Witteveen+Bos

memorandum

Witteveen+Bos
Willemstraat 28
P.O. Box 3465
4800 DL Breda
The Netherlands
telephone +31 76 523 33 33
fax +31 76 514 44 42
www.witteveenbos.com

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prepared by	P. van Weelden MSc
approved by	ir. H.P. Laboyrie
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initials

to	Agency NL	B. Lamoree (Ben)
copy	Deltares	P. Letitre (Peter)
	Witteveen+Bos	P. Laboyrie (Polite)
		T. van den Broek (Theo)
	Wissing	P. Kalsbeek (Piet)

Introduction

Mid July of 2013, an advisory board meeting will be held in Beira, Mozambique. Also, a small donor conference will be held. Because of these occasions, some preliminary project briefs have been drawn up in this memo. These project briefs are based on the results of the first phases of the project Masterplan Beira 2035. We remark these project briefs will be part of the longlist of projects (the longlist is a result of the Masterplan project), but do not provide a complete overview of necessary and urgent projects. The Masterplan project, including the longlist of projects, will be completed in the fourth quarter of 2013.

Challenges for Beira

Beira is located in the delta of the Pungue River, where the Pungue River meets the Indian Ocean. The city is facing several challenges. First, economic growth and population growth will result in substantial demand for (new) land and infrastructure, in a low scenario as well as a high scenario, see table 1 for a projection of the projected demand for land with regard to residential areas.

Table 1. Projection of the Beira population and residential areas (2035)

	current	projection 2035	
		low scenario (2.25 %)	high scenario (4.25 %)
total population	443,369	827,000	1,422,000
total hectares residential areas	7,743	11,366	16,991

However, urban development is poorly regulated and settlements in flood prone areas and without basic infrastructure are, unfortunately, very common. More suitable land and

infrastructure are needed for industrial purposes, for new and improved housing and for public facilities. Moreover, the current poor housing conditions in large parts of the city have to be improved.

Second, the city is facing serious climate-related threats. A clear climate adaptation strategy is of major importance because the city is located just a few meters above sea level and faces heavy rainfall during the summer. In addition, Beira is confronted with other water-related challenges such as the provision of safe (drinking) water and the improvement of flood protection through appropriate storm water and sewer systems.

Fortunately, Beira is not only faced with threats and problems. The port of Beira and the strategic location of Beira near the Indian Ocean and at the end of the Beira corridor (rail, road plus an oil pipeline) give Beira an advantage over other Mozambican and African cities. Combined with the economic possibilities in the hinterland (e.g. vast coal reserves, vast agricultural lands and increased demand for goods in hinterland countries), several opportunities exist to improve the socioeconomic conditions in Beira.

Urgent follow-up projects

Based on the strategic challenges above, an integrated strategic planning framework and urgent 'no-regret' projects are necessary. The project Masterplan Beira will provide the necessary strategic planning framework. Part of the Masterplan project is also the development of a longlist of projects which contribute to the long term sustainable urban development of Beira. During the current phase of the Masterplan project (phase A-2 of phase A-1 to A-4), some urgent projects have already been identified. These are shortly summed up below. Project 3a to 3b are hereby 'nested', which means 3b and 3c have to be based on the results of project 3a.

Table 2. Preliminary list of follow-up projects

no	project title	project goal
1	capacity building and institutional strengthening	to realize integrated urban development plans and to effectively and efficiently implement plans
2	optimization study into dredging of port access channel	to reduce operating and life cycle costs of the port and to increase the competitive position of the port of Beira
3a	urban transport plan	to develop an integrated urban transport policy which incorporates public transport and which enables CMB to effectively and efficiently improve the accessibility and attractiveness of Beira
3b	rehabilitation and paving of primary access roads	to improve the accessibility of Beira and its primary centres of activity (e.g. the port and the city centre) on the short term, within the city boundaries
3c	rehabilitation and improvement of hinterland transport infrastructure	to improve the long range accessibility of Beira via hinterland road and rail connections, outside the city boundaries
4	drinking water	to improve the currently poor living conditions for the inhabitants of Beira
5	sewage	to improve the currently poor living conditions for the inhabitants of Beira
6	coastal protection	to improve the resilience of Beira to flooding and climate change and ultimately to improve the attractiveness of Beira
7	drainage	to improve the resilience of Beira to flooding and climate change and ultimately to improve the attractiveness of Beira
8	social housing	to improve the currently poor living conditions for the inhabitants of Beira who currently cannot afford adequate housing
9	development of structure plans	to elaborate the strategic urban development of the Masterplan and

no	project title	project goal
		to provide more detailed planning guidelines and principles, based on an integrated approach to interrelated problems (specifically increasing housing demand and flood risks)
10	land development company	to effectively and efficiently use the sand which is retrieved during port dredging operations for the levelling and raising of future residential and industrial areas, thereby reducing flood risks and also providing an instrument for the development of residential and industrial areas

Project briefs

For each project above (1 to 10) a project brief has been drawn up. As mentioned before, these project briefs are based on the preliminary results of the Masterplan project. Project 10 (land development company) will be elaborated in more detail in a parallel process with local stakeholders and has therefore not been included in this memorandum.

1. Capacity building and institutional strengthening	
Cause/motive	The municipality of Beira (CMB) is currently not equipped to realize integrated urban development plans, to coordinate urban planning and to realize basic urban infrastructure. This leads to the following current problems: - land use conflicts in industrial and residential areas. Land use conflicts lead to disorderly and inefficient urban patterns. Ultimately, they hinder the economic development of Beira; - land speculation. Land speculation contributes to land use conflicts, increased land prices and ultimately hinder the development of residential and industrial areas which are provided with necessary infrastructure; - (very) poor living conditions of the inhabitants of Beira due to the development of residential areas in unsuitable flood prone areas; - (very) poor living conditions due to the development of residential areas without the provision of basic infrastructure (e.g. drinking water, sewage, drainage). The average forecasted population growth of the city of Beira until 2035 ranges from 2,25% to 4,25% per year. These forecasts imply an increased demand for residential areas of several thousands of hectares until 2035. The problems above will therefore become worse if CMB is not adequately equipped for it tasks related to urban planning.
Project	Capacity building and institutional strengthening of CMB has to focus on (integrated) urban planning, the implementation of urban development plans, the enhancement of the cooperation between public and private stakeholders, the funding and financing of projects and the effective procurement of goods and services. Capacity building and institutional strengthening of CMB is necessary on three levels: - strategic and community level; - institutional and policy level; - organizational and individual level. *Strategic and community level* The top and middle management of CMB, the city council and the top management of the private sector parties have to increase their knowledge at a strategic level on 'business models' with regard to urban development (including industrial and residential areas as well as related public services and infrastructure). Also more knowledge is necessary with regard to PPP (Public Private Partnership) and the preconditions from a public and a private point of view to organize successful PPP-projects. Ultimately, on a strategic level, the cooperation between public and private stakeholders should be stimulated and intensified.

1. Capacity building and institutional strengthening	
	Institutional and policy level The implementation of the urban development strategy of the Masterplan should be carefully elaborated and planned by the management of CMB in cooperation with legal and financial experts. New implementation policies should be developed. Relevant topics for these policies are, for example, land concessions, land use conflicts, land speculation and building rights. Also, policies should be developed with regard to the acquisition of external financial resources, especially private financial resources, and to increase the funding and financing capacity of the municipality. *Organizational and individual level* An important follow-up project of the Masterplan project is the development of integrated urban development plans (also see project 9), which take into account the natural physical characteristics of Beira, specifically flood prone areas, and the necessary spatial requirements for basic infrastructure and services. This goal is to be reached via enabling and stimulating cooperation between departments of CFM on all planning levels and enabling integrated urban planning. The necessary primary requirements for integrated urban planning (e.g. sound registration of concessions) are first to be further identified. Increased knowledge and skills with regard to procurement, tendering and contracting of goods, services and works from external resources are important to effectively implement plans. CMB should be well equipped to prepare projects and procure goods and services at the best possible cost and quality, and should also be equipped to effectively manage and control the execution, completion and follow-up care of projects.

2. Study into optimization of dredging of port access channel	
Cause/motive	CFM (Mozambican Ports and Railways) has planned the future expansion area of the port to the north of the port, adjacent to the current port, alongside and upstream the Pungue river. This area provides ample space for the required port expansion. However, this area could be considered unfavourable, based on the following issues: - the high maintenance dredging cost (approximately 2 million m^3 per year at a cost of circa 8 million USD per year)[1] in the current situation; - the ever increasing size of vessels and the subsequent necessity for a deeper port. In turn, this requires extra initial dredging and more maintenance dredging of the port and the port access channel; - also, dredging upstream could result in higher costs than dredging downstream the Pungue river. The issues above result in high life cycle costs of current port operations and even higher costs if the port is expanded upstream the Pungue river. To improve the competitive position of the port, dredging of the port access channel should be as efficiently as possible.
Project	The issues above justify the question whether the dredging operations of the port access channel could be optimized. Specifically, a risk analysis with regard to dredging costs versus the risks and benefits of less dredging activities should be part of the study. CFM is the primary beneficiary of this study. Any study into dredging of the port access channel should be executed in cooperation with CFM.

[1] Predictions on the mean annual sedimentation rate range from 2.1 to 2.7 million m3. These figures are based on extensive research from 1990 to 1996 (JICA, 1998). The dredging cost per m3 depends upon a number of factors. The indicative price of 4 USD per m3 is a relatively low price for international dredging projects, reflecting sandy (loose) materials and a relatively short distance to the site for depositing the dredging material (on- or offshore).

3a. Urban transport plan	
Cause/motive	The economic development of Beira, specifically port development, depends on the accessibility of Beira via road and rail. Currently, the accessibility of Beira via land infrastructure is generally poor, due to: - the poor condition of roads and rail. Specific problems are the access road to the port in Beira, which has not enough capacity and where large potholes cause traffic jams, and the poor condition of rail infrastructure from Beira to the hinterland, where rainfall can lead to long downtimes of rail transport; - the indirect road connections to the north and south of Mozambique, leading to long travel distances and travel times.
Project	The problems above are addressed in three projects (projects 3a to 3c). First, project 3a comprises the development of an urban transport plan. This project should comprise a study into traffic forecasts, road and rail capacity requirements and optimization and extension of public transport and should be based on future urban expansion plans (e.g. within the Masterplan). A specific point of attention is the access of the port via a new road connection of 5 - 10 kilometres. The exact road distance depends on the location of the connection to the EN6 (the current main access road to Beira).

3b. Rehabilitation and paving of Beira access roads	
Cause/motive	The economic development of Beira, specifically port development, depends on the accessibility of Beira via road and rail. Currently, the accessibility of Beira via land infrastructure is generally poor, due to: - the poor condition of roads and rail. Specific problems are the access road to the port in Beira, which has not enough capacity and where large potholes cause traffic jams, and the poor condition of rail infrastructure from Beira to the hinterland, where rainfall can lead to long downtimes of rail transport; - the indirect road connections to the north and south of Mozambique, leading to long travel distances and travel times.
Project	The problems above are addressed in three projects (projects 3a to 3c). Clear and evident road access problems can be solved through the paving and widening of dirt roads. These activities should be based on a thorough inventory of intensely used poor quality roads and the urban transport plan (project 3a). We assume several dozens of miles of road infrastructure need to be repaired and improved. An exact calculation of the length of repairs of road infrastructure depends on the length of roads which are already planned to be repaired and/or improved. This needs to be further researched. A specific point of attention is the use of durable materials and the realization of solid foundations: currently, paved roads in Mozambique and in Beira wear out easily due to a combination of heavy rains and poor foundations.

3c. Rehabilitation and improvement of hinterland transport infrastructure	
Cause/motive	The economic development of Beira, specifically port development, depends on the accessibility of Beira via road and rail. Currently, the accessibility of Beira via land infrastructure is generally poor, due to: - the poor condition of roads and rail. Specific problems are the access road to the port in Beira, which has not enough capacity and where large potholes cause traffic jams, and the poor condition of rail infrastructure from Beira to the hinterland, where rainfall can lead to long downtimes of rail transport; - the indirect road connections to the north and south of Mozambique, leading to long travel distances and travel times. For example, heavy rains and poor maintenance of the Sena line has had an important negative impact on coal transport via the Sena line in early 2013 (source: CFM):

3c. Rehabilitation and improvement of hinterland transport infrastructure	
	- transported tons of coal in January: 299.000; - transported tons of coal in February: 10.500; - transported tons of coal in March: 224.000; - transported tons of coal in April: 322.500. Assuming an average transport of circa 300.000 tons of coal per month, coal transport in February 2013 virtually ceased. In 2012, coal traffic quantities along the Sena railway line have shown an increase from circa 113.000 tons of coal per month to and above 300.000 tons of coal per month. The accumulated coal transport over 2012 amounted to 2,7 million tonnes.
Project	The problems above are addressed in three projects (projects 3a to 3c). Currently, plans for the rehabilitation and capacity increase of rail and road infrastructure in the hinterland of Beira exist. However, the implementation of these plans is far from guaranteed because of insufficient financial means. Project 3c therefore comprises research into urgent problems and projects and an analysis of financing and funding possibilities. Specific points of attention are the resilience of road and rail infrastructure to flooding and drainage infrastructure, with the goal to prevent (long) transport downtimes.

4. Drinking water	
Cause/motive	The capacity of the current drinking water treatment plant for the city of Beira lacks capacity to fulfil the drinking water requirements for the forecasted population in 2035 (in both low and high population growth scenarios). Moreover, 70% of the population of the city is covered by the household connection or public standpipe. The supply of potable water to the population of Beira has to be ensured. The project serves three goals: 1. reducing non-revenue water; 2. increasing treatment capacity; 3. constructing drinking water distribution infrastructure.
Project	Reducing non-revenue water is a measurement project, focusing on measuring the losses from reservoirs, piping mains and theft as well as non-reliable water meters. By identifying, quantifying and addressing these losses, an increase in available potable water could be realized. An IWA task force has set a general equation for the unavoidable annual real losses (UARL) from the drinking water distribution network. Reduction of apparent losses will lead to the total system losses being closer to the UARL. Once losses have been reduced, the capacity of the drinking water treatment works should be increased to meet the future demand based on the population-scenarios. While meeting the required capacity, another project is to expand the drinking water treatment distribution network to provide the urban population of Beira with treated, potable water by household connection or public standpipe.

5. Sewage	
Cause/motive	Within the context of the Masterplan, a global analysis into sewage treatment and sanitation will be conducted. This analysis has not been completed at this stage of the Masterplan project. At this point, we can only conclude the capacity of the current wastewater treatment plant is insufficient for the future Beira population. The current wastewater treatment plant is designed at a capacity of 85.000 inhabitants. While a large part of the city is not connected to the sewer network, the capacity of the wastewater treatment plant must be increased to meet the future wastewater production.
Project	Increase the capacity of wastewater treatment plant.

6. Coastal protection	
Cause/motive	The coast of Beira is eroding as a result of a combination of natural and man-induced causes. The southern coast is protected by groynes which are presently only partly effective due to their state of decay. Also the natural coast east of the city is currently showing erosion, which may in the future adversely affect the southern coast. A plan for beach and groyne improvement has been developed by Consulmar. The concept of the proposed solution in this study is considered solid. However, some aspects of the plan are questionable (such as the phasing of construction and the necessity and possibly negative impact of training walls at the drainage outfall). Limited coastal protection works which are carried out so far deviate from the original plan. Since these works are very local and do not seem to be part of a well-designed overall plan, these measures may be(come) dysfunctional or even may have adverse impacts on the coast on the longer run.
Project	The present coastal protection system can relatively easily be adapted to changing conditions in the future (due to climate change) if sufficient volumes of good quality beach sand can be obtained at reasonable costs. Our main recommendations are: - reconsider some aspects of the present coastal protection plan (such as the phasing of construction and the training walls at the drainage outfall); - develop a new plan for phased construction of coastal protection measures and carry out this plan; - anticipate on regular beach replenishment with new sand (beach maintenance); - anticipate on future measures for adaptation to sea level rise (additional sand); - use sand accumulated at present outfall location (sand spit) for beach improvement; - prevent (illegal) sand mining from the beach; - try to keep dredged sand (from port and channels) in the active coastal system; - start monitoring the coast south and east of the city; - carry out studies for above-mentioned reconsiderations of the plans and for adaption to climate change. Consulmar estimated the costs for their beach improvement plan at 60 million to 70 million USD. We roughly estimate the costs for regular beach maintenance plus compensation for sea level rise till 2035 at 4 million to 10 million USD. A more detailed study is required to make a more reliable and accurate estimate of these costs and to extend the scope of the study to include the main recommendations above.

7. Drainage	
Cause/motive	Beira is subject to frequent flooding during periods of intense rainfall. There are various reasons for the current problems: - a lack of maintenance of the existing network; - high construction density in the urbanized areas; - expansion of the urbanized area in north eastern direction; - inadequate conveyance capacity of the existing drainage system; - inadequate retention storage facilities, in particular at the coastal outlet of the drainage system. The frequent flooding events pose health risks for the inhabitants of Beira and are a threat to the sustainable urban development of Beira.
Project	Previous studies are mainly aimed at solving current problems. Taking into account the expansion of residential and industrial areas in the future, additional measures are necessary to prevent future problems with regard to flooding and drainage.

7. Drainage	
	First, expansion of the drainage system and construction of additional tidal drainage outlets and retention facilities are required. Also, additional retention facilities need to be created within the present urbanised areas. Re-opening of the Rio Chiveve is a measure to alleviate the present southern drainage outlet. A new drainage study will be performed (starting in July 2013) that will include the future expansion areas. Within this study the following components need to be addressed: - improved data on details of the drainage infrastructure such as cross-sections, hydraulic structures and terrain levels (ideally including LIDAR surveys); - improved data on rainfall and sea level characteristics; - model calibration based upon water level and preferably also flow monitoring; - statistical processing of forcing data such as rainfall combined with tidal conditions and the simulation of the impacts of representative conditions; - evaluation of a wide range of possible interventions, making efficiently use of the natural terrain conditions and the associated cost-benefit analyses. Also taking into account the long term view on the future urban development of Beira for the complete area east of Beira-Dondo and the future port and industrial expansion areas; - evaluation of new works (levelling, embankment, roads, rail), the required interventions and their implications on the drainage system. With regard to costs: - the World Bank currently finances two projects in Beira: urban flood control signed and approved with a budget of 70 million US$ and the Pilot Project Climate Resilience (PPCR) on rehabilitation of the Rio Chiveve with a budget of circa 15 Million US$; - KfW finances one project on the rehabilitation of the Rio Chiveve (15 Million Euro); - we expect an additional amount of around 70 - 90 Million Euros is needed to design and build the drainage system in the future expansion areas; - The exact scope of the present and future studies will be discussed on the 18th of July with staff from AIAS, World Bank and the consultants hired for the study.

8. Social housing	
Cause/motive	Currently, a large part of the inhabitants of Beira suffer poor living conditions and cannot afford good quality houses or even houses which meet the minimum requirements of the national housing standard. Furthermore, newly developed residential areas lack basic infrastructure (e.g. electricity, drinking water, sewage, drainage), houses of (very) poor quality are still being built and programs for low cost (social) housing are absent. A solution to the poor living conditions of a large part of the inhabitants of Beira is therefore far from close.
Project	With regard to the improvement of living conditions, there is an important and delicate choice to be made: the improvement of houses, infrastructure and services in current residential areas versus the clearing of current residential areas plus the integrated development of new residential areas which are provided with necessary infrastructure, including areas which are dedicated to low cost (social) housing. This choice should in principle be considered for each individual area. A combination of both strategies throughout the city is conceivable. Regardless the strategy, the overall goal is to provide the inhabitants of Beira with affordable houses of good quality and which are provided with basic infrastructure. The project comprises a study into the feasibility of the planned development and implementation of social housing. This study should address technical, institutional and financial aspects.

9. Development of structure plans	
Cause/motive	The municipality of Beira (CMB) is not able - in terms of financial and human resources - to realize integrated urban development plans, to coordinate urban planning and to realize basic urban infrastructure. This leads to the following current problems: - land use conflicts in industrial and residential areas. Land use conflicts lead to disorderly and inefficient urban patterns. Ultimately, they hinder the economic development of Beira; - land speculation. Land speculation contributes to land use conflicts, increased land prices and ultimately hinders the development of residential and industrial areas which are provided with necessary infrastructure; - (very) poor living conditions of the inhabitants of Beira due to the development of residential areas in unsuitable flood prone areas; - (very) poor living conditions due to the development of residential areas without the provision of basic infrastructure (e.g. drinking water, sewage, drainage) because providers of infrastructure (EDM, FIPAG etc.) cannot anticipate on the urban development of Beira. The average forecasted population growth of the city of Beira until 2035 ranges from 2,25% to 4,25% per year. These forecasts imply an increased demand for residential areas of several thousands of hectares until 2035. This means the problems above will only become worse if no interventions are made. To effectively address the problems above, plans for the urban development of Beira on different planning levels are necessary and have to be developed in cooperation with relevant stakeholders (specifically providers of infrastructure).
Project	Generally, urban planning takes place on different geographical scales. Planning on each scale deals with different issues and decisions: - a masterplan provides a comprehensive (strategic) vision on the expected trends and spatial development of the city. It clearly deals with strategic issues on the long term; - a structure plan provides a spatial and functional structure for a specified area. This can be the entire city, or a part of a city. General land use is part of a structure plan; - a detailed plan or a zoning plan deals with operational issues (e.g. location, measurements and financial feasibility). The different scales of planning imply a different degree of flexibility and detail. For example, zoning plans deal with decisions for clearly delineated areas. Strategic plans on a regional or city level deal with decisions for the long term and for large areas (areas which are sometimes not even clearly defined). The level of uncertainty on this planning scale is great, to such an extent some developments might not even take place. Strategic planning implies a high level of flexibility and a low level of detail. We understand infrastructure and service providers want to reduce uncertainties when they plan investments, to reduce the risk of failed investments. They desire clear and fixed plans for urban development to plan their investments. The important question is: how to be flexible and at the same time reduce investment risks? This dilemma can only be solved via staged planning and sustainable public - public and public - private cooperation. Staged planning implies the development of plans on each relevant scale. Sustainable public - public and public - private cooperation implies the discussion and cooperation between relevant public - public and public - private parties on each planning level (this point has been elaborated more in project brief 1). Project 9 focuses on the design and implementation of structure plans for parts of the city, ultimately covering the whole urban area of Beira. The structure plans first have to fit into the urban development strategy of the Masterplan. Second, the structure plans focus on specific areas (port, city centre, new town and/or residential areas) and are more detailed than the Masterplan: the structure plans will indicate general land use (scale 1:10.000/1:5000) and rough

9. Development of structure plans	
	boundaries for road and rail infrastructure, services, housing, business and industry. The first steps should be (1) the design of a structure plan for the city centre and the adjacent surrounding areas and (2) the development of structure plan for the residential and industrial expansion areas which are to be developed in the near future (<10 years), for example the port expansion area and the area surrounding Manga and the airport. In these future expansion areas, already a lot of concessions have been released and building licenses have been issued. However, without any planning or coordination, these areas will suffer the same problems as mentioned before (e.g. no flood protection and shortages of basic infrastructure).