Waterproof Manado

Life must be safe and secure,
not only today but also in the future!

CT 4061-09 Multidisciplinary project

General notice to the reader:

In the academic programme for Hydraulic Engineering we have in the 4th year (i.e. in the first year of the Master Programme) the requirement that students should do in a group of four to six persons a so-called "groupwork". It is also called "Master Project". During this groupwork they should make a full design of something. The work should be integral, starting with terms of reference, and ending with the real design. This can be a structure, but also it can be a harbour lay-out, a policy plan design, etc. The total time available for the project is in the order of two months and will provide 10 European Credits. It has to be practical and applied.
It is certainly not an M.Sc. thesis assignment (the thesis work is individual, 6 months and more focussed on research or advanced design work on details). But it is also not an apprenticeship, internship or traineeship where the student has to work together with a group of experienced people. For this groupwork they have to solve the problem on their own (of course with guidance).

This report is the result of such a Master Project. This report has been assessed by staff of TU Delft. It has been provided with a passing mark (i.e. a mark between 6 and 10 on a scale of 10), and consequently considered sufficient for publication.

However, this work has not been fully corrected by TU Delft staff and therefore should be considered as a product made in the framework of education, and not as a consultancy report made by TU Delft.

The opinions presented in this report are neither the opinions of TU Delft, neither of the other sponsoring organisations.

Department of Hydraulic Engineering
Delft University of Technology

Waterproof Manado

CT 4061-09 Multidisciplinary project

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Every day you may make progress. Every step may be fruitful. Yet, there will stretch out before you an ever-lengthening, ever-ascending, ever-improving path. You know you will never get to the end of the journey. But this, so far from discouraging, only adds to the joy and glory of the climb.

Winston Churchill

Preface

Stagnation means decline, even so for the municipality of Manado. In the past few years the coastline of Manado experienced problems with erosion and the inner city of Manado showed a major problem with flooding and garbage. Parts of shore inside the boundaries of Manado flushed away due to changes in the currents and a lot of garbage lies on the streets and make their way to the Bunaken National Park.

In other words, the city of Manado expanded in the last decade so large, the current situation can't handle the habitats of all these people. Besides the demographics growth, the climate is changing rapidly. The intensity of the rains are heavier which results in a higher discharge. A city with the size of Manado should preserve the safety of their inhabitants at all cost with a proper understanding of the surrounding environment.

Upgrade of the current situation…

A proper upgrade is the enforcement of erosion protection and additions to the water management. This report details the problem analysis, the most obvious scenario's for the future and detailed solutions for an upgrade of the city. Also known as "Waterproof Manado". The project aims to meet both meanings of "Waterproofness". To make the city watertight, no more floods giving more safety. And to give a sustainable solution, a right answer for challenges today and in the future.

This report touches upon various disciplines viz. coastal engineering, geotechnical engineering and construction management. All these different angles creates a waterproof advice with the following aspects: Coastline protection, River management, Process advices related to the mission and vision of the city and suggestions/recommendations for the future. This report has been written with a limitation of time, which resulted in the fact that not all parts of the problem have been investigated. To complete this report some assumptions are made.

The city we want to live in…

The main question of this report is: **What are the options to supplement Manado's vision and mission, making the city more safe and attractive for tourists and citizens?** This advice creates conditions to fulfil the desired vision, "*Manado Model City of Ecotourism*" and mission, "*To Make Manado as a City of Happiness*".

Kind Regards,

Projectgroup Manado

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Acknowledgement

As in many cases this research project started as an enthusiastic idea of some students. From this idea, plans grew which developed finally to this report. Coming to the final product as it lies before you would not be possible without help of many. We are very grateful for all the help. Therefore we are delighted to thank those who made this project possible.

Before there was any project, one needs to have an assignment. Coming to find an assignment we've met Ir. H.J. Verhagen. Ir. H.J. Verhagen not only helped us finding an assignment, but also guided us during the whole process. Besides Ir. H.J. Verhagen we also want to thank Ir. J.P. Oostveen and Ir. Drs. J.G. Verlaan for helping us attaining an academic worthy report. Thanks to Ir. H.J. Verhagen we came in contact with Ir. A.R. Kemur, MSc. who found the assignment for this project in Manado. In the preparation we found several sponsors who made it financially possible to go to Indonesia and developing this project. Our sponsors are Royal Boskalis Westminster nv, Van Oord BV, iPS and IV-Groep b.v. Besides financial support, Boskalis also supported us with their knowhow and knowledge of this area.

After a long journey we got a warm welcome by the client, the municipality of Manado and in special Dr. Ir. G.S.V. Lumentut, DEA. SH. Not only they made it possible to do a project like this. Dr. Ir. G.S.V. Lumentut, his wife Prof. dr. J.P.A. Lumentut, MSi. and children, also made us feel like home and gave an introduction to the Manadonesian culture. We thank the University of Sam Ratulangi (UNSRAT) for their hospitality. With Prof. dr. ir. J.I. Kindangen, DEA dean of the Faculty of Engineering in special. They provided us a suitable working place and academic feedback on questions which arose during the project.

Through Dr. P.K.B. Assa, ST., MSc and Ir. F.P.Y. Sumanti, MT we came in contact with many other people who helped us. Also their advices on the progress, daily guidance and support made this report as it now is. We thank them for the great amount of effort that they invested in us, without any hesitation or fall back. The city of Manado and UNSRAT gave us valuable information. In special we want to thank Mr. W. Steenie, Mr. B. Sompie, Ms. E. Cumentas, Mr. R. Kalesaran, Ms. J. Mamoto, Mr. N. Hendrawan, Mr. D. Rumokoy for their input and answers regarding our research.

In the 9 weeks of our stay in Manado City we met many people who made our stay in this wonderful city even more pleasant. In special we thank: Walter, Omi, Lamber, Simone, Fransman, Fadly, Seleta, Novie, Rheta, Melia, Yoan, Vivi, Vini, Feybe, Christy, Tiza, Gadyliana, Fricilia, Maknolai, Vonny, Achied, Frank, Rico, Jan en Ineke.

Last but not least we want to thank the ones who stayed back in the Netherlands. Our parents, girlfriends, brothers and sisters and friends for supporting us from the start till the end. We can't hardly understand the burden it was to miss us for several months. We also like to thank the founder of Skype and the Internet for making it possible to easily keep in contact with our loved ones.

Summary

Manado City is growing, its population is increasing. This demands the city to grow outside its borders and even into the sea by using land reclamation. Introducing new challenges or making challenges bigger, which are already present. Not only growth is present in the city, going forward and becoming better and better is an on-going fight for cities. The city came up with a vision *"Manado, Model City of Eco Tourism"* and a mission *"Make Manado a City of Happiness"* for their future. Introducing a study on this subject and to anticipate on the city's goals, the research question is stated as; **What are the options to supplement Manado's vision and mission, making the city more safe and attractive for tourists and citizens?** Within this research, two other challenges regarding Manado city will be investigated as well.

In the year of 2003 a major flood occurred in the city, causing great damage to the city with many casualties. Nowadays, the risk of flooding is still present. Secondly, a challenge arises at the border of the city . The coastline of Manado suffers from erosion at specific locations, possibly caused by development of the reclaimed land in the past.

Narrowing the research, an analysis will be made upon selected subjects. Analysing the coastal protection, river floods and the city's Vision and Mission gives a clear view of the current state and what could be expected from the future. The goal is to come to a sound idea of the needs and possibilities related to coastal protection, Kota Manado and its Vision and Mission.

Working towards advices, different time paths and desires are noticed. Besides recommendations, which can be adopted at any time, found solutions are divided in short, mid and long term time spans. On short term the rivers and garbage have to be handled and nuisance of either one increases day by day. At many places the river is blocked. Removing these blockages is a good start. In addition, the embankments and beds can be 'smoothened', to improve the river's flow. Besides the river attention on the short term, garbage clogs up the city. Waste Management Control is already improving. Clean ups have to be supported by the government, giving a good example to its citizens. By these measures a start is made to work towards real solutions, coming to an Improved Garbage Service.

As mentioned before, improving the Waste Management Control is a continuing process. Besides the short term, this solution has a mid-term basis too. By adaption of the 3R-principle, garbage will be even less. This principle represents the Reduction, Reuse and Recycle of materials. The amount of waste will reduce and the city will be cleaner, although it will take a while to adopt. Measurements need to be coordinated and monitored. Making so-called Pre-Project-Planning gives benefits to make them successful. This should not only be used in this case, but also for regular Civil Engineering projects.

Erosion is another problem Manado City is facing nowadays. However, its effects evolve more slowly and are thereby less noticeable. The coastline of Manado can be divided in three sections. Section one consists of the Southern part of the coastline and the municipality is already undertaking action to stop the erosion. The adopted measures are well designed and thought through. Even on places where there's little area to construct a protection, the chosen measure could also be used.

Section two is located near the boulevard area. Large land reclamations are constructed along the shore. The reclaimed areas are well protected by big stones and do not suffer from any erosion. These large land reclamations, however, do have side effects. One of them is the change in the current, leading to a flow towards the 'Bunaken' coral reef area. This flow transports a lot of sediment, dust and garbage and killing a lot of fish and coral. So, for future land reclamations, an investigation into these effects must be done if the city really cares about its environment and wants to prevent it from destroying. Section three is situated in the North of Manado. The protection of the northern coastline consists of vegetation and Mangroves. Due to certain changes in the past, among others construction of reclaimed areas, part of the northern shoreline started to erode. The continuing process of erosion can be resolved on a mid-term base. With solutions like, for instance Mangroves, it can stop the erosion and improve the environmental value of the coastline as well, leading to an eco-friendly solution.

A sustainable future for the city of Manado is obtained by their vision "*Manado Model City for Ecotourism*" and mission "*To Make Manado City a city of Happiness*". The government cannot do this on its own. Involving and, most important, convincing the local community of the vision and mission will speed up the progression. This combines the short and long term philosophy. On short notice the local community has to be convinced and at the same time, the long term vision and mission can be fulfilled too. Manado City has a great amount of opportunities to fulfil their mission and are they are well available. Even small improvements can make a change. A good example to use the opportunities and to anticipate on the mission and vision of the city is to construct several parks or a beach in the centre of town. A park or a beach can be created to attract not only tourists but also local citizens. For tourists, including divers, it will be a welcoming relaxing spot to comfort their stay in Manado. So in this way it will give the mission and vision of Manado a tremendous boost.

Contents

List of figures

Appendices

1 The assignment

1.1 Case Description

Far up north, the second largest town of Sulawesi can be found. Manado is the centre of the Sulawesi Utara province, and with his 450.000 inhabitants, the capital city of Sulawesi. Its citizens are pride of their city and established a thriving business community. Local politicians thrive to lift the city to a higher level. Thereby the government stated a vision based on the short term and a mission based on the long term development of the city. Within a few years Manado city wants to be "*Model City of Ecotourism*". Being a role model will give the city not only more attention from countries all over the world. Business will benefit from the growing tourist industry and the environment in and around the city of Manado benefits also from this mission. On the long-term, Manado wants to be "*as a City of Happiness*". Giving their citizens a better quality of life, improving safety even further and becoming a beloved city. Both, vision and mission, go hand in hand. Plans for reaching these goals are already made and ready to be implemented.

Figure 1: Map of Indonesia, the arrow indicates the location of Manado.

Manado's history goes way back. Back in the 12th century a village up in the Northern region of an island is founded by Ruru Ares. Calling itself "Wanau Wenang". The place grows through the centuries and in the 17th century (1623) the villagers changed the name into Manado. Reasons for the growth are the designation of the place as a bookie and a port for exchange of goods. Today these are still flourishing businesses. Because of this prosperity Manado became the capital city of the province Sulawesi Utara.

The number of population is still increasing. Demanding the city to grow outside its borders, and even into the sea by using land reclamation. Which introduce new challenges, or make challenges bigger that are already present. Introducing this study two of the challenges of Manado city will be investigated. In the year of 2003 a major flood occurred in the city, causing a great damage to the city. Risk of flooding is still present today. Secondly a challenge at the border of the city is point out. The coastline of Manado suffers erosion at specific locations, possibly caused by the construction of reclaimed land in the past.

Current state of affairs

Dividing the coast of Manado in three parts; south, centre and north, there are different plans or situations. In the south of Manado present-day erosion problems are already tackled by improving coastal defence in the district of Malalayang. Protecting the present infrastructure, but still create some space for local people to recreate and swim. Sights like this can be taken as an example for "*the City of Happiness*" mission. Looking further north, big land reclamation changed the shores view and topography. These newly gained areas have proven designs. Big block of ingenious stone protect the valuable land. No erosion problems at first sight, but how about the currents which are changed by these constructions? Leaving the city behind, tracking further north, one finds himself leaving the shore. A second look at the most Northern part of Manado the solid protection is rarely found. Vegetation is the dominant protector of this area. Further investigations are done in the areas, keeping the vision of ecotourism in the back of the mind.

Figure 2: The three main parts of the coastline with impressions.

Threats of flooding can be found both in the outland (sea) as in the inland of Minahasa, causing floods within the city of Manado. These threats occur few times a year. The threats from the inland occur more frequent. During raining season a great amount of water has to be transported to the seas. Flood control is done through observations in raining season. Cleaning the channels from obstacles, giving the rivers its full flow capacity. Great floods in the year of 2003 demanded a more sophisticated and systematic approach. The solution is the Urban Flood Control. Improving the embankments among the whole riverside and widening rivers where possible. From Tondano till the city of Manado this approach is adopted, solving the problems on short term.

Anatomy of the report

The content of this report has everything to do with the research done in the past 9 weeks. What can one find in this document? After a brief introduction and a sketch of the current situation the research can start. In advance and during the research project several papers are made. Combining goals and findings of the papers with the knowledge gained through the years of education, this report before you is an advice on the subjects. The process and conclusions are handled in a chronological manner, starting with the initiation phase and ending with the final recommendation. Including an evaluation of the whole process. To give an insight in the possible implementation of recommendations, showcases are made. Showcases are examples of solutions.

Purpose

Becoming a better, more clean and healthy city is one of the key goals for the future. The local government made it even their vision and mission to make "*Manado*, *Model City of Ecotourism*" and "*To make Manado as a City of Happiness*". Many know more than one. By giving students the opportunity to participate achieving this mission, international knowledge is used in practice and experiences are exchanged. Involving present challenges within a educational project has certain benefits. Although the city of Manado has to put a great effort in welcoming students from abroad, guiding them in and around the city, not forgetting their responsibility for the group and individuals. Benefits also come with the educational project. The final advice is made with an international intention, thereby some surprising insights can be given. Students have the benefits of having a somewhat wider perspective and are willing to take this challenge abroad. Newly gained knowledge can be investigated somewhat further and even put into practice.

Not only the national and international stakeholders have a gain. Students involved have also a certain motivation or gain in doing this research project. Teamwork with different disciplines abroad will be new for all of them. It is a great educational experience, especially for personal development. Working abroad will bring the students in contact with different cultures and costumes then they are used to. This could oppose problems new to them, but above all will be a welcome challenge. It will probably be not any different from future work abroad, as well as living abroad.

1.2 Objectives

Coming up with an advice is more beneficial when a systematic approach is used. Goals to be reached and additional demands alongside are written in these objectives. The final goal is to give an advice to the city of Manado for solutions of present erosion challenges and flooding nuisance. Attaining an integral approach combining possible opportunities and solution in to a broad view can be obtained. Members of the project team have their origin in different fields of Civil Engineering. Given this fact the final report can get a broad perspective. Although the vision "*Manado, Model City of Ecotourism*" and mission "*Make Manado as a City of Happiness*" has the most attention. Defining and bordering the researched area starts by stating the different subjects of the objectives. Four phases are made; the Analysis, Coastal Protection, Kota Manado and its Vision and Mission. Within the phases there also divisions. Narrowing the subject and coming to a sound idea of the needed information and possibilities. Following the Analysis the connections are made again to combine possible solution. Integrating several topics. Given is an abstract of the Project Plan.

Analysis

Obviously the current situation has to be looked over. Before one can start with a problem he or she needs to know what subjects can be expected and which subjects have the most priority. During this phase not only present construction, situation are looked after. Local people involved in the projects are interviewed. A big city like Manado is always looking towards its future and for ways to grow. Growth can be found in economics or population for example. Future plans get the full attention. Improvements are more successful if they go in harmony with other plan's devised by the city of Manado.

Coastal protection and improvement

Given the location of Manado, the coast is one of the city's border. The most important infrastructures are situated along the shore. Protecting this piece of the city has a high priority. Making this subject one of the main focuses. The main goal consists of a feasibility study and research into coastal protection and improvement near the city of Manado, in order to protect the city against water and to make future developments as sustainable as possible. Within the analysis (see Appendix C), there is attention needed for the cause of erosion, the most severe eroding locations, the historical development of the shoreline and the main processes along the shore (short term and long term). Finally an advise will be given regarding the analyzed problems and possible solutions are addressed. The protection and improvement of the shoreline should be made sustainable to ensure the quality of the protection and its surroundings for a long time. Also the construction methods and usage of materials can be made sustainable.

Kota Manado

During our investigation of the coastline on the shore of Manado, we will experience daily life in Manado city. From our residence to the University, or during our trips throughout the city and its surrounding, we will definitely notice a totally different culture with its own habits. Combining this experience and gained knowledge of Civil Engineering, advices can be given with a new perspective. The challenges analysed have one thing in common, besides a relation with Manado City, that is Flood. Many major cities struggle with garbage and rainwater drainage. Challenges within the city of Manado are still possible to overcome, but actions have to be taken rapidly. Through a general picture of the current states and plans for these challenges advices are given to come to solutions.

Vision and Mission

The city of Manado is a safe and peaceful city. Its citizens have a great deal of pride. Not only the city is a great place to be, they also have a thriving business community and beautiful residential and coastal front areas. Manado wants to improve itself and outreach their citizens and qualities. A continuous process guided by a vision and mission of "*Model City of Ecotourism*" and "*Make Manado as a City of Happiness*". A city can't reach these goals alone. Local society has to support their plans. National and international stakeholders also need to be addressed. It's necessary to identify all the stakeholders involved. Because all of them have some importance and influence. Stakeholders can also contribute in a financial way. In combination with the revenues, a clear view is given about the costs and benefits. Ways to raise funds or to make use of economical benefits can be discovered. For example Bunaken, a coral reef which is known as one of the world most beautiful riffs, is one of the aspects which is important to investigate. The objective is a stakeholders and financial analysis. Both made through several interviews with all parties involved. An outcome will serve the combined groups of Government, Consumers and Non-profit organizations.

Figure 3: The vision and mission of Manado city

1.3 Assumptions

Throughout the project there are some assumptions made because not all necessary information is available. To keep up the progress assumptions, based on our expertise.

- The analysis made by Frank Bazelmans is correct and based on the truth;
- People that are interviewed not always tell the truth. Small adjustments and personal interpretations were needed to complete the analysis;
- Depth of the water near the breakwater of the fishery post;
- The Vision and Mission of the City is the main priority of the municipality;
- Given information through analysis and constructive reports and is correct;
- Soil parameters are indicated by the known geological history of Minahasa, borings, SPT's and CPT's from nearby sites.
- The size of eroded area is reasonable measured by sight and maps.

2 Analysis

In chapter 1.2 Objectives the analysis phase is already mentioned. Analysing everything at once is possible, but brings a lot of chaos. More efficiently is stating boundaries and look at specific subjects. Because of the analysis is the basis of this research, it will be done deeply and clear. With the summaries, given below, a quick overview is established of recent development, the current situation and what the future will hold. Division between subjects is made by the topics of chapter 1.2. There are three main analysis made for this research;

- Erosion along the coastline of Manado;
- Kota Manado and its “flooding-problems” both the river, as the garbage;
- Adaption of the mission and vision from a managerial point of view.

Supplementary analysis are also made. The analysis can be found in the appendix. Within this report the information about the analysis are given abstracts of the documents. However the given information is enough to understand the conclusions and the motivation for solutions.

2.1 Erosion

The coastal analysis part is divided in three main parts (see Appendix C). One can find that some parts need to be improved, where other parts need no improvement at all. The southern part of the coastline of Manado is already under construction and the sea defence will be improved. Through the stability report, it can be stated that the design is durable. No further investigation will be done concerning this structure.

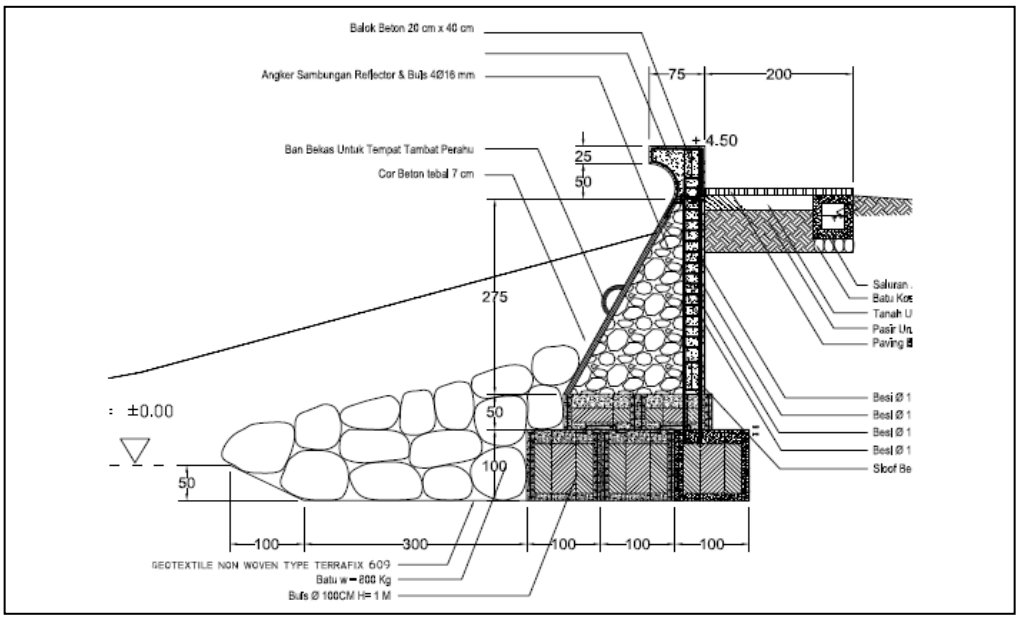

Figure 4: Design protection wall among the coast near Malalayang

Reclamation areas along the coast of Manado do not suffer from any problems, the sea defence actually is a little bit over dimensioned. Nevertheless, the reclamation area does cause a lot of (erosion) problems to the surrounding areas. The change in current pattern has led to a flow towards the ’Bunaken’ coral reef area. Initially this seems like no harm will be done, but the opposite is true.

The streaming towards 'Bunaken' caries a lot of sediment, dust and garbage and killing a lot of fish and coral. So the creation of new land has a lot of influence on the surrounding area, causing down drift erosion and pollution of coral reefs. Considering new land reclamation. One should first investigate the side effects. Not only on the close surrounding, but also on other nearby areas. Before construction of the new land starts.

Figure 5: Protection of the reclaimed land.

Figure 6: Erosion near Molas

At the last part of the shoreline up north, near Molas, erosion is potential problematic. Caused by constructing a fishery port or because of the land reclamation, a large stretch of coast has eroded. The modified current pattern along the coast is the most obvious explanation of the erosion. Therefore a research into the best solution, of the problem along the northern shoreline, has the most priority. The focus at the moment, for finding solutions for coastal problems, should lie on the northern part of the shoreline.

2.2 Kota Manado

With the raining season a great amount of water has to be transported to the seas (see Appendix D). When the cities rivers can't cope with this high discharge demand, overflowing and floods are a severe risk. Floods appear once in the 5 years. The problems addressed to floods are concentrated in the City of Manado. Largely due to the low lying position of the city. Starting with the high levels of discharge, caused by rains further upstream. Rains in the mountains can reach intensities of 100 mm/hour. Within the city the rivers, namely Tondano, Tikala and Sario river, have difficulties to coop with these amounts of water. Several reasons can be found for encountered difficulties. The most important are garbage, sedimentation and obstacles in the river.

Figure 7: Floods due to heavy rainfall

Garbage is a broad challenge to Manado City (Appendix J). It is of such importance one finds additional information about garbage in this analysing section. Sediments are always present in rivers. This is a natural way of soil transport, part of the hydraulic cycle. Upstream landslides occur, caused by a combination of deforestation and heavy rainfall. Giving the rivers more sediments than preferred, thereby increasing hydraulic resistance. Rivers will run slower by their increased density, sediments will sink to the bottom. Making the streams less deep increasing the hydraulic resistance. Hydraulic obstacles are dams, bridge piers, abutments, narrowing of the river or just a very rough bottom. These obstacles cause flow resistance and predominantly lead to a raise in water level. This water level, again, can lead to floods. Because when the width of the river decreases, narrowing the river for instance, the height of the water level has to increase to gain equilibrium again. This phenomenon is also present in the rivers in Manado.

Figure 8: Garbage caught in the river.

Already stated is hindrance in the river by garbage. Garbage is not a fixed hydraulic obstacle, like the ones described previously, but are little pieces that clog up the river. Especially near hydraulic obstacles. Garbage causes hindrance, not only in the rivers, but all over the city of Manado. It does clog up the sewer channels. This clogging up of the sewerage causes flooding too. Also influencing the neighbouring un water nature reserves 'Banaken'. Coral and Fish die because of the pollution of the garbage. Not only the 'Bunaken' gets effected, but also the water quality of the river itself will get worse because of all the garbage thrown in the river. An aspect of the problem is the awareness of inhabitants. Garbage is a problem, which is already noticed by many. But there are too few individual who undertake action in solving or even contribute to solving the problem.

2.3 Vision and Mission

Internal support for the vision and mission (see Appendix F, chapter 2.4) creates a positive charisma of the city to the outside world. Such a positive atmosphere will be picked up by other cities, in and outside Indonesia, so they can implement the "green" label in their own city. The strength of this marketing tool can be exploit during the implementation phase. When the world is aware of the high degree of development in the region of Manado a first signal is given to attract tourism and investors. A proper marketing department is needed to put Bunaken and Manado on the map, which starts by a lot of information distribution to the citizens of Manado.

A common management style that is implemented in the project management of civil engineering projects in Manado can be summarized as a strict PI approach, based on hierarchy. (see Appendix F, chapter 3.4) Because the fact that there is no demand for consideration of environmental aspects, this form of management works very good. When there comes a switch to an aerial approach, small adjustments need to be made to assure that the surroundings are managed.

Figure 9: Sharing the same idea and goals, gives unity in the approach

The concept of involving people in the matters that affect them is a well-accepted principle of leadership and management. Involvement is a powerful value that affirms the unique contributions of the individual. It unlocks enormous potential through synergy and allows organizations to implement changes more effectively. So when possible solutions come to the table, to solve the unique problems inside the city, the use of local characteristics are needed. There is no need to re-invent the wheel, but every solution needs to be investigated on the feasibility of the location by the use of their own strengths. Successes from other cities are no guarantee for a success in Manado.

To prevent the city of any form of corruption, a transparent communication in the process needs to be established. A new management approach is therefore necessary to implement the Ecotourism image to the city of Manado. All stakeholders and environmental issues have to be taken into account when it comes to formulating a scope. The context of the process is interwoven and erratic, every stakeholders has his own interests and thinks strategically to ensure his personal goals will be reached. While the city of Manado is aware of the need to map the stakeholders and environmental impacts, the execution is not there. A clear hierarchical or network approach is not the answer to solve this problem in a city like Manado. (see Appendix F, chapter 2.2) Combining both approaches is the best way to manage the city in order to achieve the main goals, "*Manado Model City of* Ecotoursim" and "*To make Manado as a City of Happiness*". Both approaches have their advantages, based on the habits of the people and diverted interests of the stakeholders.

2.4 Overall conclusion

Given the analysis improvements can easily be made. Observing present situation and looking into future planning opportunities can be spotted. Though these opportunities or solutions cannot be adopted right away. Structuring of the opportunities, solutions and advices are divided in a Short term, Midterm and a Long term. The Long term solutions, as mentioned, need more time to develop or to have an effect. When solutions have an effect immediately after execution it is called a short term solution. It is obvious, but in between the short and long term, the mid term can be found. If these solutions can be implemented dependents on many internal and external factors. Like financial support, technical feasibility and the necessity of these kind of solutions dependent on demographic, economical and other factors in the future.

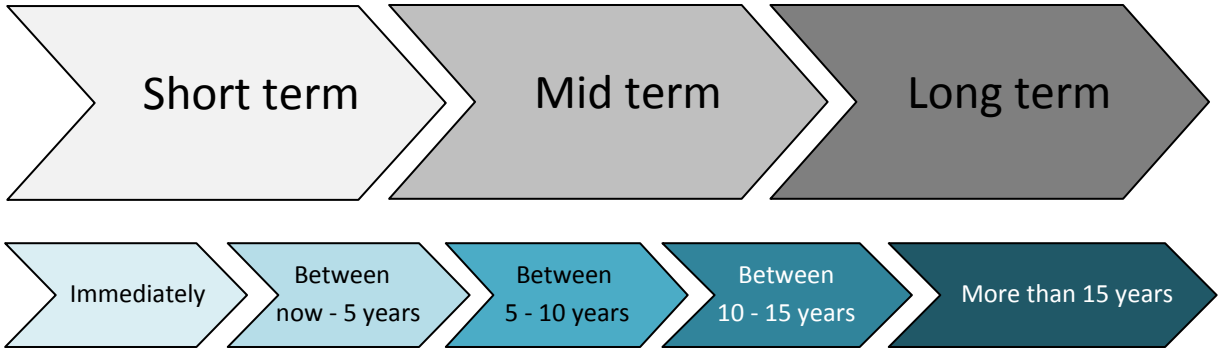

Figure 10: Visualisation of the concept short and long term.

Seen in Figure 10 is a very schematic overview of the definition Short and Long term. Splitting the solutions up in this way needs special attention, but has its benefits. The energy and effort put in solutions can be used more efficiently. Coming faster to a satisfying result. Using this approach for the integral approach of the report gives the client an easy overview and division of solutions.

3 Advices

Conclusions drawn from the analysis can be found in the analysis documents. Short overviews of these documents are already given. Looking at new developments and future planes, possible solutions can be given (see Appendix G,H,J). A big city as Manado has to coop with challenges, improving good solutions with even better solutions. Development is demanded to accomplish solutions. Without progress adaption of solutions or improvements is difficult, not to say impossible. By this fact solutions are arranged by their impact over time (Short, Mid and Long term solutions). For different challenges the same solution can give an improvement. Due to the integral approach, all solution will be highlighted. Before solutions are called, recommendation are made. They can be adopted now or in the future. Following this sequence, the recommendations and solutions are highlighted separately.

3.1 Recommendations

Kota Manado Rivers

Almost every year major flood occurs in the floodplain of Manado City. This undesirable event must be prevented and therefore some recommendations will be given to take care of the flood;

- ***Work on short time solutions, simultaneously on the mid and long term solution .***
  There is a need to work on short time solutions which include emergency changes. These emergency changes will prevent flooding in the next few years. However, with phenomena like climate change and sea level rise, a mid-term and long-term plan should be made. The short-term measures should be in accordance with the long-term plans

- ***Long-term plans should take social and environmental impact into account.***
  The social impact and the effect on the environment should be given much attention. Especially wrong decisions, on the long-term scale, can lead to undesirable consequences. Therefore, this aspects should be taken into account and evaluated on the short-term so weak point can be detected in an early stage.

- ***Always consider the bigger picture of the problem.***
  By looking at a broader perspective, problems can be handled better. A good example of this is the plan 'Urban Flood Control'. The goals are very clear, but it does not look at the bigger picture. In that way it does not use their opportunities and different/better solutions are disregarded.

Kota Manado Garbage

Daily Manado will deal with its garbage challenge. In the future this is going to be more and more. Following are recommendations given for future of Manado. Some can be used already tomorrow, others only after a few years;

- ***Work with today's solutions, if tomorrow there is something better you can improve it.***
  A solution, as bad as it is, is already better than no solution at all. Adapting a solution today will solve some of the problem at that moment, or even hinder the growth of the problem.

- ***Irreversible damage can destroy entire specimens, thereby it must be prevented.***
  When there is damage done, non can repair it. So first of all irreversible damage has to be prevented.

- ***Involve as many parties as possible in solving the garbage problem.***
  In the analysis of the vision and mission one could already found the importance of involving local people. Schools, tourists, the tourist industry and companies have to participate in the process. It not only makes them aware of the problem, but also motivates them to support the initiative.

Erosion

Seen the long shoreline, multiple solutions could be adopted for different situation. Although this diversity of solutions is possible, a few overall recommendations can be made;

- ***Coastal erosion, present at the north, should be dealt with on the Mid-term.***
  The northern part of the shoreline suffers from erosion, but it has a different source regarding the southern shoreline. Due to the construction of the fishery port and reclamation areas, the current pattern changed in such a way that an eddy originated, down drift of the fishery port, which is causing the erosion. The circumstances nowadays cannot be turned back in time, but to prevent the shoreline from even worse problems, unique solutions are needed.

- ***Collect data on a regular basis and archive it in such a way it can be found easily.***
  During the analysis and investigations of civil engineering problems it has been faced very often, a lack of available data. Information about necessary parameters is lost, vanished of never been recorded. To have an effortless investigation about the shoreline of Manado, structural monitor and archive has to be implemented on a very short period of time. So the municipality has to survey the shore of Manado. Today, tomorrow and the day after.

Vision and mission

Following the management analysis of the implementation of the vision and mission, clear recommendations are given for near future. These plans face some difficulties. By taking seriously account of these recommendations, the process will improve, without spending more money.

- ***If you wait for the latest technologies or improvements, you'll wait forever.***
  This is true for all innovations. Don't be afraid to invest in a solution today because you're afraid something better will come next year. Guess what, there will be something better next year. But, the new solution will be superseded in a year, too. What comes out next does not make your investment today any less capable. You're need to solve the problem from now. Come what may, you can benefit years of use from it.

- ***Create clean and recreational areas in the city centre.***
  "*To make Manado as a City of Happiness*" is a perfect mission to fulfil the needs of the inhabitants. To create happiness among the citizens, well known nuisances have be terminated. This includes the lake of recreational areas in the city centre and the filthiness of the streets and rivers.

- ***The infrastructure of Manado City needs to be improved in terms of quantity and quality.***
  Not only the roads has to be taken care of, but especially the drinking water, electricity and internet need attention. To be an economical city which prefer substantial growth, they must rely on good working internal transport, electricity facilities and fresh water supply.

- ***The available knowledge is not applied in the construction industry.***
  There is a lot of room to improve the current process but this will not be implemented. By drawing a beautiful picture about the situation, you block any development. It is time to show your weaknesses, so other parties can be useful to overcome serious shortcomings.

3.2 Short term solutions

Needs are the primary factor for choosing a short term solution. They give immediate results. Can work very rigorous, but effective. On short term bases problems of Kota Manado have to be tackled, also regarding the Mission and Vision some short term solutions need to be addressed.

Due to the return period of 5 years, solutions toward flooding have to be adopted fast. Minimizing risks is the main goal to preserve the safety of the citizens. Short term solutions will fulfil these demands perfectly. Looking deeper in to the rivers a backwater curve is the main cause of floods. Increased hydraulic resistance favours the curves, giving areas a higher risk of flooding. The trend in solving these problems or the general advice is to remove the blockages or improve the flow through. Some very sharp bends are present in the river system in Manado. In addition 'smoothening' of bends can help to improve the river's flow.

Figure 11: Artist Impression of Urban Flood Control plan, example of 'smoothening of bends

Challenges of Kota Manado need that much attention, they could be better solved yesterday than tomorrow. The river floods are a sequencing event, garbage however is on a daily business. Starting today will already decrease the problems of tomorrow. Two phases can be adopted; Phase 1 consist of the improvement of the waste management system and intensify and support of cleans ups. Stating a good example for its own people and already attacking the problems. Phase 2 is collection of the garbage through the improved garbage services. Catchment of floating waste in rivers and in run off system. Start the collection and handling of oil and batteries in a responsible way. Calling a hold to the current dumping of them.

Figure 12: River Celan Up Manado, 2011

A business case, which is very common in the Western world, is not implemented in here. Detailed plans about the development of the region and especially the city of Manado is missing. This results in a lack of project rationale, project scope definition and feasibility analysis.

Every project, related to the vision and mission of Manado City is on its own. While the city of Manado is aware of the need to map the stakeholders and environmental impacts, the execution is not there. On the short term it is wise to implement the so-called pre-project-planning to gain benefits in the near future. The construction of civil engineering projects will take place and need a structured and uniform approach.

3.3 Mid term solutions

Challenges which are minor today, can be severe in the next couple of years. Manado City experiences erosion challenges. Some are already encountered (it can be said on Short Term) others are increasing over the years. As mentioned before, the location of Batusaiki needs attention on the Mid Term, namely stopping the erosion. Within 5 years the erosion takes more land and more land. The solution will need time to acquire an equilibrium in the coastal profile.

A good solution is with mangroves, because mangroves have a high ecological value and from an environmental point of view they are the best solution. Mangroves are a natural coastal protection, which prevents the shoreline from eroding any further. There are, nonetheless, additional constructions needed to guarantee the growth of the mangroves. The city of Manado will make use of their own opportunities and are improving their environment.

Figure 13: Mangroves protecting the beaches of Bunaken against erosion.

Construction of a breakwater is another option. It diverts the current in such a way that it cannot reach the shoreline anymore. An investigation into the effectiveness of the breakwater is essential. Besides a breakwater, coastal protection along the shoreline is another alternative. Protection can be constructed by stones/rock or by sandbags. Both have their pro's and con's. Involved risks is that this protection could shift the erosion problem northwards. Rubble of the breakwater can create a habitat for flora and fauna and is a solid solution.

Figure 14: Rubble breakwater (bleu) and the change in current (red arrow)

Not only the coastal problem solved on a mid-term bases. Garbage problems in and around Manado city can be decreased over time. Using the 3R-principle the garbage production will maintain and not grow overtime. 3R stands for **R**educe waste, **R**euse materials and **R**ecycle the materials which have to be thrown away eventually. From existing practices this 3R-principle will be expanded very slow to full scale.

3.4 Long term solutions

Manado has made a plan where to be in the future. In the analysis this vision "*Manado Model City of Ecotourism"* and the mission "*To make Manado as a City of Happiness*" are viewed intensely. Manado city wants to be more attractive for visiting tourists. Some say they want to make it the second Bali of Indonesia. However, among a lot of things like making the city cleaner, more organized, more save, they need to create accommodations for these tourist to enjoy their stay in Manado. Even if these tourist are coming for the diving and they stay only in Manado city for the night, they want something to do and to relax in the evening hours.

4 Showcases

Large amounts of text are already used to give advice up on current challenges. Although the words are clear and sound the general picture can still be a bit blurry. Questions arise like what do we need to do first? And where do we need to adopt the advice? Already a division is made for short, mid en long term solutions. Arranged by the necessity, size of the solution and their effect (immediately or after a while). Using the given advices in practice can be somewhat problematic. Thereby showcases are drawn. Locations which are influenced by the challenges and can be used as an example for the adaption of the solutions. Making the end results visible contributes to the understanding and image of the results. Giving the reader a feeling with abstract definitions and advices within the report. Showcases are given for the subjects handled before. In the following showcases one can find examples of the adoption of given solution or recommendations.

4.1 Flood prevention plan

Annually, floods occur in the floodplain of Manado City and subsequently inundates vast areas. This yearly event is due to heavy rainfall, what consequently leads to a high river discharge and raise in water level. Problems like this can be solved quite easily by selecting the right measures and actions. With a short, mid, and long term integrated master plan, the city of Manado will be waterproof.

Figure 15: Bend improvement

On short term, several solutions are recommended to improve the river flow. Improvement of the flow, subsequently leads to decrease in water level and therefore decreases the probability of flooding. The solutions are anticipation on weak spots of the river. By developing these aspects, the floodplain will remain dry.

Figure 15 represents one of the best solutions. A lot of hydraulic resistance is caused by narrow and sharp bends, but also vegetation located in bends. By fixing the bends, the flow will be improved. A second solution, which is very similar to the previous solution, is to widen the river. Give water the opportunity to flow towards the sea with more space available would be a tremendous stimulation, regarding the prevention of flood.

Another way to improve the river flow is to remove all the hydraulic obstacles. Figure 16 visualises the removal of these objects. Without all the bridges, dams, fish cages, water plants and other objects, this would, too, gives the river flow a tremendous stimulation.

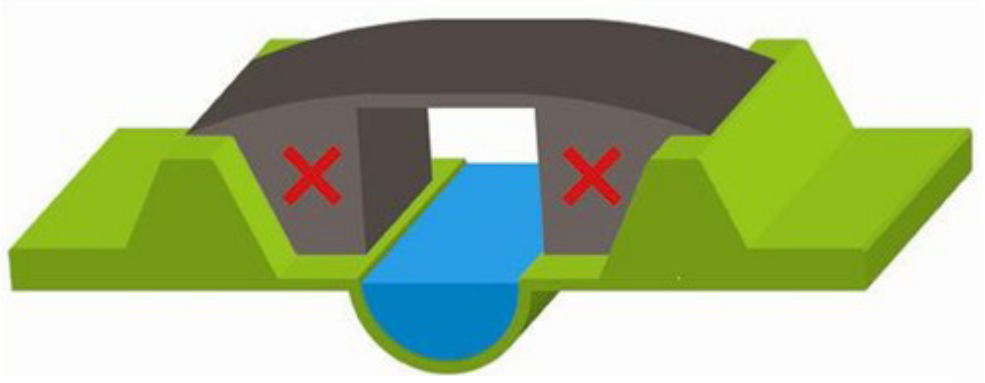

Figure 16: Removal of hydraulic obstacles

These short time solutions do not only give the river flow a boost, it also contributes to the long term water management plan. A similar project is executed in The Netherlands, called 'Room for the River', with great success. As the title mentions it, the long term project to give the river more room is inevitable for Manado as well. Starting with short term solution as described above and gradually create more room for the river will prevent the floods. Taking into account society and the environmental contributes to the eco-friendly vision of the city and creating a sustainable solution.

To improve these recommended solutions and make this master plan waterproof, a mid-term solution will have to be integrated. Besides improving the flow, storing water to relieve the river is another recommended solution. This would be the mid-term solution in a way that storage areas have to be created to retain water. Retention areas can be used in various ways, which makes construction of these areas very attractive. For instance lakes can be created to store water in rainy season and during summer it can be used as a recreational lake. Another interesting multi-functional construction is an underground storage area which can be used as parking space. Figure 17 visualises an underground parking space, which will be used to store water during heavy rainfall. This underground water storage only needs to be used a few times a year, the remaining time it can be used as parking space. The multi-functionality of these structures makes it very interesting to construct these water retention areas. So, the addition of this mid-term solution truly will make Manado City waterproof.

Figure 17: Underground water retention

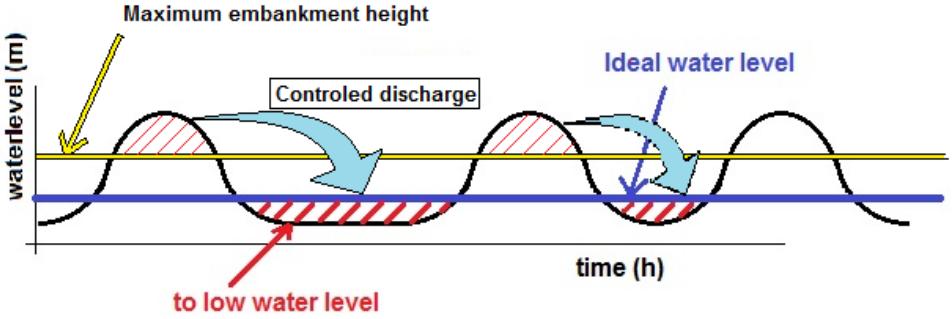

Figure 18: Schematic water control scheme, during a year

4.2 Garbage plan

Garbage on the streets of Manado is one of three big problems in the city. The urgency of this matter must not be underestimated. Especially Nature is one of the biggest losers. By this, one can expect big losses for humans. That's why their living environment must be accounted for.

The first problem to be attacked is garbage that lies on the streets. Improve the collection system and place more garbage bins are solution. Whereby people can better access the garbage services. The visibility of garbage men on the streets must also be pointed out. With them being more visible people will feel more stimulated to take their trash out.

Figure 19: Example how garbage man can look like

Figure 20: Placing more garbage bins on the street

A good way to encounter the problem of garbage in the rivers is to build structures that will block the flow of waste towards the sea. Garbage collection nets are perfectly suitable to do this job. They let the water from heavy rains pass, but stop any litter from going to the sea.

Figure 21: Floatable barrier to collect garbage

Figure 22: A collection net seen form a rivermouth

Reducing the pile of garbage, by means of recycling, solves a great deal of the accumulation of garbage in the city of Manado and in the neighbouring Islands. It is one of the main goals that should be stated in a future master plan for the city of Manado. In combination with a excellent garbage collecting system, the recycling will be easy. To make money, the recycled materials can be sold to plants that make new products out of them. Making these products Eco-Friendly!

Figure 23: 3R-principle to produce less garbage

Figure 24: Making new products out of old

4.3 Erosion

From the recommendations, it can be obtained that the northern part of the coastline really need to be protected. Otherwise the problems will evolve more and more, and can eventually lead to irresolvable problems. To anticipate on the not only the Mission and Vision of Manado City, but also the local resources and opportunities. One can, besides improving the protection, improve the ecological and environmental value of the coastline.

Mangroves are an excellent coastal protection, which will reduce the erosion and do have an environmental value as well. To use only mangroves, therefore, will increase the ecosystem services.

Figure 25: Mangrove shoreline

Ecosystem services have several functions like regulating, provisioning, cultural and supporting. So, besides protecting the coast (regulating), mangroves can also provide woods (provision), they have a recreational function and therefore it improves tourism (cultural), and finally they nurse habitats (supporting). Figure 25 visualises a mangrove forest along the coast, which illustrates the ecological and environmental value it adds.

Fully grown mangrove forests are present northwards of the eroded shoreline. This means that such a forest can resists changed current patterns and all other hydrological conditions which are present. The only point of attention is the growth of seeds. However, a lot of research is done and many guidelines are present. So this will be a great opportunity to apply mangroves as a coastal protection.

Constructing a breakwater diverts the current in such a way that it cannot reach the shoreline anymore. In combination with the rehabilitation of mangroves, this will be a very durable solution. Using only mangroves as a coastal protection can have some flaw backs and depends on the growing ability of the mangrove seeds. The breakwater as an additional solution will divert the current, the mangroves can grow untroubled and the erosion will disappear like there has never been erosion.

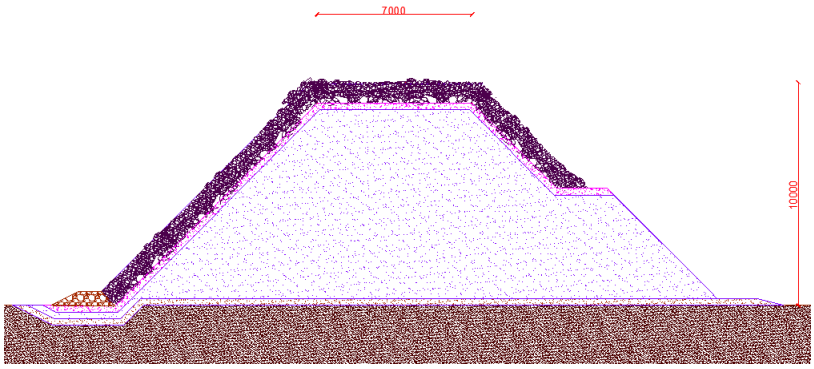

Figure 26: Reduced breakwater

The solution which contains the breakwater is strongly recommended, simply because it solves the problem and is sustainable and solid. One can choose to apply a regular breakwater or a reduced breakwater. Figure 26 illustrates the design of a reduced breakwater, which actually means that a reduced amount of material is used. The inner slope, meaning the slope that faces the shore, doesn't need an armour layer, because the

hydrological conditions are very minor. Besides, it does keep its environmental contribution. The underwater rubble creates a great amount of habitat for fish, sea animals, sea plants and it even gives coral the opportunity to grow. Therefore, applying mangroves in combination with a breakwater is very durable, environmental and ecological solution.

The erosion, nowadays, is very severe and to prevent the shoreline from retrieving any further, a coastal protection is needed. Instead of applying a durable solution, a short term solution which retains the present shoreline position is another effective solution. This cheap solution can be applied right away and stops the erosion problem. As a shoreline protection, a few options will be recommended. Sandbags and a rubble mound protection are excellent protections which are very effective.

Figure 27: Rubble coastal protection

The advantage of using rubble is that it is locally available and can be applied very easily. From an ecological point of view, rubble is a good method to construct the protection. Rubble is a natural product and creates habitats for fish and sea plants. Figure 27 visualises a rubble mound coastal protection.

Sandbags are the most simple and cheapest solution to protect the shoreline. A sandbag could consist of a degradable or a non-degradable bag. However, to guarantee the durability of this protection, non-degradable bags are recommended to use. As long as bags don't get separated from the rest, and they won't, it is a good environmental solution.

Figure 28: Coastal protection with sandbags

In 1953, a major flood occurred in The Netherlands. Large parts inundated, because of breaches in dikes. To stop the inundation and the breaches from eroding any further, mainly sandbags were used. This seemed a very effective solution, because it actually stopped the flood. So, with this example as a good reference, the use of sandbags are recommended. Figure 28 visualises a good coastal protection of sandbags.

4.4 Manado Beach

Manado City is one of the major cities in North Sulawesi, surrounded by several volcanoes and lies in the middle of green and untouched nature. The city has one of the most beautiful pieces of nature one can think of: Bunaken Marine Park. This is one of the top five diving spots in the world.

Figure 29: Recreational beach along boulevard

To expand these attractive sites towards Manado City and to create something new within the boundaries of the city, the construction of a beach will be great comprising solution. To let more tourists visit the city itself and to satisfy local citizens as well, the existence of a beach would give the city's Mission a huge impulse. Figure 29 represents an excellent example of this.

According to the youth of Manado, one of the top five of annoyances about the city is the lack of recreational space. Areas without shops and buildings, where people can meet and relax in the open. Nowadays there are practically no places like described above and almost the entire local youth is going to the shopping malls to hang out.

This indicates that there is a need for green areas and relaxing spots. Along the shoreline, there are a lot of land reclamations created in the last two decennia, that replaced the sandy shoreline of Manado. Because of this, a lot of recreational space disappeared and there is almost no area left to relax and watch the sunset along the city's beautiful sea side. This development does not stimulate the tourist industry, what makes the creation of the beach even more desirable.

Figure 30: View towards reclaimed area

Figure 31: Top view of the recreational beach

Along the shoreline, there are some stretches that are not completely occupied and therefore are not visited intensely. An example of such a stretch along the coast is the one near the McDonald's, located behind the MegaMall. This area already contains several restaurants and bars. An addition of a beach along this stretch will make this 'boulevard' one of the most flourishing areas of Manado City.

To create this beach in along the shoreline of Manado, several challenges are concerned, which are very well manageable. One of the challenges is the presence of a rather steep slope and how to create a gentle sloping beach. This can easily be resolved by construction of a submerged breakwater. The structure can keep the sand of the beach at its designed place and it prevents the sand from sliding down to the deeper parts of the sea as well. This submerged breakwater will be attached to the existing breakwater and to the shore protection. In this way, a closed area will be created and will be filled with sand and finally create a gentle beach of about 25 meters wide along the boulevard road. Figure 32 visualizes the cross section of the beach and represents that such a beach can easily be created.

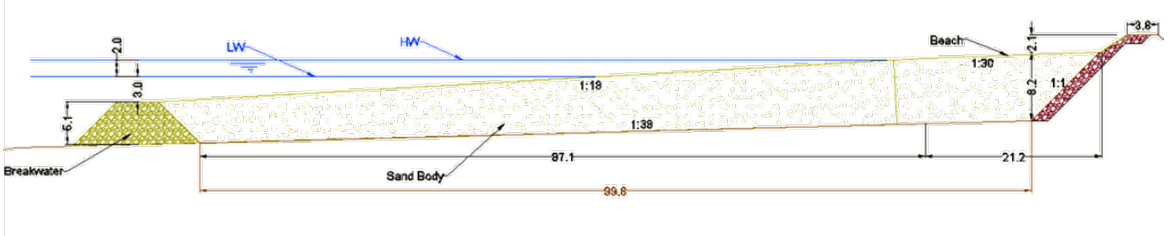

Figure 32: Cross section of the beach

5 Conclusion

Manado city has many opportunities to improve itself. Already the city is prosperous and, by raising the bar for itself it will become an even congenial city today and in future. Things can always be improved. Taking action today, will enhance your position of tomorrow. Coming to Indonesia gave the change to contribute to the city's goals. Making it more solid the research question was written down; **What are the options to supplement Manado's vision and mission, making the city more safe and attractive for tourists and citizens?**

To answer this question with a proper and well based advise, their vision "*Manado, Model City of Ecotourism*" and mission "*Make Manado as a City of Happiness*" is used as foundation. These goals inspire people, but they have to be supported by actions. Actions that are fixed in a master plan, which is reviewed after a certain time. But such a plan is not enough. The most effective master plan is one supported by the citizens. Starting by involving more citizens and parties in the actions, will contribute to a sustainable outcome. In the advices a division in approaches is made over the short, mid and long term. Due to this approach, actions are prioritised and one can expect when the desired effects will happen. The short term actions will secure the highest priority of every government, the safety of its people. By these fast actions, small adjustments have to be made to encounter danger of river flooding and erosion. On the other hand the mid and especially the long term actions improve the attractiveness of the city. Garbage is no longer a nuisance of the people and by the construction of recreational areas the citizens will be proud to live and work in Manado City.

In a broad view the resources of Manado are very rich. Given their vision "*Manado, Model City of Ecotourism*" many chances lie before them to accomplish this goal. Sharing their people behind the idea is one. It's a start. By convincing the citizens of the vision, the next step is much easier. Present facilities are needed to be improved and challenges to be solved. Making use of their own resources is the best way to get sustainable solutions. For this there is no need to re-invent the wheel, but every solution needs to be investigated on the feasibility of the location by the use of their own strengths. The reduction of your weaknesses, will stagnate the benefits of your strengths. Taking this in account will improve the qualities of the city. Actions need to have the right motivation and enforcement. Look at the current situations and analyse the needs of tomorrow to make a 'Waterproof plan'. Using this master plan, the city of Manado can coop with both, the challenges of today and in the future.

Every day you may make progress. Every step may be fruitful. Yet, there will stretch out before you an ever-lengthening, ever-ascending, ever-improving path. You know you will never get to the end of the journey. But this, so far from discouraging, only adds to the joy and glory of the climb.

Winston Churchill

6 Evaluation

Investigating the topics, within and for the city of Manado, needed all our experience and education from the past. Even so there are fields in which we are not entirely specialized that are investigated. With common sense the first ideas and opinions were written on paper. However, there is always room for adaption. Reviewing the composition of the project group, one could state that it was sufficient. Although, by adding one spatial planner the subject would have had a bigger approach. This accomplishes the produced showcases and recommendations.

In 9 weeks this report is completed. During this period of time, a great effort and devotion was needed to accomplish a proper and academic report. Staying in an unknown country for quite a long time, is a great experience. A little effort had to be put in adapting to the Indonesian culture, because Indonesian people are so kind, familiarizing went almost natural. Looking back, one could say we've grown not only in a professional way, but also as a person. By delivering this report to the Municipality of Manado. The students will, hopefully, contribute to the improvement of the city and thereby helping the local government. As mentioned in chapter 1.1. Besides the assignment there was also another objective regarding the project. Not only the client will be satisfied, the students also improved themselves on a different level. Reviewing the overall process, amongst others they improved their communication abilities, adapted to a whole different culture, learned a new language and became independent in finding information. Enriching their personality with the lessons learned, approaching others with more respect and becoming more empathic.

A great process of learning has taken place. However, this process is not ended. Evaluating the total project gives insight in points of improvement, which could be examined better now they are known. Some points of improvement are;

- Getting stuff done needs a lot energy from your own side;
- A strict planning, could give surprises;
- Don't lose the initial vision you had from the start;
- Within your project team, be clear about your ideas and opinions. Stay open for those of others;
- Adopting to the culture of a company/country gives you the advantage to make realistic expectations.

7 Data collection:

7.1 Documents:

General

01; **Weather Manado**; Summary of weather information in North Sulawesi.

02; *Tyler Blake Davis (2005);* **Final Report Economic Impacts of Dive Tourism in Bunaken National Park;** Economic Impact assessment on the Dive tourism in North Sulawesi.

03; *Kota Manado (2010);* **Area description Manado**; Description of the city of Manado, including the surroundings.

04; *Prof. dr.ir. C. van den Akker / Ir. M.E. Boomgaard (1997);* **Hydrology ct3010**; Lecture notes of Hydrology, ct3010, Civil Engineering TU Delft.

05; *Badan Pusat Statistiek Kota Manado (2008);* **Manado in numbers 2008**; All figures and numbers of the society, economy and area of Manado.

06; *Badan Pusat Statistiek Kebupaten Minahasa Utara (2008);* **North Minahasa in numbers 2008**; All figures and numbers of the society, economy and area of North Minahasa.

07; *Kota Manado (2009);* **Cost overview Malalayang and Ganges**; Display of the costs involved in the two projects on Ganges and Malalayang.

08; *PT. Transka Dharma Konsultan;* **Lap Hukum dan Kelembagaan, legal report**; Several stakeholders, legal processes, jurisdictions in the projects of Malalayang and Gangga.

09; *PT. Transka Dharma Konsultan;* **Sosek, Social and economical Analyses**.

10; *PT. Transka Dharma Konsultan;* **Lingkungan, Report of the surroundings of Manado city**; Area survey of the surroundings of Manado City.

11; *PT. Transka Dharma Konsultan;* **BAB VI-Spektek (ok)_EN;** Technical specifications and method of execution.

12; *PT. Transka Dharma Konsultan;* **Topografi (edit), report topography_EN**; Report on the topography of the coast of Malalayang, including survey method.

13; *PT. Transka Dharma Konsultan;* **Draft Final Report _Economical Analysis_ENG**; Economical analyses of the city of Manado, District Malalayang Likupang and Western District of North Minahasa Regency.

Coastal

01; *Jurusan Geografi UNiversitas Negeri Manado dan BPLH Kota Manado, Prof. Mithel Kumayas, M.Si dan Joyce Ch. Kumaat,S.Pi,M.Sc (2009)*; **Laporan Abrasi Final**; Final abrasion report about the coastline and beach area of Manado.

02; *P. A. Angmalisan (2007);* **Current Information**; Current information in the Bay of Manado.

03; *Steven A.Hughes, PhD;* .**Scour and scour protection**; Presentation about scour and scour protection.

04; *Global Wave Statistics (1986);* **Global Wave Statistics 52 (Philippines)**; Global wave data close to the Philipines.

05; *Richard D. Ray, Gary D. Egbert and Svetlana Y. Erofeeva;* **Tides in the Indonesian Seas**; Tidal description in the seas around Indonesia.

06; *PT. Transka Dharma Konsultan;* **Final Executive Summary, ENG**; Final Executive Summary on the shore protection at the Malalayang coastline.

07; *PT. Transka Dharma Konsultan;* **Struktur (ok),Stability calculation of a coastal defence**; Stability and safety calculations of the designed seawall at the Malalayang coastline.

08; *PT. Transka Dharma Konsultan;* **JOY-OP Pasir PUTIH-1_ENG**; Physical processes on a sandy beach.

09; *PT. Transka Dharma Konsultan;* **Hidro-Oseanografi (edit-johan)_ENG**; Hydrographic and oceanographic analyses of the coasts of Malalayang and Gangga, Including survey.

10; *CIRIA; CUR; CETMEF (2007);* **Rock Manual**; The use of rock in hydraulic engineering (2nd edition).

11; *Gerrit J. Schiereck (2001);* **Introduction to bed, bank and shore protection**.

12; *www.easytide.co.uk/EASYTIDE (2011);* Tidal information Manado Bay

River

01; *Office Of Hydrology (2008-2011);* **River in Manado Publications**; River data, including discharge and water depth, of the four largest rivers in Manado, ending on the coastline of Manado.

02; *Kota Manado (2010);* **Proposal Tondano River 02**; Current proposal about the problems along the Tondano River. (Indonesian Language).

03; *'Various' (2003)***; Articles about the flooding of Manado in 2003**; Several articles about the major flooding in 2003, about influence of Lake Tondano.

04; *Wim Silva, (2002);* **Room for the River**; How much water can enter The Netherlands at Lobith; Now and in the future.

05; *Amrta Institute for Water Literacy;* **Public-Public Partnership**; Article about Public-Public Partnerships in Indonesia, including Water Drenthe.

06; *Benjamin J.B. Nanlohy, Rachmad Jayadi (2008);* **Studi alternatif pengendalian danjir**; Alternative flood control study of Tondano River in Manado city.

Construction Management Engineering

01; *Kota Manado (2010)*; Visi dan Misi

02; *Mahbubani, K. (1998)*; Can Asians Think? Understanding between the east and west

03; *De Bruijn, H., Ten Heuvelhof, E., (2008)*; Management in Networks, On multi-actor decision making;

04; *Sumanti, F.P.Y., Wibowo, M.A. (2011)*; Preliminary study on pre-project planning activities of public infrastructure projects

05; *Graafland, J., Nijhof, A. (2006)*; Transparency, market operation and trust in the Dutch construction industry: an exploratory study

06; *Kaptein, M. (2003)*; The open enterprise: a business ethical topic

07; *Hobma, F.A.M., Schutte-Postma, E.T. (2010)*; Planning and development Law in the Netherlands

08; *Stahlke, L. (2007)*; Values Determine Working Relationships

09; *Konsultasi Publik (2004)*; Pedoman Teknis Pengembangan Reklamasi Pantai dan Bangunan Pengamannya

10; *Badan Pusat Statistik, (2008)*; Manado Dalam Angka 2008

11; *Van Gunsteren, A., Binnenkamp, R., De Graaf, R.P., (2011)*; Stakeholder-oriented Project Management;

12; *Doratli, N., Onal Hoskara, S. & Fasli, M. (2004)*; An analytical methodology for revitalization strategies in historic urban quarters: a case study of the Walled City of Nicosia, North Cyprus.

13; *Winch, G. (2010)*; Managing construction projects

14; *Meredith, J. R., Mantel, S. J. Jr. (2006)*; Project Management A Managerial Approach

15; *Brealey, R.A., Myers, S.C., Allen, F. (2008)*; Principles of Corporate

16; *Armta Institute for Water Literacy (2006)*; Public Private Partnership Indonesia

17; *Yescombe, E.R. (2007)*; PPP; Principles Of Policy And Finance

Geotechnical

01; *PT. Transka Dharma Konsultan;* **Geotek-Mektan(ok)final_EN**; Geomorphological data on the Manado and Gangga area.

02; *PT. Transka Dharma Konsultan;* **JOY-OP Pasir PUTIH-1_ENG;** Methodology and environmental analysis related to the work on the beach nourishment Malalayang.

03; *S. A. El-Swaify, E. W. Dangler & C. L. Armstrong (1982);* **PNAAR134;** Soil Erosion by Water in the Tropics.

04; *PT. Transka Dharma Konsultan;* **bab-5_2009-b (ok)_SOIL INVESTIGATION_EN**; Analyses of shoreline change including soil investigation.

05; *PT. Transka Dharma Konsultan;* **Geotek-Mektan(ok)final_EN**; Geological report for mechanical engineering.

06; *Universitas Sam Ratulangi, Facultas Technik (2006);* **Sondir & Bor Data**; CPT (Cone Penetration Test), SPT (Standard Penetration Test) and Boring (Sample test).

07; *A. Verruijt, Delft University of Technology (2010);* **Soil Mechanics**; Lecture notes of the course Soil Mechanics, TU Delft.

7.2 Maps / Charts

General

01; **Map the location of Manado**; Location Manado, North Sulawesi.
02; **Map districts Manado;** District description of Manado
03; **Height map Manado**; Depth contours of Manado bay.
04; **Bay Manado with Quarry location**;

Coastal

01; **Drawings protection design Coast Malalayang**; several drawings of the protection on the Malalayang coast, including cross sections.
02; **Satelite fotos + Impressions**; Satelite fotos and Impressions of the Malalayang coastline

River

01; **Manado Map**; River endings along the coast of Manado
02; **River Basin**; River basins of the largest rivers in Manado
03; **Rivers North Sulawesi**; River catchments in North Sulawesi
04; **Sulut Foto Udara**; 3D topography of North Sulawesi
05; **Influences on river system**; Influences on the river system around Manado

Geotechnical

01; **Peta Geologi Leminar Manado, Sulawesi Utara**; Systematic Geological map of Indonesia, area Manado. *Geological research and development centre.*