ensure the participation of vulnerable communities and to support adequate and equitable resource allocation to DRR interventions at the local level.

49. The volume of allocated resources is not always sufficient to support the initiatives of communities and local government representatives on DRR and CCA.

61. There needs to be a greater focus on Gender and inclusion.

66. Lack of effective coordination among stakeholders to create reliable information at various levels is a key constraint.

46. Lack of understanding of how to mainstream CRA and URA in all development planning process from the local to national level.

58. Local level DMCs are not well equipped and have inadequate capacity to function well on DRR issues.

59. There are communication challenges between DMCs at various levels.

53. Though CRA is being conducted at the local level, there is still a need to strengthen the linkages between the ADP and the CRA/Risk Reduction Action Plan (RRAP) process.

60. DMCs have insufficient funds to carry out regular activities such as meetings and awareness raising programs.

63. A strategy for how information and plans arising from DMC meetings with the community is needed.

64. Linkages need to be built between proposed Ward Disaster Management Committee (WDMC) and Union Disaster Management Committee (UDMC) to strengthen community participation in DRR and humanitarian interventions.
65. Strong advocacy by civil societies to institutionalize the proposed WDMC in the SOD is needed.
59. There are communication challenges between DMCs at various levels.
58. Local level DMCs are not well equipped and have inadequate capacity to function well on DRR issues.

PUBLIC AWARENESS & EDUCATION
101. Collaboration with the private sector must be increased to inject required resources into the promotion of climate-sensitive household energy consumption technologies.
79. Gender and DRR perspectives need to be adequately addressed in all curricula and training modules of government and non-government agencies. (in education)
Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.
89. A lack of resources and efforts to increase the effectiveness of the mass awareness raising on DRR and emergency preparedness remains a key challenge.
90. There is limited investment and proactive involvement by the private sector and their proactive involvement is also absence in DRR mass awareness raising programs.
91. Few activities are initiated by the GoB to involve the local community in the DRR decision making process.
92. A strategy for public awareness raising programs needs to be developed and implemented to increase the impact of DRR-CCA mass awareness raising programs supported by the GoB and NGOs.
93. Common guidelines for hazard specific public awareness raising campaigns should be developed.
94. The GoB should prepare an information management system to track with DMCs have received training and by whom they have been trained.
95. Significant further work is needed to create mass awareness of DRR-CCA and school DRR issues, for which more investment is required from private sector, development partners including community radios and televisions.

REGIONAL LEVEL/INTERNATIONAL COOPERATIONS
31. The lack of an effective dialogue among the regional countries is halting the process.
33. Resources need to be provided from the national level to organize training on this issue and to enhance advocacy efforts at the regional level (Forecasting and EW).

Market based Instruments
X

Disaster Management

Emergency Planning & Preparedness
... problems with emergency planning are

16. Information hubs need to be equipped with the proper technology and must be accessible to all stakeholders. (key hazards/vulnerabilities)
19. A system for local level planners (DMCs), who do not have access to the internet, is needed to ensure that they have access to the disaster information database.
61. There needs to be a greater focus on Gender and inclusion.
65. Strong advocacy by civil societies to institutionalize the proposed WDMC in the SOD is needed.

CONTINGENCY PLANNING
35. Sectoral contingency plans need to be developed by all departments and ministries.
43. Lack of contingency plans and the allocation of resource for all sectors.
39. Absence of local contingency fund or long process to disburse the funds from the national to local level;
47. Lack of planning at the government level for school risk assessment and reflection of identified risks in the education planning process.
148. Contingency planning needs to be gender and disability inclusive.
149. Local level contingency plans are inadequate as a result of the limited capacity of trained staff and availability of financial and technical resources such as space-based technology.

KNOWLEDGE GAPS AFFECTING EMERGENCY PLANNING

28. Research on hazards affecting sub-regional or regional areas is limited and inadequate.

RISK ASSESSMENT

1. There is a need to develop standardized methodology and reporting process for all risk assessments, mapping exercises, and data compilation.
2. Risk assessment of lifeline sectors, i.e., health, water and sanitation, energy, agriculture, and livestock needs to be prioritized at the national and local levels.
3. Multiple formats are still in use for community-level risk assessments by various NGOs.
4. Investment is needed to produce necessary scientific data with the support of space technology.
5. Inclusion of gender, indigenous people, minorities, persons with disability, and older persons needs to be integrated in all multi-hazard risk assessment tools (CRA/URA).
6. There is an absence of mechanisms for school and hospital risk assessments and arsenic risk assessment in the multi-hazard risk and vulnerability assessment format.
7. Flood, cyclone, and all climate related probable risk scenarios need to be developed with scientific data using the appropriate technology.
10. There is a need to develop hub for information assessment (risk assessment)
11. An expert team is needed to provide support for risk assessment at the national and local levels.

... problems with preparedness are

45. Preference for infrastructure reconstruction and other recovery initiatives rather than preparedness initiatives, especially capacity building initiatives.
115. Yet to roll out the ‘Cyclone Shelter Construction Maintenance and Management Policy 2011’ at the local level.

Strong policy, technical and institutional capacities and mechanisms for disaster risk management, with a disaster risk reduction perspective are in place.
134. Inadequate capacities of trained staffs, financial resources, and technical resources such as space based technology are minor constraints.
135. Often GoB institutions and departments do not have modern technical skills and logistical resources.
136. At the national level, urban and local level disaster preparedness plans at times do not incorporate hydro-meteorological disasters.
137. Further support to roll out policies and frameworks from the national level to the local level is required to ensure the implementation of those tools.
138. Further efforts are needed to fully incorporate preparedness into the regular planning and management processes of education and health facilities.
78. All stakeholders need to continue to address preparedness issues through school-level risk assessment, planning, and response.
80. The financial, educational, and human costs of disasters on schools, children, teachers, and educational opportunities are increasing every year. Therefore, the GoB needs to emphasize education in emergencies and DRR in education in rural and urban areas.

Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.
139. Inadequate contingency plans and lack of regular drills and simulations, in addition to limited awareness and poor resource allocation, are significant challenges.
140. Changes in human resources (disaster managers) in local-level administration and government bodies make it difficult to regularly update and implement the plan. Regular minimized during emergencies, including through the use of schools as shelters. This needs to be a priority at school and national levels.

141. The allocation of resources for preparedness activities and materials needs to be incorporated within the budget.

142. Schools that are used as shelters need to be properly equipped to accommodate residents, while also continuing education during and after disasters.

143. The absence of a flood shelter management policy remains a major constraint.

144. Maintenance of flood and cyclone shelters is a big challenge.

145. In areas where CPP is active, the coordination of search and rescue teams and first aid teams is very good, with a high level acceptance of CPP volunteers by the community; this good practice needs to be replicated throughout the country.

146. More detailed planning needs to be conducted within the education and health systems to ensure that disruption is minimized during emergencies, including through the use of schools as shelters. This needs to be a priority at school and national levels.

**Flood & Cyclone Forecast & Early Warning**

... problems with F/C forecasting are considering

**TECHNOLOGY FOR MONITORING AND DATA COLLECTION**

12. The limited access to territorial data and the absence of a monitoring system for salinity ingress, water logging, cold waves, and flash floods has remained a challenge.

17. A consistent monitoring system for hazards such as salinity, water logging, tornadoes, flash floods, and cold waves needs to be developed and institutionalized at the local and national levels.

29. The lack of available data on water levels and rainfall upstream from Bangladesh in neighboring states, as well as a lack of access to satellites for real-time data collection on precipitation remained major challenges.

27. The GoB needs to put greater emphasis on developing and supporting EW systems for all types of disasters, including flash floods, landslides, and waterlogging.

... problems with Early Warning are considering

71. The lack of in-depth research on the effectiveness of EW generation and dissemination at the local and national levels.

**Regional Cooperation:**

30. At present, much needed technological up-gradation of the regional EW system have not been finalized.

32. The regional information exchange process for EW of disasters needs to be strengthened and emphasized at the SAARC level.

**Receiving of EW messages:**

21. One of the key constraints has been that the EW messages are not in a format which community people can easily understand and use.

23. Despite playing an effective role and being in demand in their communities and local authorities, community radio stations cannot cover large areas with their programming due to national policies, limited technology, and lack of resources.

26. EW awareness and knowledge building needs to be initiated at the school level.

68. Lack of an inclusive EW dissemination process (most vulnerable groups such as persons with disabilities, older persons, women, and children are not incorporated in the dissemination process).

69. People pay less attention to EW message disseminated through radio and television.

72. Even when information is available, people fail to interpret the meaning of messages and fail to translate the message into action.

**Sending EW messages:**
22. Another constraint is that the local level DMCs are not always proactive and they require intensive follow up.  
24. An effective EW system is needed for flood and flash flood to minimize negative impact in the vulnerable areas. DMCs need EW dissemination instruments and user-friendly technology to disseminate flood EW messages through CBOs and Community Volunteers (CV).  
25. The media also requires training on the proper communication of EW messages and systems so that they can effectively transmit the warnings. There is a strong demand from the local level to develop systems that link communities with the BMD.  
70. The lack of up-to-date information when the hazard changes its direction.  
73. There is a need to provide more comprehensive information at the community level, along with clear action points (what to do, when to do and how to do).  

Response Measures  
… problems with Response are considering  
Information  
9. There are challenges in collecting and disseminating detailed information from the upazila and union levels in a timely manner during a disaster.  
20. There is a need for more technology and instruments at the DMC level to monitor disasters at the local level.  

Double: Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews.  
152. The big challenge of ensuring that needs assessments address those most severely affected by disaster remains;  
153. this is largely due to inadequate logistical support, the remote and inaccessible geographical location of many disaster affected areas, and the involvement of political considerations in the assessment process, and the failure to immediately disseminate the results of post-disaster reviews and impact assessments.  
154. The decisions of the HCTT and various clusters are not available at the district and upazila levels; in addition, not all national NGOs are members of the various clusters.  

Education  
74. General disaster messages are available in the education curriculum at the primary and secondary level but not specifically on preparedness, mitigation, rescue or recovery issues  
76. Inclusion, gender, and disabilities need more focus in the curriculum design, (e.g. disaster professionals in universities)  
77. Issues related to recovery and rehabilitation have not been incorporated in the regular education program curriculum or in the curriculum of professional development courses.  

Financial means  
…… problems with Financial means are considering  

Financial reserves and contingency mechanisms are in place to support effective response and recovery when required.  
147. The GoB and NGOs must mobilize adequate resources from development partners to meet the needs in medium and large-scale disasters; contingency funds are often insufficient to meet the needs.  
151. Problems of risk financing and the non-existence of risk transfers were also key challenges.  
52. Political influence on the resource allocation process is a constraint for DRR and post-disaster response projects.  
52. Political influence on the resource allocation process is a constraint for DRR and post-disaster response projects.  

Recovery & Rebuilding
problems with recovery is usually….

150. Inadequate funding for recovery and reconstruction remains a major constraint.

18. The roll out of JNA (Joint Necessity Analysis) to local level stakeholders is needed to build local capacity.

Education
77. Issues related to recovery and rehabilitation have not been incorporated in the regular education program curriculum or in the curriculum of professional development courses.

Double: Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews.

152. The big challenge of ensuring that needs assessments address those most severely affected by disaster remains;

153. this is largely due to inadequate logistical support, the remote and inaccessible geographical location of many disaster affected areas, and the involvement of political considerations in the assessment process, and the failure to immediately disseminate the results of post-disaster reviews and impact assessments.

154. The decisions of the HCTT and various clusters are not available at the district and upazila levels; in addition, not all national NGOs are members of the various clusters.

Post-disaster data collection
155. Maintaining data quality is also a significant constraint during the assessments, often as a result of the short time period allocated for data collection.

156. To overcome these challenges, good governance should be established among service providers and local-level need assessment teams must be well equipped.

Disaster risk reduction measures are integrated into post disaster recovery and rehabilitation processes.

124. Currently, humanitarian assistance is emphasized by the GoB and development partners. However, less emphasis has been given to the recovery and reconstruction phases, which requires more financing and time. The concept of 'extended support' in the recovery phase reduces the potential for DRR integration, as there are insufficient resources to cover all affected households.

125. One of the major constraints of integrating DRR in post-disaster activities and recovery programming is the absence of an agreed guideline for the integration of DRR and CCA at the national level. (double)

CAPACTIES
126. Limited availability of resources.

127. Delayed approval processes for recovery projects due to lack of quality, knowledge, and priority setting in the project proposals.

129. Absence of guidelines and preconstruction assessments for community level infrastructure development projects.

128. Lack of common understanding of the priorities for recovery and reconstruction projects.
### Layer 1: Structural Measures

<table>
<thead>
<tr>
<th>Key Measures and Actions</th>
<th>Results of the HFA 2015 self-assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Structural Measures</td>
</tr>
<tr>
<td>F</td>
<td>Flow diversion</td>
</tr>
<tr>
<td>F</td>
<td>Water Retention</td>
</tr>
<tr>
<td>F</td>
<td>Increase Drainage Capacity</td>
</tr>
<tr>
<td>F</td>
<td>Flood &amp; Cyclone robust construction</td>
</tr>
<tr>
<td>F</td>
<td>Infrastructure, Facilities &amp; Houses</td>
</tr>
<tr>
<td>F/C</td>
<td>HFA: The National Building Code requires an up-date considering potential hazards[118]. There is low awareness on building codes amongst all stakeholders, local authorities as well as building owners[120/121]. Engineers from local authorities require training for more risk robust construction[123], there is a lack of capacities and knowledge for monitoring and enforcement[117], but also on qualified contractors, construction material including clean water is missing[112-114]. Urban Planning: There is no specific site selection for developments, no environmental impact assessments, no cost-benefit analysis or risk assessments, coordination among stakeholder remain a challenge[122/130/131/132].</td>
</tr>
</tbody>
</table>
### Layer 2: Non-Structural Measures

#### Flood Management & Disaster Risk Reduction

<table>
<thead>
<tr>
<th>Regulation &amp; Policy Framework</th>
<th>F/C</th>
<th>HFA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulations &amp; Development Policies</td>
<td>F/C</td>
<td>Urban Planning: There is no specific site selection for developments, no environmental impact assessments, no cost-benefit analysis or risk assessments, coordination among stakeholder remain a challenge[122/130/131/132]. Safety Net Programs: Mitigation plans for livelihood risks need to be developed[8]. Safety net programs lacking resources, coordination, local ownership, strategic direction, inclusion of all vulnerable groups and need to be scaled up[102-106]. Safety net programs need to be monitored, especially cash transfer[108/109].</td>
</tr>
<tr>
<td>Protecting and utilizing of Ecosystem services</td>
<td>F</td>
<td>HFA: Problems for protecting and restoring regulatory ecosystem services are the lack of internal and external resources, capacities of institutions and the translation of national policies into action[96/100]. Natural resource management has not been integrated into DRM initiatives at the local level[97].</td>
</tr>
<tr>
<td>Mainstreaming of DRR/CCA</td>
<td>F/C</td>
<td>HFA: During post-disaster rebuilding there are no guidelines to implement DRR/CCA[125]. There is a lack of awareness on regulatory documents, roles and responsibilities on DRR on the local level; the development plans are not designed to integrate risk management[34], there is no risk assessment and future possible risk is not considered [40]. Funding for DRR is not utilized correctly due to lack of knowledge, technical and considering policies/procedures. DRR/CCA funds are not utilized on the local level due to missing coordination between GoB and NGOs and DRR/CCA issues are not incorporated into annual plans of the General Economic Division[42/50/5]. Dissemination of research findings needs to be improved and DRR/CCA projects and awareness campaigns should raise public awareness, esp. considering environmental protection[87/95/99].</td>
</tr>
<tr>
<td>Capacity Building &amp; Research</td>
<td>F/C</td>
<td>HFA:</td>
</tr>
<tr>
<td>Increase of Institutional Capacities</td>
<td>F</td>
<td>Analysis of actual losses and damage scenarios lack a uniform style, damage data bases are not maintained well on the local level, furthermore they are not acknowledged at central level[13-15]. Gender and inclusion in DRM is neither acknowledged in training of governmental/non-governmental institutions, nor in the national multi sectoral platform or the local Disaster Management Committees[61/79]. Resource allocation processes are not only challenged by the lack of resources but also due to flawed project documents, uncoordinated governmental agencies, lack of transparency at national/district level considering vulnerability and risk of the projects, political influence and a shortage of knowledge on Cost-benefit analysis[38/41/52/110].</td>
</tr>
<tr>
<td>Reduce Pollution</td>
<td>F</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Research and Innovation</td>
<td>F/C</td>
<td>HFA: More human resources for research and more research on DRR (esp. DRR on the community level and cost-effectiveness) is needed, [83/85/86]. Coordination amongst different research institutes and also between research institutes and the private sector (e.g. for funding) is missing[87/88]. Dissemination of research findings amongst actors on the national level, different stakeholder/communities has not been established[81/82].</td>
</tr>
</tbody>
</table>

### Coordination & Communication

<table>
<thead>
<tr>
<th>Partnerships &amp; Cooperations, Stakeholder Involvement &amp; Participation</th>
<th>F/C</th>
<th>HFA: The lack of effective dialogues with the regional countries hinder regional cooperations on risk reduction, furthermore there is no information exchange e.g. for early warning messages and there are no resources to tackle this issue delegated from the national government[31-33]. Public Participation: Apart from weak support mechanisms and a troubled resource</th>
</tr>
</thead>
</table>
allocation, community participation and decentralization considering DRM is facing several challenges[44/48/49]: Community Risk Assessments (CRA) are only conducted in a small number of areas, different guidelines are used and the local governments need to be encouraged to manifest the CRA information in the ‘Annual Development Plan’ and the ‘Risk Reduction Action Plan’ process[46/53/54].

Similar problems exist on the district (upazila) and the national level: The risk assessments are not integrated into development planning, also information sharing from local to national level remains a challenge for participation[55/56/67].

Disaster Management Committees (DMC) do not have the capacities for DRM and have insufficient funds for regular activities[58/60]. Knowledge and skills for DMC meetings with the community on how information is collected and how plans with the community can be made are missing, moreover communication between DMCs remains a problem[58/60/59/63]. It is suggested to initiate DMC trainings and collect the training data[94]. To coordinate community participation on different scales Ward-DMCs and Union-DMCs are proposed[64/65]. Civil Society Organizations are needed to institutionalize the proposed Ward/Union-DMCs in order to implement the ‘Standing Orders on Disasters’ in Bangladesh[65].

| F/C Public Awareness, Education | HFA:  
**Information and Communication:** The coordination of reliable information seems to be a key constraint, e.g. information on disasters for the public. The distribution of knowledge is partly channeled through educational institutions, this is not including people who are not connected to schools, e.g. older people; research publications should be made more accessible for the general public[66/75/84].  
An increase of public awareness requires resources for mass awareness campaigns or the involvement or communities into the decision making process[89/91]. A strategy for public awareness raising programs considering DRR/CCA and common guidelines for hazard specific awareness should be developed[92/93]. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F/C Subsidies or Taxation, Income opportunity</td>
<td>Not mentioned</td>
</tr>
</tbody>
</table>

**Market-based Instruments**
<table>
<thead>
<tr>
<th>Disaster Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F/C</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>short/med.</strong></td>
</tr>
<tr>
<td><strong>F/C</strong></td>
</tr>
<tr>
<td>F/C</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>Response Measures short/med.</td>
</tr>
<tr>
<td>Financial means for response/Recovery short/med.</td>
</tr>
<tr>
<td>Flood and Disaster Recovery, Re-organization &amp; Rebuilding medium</td>
</tr>
</tbody>
</table>
## App.10 Log Frame

A) Explanation of the logFrame Matrix in short, adapted from European Commission (2004)

B) LogFrames for the three different project parts, cyclone shelter, waste management and bio-center

C) Stakeholder analysis, Problem and Objective Trees for the three project parts

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Objectively verifiable indicators of achievement</th>
<th>Sources and means of verification</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>What is the overall broader impact to which the action will contribute?</td>
<td>What are the key indicators related to the overall goal?</td>
<td>What are the external factors necessary to sustain objectives in the long term?</td>
</tr>
<tr>
<td>Purpose</td>
<td>What is the immediate development outcome at the end of the project?</td>
<td>Which indicators clearly show that the objective of the action has been achieved?</td>
<td>Which factors and conditions are necessary to achieve that objective? (external conditions)</td>
</tr>
<tr>
<td>Outputs</td>
<td>What are the specifically deliverable results envisaged to achieve the specific objectives?</td>
<td>What are the indicators to measure whether and to what extent the action achieves the expected results?</td>
<td>What external conditions must be met to obtain the expected results on schedule?</td>
</tr>
<tr>
<td>Activities</td>
<td>What are the key activities to be carried out and in what sequence in order to produce the expected results?</td>
<td>Means: What are the means required to implement these activities, e.g., personnel, equipment, supplies, etc.</td>
<td>What are the sources of information about action progress?</td>
</tr>
<tr>
<td></td>
<td>Costs</td>
<td>Costs</td>
<td>Costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

79
### B) LogFrames for the three different project parts: cyclone shelter, waste management and bio-center

The ‘Logical Framework Approach’ was used to describe the projects, the structure of stakeholder analysis, problem and objective trees and finally the ‘LogFrame Matrix’ are adapted from European Commission, Project Cycle Management Guidelines (2004).

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Indicators*</th>
<th>Sources/Means of Verification</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waste Management</strong></td>
<td>Decrease flood/cyclone vulnerability</td>
<td>Days when schools remained closed due to flooding during monsoon season should decrease by X% (in the second year after implementation)</td>
<td>A suitable school needs to be identified; administration should have information from before and 2 years after the project was implemented</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increase drainage capacity</td>
<td>Reduction of Floods/Water logging by x% during monsoon season (in the second year after implementation) compared to base data report (Ecorys)</td>
<td>Definition of a flood (height at specific location connected to base data information): counting days in the 2nd year after project implementation</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Waste collection and recycling to reduce waste accumulation in water bodies</td>
<td>No waste in water bodies in the project area (in the second year after implementation)</td>
<td>Field visit and photo documentation before and after the implementation</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td>1. Community based waste collection: +Set up Administration and voucher system* +design and build drop off facilities combined with cyclone shelter at strategic location(s) 2. Recycling business: +identify possible margins for plastic/paper/organic waste and a pricing/subsidy system for source separated waste +Identifying suitable entrepreneurs (and required support, e.g. credits) or already established businesses for recycling</td>
<td>Means: School records: closed due to flooding; Records of waterlogging; Photo documentary,</td>
<td>Who: Infrastructure and Planning Department: Drainage/ Sewerage Costs: Working hours of civil servant to prepare and collect data and present it</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Administration and voucher system*:

A ‘Waste Agency’ or the Municipality needs to list participating community members; per person/household a certain amount of source recycled waste can be exchanged for vouchers (e.g. food, bus tickets). Further research is required to understand how much subsidy is necessary to cover the continuous flow of waste;

Indicator* depend on the size of the project, whole of BCC or pilot area;

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Indicators</th>
<th>Sources/Means of Verification</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclone Shelter</td>
<td>Decrease flood / cyclone vulnerability</td>
<td>Number of days when shelter was provided due to storm/flood events (1st year after construction)</td>
<td>Bio center should offer a number of free toilets during storm/flood (claim back compensation from municipality per day of incident)</td>
</tr>
<tr>
<td>Goal</td>
<td>Reduction of health impacts/ Casualties during cyclones / floods</td>
<td>Number of patients during the next river flooding/storm surge event in the project area (dependent on availability of data)</td>
<td>Administration from Hospitals and medical services close to project area</td>
</tr>
<tr>
<td>Purpose</td>
<td>+Cyclone Shelters +Management strategy (regarding use as bio center and waste transfer station)</td>
<td>Multi-Purpose functionality of Cyclone Shelter and Management Strategy is approved (after fine tuning)</td>
<td>Building codes and land use planning are showing effects and the built environment becomes more storm and flood robust.</td>
</tr>
<tr>
<td>Outputs</td>
<td>+Cyclone Shelters +Management strategy (regarding use as bio center and waste transfer station)</td>
<td>Multi-Purpose functionality of Cyclone Shelter and Management Strategy is approved (after fine tuning)</td>
<td>The pilot is approved by key actors from the municipality and will be rolled out over BCC area after</td>
</tr>
<tr>
<td>Activities</td>
<td>1. Funding and Construction of Cyclone Shelters at suitable locations 2. Renting facilities to entrepreneurs or setting up a municipal operation plan</td>
<td>Means: Documentation from hospital bio center and municipality</td>
<td>Inhabitants of BCC use the shelter during extreme weather events. A Sufficient number of shelters are implemented in BCC already and early warning messages are successful.</td>
</tr>
<tr>
<td></td>
<td>Input: Research on Design of Shelter: use as bio center and waste transfer station; requirements considering statistical storm surge height;</td>
<td>Who: Operator of the bio center and municipality</td>
<td>Cyclone shelter have been proven to be a good and appreciated tool to decrease flood/cyclone vulnerability (further research and stakeholder involvement)</td>
</tr>
<tr>
<td>Project Description</td>
<td>Indicators</td>
<td>Sources/Means of Verification</td>
<td>Assumptions</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
<td>------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Bio center</strong></td>
<td>Decrease flood/cyclone vulnerability</td>
<td>The percentage of people using the shelter during storm warning should be at least 30% of the target group (scaling) during the next cyclone</td>
<td>Number of people needs to be counted/estimated by responsible person during an incident (e.g. disaster management committee, DMC)</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Sanitation and cooking facilities for slum areas and improvement of cyclone shelter</td>
<td>The size of the eco center is determined before it is build, in order to prove success the business should be profitable</td>
<td>Business is functioning and creating revenues (e.g. under the same entrepreneur) after 2 years</td>
</tr>
<tr>
<td><strong>Outputs</strong></td>
<td>+Cyclone Shelter Facility Management and Arrangements</td>
<td>All technical equipment is functioning, the property is managed well and the business produces revenues (same entrepreneur after 2 years)</td>
<td>Field visit and photo documentation e.g. by the DMC, 2 years after</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td>1. Find commitment of key stakeholder and funding for Design and Construction of the Building 2. Finding suitable actors/entrepreneurs and arrangements (PPP)</td>
<td>Means: Administrative documents and information from the operator of the eco center Photo documentation</td>
<td>1. Cyclone shelter have been proven to be a good and appreciated tool to decrease flood/cyclone vulnerability (further research and stakeholder involvement) 2. Successful Design of a cyclone/flood robust biogas reactor and plumbing</td>
</tr>
</tbody>
</table>
C) Stakeholder analysis, Problem and Objective Trees for the three project parts

### Waste Collection

#### Problem Tree

<table>
<thead>
<tr>
<th>Effects</th>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water logging/Flooding</td>
<td>Environmental and Human health issues</td>
<td>Loss of resources due to lack of recycling</td>
</tr>
<tr>
<td></td>
<td>Accumulation of waste, esp. in river, channels and ponds is blocking sewers and Decrease of Conveyance/Storage Capacity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Waste Collection and Management</td>
<td></td>
</tr>
</tbody>
</table>

#### Stakeholder Analysis

<table>
<thead>
<tr>
<th>Stakeholder and basic characteristics</th>
<th>Interests? How are they affected by the problem</th>
<th>Capacity and Motivation to bring change</th>
<th>Possible Actions to address stakeholder interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhabitants of informal settlements</td>
<td>Improve living situation and income; hygiene and health issues;</td>
<td>Low capacity; High motivation</td>
<td>Participation combined with Benefits, e.g. vouchers for source recycled waste at drop off station; Opportunity: Recycling Business</td>
</tr>
<tr>
<td>Citizen (better off)</td>
<td>Nuisance and smell; Problem to get rid of waste;</td>
<td>Medium capacity; Medium motivation</td>
<td>Participation combined with Benefits, e.g. vouchers for source recycled waste at drop off station or free pick up service; Opportunity: Recycling Business</td>
</tr>
<tr>
<td>Companies, Investors</td>
<td>Nuisance and smell; Problem to get rid of waste;</td>
<td>Medium Capacity; Medium motivation</td>
<td>Free waste pick up service if source separated; Opportunity: Recycling Business</td>
</tr>
<tr>
<td>Municipality</td>
<td>Improvement of urban management wanted; Blockage of sewer system / drainage, needs to be solved by them; most important stakeholder;</td>
<td>Medium capacity; High motivation</td>
<td>Support (financial, knowledge); Commitment from key actors by involving them into the process from the beginning to safeguard ownership and good governance of bottom up approach</td>
</tr>
<tr>
<td>Donors, Development Partner/Agencies</td>
<td>Interested in development projects, helping and improving the overall situation; KfW esp. interested in climate change adaptation (flood/cyclones);</td>
<td>High capacity; Medium motivation</td>
<td>Approaching them if common interest; create synergy; Show positive examples from other countries;</td>
</tr>
</tbody>
</table>
**Objective Tree**

**Ends**
- Less/No Floods and Water logging
- Recovering of Resources
- Environmental and Health improvements
- Improved Drainage Capacity/Storage
- Community Based Waste Collection
- **Business Opportunity:** Recycling of source separated waste
### Cyclone Shelter

#### Problem Tree

<table>
<thead>
<tr>
<th>Effects</th>
<th>Problems</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disasters with Injuries, Casualties and low Resilience</td>
<td>Low quality of houses esp. in slum areas</td>
<td>Cyclones, Storm surges and Flooding in BCC</td>
</tr>
</tbody>
</table>

#### Stakeholder Analysis

<table>
<thead>
<tr>
<th>Stakeholder and basic characteristics</th>
<th>Interests? How are they affected by the problem</th>
<th>Capacity and Motivation to bring change</th>
<th>Possible Actions to address stakeholder interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhabitants of informal settlements</td>
<td>Decrease of live quality; Threat to life and health;</td>
<td>Low capacity; High motivation</td>
<td>Involving in Maintenance: roles and responsibilities, e.g. due to business opportunity: bio center/waste recycling</td>
</tr>
<tr>
<td>Citizen (better off)</td>
<td>Assuming they have robust houses/assets there is still threat to life and health</td>
<td>Medium capacity; Medium motivation</td>
<td>Involving in Maintenance: roles and responsibilities, e.g. due to business opportunity: bio center/waste recycling</td>
</tr>
<tr>
<td>Companies&amp; Investors</td>
<td>Threat to life and health of workers</td>
<td>Medium capacity; Medium motivation</td>
<td>Funding in connection with Corporate Social Responsibility;</td>
</tr>
<tr>
<td>Municipality</td>
<td>Capacities for emergency response are low, disaster risk in BCC is high, shelter pose a suitable alternative for disaster management;</td>
<td>Medium capacity; High motivation</td>
<td>Support (financial, engineering); Low maintenance requirements; Synergy: Economic Development;</td>
</tr>
<tr>
<td>Donors, Development Partner/ Agencies</td>
<td>Interested in development projects, helping and improving the overall situation; KfW esp. interested in climate change adaptation (flood/cyclones);</td>
<td>High capacity; Medium motivation</td>
<td>Approaching them if common interest or create synergy (sanitation, waste management); Show positive examples from other countries;</td>
</tr>
</tbody>
</table>
### Objective Tree

#### Ends

Reduction of health impacts/Casualties due to floods and cyclones and Increase in Resilience

#### Objectives

Reduction of Injuries / Casualties during cyclones/floods

#### Means

<table>
<thead>
<tr>
<th>Provide shelters for Cyclones, Storm surges and Flooding</th>
<th>Business Opportunity and Cyclone Maintenance:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bio center for toilets shower/cooking facilities; Additional use for waste transfer station</td>
</tr>
</tbody>
</table>
**Bio Center**

**Problem Tree:**

<table>
<thead>
<tr>
<th>Effects</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad sanitation, waterborne disease, vicious cycle poverty</td>
<td>Polluted flood water</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Causes</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stakeholder Analysis:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stakeholder and basic characteristics</strong></td>
</tr>
<tr>
<td><strong>Interests? How are they affected by the problem</strong></td>
</tr>
<tr>
<td><strong>Capacity and Motivation to bring change</strong></td>
</tr>
<tr>
<td><strong>Possible Actions to address stakeholder interests</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Inhabitants of informal settlements</strong></td>
</tr>
<tr>
<td>Bad sanitation, waterborne disease, vicious cycle poverty;</td>
</tr>
<tr>
<td>Low capacity</td>
</tr>
<tr>
<td>High motivation</td>
</tr>
<tr>
<td>Need for sanitation/facilities:</td>
</tr>
<tr>
<td>Target group of the bio center, use of toilet, cooking and shower facilities for low price;</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Citizen (better off)</strong></td>
</tr>
<tr>
<td>Bio center offers toilets/showers/cooking facilities in the cyclone shelters during storms/floods;</td>
</tr>
<tr>
<td>Medium capacity</td>
</tr>
<tr>
<td>Medium motivation</td>
</tr>
<tr>
<td>Involvement or information in an early stage of the project;</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Companies &amp; Investors</strong></td>
</tr>
<tr>
<td>Threat to life and health of workers</td>
</tr>
<tr>
<td>Medium capacity</td>
</tr>
<tr>
<td>Medium motivation</td>
</tr>
<tr>
<td>Involvement at an early stage;</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Municipality</strong></td>
</tr>
<tr>
<td>Capacities for emergency response are low, disaster risk in BCC is high, shelter pose a suitable alternative for disaster management;</td>
</tr>
<tr>
<td>Medium capacity</td>
</tr>
<tr>
<td>High motivation</td>
</tr>
<tr>
<td>Synergies and Partnerships;</td>
</tr>
<tr>
<td>Support (financial, engineering);</td>
</tr>
<tr>
<td>Low maintenance requirements;</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Donors, Development Partner/Agencies</strong></td>
</tr>
<tr>
<td>Interested in development projects, helping and improving the overall situation; KfW esp. interested in climate change adaptation (flood/cyclones);</td>
</tr>
<tr>
<td>High capacity</td>
</tr>
<tr>
<td>Medium motivation</td>
</tr>
<tr>
<td>Approaching them if common interest; create synergy;</td>
</tr>
<tr>
<td>Show positive examples from other countries;</td>
</tr>
</tbody>
</table>
**Objective Tree**

**Ends**

Improve of Sanitation and Health

**Objective**

sanitation/ cooking facilities for slums

**Means**

- Decentralized energy/ waste water solution
- Flood/Cyclone robust set up and hub for waste drop off

**Business Opportunity:**

Income for use of facilities