Oceanus International

A Strategy to Grow

by IRPdelft

Cancun, August 2017

Oceanus International

A Strategy to Grow

Client

Oceanus International

Pablo Besquin
info@oceanusinternacional.com
+ 52 998 161 0066

www.oceanusinternacional.com

Submitted by

International Research Project

Mekelweg 4
P 2628CD Delft
The Netherlands

www.irpdelft.nl

Commissioned by

Delft University of Technology

Postbus 5
2600 AA Delft
The Netherlands

www.tudelft.nl

“

This project was executed for *Oceanus Interantional*, a company providing integral solutions for coastal erosion and flood control, by *International Research Project Delft*, a foundation offering innovative and challenging business project in emerging markets around the world.

During this two months project, four master students from the Technical University of Delft were brought together. They visited project sites and company offices, interviewed employees and several stakeholders, in Mexico and Colombia, to support Oceanus International with a strategy to expand to the South-American market and Caribbean area.

”

Executive Summary

Oceanus International is a company that provides integral solutions for coastal erosion and flood control, for governments and most of all for the tourism industry. Oceanus is a Mexican company with offices in among others the U.S., Colombia and the Netherlands. Some of the services are building artificial reefs, placing Geo cylinders, creating artificial beaches or dunes and provide the maintenance for them. To increase their market share they want to adjust their position from a modest Mexican-rooted company to a reliable, environmental friendly Dutch-American-Mexican company that delivers the highest quality solutions.

IRPdelft will provide Oceanus International a strategy supporting these pillars, help them grow and expand to the entire South-American continent including the Caribbean. This report will describe each part in following order:

Internal analysis
The internal analysis will start with a brief introduction of Oceanus International as a company with its vision and mission. The current organizational structure was analys−−ed, a process timeline of their turnkey solution was built and a complete company map including all stakeholders, products and services was created. With the use of these insights, the strengths, weaknesses, opportunities and threats were discussed. The internal analysis is concluded with a strategy and vision (recommendations, advices, conclusions) for Oceanus to tackle the future.

Tools
There are two main tools to support the decision making of the expansion to a certain country: the issue tree and the business case. The first one structures the important factors of the decision making in a pyramid of main- and sub- issues, while the second one estimates the revenue that an expansion to a country would bring to Oceanus and the ROI of possible projects abroad.

Market research
The countries Argentina, Costa Rica, Colombia, Ecuador, Mexico, Panama and Peru are evaluated on possible market opportunities for Oceanus, consisting of planned projects by governments (national or regional) and NGO's, targeting coasts, rivers, cities with certain water management problems with the potential to develop as a project.

Technical report
The chapter consists of a summary of important information of the Masterplan Coastal Erosion in Colombia, Building with Nature applications in river and coastal engineering and numerical software products (for simulations and flood protection) available for aforementioned applications.

Contact list
The contact list was made during the project. Most of the persons were contacted to gather information about possible opportunities for Oceanus in certain countries, to create awareness that Oceanus is bringing in Dutch knowledge, or for any other information.

Acknowledgements

During our project, we had the help and guidance of some respected persons, who deserve our gratitude. We would like to show our greatest gratitude to Pablo Besquin for giving us the opportunity to work for his company Oceanus International. Pablo, our days in Mexico were amazing. You spend a lot of time with us visiting projects sites, answered all our questions and showed us the Yucatan region.

Furthermore, we want to thank all the people working within Oceanus Mexico, who helped us answering our questions and showed us their passion for this great company.

In addition a special thanks to Oscar Sorza, who guided us during our stay in Colombia. Oscar, it was a pleasure to work with you, meet your family and from now on we will always remember the vallenato music!

Also we would like to thank Maurits, who guided us in the Netherlands and provided us with some really useful contacts. As well we want to thank our project coach Erik. Thanks for your strategic advice during our project. You took the time to answer some of our hard questions.

At last we thank all those who have directly and indirectly guided and helped us during the seven weeks of the project!

Maartje, Wouter, Alessandro and Stijn

The Team

The multidisciplinary team consists of four master students from the Delft University of Technology. They bundled their different expertises to provide the best result.

Wouter Neisingh
wouter.neisingh@irpdelft.nl
Water Management

‘In my study I focus on the mix between specific coastal engineering problems and the larger water related challenges that we face globally. The activities of Oceanus fit perfectly in this scope and therefore I’m able to cooperate well on the technical level.’

Alessandro Giordani
alessandro.giordani@irpdelft.nl
Management of Technology

‘With an international background in engineering and technology, my current studies in business allow me to analyze enterprise problems from different perspectives. Understanding “the big picture”, my specialization is providing strategic knowledge management and effective decision-making processes to technological startups which aim to scale-up.’

Maartje van Zon
maartje.vanzon@irpdelft.nl
Integrated Product Design

‘The focus during my study is on innovation within companies. I am able to search for new markets, future trends and analysing companies or competitors.
My strength is detecting areas for out-of-the-box opportunities.’

Stijn Elderenbosch
stijn.elderenbosch@irpdelft.nl
System en Control Engineering

‘My strength is my analytical way of thinking, which I developed during my study period. Splitting big problems in several smaller problems and solve them in the right order to solve the problem as a whole.’

Table of Content

1. Internal Analysis

2. Tools

3. Market Research

4. Technical Report

5. Contact List

Photo: office Oceanus International, Cancun, Mexico.

In order to gain more information about Oceanus International, an internal analysis was executed. In this part, the results of this analysis will be discussed. The internal analysis will start with a brief introduction of Oceanus International as a company with its vision and mission. The current organisational structure was analysed, a process timeline of their turnkey solution was built and a complete company map including all stakeholders, products and services was created. With the use of these insights, the strengths, weaknesses, opportunities and threats were discussed. The internal analysis is concluded with a strategy and vision (recommendations, advices, conclusions) for Oceanus to approach future.

1.1 The Company

We provide a turn key solution to governments, tourism industry and environmental institutions to coastal erosion and flood control.

Why - Vision
Oceanus is a reliable business partner in coastal engineering, providing high quality scientific and environmentally friendly solutions to their customers, while connecting Dutch expertise with local markets in Latin America. Oceanus will be the first choice for coastal or flood protection, beach recovery or creation solutions in South America, Latin America or in the Caribbean.

How - Mission
Oceanus' mission is solving problems related to exploitation of resources in aquatic systems with environmental services, coastal and flood protection, marine construction, beach recovery, cenote dredging and sand pumping, dedicated to protecting the ecologic environment. Oceanus offers services ranging from technical studies, to the manufacturing, installation and maintenance of innovative hydraulic products, such as artificial reefs, Geo cylinders, Xblocs and gabions.

General Business Activity
Oceanus International is a company that provides integral solutions for coastal erosion and flood control, for governments and the tourism industry. It is a joint Mexican/Dutch company, combining technical expertise from the Netherlands with the local network and markets in Latin America. Oceanus provides several services, differing from conducting technical studies, to manufacturing, installation and maintenance of artificial reefs, Geo cylinders, artificial beaches or dunes. Oceanus aspires to deliver their services in the most sustainable way, following for instance the Building with Nature principle. Currently Oceanus is active in Mexico and Colombia.

Company Strategy
Depending on the most relevant market per country, Oceanus focuses either on the private sector, or the public sector. For instance in Mexico they play an important role in the private tourism sector, whereas in Colombia it focuses more on public studies and projects.

1.2 Organisational Structure

The organisational chart shows the basis internal structure of Oceanus International (see *Figure 1*). It shows the departments, functions and how they relate to each other. The organogram can be useful for both internal and external use and is part of the business plan.

For a detailed organisational structure of the Oceanus branch in Colombia see Appendix I.

Objective

The visual representation shows a clear reporting structure, so every employees knows who to report to, who to contact when there is an issue that needs to be resolved or a question that needs to be answered. This clarification can lead to communication improvements within the company and guide new employees. A well-managed organisational chart helps to visualize the workload of individuals and can indicate under- or overcapacity within a department or show the workload of individuals. So, this organogram makes future planning easier.

Note that the organogram is not showing the informal channels. Especially in the case of Ocenaus International the informal communication and relationships are strongly present but not visualised in the following figures.

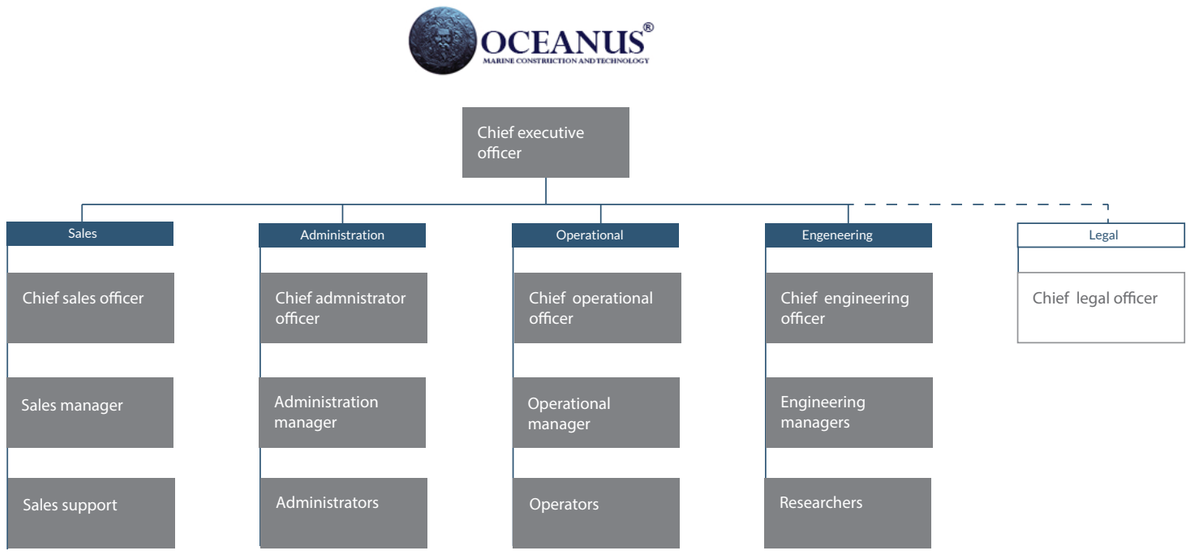


Figure 1 -Organisational Structure or Governance of Oceanus International

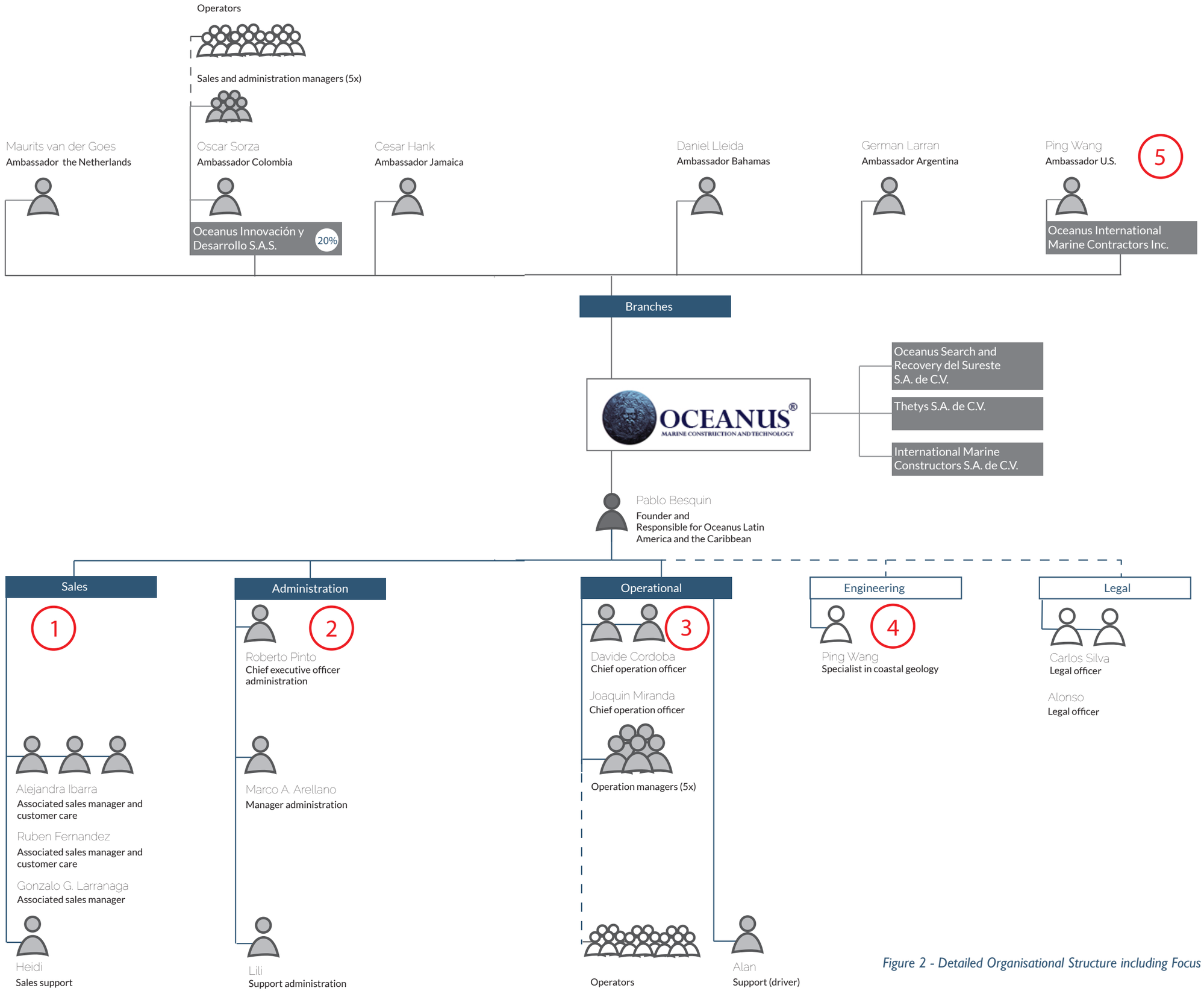


Figure 2 - Detailed Organisational Structure including Focus points

1.3 Process Timeline

The operational timeline is a visual representation of the progress of the turnkey solution Oceanus International offers. This visual was created to give an idea of the different operation phases for Oceanus International.

The whole process is divided in five phases: sales, engineering, legal, construction and maintenance (see *Figure 3*).

See *Figure 4* for the detailed timeline. The preparation starts with a sales opening (1.1). Mostly, the sales opening is a call for help from a private hotel. Pablo (CEO) will bring a visit to the project site for a first technical inspection (1.2).

After the visit and technical inspection a contract can be assembled. Signing the contract is also the moment of the first payment, around 10% of the total budget. After the first payment the technical environmental proposal (2.1) is delivered. Also, the detailed engineering study (2.2) is started by Dr. Wang (Chief Engineering Officier).

After the engineering phase the legal management starts. The legal department will execute a legal study (3.1). Followed by around twelve months of waiting time (3.2) to receive approval for all permits. Because of the time consuming legal phase, an additional feasibility study (4.1) has to be done after receiving the permits.

The construction phase will start with a signed second contract, including the payment of around 70% of the total budget. After the contract Oceanus has to gain resources (4.2). This can differ from ordering sediment to the design and manufacturing of artificial reefs. The actual construction work (4.3), such as placing breakwaters or filling gabions, will take four to six moths on average. For this phase extra operators will be hired on project base.

To monitor and preserve the project, Oceanus conducts yearly maintenance (5.1). The yearly costs are around 10% of the total budget.

Oceanus started their first fully complete turnkey solution for the Paradisus hotel in the beginning of 2017. Although, they have executed parts of the turnkey solution in several previous projects.

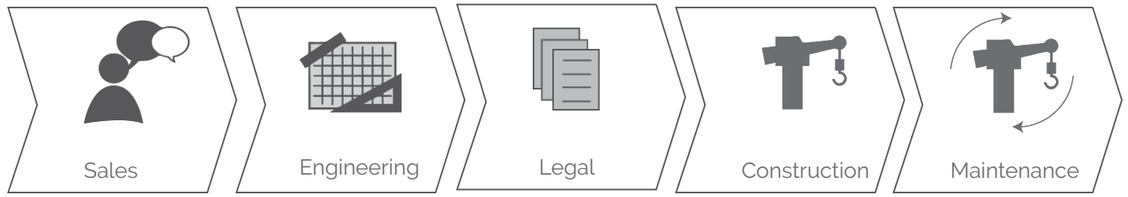
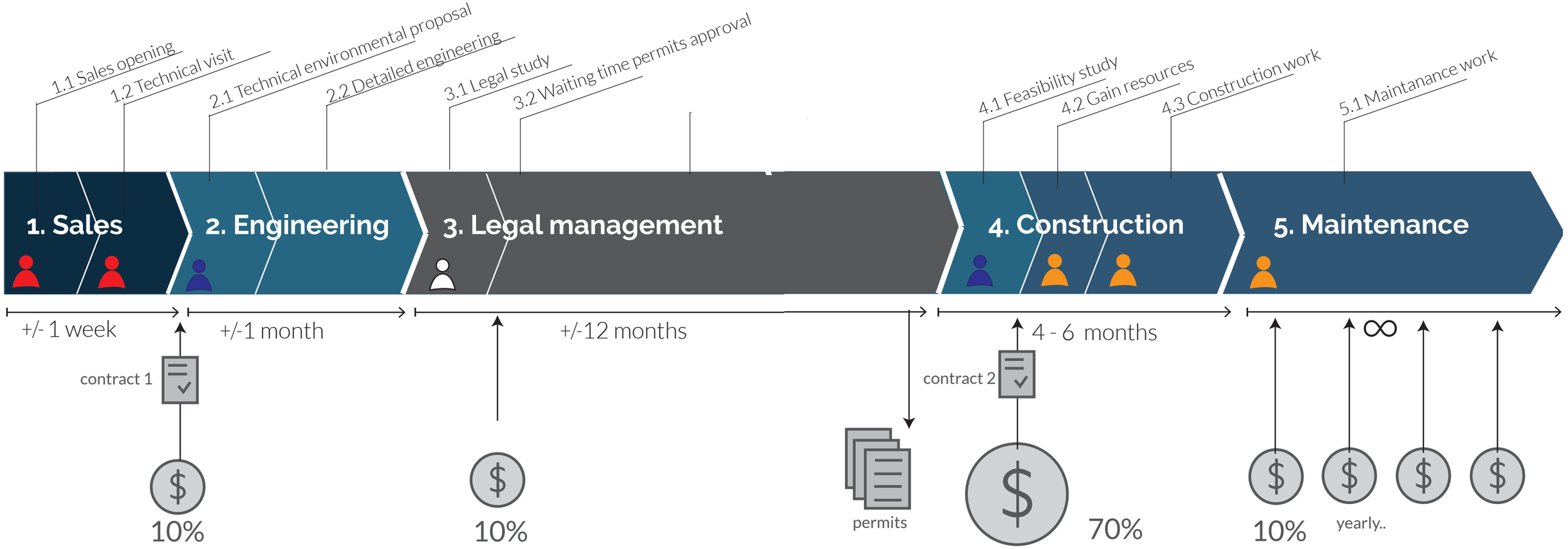


Figure 3 - The different phases of a key turn project

Photo: Interactive session, Puerto Aventuras, Mexico



Responsible departments

- Sales department
- Engineering department
- Legal department
- Operational department

Workload indication over the year

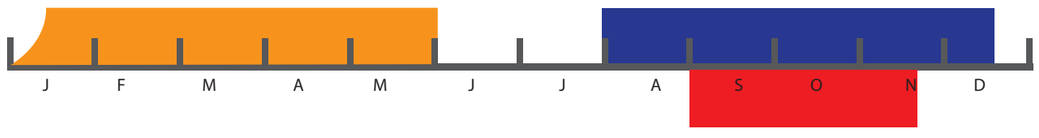


Figure 4 - Detailed Organisational Structure including Focus points

1.4 Products and Services

Products

Geo cylinders * (Artificial Dunes + Hydrocylinders), plastic gabions, Artificial reefs*, geotextile (*), floating docks, marine wood, sand, hydrocylinders*, Xblocs, seagrass recovery, marine Energy (see *Figure 5*).

* Note that geocilinders are used to build artificial dunes. Water filled geocilinders are hydocylinders. The bags of the gabions and geotextile are both products of polypropylene.

Besides these products Oceanus also owns and rents pumps for dredging and pumping. Depending on the on-going projects, Oceanus owns several other small products such as: boats (rafts), manufacturing machinery (e.g. welding machines), diving equipment, strings for the gabions and sediment such as sand, rocks and concrete.

The services oceanus provides are divided in engineering/ legal management (phase 2 and 3) and construction/ maintanance (phase 4 and 5). See *Figure 6*, for the overview and description.

Services


Geo cylinders

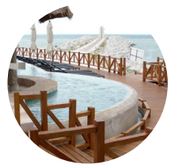

Plastic Gabions


Artificial reefs

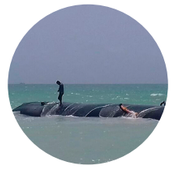

Geotextile


Xbloc


Floating docks


Marine wood


Sand


Hydrocylinders


Pumps

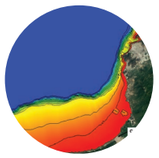

Seagrass recovery


Marine Energy


Artificial dunes

Figure 5 - Products Oceanus provides

Engineering & Legal Management



Studies

Biology, geology, engineering and hydrology studies to diagnose the problem that causes the coastal problem.

Legal management

Provides requirements that need to be elaborated in order to present the project to the authorities for approval.

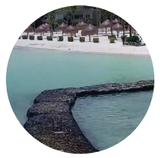
Supervision dredging

Monitors and controls of dredging with the use of strategic alliances of academic and private engineering firms, national and international.

Submarine drones

For under water inspections or environmental monitoring, (submarine) drones are used.

Construction & Maintanance



Coastal protection

Designs solutions tailored to the needs of each coast and offers long-term protections solutions.

Beach maintenance

Ensures the long life investment on the coast by maintenance throughout the year.

Beach recovery

Designs solutions tailored to the needs of the customer to recover beaches.

Reduce & control floods

Provides studies, modelling approaches and solutions to reduce and control floods.

Emergency actions hurricanes

Provides the equipment and expertise to alleviate areas of natural disaster duet o hurricanes or floods.

Dredging & pumping

Provides equipment and services for dredging and pumping.

Sales & import of sand

In the position to transfer and import white sand from sandbanks.

Sargassum cleaning (seaweed)

Provides equipment for the daily cleaning of Sargazo and maintenance of its beaches with a monthly or semi-annual program.

Cenotes cleaning (sinkholes)

Provides diving, dredging and pumping solutions to clean cenottes.

Figure 6 - Services Oceanus provides

1.5 Supply Chain

A step in analysing a company is the so called “company framing”: this is about understanding the context, the business units, the activities/processes, the network and the operation of a company. It is useful to structure all this to have a complete overview of the company context. In case of Oceanus, because its main core is the local network of partners and suppliers, and because the markets where it operates are so diverse, it is particularly useful to structure its supply chain.
The company supply chain is described in literature as the process of all parties involved in fulfilling a customer request. In other words, it is the integration of all the activities, persons, and business through which a product is transferred from one place to another.

This scheme (see *Figure 7*) shows suppliers which provide some resources to Oceanus, through their processes transform them in products/services that are made to offer certain businesses to the final customers. The figure clarifies the network of suppliers and partners and the resources that these actors are providing. At the same time, it clarifies the “adding value activities” that Oceanus puts into the business, beside the value of the network itself. Finally, it gives an overview of the “Oceanus markets” composed of its products/services in certain businesses, and the final customers that are addressed. Through this scheme it is possible to see what resource is made to offer a certain product, or what steps are necessary to serve a certain customer. Following up, the figure helps decision making about modifying the internal structure of a company, because it links everything within the company and makes it clear to see the consequences of any structural change.

The figure maps Oceanus’ processes, products and services, and helps to understand possibilities and how the company works. It is also useful for the future vision, to understand what resources are needed to reach a certain goal and to understand what they should work on.

Finally, this tool is useful to have a clear structure to present to employees and external collaborators, because it simply and clearly shows almost the entire company at once.

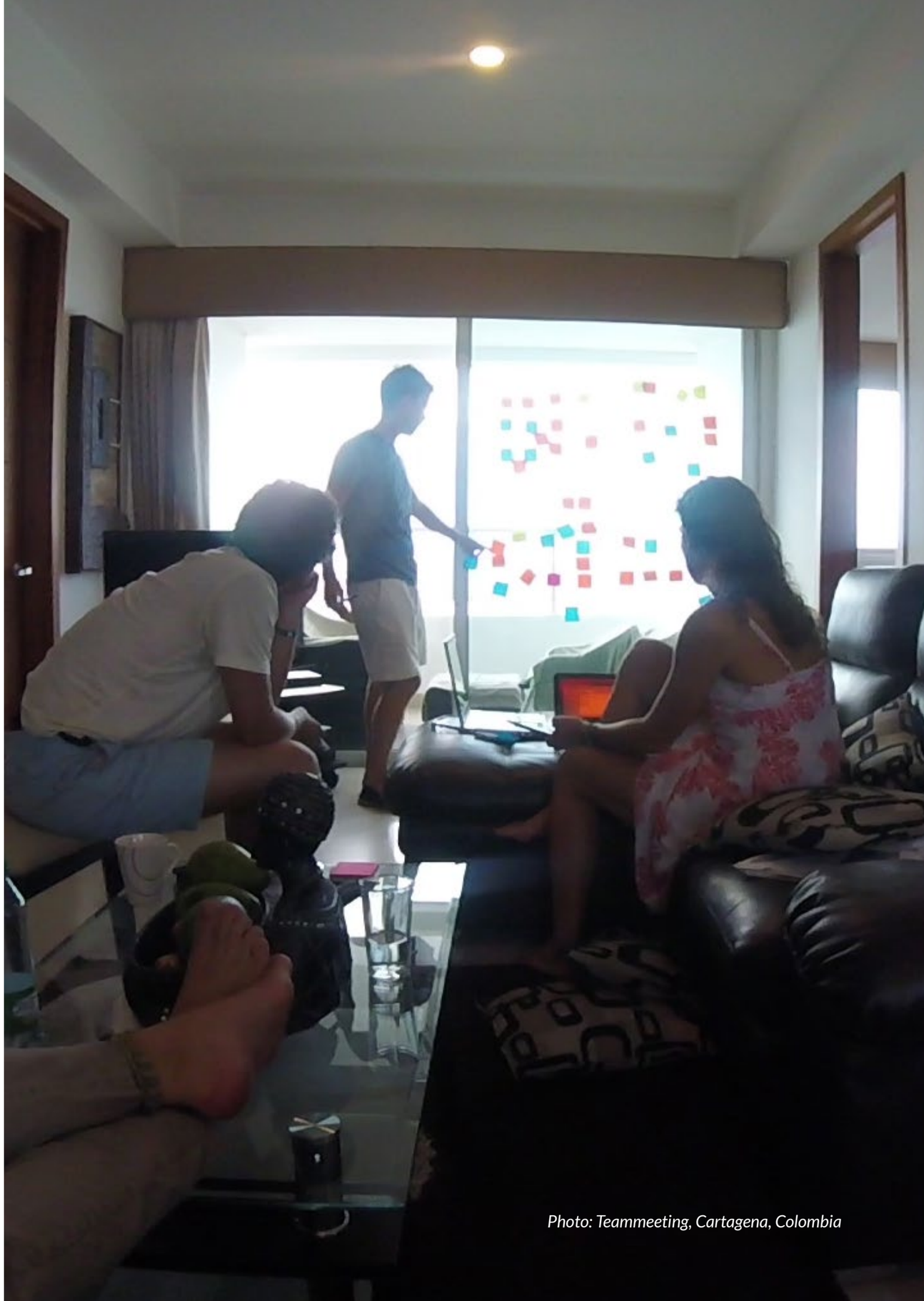


Photo: Teammeeting, Cartagena, Colombia

1.6 SWOT

During the project an internal analysis has been conducted to obtain the strengths and weaknesses of Oceanus. Besides this a research has been conducted to obtain the opportunities and threats that could influence Oceanus during their expansion. The insights were gathered through interviews with employees and stakeholders and using external sources.

The findings of this analysis are merged in the table on the next page.

- Strengths: internal characteristics of Oceanus that give it an advantage over others.
- Weaknesses: internal characteristics of Oceanus that place the business at a disadvantage relative to others
- Opportunities: external elements that Oceanus could exploit to its advantage
- Threats: external elements that could cause trouble for Oceanus

Strengths

- Oceanus maintains a wide local network (Mexico), international network (represented in Colombia, U.S., the Netherlands, Jamaica, Bahamas, Argentina) and has great networking skills due to a good cultural understanding.
- Delivers high quality scientific knowledge, through the agreement with Dr. Wang.
- In favour of sustainability principles and environmentally friendly solutions.
- A humble, lean, ambitious and open-minded company.
- Owns patents for; artificial reefs and Xblocs.
- Manages a diversity of project applications by offering a wide range of products and services.

Weaknesses

- No clear working and organisational structure, which makes the company dependent on their key employees.
- Lack of administration (e.g. accounting, annual reports).
- Limited engineering diversity (e.g. modelling).
- Little in-house knowledge, experiences and materials, which makes the company dependent on partners and suppliers (missing added value).
- Discontinuous production line followed by discontinuous revenues.
- No large-scale or international project in their portfolio.
- Dependent on time-consuming bureaucratic procedures by governmental regulations.

Opportunities

- Climate change threatens coastal areas. (e.g. human interventions, pollution).
- Latin America is investing in nature projects for environmental sustainability (e.g. the building with nature concept).
- Market segment: river management.
- Research and financial support by the Colombian and Dutch governments.
- The rise of innovative products (e.g. 3d-printing and drones).
- An emerging Latin American economy.
- Latin America is getting political stable.

Threats

- Hard to hire reliable employees with the desired capacities.
- National and Dutch competitors.
- Changing of political stability and viewpoints on coastal protection.
- Losing leverage or expiring patents.
- Depending on import taxes and regulations of countries.

1.7 Strategy

The following section will reflect on the analysis and will elaborate on the expansion strategy. It is a broad reflection on all the possibilities, the main issues in the case of the expansion, and tries to give final conclusions and advices. The section will end with a final recommendation how to split equity when opening a new branch abroad.

Re-design company values

At this point Oceanus has no clear company values communicated to the employees or customers. The website and the document 'manual de procedimentos' should be the communication channels.

We recommend to replace the nine company values, as currently presented in the 'manual de procedimentos' (i.e. quality, reliability, leadership, responsibility, innovation and discipline) with three new values covering these nine characteristics. Oceanus should position the company as a reliable, environmental friendly company, which provides high quality scientific solutions.

- **Environmental friendly**
  (covers: leadership, responsibility)
  Currently, driven by a rising awareness about the consequences and subsequent importance to act, there is an increasing incentive to take environmental friendly solutions at heart of a design process. Both governmental institutions and private organisations are willing to invest in environmental friendly solutions. Oceanus already aspires to be a leader in hydraulic solutions and to take care of the social- and ecological environment. Combining these, Oceanus could position itself as a leader in environmentally friendly hydraulic solutions whilst taking into account the social and ecological environment. Especially, the Building with Nature principles fit perfect within this company value (see chapter 4).

- **Scientific solutions**
  (covers: quality, innovative, discipline)
  Oceanus is a humble, ambitious company with great networking skills. Oceanus has good connections with universities and researches and uses their knowledge in their solutions. The combination of these qualities makes it possible to offer innovative and high quality solutions on an academic level. This is a strength that distinguishes Oceanus from other companies; therefore it is a smart movement to make it a company value. Especially, because the scientific/academic solutions create more trust from customers. Besides this governments get more and more aware with the fact that scientifically proven integrated projects are more sustainable. Therefore permits for these projects are easier to acquire.

- **Reliable**
  (covers: reliable, responsible)
  A Mexican company cooperating with Dutch companies, should present itself as reliable. Because of the cultural differences, especially in uncertainty avoidance, long term orientation and indulgency, it is important that customers can trust on the agreements they make with Oceanus. Oceanus is responsible to deliver work that meets the agreements, the quality of the work should be consistent, with high quality and perfect performance.

Figure 8 -Re-designed company values for Ocenaus

Product & Service Portfolio

Oceanus takes the role as project manager. They create the connection for international and local coastal construction companies with local governments, legal departments, customers and suppliers. To create more value, a company needs to align itself with their customers, suppliers, and employees. The creation of value is the way to develop new markets and expand existing ones. To develop the opportunity to expand, Oceanus could adjust more focus within their businesses.

A way to add more focus in the business is offering less products and services, so they excel in the few products and services they offer. From what we saw so far we made a distinction in the product/service portfolio; the products Oceanus should focus on and the products they should neglect. However, those products and services should not be totally neglected, especially not in the existing market (Mexico), where these activities are profitable. Oceanus should just not focus on the neglected products and services in new markets.

The products were neglected because Oceanus did not do projects with the products so far or they cannot compete the competitors in this field, because of a lack of experience, not profitable enough, to much time consuming, no added valua or because of the company size (for example dredging sand using pumps).

Products to focus on: plastic gabions, geo cylinders, artificial reefs, geotextile and Xblocs.

Services to focus on: studies (technical and environmental), coastal protection (beach maintenance and recovery), flood control & reduction, emergency actions & hurricanes.

Products to neglect: floating docks, marine woods, sand, seagrass recovery, marine energy, pumps.

Services to neglect: cenote recovery, sargassum cleaning sales & import of sand (inhouse), dredging & pumping (inhouse), legal management, submarine drones.

Rivers

As the market research turned out, a further research should be done to the expansion to river management. Specifically to river flood protection, river dredging, riverbed erosion control and other river related construction and research activities. Since in South and Latin America there are lots of problems with floodings of rivers after heavy precipitations and most of the national governments are willing to invest in the solutions to these problems. The market research showed that there is a big potential for rivers opportunity for Oceanus. Furthermore, we could conclude after some interviews with local and Dutch experts that the difference between river and coastal dynamics are quite similar.

So since the market for river research and construction is quite big, there is financing available for these projects and the expansion to this market is a relatively small step, we strongly advise to do another in depth research in expansion to rivers.

Expansion Strategy

Oceanus contracts customers, hires the right companies, manufactures its products, does the operations, and supervises the projects to meet the customer's requirements. The most distinctive factor that distinguishes Oceanus from other competitors, is its network of connections and partners. It provides Oceanus with the patents of the technologies, good connections with professors and engineers and collaborations with American and Dutch companies. They provide their customers with an integral solution made of a vast range of products and services thanks to their network.

Summarizing, Oceanus is basically characterized by 3 "adding value aspects" (listed in order of importance):

1. **Local and international network**: Oceanus can provide a vast number of products and services, bringing many actors and partners at the table. Some examples of outsourced activities are the oceanographic studies and computer simulations, the legal issues, and some esthetic products that are applied during the beach construction (like marine wood structure).

2. **Project management and operation:** given a certain problem, Oceanus knows what solutions are the best and what company is more appropriate for a certain job. Moreover, they manage all the operations of the project and take the responsibility to insure high-quality results.

3. **Products manufacturing:** Oceanus produces the products they use and have the exclusive local patents for some of them. However, the production is basic – mostly welding, bending and cutting iron, making concrete, and stitching plastic textile – and it is discontinuous: it "switches on" only when the company gets a project.

Since Oceanus wants to expand to foreign countries and grow its business, it is important to reevaluate the company and decide what structure is more appropriate for the expansion. What shape should Oceanus have in each country? Should the structure of Oceanus in Mexico change? Is it appropriate?

During our project, we got to know the company and we will give our reflection on the adding value aspects.

Local and International network
Oceanus should consider to modify the scheme of actors in its network. Three possibilities are examined to expand to a foreign country: using the same network scheme, increasing it, or decreasing it.

Oceanus could:
- Replicate the same network scheme in other countries, with few possible differences. The study is done by the same external professor Ping Wang, and the products are imported from the Mexican office, keeping the production centralized.
- Reduce the network to some key actors and develop internal capabilities, particularly an R&D department capable to deliver the engineering studies. The problem in this case is the fixed costs that an R&D department would bring. Maintaining an R&D department is expensive, and the current discontinuous cash flow (project based) is insufficient (a more detailed feasibility study is recommended).
- Outsource even more, for example the basic discontinuous production. Oceanus could just provide the design to a company that can weld and fabricate with iron and concrete, and they save the costs to maintain a factory (again, a more detailed research is recommended).

Project Management and Operations
Oceanus should find good project managers and supervisors in each country, and should motivate current project managers - who are willing to travel - to take care of the first initial projects abroad, including training the foreign colleagues.

Product Manufacturing
There are mainly two issues. The first matter concerns the production in Mexico. Should the production process expand by finding other markets for its products, should it be kept how it is now, or should it be outsourced completely? The other issue is about the expansion abroad. Should Oceanus import products from Mexico or should it produce locally?

Summarizing, these strategy possibilities can be structured in two main issues:
- About the R&D capability, should it be developed internally or not?
- About the Product manufacturing, should it be kept like it is now, increased and made it continuous, or outsourced?

Developing Internal Capabilities

If the added value of Oceanus is mostly the network of actors, then an R&D is not strictly necessary. It might be a good selling point to support expanding the network to acquire more projects thanks to its reputation, but it would not add a lot of value to the company.

The development of the R&D can be done following different strategies, each with its own advantages and disadvantages.

A strategy could be to expand the R&D section in the Netherlands, so Oceanus could easily obtain American-Dutch expertise and engineering. It would also intensify the link with the Dutch industry and support building a network. Besides, it is preferable to be independent from a single person. It would be possible that in the current situation professor Wang refuses to cooperate in a project. In that case, Oceanus would be forced to decline the project as well. A disadvantage of hiring more than one person - for instance one local engineer per country - is that it might become complicated to manage. Having an R&D department central in Mexico with employees (e.g. engineers) available to travel would guarantee an internal and central knowledge belonging to the company, instead of a divided system where knowledge is distributed among single individuals. However, the downsides of an R&D department are the big costs and the low efficacy in case of a mainly network-based business; Oceanus would face the risk to fail to compete against big R&D competitors. An exception would be to find a niche and to develop an R&D center focused on that niche (e.g. renewable materials, sustainable products).

Thus, the final recommendation about developing an internal R&D capability is to start investing in a second person in the Netherlands, or maybe a local engineer in Mexico or Colombia. Afterwards, it should consider a niche market which the company wants to enter to become a leader by developing a targeted R&D to that niche. It could be useful to build a financial model to estimate the number of projects that would be necessary to cover the R&D expenses and those of other internal capabilities-developing departments.

Production

There are three different methods to get the products of Oceanus in the country of expansion. Which method is the best suited for that country totally depends on the situation in that country.
The first method is to simply import the products from the factory in Mexico, or maybe an other factory of Oceanus in a nearby country. This can only work if the import rates of industrial goods are low.
The second method is to outsource the production of the products to a local partner. Since the production is really simple, this can easily be done. This method would be successful if a relative small amounts of products is needed in that country. Or if Oceanus wants to do a trial project in that country and does not want to invest in a whole new factory already.
The last method is to replicate the Mexican factory in the new country and do the production itself. This method can work out if a large scale of products is needed in the country and the capital needed for the factory is relatively low.

The best option for the manufacturing in Mexico would be to expand the production of the most successful products and create a continuous production line.This way the production can be stabilized and will bring a continuous cash flow to finance a possible R&D department or create equity for other expansion. The challenge with this is to find a continuous demand of the products. The continuous demand is necessary because a production line should run 24/7, otherwise the production will be inefficient and Oceanus can not compete the competition.

To create the desired demand Oceanus could search for new markets (e.g. the geo-cylinder sold to the mining and agriculture industry as a container for transportation of goods) or they could increase the amount of projects around the globe so that the production in Mexico would be (semi-) continuous to produce for the branches abroad. This is, however, complex and not to be expected given the current state of Oceanus, neither is the production too complex to outsource.

Thus, the final recommendation about the own factory is to carefully choose the most successful products to manufacture internally and to find other markets to have a constant production. In case the research for markets with constant demand would fail, it is better to outsource the production. The R&D could support this process in case a niche - for example innovative and sustainable products - is entered.

Conclusion

Observing the global market where Oceanus wants to operate in (coastal protection and marine constructions), Oceanus should function as the networking actor by connecting customers, companies, stakeholders and supervising operations. They cannot compete with the R&D departments of bigger companies in the same sector aiming for the same markets (e.g. Boskalis) on technical, operational and maintenance level.

Thus our advice for Oceanus would be to clearly communicate their networking strengths to the Dutch industry as its value proposition. Since the weakness of the Dutch industry is their networking skills within the Latin American market, it simultaneously is the strength of Oceanus. The value proposition in this case would be providing a local network and ensuring a high-quality project management of the local actors and resources. On the other hand, the local stakeholders want to hear professionality and technology. That is why enhancing relations with the Dutch and American industry could help Oceanus to emerge as leader in local markets, creating a win-win strategy that would enhance itself in a reinforcing loop.

A challenge to take into account is if Oceanus acquires the knowledge and technology of its partners, it is possible that in the long run the local and international stakeholders will learn how to cooperate without intermediaries, hence bypassing Oceanus. Therefore, Oceanus should also become R&D leader in specific niche markets. If Oceanus acquires knowledge of the specific niche instead, it will confirm itself as a local leader and expert, and it will be still convenient for companies like Boskalis to outsource services.

To achieve the objective (i.e. stable production of products sold in diverse markets, a niche R&D department, and integral services offered to chains of hotels or big governmental projects with yearly fixed revenues), the business model in Mexico must be made as stable as possible and a continuous income has to be created. So to face the expansion, Oceanus should develop their main business in Mexico by for example having more employees available to send abroad and get the first projects in foreign countries. To create the continuous income the customers should pay the maintenance (fee) every year in exchange of always-perfect beaches (in terms of meters of sand, sargassum cleaning, etc.).

Each expansion is project-specific, and each country should be approached differently, hence Oceanus should be flexible and able to adapt to optimize the market fit. Its cores should remain to bring international actors to the local ones and vice-versa, and to manage the project bringing its own expertise.

A remark about the Equity
It is complicated to calculate and divide equity shares when opening a new branch abroad. A traditional way to split equity when opening a new company is looking at the percentage of the invested money with respect to the company value. When a shareholder invests 10% of the total value of the company (not the total money invested to open the company), the shareholder owns the expected 10% of the equity. Additionally, a traditional rule is not to have more than 5 founders.

Another possibility for Oceanus would be to divide the shares percentages on the base of the portion of network provided by each partner, because Oceanus main core is bringing stakeholders togethers.

In addition, when looking for equity among external investors, Oceanus should be aware that usually the first round investor might ask for 25 to 45% of the equity for their investments, and that before an IPO (initial public offer) the founders should not have less than 25% of the company. When a company does not want to start a IPO but just starting a strategy to raise financial resources through equity, a common structure would be: founders 20-30%, angel investors 20-30%, option pool 20%, venture capitalists 30-40%.

In case of the investment of a private equity company, most of the times it wants at least 50% of the equity shares and it wants the owners/founders of the company to reinvest in the company.

A remark about Communication

One of the main challenges to overcome during the expansion of a company is to maintain good communication within the company.

The first challenge is sharing knowledge within the company in different countries. For instance, a local engineer in Colombia gathers some information and it is important that the whole company becomes aware of it. Therefore a solution could be, creating a working culture where all the activities are being reported in logs. Employees will write all their activities of that day in that log. These logs will also help to make better schedules for projects and evaluate workers. It might be a cultural challenge to implement this, but it can be really useful. The second challenge is the communication of the administrative activities and financial expenses and incomes. For an expanding company it is important to know the largest costs, what the expansion to a certain country costs, what the profit will be, which business are profitable, which businesses need more attention or maybe have to be sold. If this financial picture is not clear, a company is not able to expand in a sustainable way.

Furthermore, it is important to have a correct and up to date administration, because it is required for investments of private investors (e.g. private equity firms). Without the precise administration there will be no investment of reliable investors.

At last, Oceanus faces challenges in communication since it aspires to cooperate with Dutch industries and institutions. For a good communication with Dutch people, it is important to always keep the following points in mind:

- Clarity: Dutch expect people to be concrete and clear, in what you want, what your goal is and what they can expect from you.
- Reliability: Reliability is important for Dutch companies. They really count on agreements, promises and appointments. Even when there only is an oral agreement.
- Credibility: Do not “overpromise”. Dutch people love to keep stories to the facts. If an answer is unknown, just be honest about it and be credible.
- Punctuality: Dutch people are always on time, having a deadline, meeting, call or whatever you agreed, planned or promised. When something unexpected happens and you will not make it, say it as soon as possible.
- Directness: Dutch people are very direct, if they like something they will say it and if they do not like something they will also say it. Do not feel offended when they say that they do not like something, it is business not personal. But they like to be treated in the same way, if you do not like some work of them, say it, they will interpret it as a recommendation and will try to improve. Furthermore, this point includes concreteness. Answers should be kept short and to the point, the goal has to be clear.
- Planning: Dutch people like to plan everything ahead; for normal meetings at least two weeks ahead and more important meetings even further ahead. For Dutch people it is important to stick to this planning. Try to take this in account and plan Dutch visits way in advance.
- Expectation management: Dutch people like to work in such a way that they can strive for a certain goal. They want the same from you, they want to know what they can expect from you.

This is in a nutshell how to communicate with Dutch people but of course it is more complicated than this. Maurits van der Goes can be a really good asset in the Dutch communication in the Netherlands, but he might also be a good teacher to people within Oceanus how to communicate with Dutch people.

Photo: Ivemar, Santa Marta, Colombia

2.1 Issue Tree

2.2 Expansion Business Case

At this stage, there are two main tools to support the decision making about the expansion to a certain country: the issue tree and the business case. The first one structures the important factors of the decision making in a pyramid of main- and sub- issues, while the second one estimates the revenue that an expansion to a country would bring to Oceanus and the ROI of possible projects abroad. The issue tree should be used to decide if Oceanus should expand to a country whose the market research described the potential. Thus, from the market research, the issue tree results in a short list of possible candidates for the expansion. Finally, the business case will rank them by revenue to decide which one is best to expand to firstly when having imitated resources. The business case also gives a complete view of the expansion with cash-flows, financial plan, and risk analysis. The business case is already used within the issue tree to answer a sub-issue in the pyramid, so in this sense, the two tools must be used simultaneously.

In the next section of this report, the tools to support the expansion of the issue tree and the business case will be described in detail. The market research will follow in the section after.

2.1 Issue Tree

The issue tree is depicted on the next page. It consists of a structured sequence of questions yes/no that would lead the user to finally answer the main question "Should Oceanus expand to the country X?" As explained in the introduction, this tool supports the decision making of expanding to a country suggested by the market research. It will show the possibilities and threats in a certain country and the issue tree will say if those possibilities are economically advantageous on the one hand, and if the company is internally ready to expand on the other hand. Thus, the tool shows the reasons of a negative answer and helps the company to work on its weak points and face the expansion.

How it works

At the top of the tree there is the main question "Should Oceanus expand to the country X?", and below the problem is structured in sub-questions breaking down the complexity. The user should start answering the questions from the bottom and step by step reaching the top of the tree. Answering "yes" to a group of questions at the bottom, the user can mark the question above as a "yes", and proceed with the iteration to answer more complicated questions placed above. The right way to use this tool is to start answering the questions from the bottom.

If the foreign market is not economically advantageous, the company can not do much to change the situation, and the expansion must wait for better opportunities. If the left part of the tree is marked as "yes", then the internal factors become decisive and the company should question itself, if they have the recourses to support the expansion. In this case the tool not only support the decision-making process but also shows the focus points that has to be taken into account, expanding in foreign markets. Finally, the tree is made following the principle of MECE, that stays for mutually exclusive and collectively exhaustive, the questions do not overlap and cover all the possibilities.

Using the tool, step by step

Starting from the left branch, the first question is: "is the expansion convenient?". To answer this question, the first step is to check if the projects the company aims to undertake are sufficiently advantageous to insure a return on investment of at least 15% (major 25% is preferable). To answer this specific question, the user should use the "Business Case excel tool" explained later in this report. After having marked Y/N to this question, the user should reflect if there are growing opportunities or not, i.e. if the sector which the company aims to enter is forecasted to grow or not. Finally, the last question to be answered is if the market is already saturated by the competition or not. To answer, the user must reflect on two sub-issues: "Is there any initial space for the company to enter the market?" And "is the company able to defeat the competitors? Does it have competitive advantages?". If both these questions are answered favorably, then the user answered Y to every sub-questions and can conclude that "the expansion is convenient".

The other sub-issue to complete the external branch of the tree is if the "expansion is socially/legally feasible". Socially, because the government and the local companies involved in the business must be approve with cooperating with a foreign company (for instance, the local government should not support protectionist policies or preferring local enterprises only). Legally, because there should not be too high importation taxes nor particular taxes on foreign companies. If these questions are answered favorably too, the entire sub-branch gives a "green light". Thus, the country under stake is a good candidate for the expansion, and the focus of the analysis switches on the internal factors, i.e. whether the company is well prepared for the expansion or not.

The right sub-branch basically reflects on two main issues: the network and the resources. About the network, the company must always have the local political support, Dr. Ping Wang for the engineering studies (or someone equivalent that could do the same job in the same or better way), a local legal partner – being able to acquire the permits and to provide support about marine and accounting laws – and a local logistics partner. Furthermore, the network might require specific partners such as "Boskalis" – if the project was about industrial dredging – and specific local suppliers to provide the equipment (i.e. the dredging pumps) and the raw materials (i.e. concrete, sand).

About the resources, Oceanus should be financially prepared for the expansion. It means having the necessary cash reserves, convenient bank loans, or sufficient equity brought by investors or local partners founding the new branch abroad. In addition, Oceanus should have enough labor force. It mostly requires four main positions: administration & accounting, the divers and workers, the project managers or supervisors and the sales persons. These positions can be found locally or be covered by current employees available to move to develop the branch abroad. These four departments should be ready and planned before the expansion, while other secondary roles can be added later. Finally, when Oceanus should bring new technologies to a foreign market, it should worry to get the local patents to protect its copyright from local competitors. If all these factors are answered favorably, Oceanus is ready for a successful expansion. In case of some negative answers, Oceanus can use this tool to focus its effort to prepare itself for future expansion.

Remarks

A first remark is that this issue tree is based on the strategy that Oceanus will hit a new country when there is a big project that brings enough revenue to support the expansion costs. Thus, Oceanus will undertake the expansion after a profitable project has been identified as first objective. That is why the first element of the sub-branch about the convenience of the expansion is about a project ROI major 15% (at least).

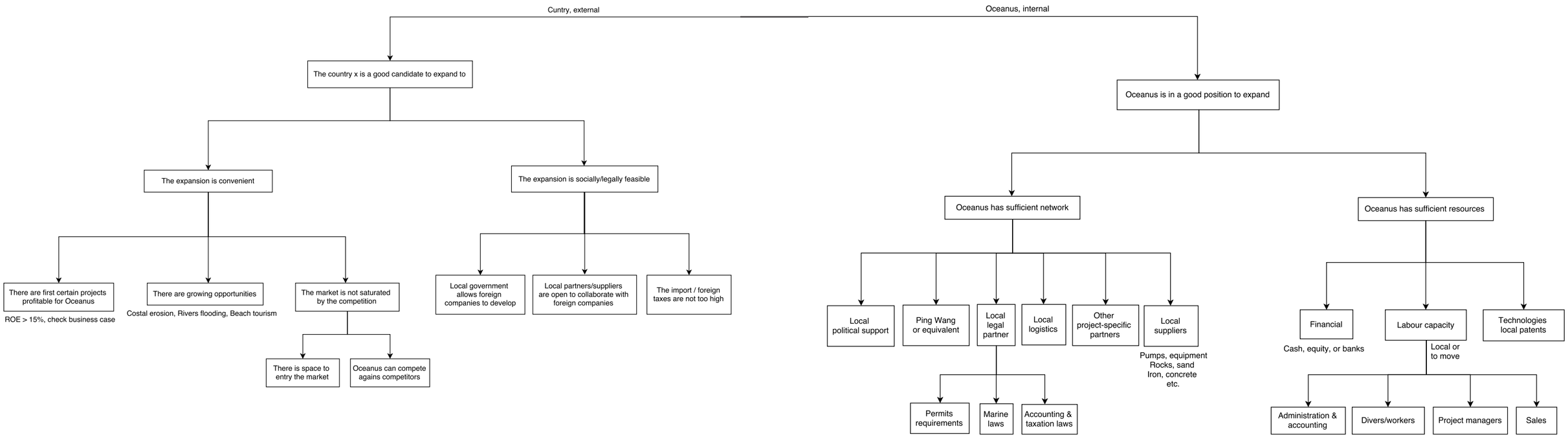
Consequently, the issue tree can also be used for a specific project. Because the expansion is basically seen as completing a successful project in a promising foreign market, this tool can also be used to support the decision making about a project in existing markets. In this case, many sub-issues of the tree are not necessary, and the user can mark them as "yes boxes". In this sense, this tool can also be seen as a detailed "check-list" of necessary factors for a successful project.

Limitations

The issue tree is general and cannot go too much into the specificity of each country. For example, the tool does not include if Oceanus will set a local factory or will import all the products from Mexico or outsource the production. Thus, it provides felxibility. The issues can be covered by correctly interpreting the right sub-questions. In case Oceanus plans to import its products from Mexico, the issue "the import / foreign taxes are not too high" has a particular emphasis on the importation taxes, while if Oceanus plans to open a local plant, the sub-issue "other project-specific partners" will have to consider the necessary local actors for producing locally.

A final remark is that the issue tree just answers "yes/no" when questioning about expanding to a certain country. The main limitation of this is that in case of multiple countries answered favorably, the tool does not say anything about their ranking of importance, and if Oceanus would have enough resources to support the multiple expansions. For this the businesscase can be used. The one that brings the most revenue is to be considered as the best country to expand to. Then, the internal branch of the issue tree must be re-evaluated for the other countries once the resources necessary for the most convenient expansion have been removed from the available ones.

Should Oceanus expand to Country X?



2.2 Expansion Business Case

This tool estimates the economical convenience of an expansion to a certain country.

The business case follows the line used in the issue tree and it is well integrated with the market research. When Oceanus identifies project opportunities, the business case helps to estimate the costs and the benefits and asses the expansion case.

Thus, it is another tool to support the expansion decision, but it also does say how much money is needed to expand.

This tool can be used to discuss with banks when loans are required, or how to distribute the equity and profit among partners.

How it works

Besides this introductory sheet, this tool is made of 5 pages for:

1. setting the projects prices;
2. setting the taxation rates and probabilities for risks or not acquiring the projects;
3. estimating the costs and the benefits related to the projects through the years;
4. analysing the results of the expansion in the 4 different ways;
5. analysing each single project in detail for further considerations.

The sheets must be filled in this order.

Remark: the user must insert data only in the white cells.

Pricing

The numbers computed with Alejandra's excel sheets should be used to fill in this sheet to estimate the revenue of the projects.

The "Y/N" column allows to modify dynamically the chosen selection. It is useful in case the user would like to see the difference with/without the income from the engineering study.

INTRODUCTION

This tool estimates the economical convenience of an expansion to a certain country. This model is based on the following strategy: the company finds projects that it could complete in the foreign country (max 3), and decide if expandig to that country according to the related costs and benefits.

How to use this tool

Besides this introductory sheet, this tool is made of 5 pages for:
1. integrating the excel sheets used by the company to set the projects prices;
2. setting the taxation rates and probabilities for risks or not acquiring the projects;
3. estimating the costs and the benefits related to the projects through the years;
4. analyzing the results of the expansion in the 4 different ways;
5. analyzing each single project in detail for further considerations.

The must be filled in according this order.

Remark the user must insert data only in the white cells.

4 WAYS TO ASSESS AN EXPANSION

Method	Answers the question...	Expressed in...	Typically used for...
Return on Investment (ROI)	How much profit does the project generate compared to its costs?	Percentage	Most common indicator for an investment. It says how much profit the project generates for each dollar of investment
Net Present Value (NPV)	How much is this project worth to the business?	Dollars	Projects with large expenditures
Internal Rate of Return (IRR)	What rate of return will this project deliver over its lifecycle?	Percentage	Projects that the company reports on externally, especially those that require you to borrow money (to negotiate with banks)
Payback Period	How long will it take to recoup the investment?	Months or years	Projects with a heavy upfront investment, such as facilities projects; productivity projects that accumulate benefits over time

Introduction | Pricing | Correctors | Costs & Benefits | RESULTS | Projects NPV

Figure 9 -Screenshot introduction business case

This sheet is made to be integrated with the other excel sheets used to set the prices in the company
In the cells Y/N insert "1" if the product/service is used in that project and so its pricing is applied, "0" otherwise
This prices are considered already including the taxes on sales (VAT)

		Project 1		Project 2		Project 3	
		Y/N	Price	Y/N	Price	Y/N	Price
Products	Study	1	20000,00	1	12000,00	0	0,00
	Permits	1	7000,00	0	7000,00	0	0,00
	AMA	1	80000,00	0	0,00	0	0,00
	Geo-cylinders	0	0,00	1	70000,00	0	0,00
	Gabions	0	0,00	0	0,00	0	0,00
	Operation	1	25000,00	1	2000,00	0	0,00
FINAL		132000,00		84000,00		0,00	

Description Project 1	Description Project 2	Description Project 3
AMA project + study + permit	Geocylinder + study	no third project

Figure 10 -Screenshot pricing business case

Correctors

In this sheet, some correcting coefficients are set. They mostly take in consideration the taxation rates, the possibilities to acquire the projects, and the possible risks. The taxation rate on the sales (the VAT) is also taken into account because it integrates Alejandra's tool which does consider the VAT within the prices.

This sheet mostly collects correcting parameters to adjust the final revenues and profits
It concerns about the taxations rate in the country of expansion and of the possible risks

TAXES		
On the sales (VAT)	20%	because the pricing sheet includes the VAT
On the profit	50%	

RISKS OF NOT GETTING THE PROJECT		
Project 1	100%	100% means Oceanus will get the project for sure
Project 2	80%	
Project 3	80%	

RISKS ON THE COSTS	%	Description	Example
Economic	10%	the percentage of higher costs	10% means the costs will be 10% higher
Delay	10%	the percentage of delay	10% means the costs will be 10% higher
Other			
TOTAL	10%		

RISKS ON THE REVENUES	%	Description	Example
Technical	10%	the probability of not being able to meet the technical requirements	
Commercial	10%	the probability of acquiring just a part of the forecasted project	
Other			
TOTAL	10%		

Figure 11 -Screenshot correctors business case

Costs and Benefits

On this sheet all the costs are estimated. The first column is the total amount. Then the following columns are the costs spread through the years. The final column must be the same as the first one as a check-mechanism.

The same holds for the benefits.
After the benefits the final profit is computed.

Costs and Benefits Worksheet

REMARK: COSTS AND BENEFITS ALREADY CONSIDER TAXES AND

COSTS

Capital Costs	Amount	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total	Estimate Rationale
Office equipment	$ 20.900	$ 20.000	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 100	$ 20.900	
												$ -	
												$ -	
Total Capital Costs	**$ 20.900**	**$ 20.000**	**$ 100**	**$ 100**	**$ 100**	**$ 100**	**$ 100**	**$ 100**	**$ 100**	**$ 100**	**$ 100**	**$ 20.900**	

Operating Costs	Amount	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total	
Office	$ 5.000	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 5.000	
Trips for meetings	$ 8.000	$ 5.000	$ 1.000	$ 1.000	$ 500	$ -	$ 500	$ -	$ -	$ -	$ -	$ 8.000	
												$ -	
Total Operating Costs	**$ 13.000**	**$ 5.500**	**$ 1.500**	**$ 1.500**	**$ 1.000**	**$ 500**	**$ 1.000**	**$ 500**	**$ 500**	**$ 500**	**$ 500**	**$ 13.000**	

Project Costs	Amount	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total	
Project 1													
Workers	$ 16.000	$ 2.000	$ 2.000	$ 2.000	$ 2.000	$ 2.000	$ 2.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 16.000	
Raw materials	$ 17.000	$ 15.000	$ -	$ -	$ -	$ -	$ 2.000	$ -	$ -	$ -	$ -	$ 17.000	
Other												$ -	
Total 1	$ 33.000	$ 17.000	$ 2.000	$ 2.000	$ 2.000	$ 2.000	$ 4.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 33.000	
Project 2													
workers	$ 10.000	$ 2.000	$ 2.000	$ 2.000	$ 1.000	$ 1.000	$ -	$ 1.000	$ 1.000	$ -	$ -	$ 10.000	
Raw materials	$ 14.000	$ 13.000	$ -	$ -	$ -	$ -	$ -	$ -	$ 1.000	$ -	$ -	$ 14.000	
Other												$ -	
Total 2	$ 24.000	$ 15.000	$ 2.000	$ 2.000	$ 1.000	$ 1.000	$ -	$ 1.000	$ 2.000	$ -	$ -	$ 24.000	
Project 3													
Workers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Raw materials	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Other												$ -	
Total 3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Total Project Costs	$ 52.200	$ 29.000	$ 3.600	$ 3.600	$ 2.800	$ 2.800	$ 4.000	$ 1.800	$ 2.600	$ 1.000	$ 1.000	$ 52.200	it includes the % to not get the projects
TOTAL COSTS	$ 94.710	$ 59.950	$ 5.720	$ 5.720	$ 4.290	$ 3.740	$ 5.610	$ 2.640	$ 3.520	$ 1.760	$ 1.760	$ 94.710	it includes risks on costs

Figure 12 -Screenshot costs business case

BENEFITS

Project Benefits	Amount	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total	Estimate Rationale
Project 1													
Revenue	$ 132.000	$ 10.000	$ 10.000	$ 10.000	$ 40.000	$ 30.000	$ 10.000	$ 10.000	$ 10.000	$ -	$ 2.000	$ 132.000	
												$ -	
Total 1	$ 132.000	$ 10.000	$ 10.000	$ 10.000	$ 40.000	$ 30.000	$ 10.000	$ 10.000	$ 10.000	$ -	$ 2.000	$ 132.000	
Project 2													
Revenue	$ 84.000	$ 2.000	$ 2.000	$ 2.000	$ 2.000	$ 20.000	$ 12.000	$ 12.000	$ 10.000	$ 10.000	$ 12.000	$ 84.000	
												$ -	
Total 2	$ 84.000	$ 2.000	$ 2.000	$ 2.000	$ 2.000	$ 20.000	$ 12.000	$ 12.000	$ 10.000	$ 10.000	$ 12.000	$ 84.000	
Project 3													
Revenue	$ -											$ -	
												$ -	
Total 3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Total Project Benefits	$ 199.200	$ 11.600	$ 11.600	$ 11.600	$ 41.600	$ 46.000	$ 19.600	$ 19.600	$ 18.000	$ 8.000	$ 11.600	$ 199.200	it includes the % to not get the projects

Other Benefits	Amount	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total	
Intangible benefit	$ 10.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 10.000	Projet 1 would increase Oceanus Image!
												$ -	
Total Other Benefits	$ 10.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 1.000	$ 10.000	
TOTAL BENEFITS	$ 150.624	$ 9.072	$ 9.072	$ 9.072	$ 30.672	$ 33.840	$ 14.832	$ 14.832	$ 13.680	$ 6.480	$ 9.072	$ 150.624	it includes risks on revenues and VAT

TOTAL PROFIT	$27.957,00	-$25.439,00	$1.676,00	$1.676,00	$13.191,00	$15.050,00	$4.611,00	$6.096,00	$5.080,00	$2.360,00	$3.656,00	$27.957,00	it includes the taxes on the profit
Cumulative Profit		-$25.439,00	-$23.763,00	-$22.087,00	-$8.896,00	$6.154,00	$10.765,00	$16.861,00	$21.941,00	$24.301,00	$27.957,00		

Figure 13 -Screenshot benefits business case

Results

In the last sheet the results become visable.

The indicators are in order of importance:

- The return on investment (ROI) must be above 25% to have a convenient expansion. It shows how convenient an investment is, and how much gain comes from each invested dollar.

- The net present value (NPV) must be a positive value. The higher the NPV is the more added value it will bring to the company. It is important to set some parameters to compute the discounting rate (used to evaluate the future value of money). These parameters are the average interest rate of a U.S. bond and S&P500. The parameter ß is an indicator of the correlation between your investment and the financial market. If not known, it is advised to leave it at 1.5.

- The IRR is an indicator that indicates the interest rate that your investment would have if it were a bond. It is particularly useful when discussing with banks for loans.

- The payback indicates the time when the project will get positive. In other words, it indicates how many years are needed before the project come back to be positive. This is particularly useful for projects that have big investments upfront or on credit (the client is paying later).

Projects

This final sheet is to make further evaluations on a single project. If the expansion plan is about three projects abroad, but the company has the resources just for one, this sheet can help to decide which project is more profitable.

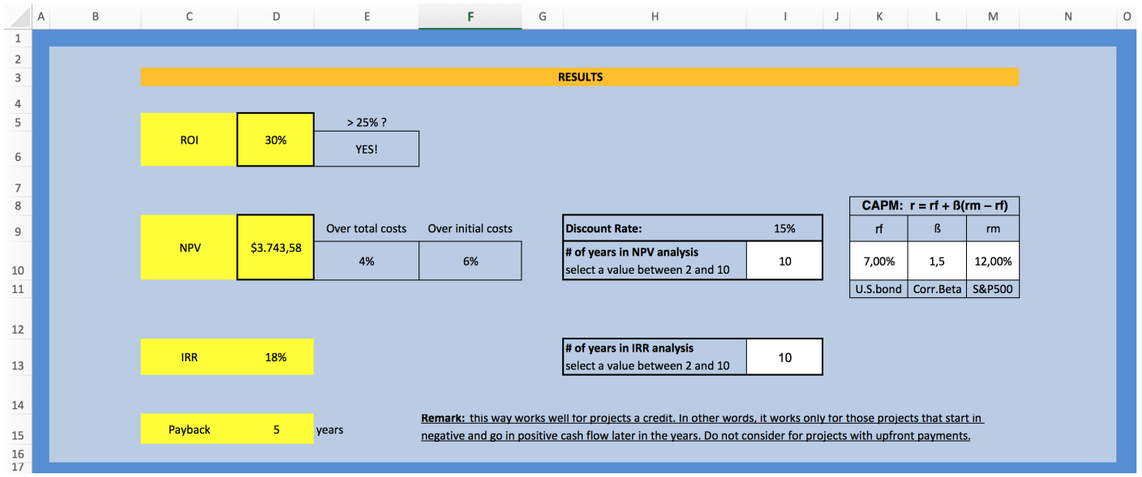


Figure 14 -Screenshot result business case

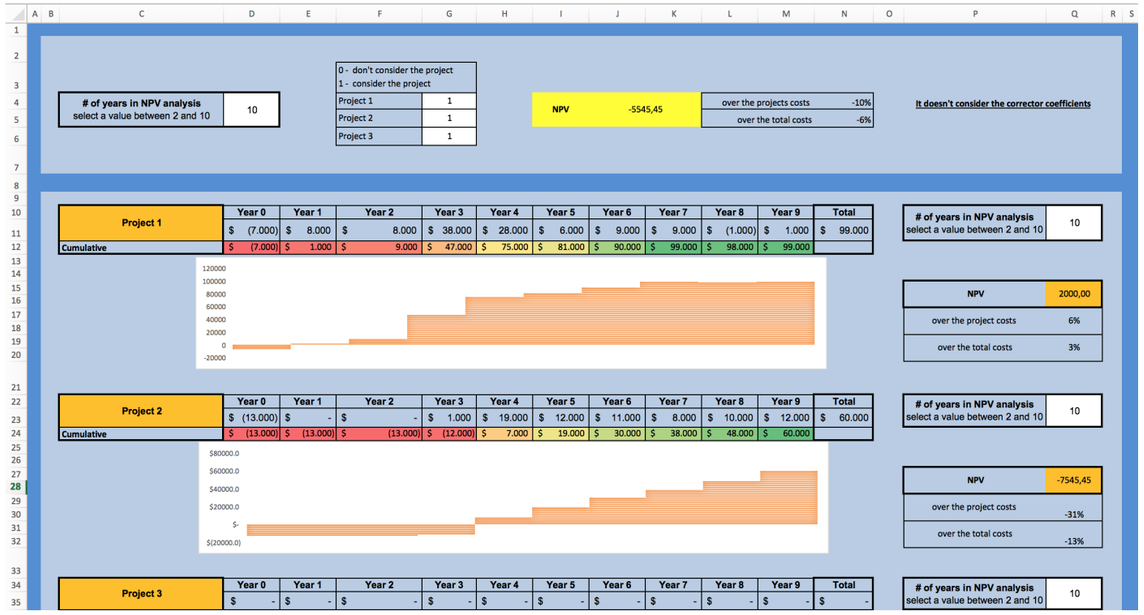


Figure 15 -Screenshot projects business case

3. Market Research

Photo: RN90, KM19, Colombia

The market research supports Oceanus' decision making to determine to which countries it should expand. Each country is evaluated on possible market opportunities for Oceanus, consisting of planned projects by governments (national or regional) and NGO's, targeting coasts, rivers, cities with certain water management problems with the potential to develop as a project. The scope of Oceanus is defined as projects within the current expertise of Oceanus, either in Mexico or Colombia, or projects which are quite similar to the expertise of Oceanus.

This market research should be used as an advice, which countries might be interesting for expansion of Oceanus. However, further in depth research has to be conducted prior to taking a decision on such an expansion. Especially the legal and political situation of a country require additional attention.

3.1 Explanation

Sources

For the market research, exclusively Dutch reports regarding water related problems in South and Latin America were used. Most of the reports are written by the DRR team (the Dutch Risk Reduction team); a team of Dutch experts in water management who are sent to a country to help them with their water related issues.

There are several reasons why the decision is made to use Dutch reports. In the first place for the quality and the reliability of the information. The Dutch are experts on water related issues, and both government and industry take the importance of exporting this expertise at heart. Therefore, these reports are of excellent quality and are very relevant to the expansion of Oceanus. Secondly, as Oceanus aspires to become a Dutch-Mexican company, this information is most relevant for the future of Oceanus to increase the ties with the Dutch industry. The third reason is that there is too much information available to process given the limited time available for this project. Therefore, the decision is made to help Oceanus in analyzing all the Dutch information, which Oceanus did not have access to.

Advice

The most important conclusion drawn from the market research, is that Oceanus should consider expanding to river erosion protection and flood control. Problems with flooded rivers are abundant in South and Latin America during El Niño and other events of extreme precipitation. Typically, the solution to protect the rivers against these floods are very similar or near identical to the methods used by Oceanus for coastal protection. For instance solutions which make use of gabions, dredging, concrete hydraulic structures, groynes etc. Furthermore, the dynamic behavior of a river and the river beds do not differ that much from the dynamics of a sea and the coast.

Furthermore the projects described in the market research are relatively big projects. The projects require a thorough research before the actual construction. Some parts of the projects are simply too big for Oceanus to handle and some fit perfectly in its scope. Accordingly, the second advice would be that Oceanus should expand its network in potential countries in order to win projects and execute these jointly, in collaboration with one of the big partners of Oceanus execute the project.

Photo: CORPAMAG, Santa Marta, Colombia

Argentina

In Argentina, floods are a recurring problem in nearly all regions of Argentina, causing severe problems. Obviously, the safety of the Argentinian people, but also big economical problems, the most important one being for the agriculture sector. Some lands can be flooded for months and the area has to recover for several other months.

The economical damage can rise until more than $US 100 million. Besides bringing problems to the agriculture, the floodings bring cause damage to the infrastructure of Argentina too. Roads can be blocked for weeks, making transport by road impossible. The Dutch Risk Reduction team was brought in to evaluate two big problems in Argentina, the Paso de las Piedras dique and the Rio Salado.

Projects

	Technical	Markets	Economics & Politics
1. Rio Salado	*The construction work that has to be done to the river is not in line with the current activities of Oceanus.*	*The construction project for this river already started 8 years ago and most of the work Oceanus could have done is done.*	*The government of Argentina still invests in this project.*
2. Other rivers	*Also several other regions in Argentina suffer from floods. However, since there is no information available about the solutions to these floods it is hard to say anything about it.*	*Possibly dikes, dredging and reinforcements.*	*The chances are high that if the Rio Salado is a success, the government will start financing these projects.*
3. Coastal erosion	*Unknown*		

National Level

Unfortunately, very little Dutch information about Argentina is available, which hindered conducting the market research. Nevertheless, opportunities for Oceanus might be present, but further research is required. First, the coastal erosion problem in Argentina is unknown to the Dutch water sector, but this does necessarily imply an absence of these problems. If coastal erosion problems do exist, it is likely that projects do or will exist, since the tourism industry of Argentina is significant and the coast of Argentina is one of the biggest tourist attractions.

Technical

+- There might be a possibility to do river erosion protection in one of the rivers besides Rio Salado.

\- The coastal problems are unknown.

\- All the construction work which Oceanus could do for Rio Salado is already done.

Markets

\+ It might be possible that the current services and products of Oceanus can be used for the reinforcements of the other rivers (besides Rio Salado).

\- There are already comparable local competitors active in Argentina

Despite the flood protection measures taken in the Rio Salado, Argentina still suffers from floodings. If the government acknowledges their investments as fruitful, investments in other rivers could be expected.
Furthermore suffers Argentina still from floodings, unless the flood protection of the Rio Salado. If in 2-3 years the government sees that their investment did help, they probably want to invest in the other rivers as well.

Economy

\+ The tourism industry in Argentina is quite big, which increases the chance of possible coastal construction,recovery projects. But further research needs to be done.

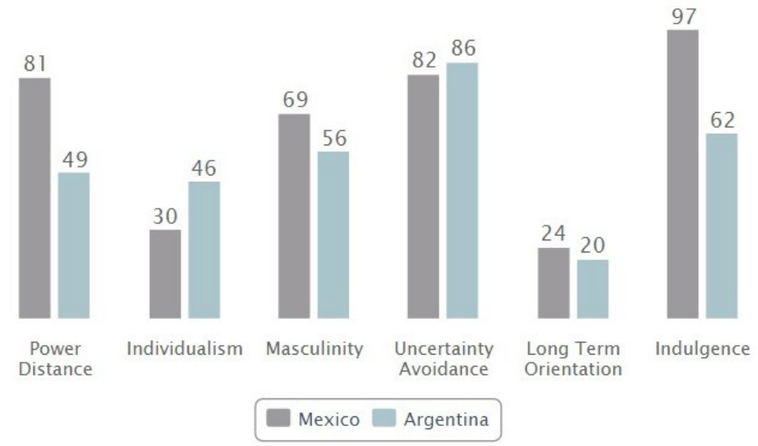
Politics

\+ Argentina tries to work with local companies. So, if Oceanus sets up an Argentinian base in Argentina just as it did in Colombia, there is a high chance of being hired.

\+ The government of Argentina has an active approach in financing projects. This can be seen in the Rio Salado project.

Cultural Level

Mexico in comparison with Argentina



Facts&Figures

4989 km coastline

$55 billion size of tourism 9,3% of GDP

18% import taxes

Colombia

Colombia has two enormous coastlines with a total of 2900 km offshore, approximately 30% of the shore suffers from coastal erosion. Because most of the coastal problems are already known for Oceanus, this market research will elaborate more on the rivers in Colombia. For further information about the coastal problems in Colombia see chapter 4. In the winter of 2010-2011 Colombia suffered from heavy inland floodings. After these floodings a big Dutch research was started for the entire water management sector in Colombia. Besides the possible coastal erosion projects, there are also a lot of interesting river forcefication/protection projects. The responsible departments are the ministry of environment and the national planning department. There are a lot of possible projects in Colombia, however it seems that there is already quite some competition for these projects.

Projects

	Technical	Markets	Economics & Politics
1.River Navigability and protection	*Large integrated river projects to increase the river navigability, flood protection and decrease the riverbed erosion.*	*Big integrated projects with research, dredging, building dikes and hydraulic structures and maintenance.*	*A lot of funds and loans are available for project like these. There are already several companies who are active in this industry. Initiative of the government. Might be challenging due to the fragmented responsibilities.*
2. Water Basin management	*Large integrated water basin projects in order to prevent Colombia from floodings.*	*Dredging, building dikes and dams on large and small scale.*	*Lots of funds and loans are available for water basin management projects. High on political agenda and several projects already identified*
3. Coastal protection/ recovery	*Severe coastal erosion problems along large parts of the coastline due to swell, wind and change in sediment transportation*	*Lots of research building breakwaters, dredging and maintenance.*	*Economically really important for the tourism industry. High on political agenda and several projects already identified.*

National Level

The Colombian government has made several big plans for the entire water management sector in Colombia. Themes include, water pollution, water drainage, river navigability, river flood protection, water basin management, port control and coastal defense. This market research will elaborate more on the rivers, water basins and a in to a certain extent about coastal defence.

Rivers

In Colombia, only 2% of the transportation sector is over water. The government wants to increase this number by a better management of the rivers. It aims to create 5 water highways in the country. To do so, some of the rivers need to be dredged, river beds need to be reinforced and dikes have to be build. For Oceanus this could be an interesting market for their construction services and for selling certain products such as geotextile, steel/plastic gabions and concrete structures. Furthermore the rivers need to be better prepared for floodings, for this problem there is still a lot of research to be done. For flood risk modeling, review chapter 4.

Water basins

Since the heavy floodings in 2010-2011 a better water basin management is high on the agenda of the government. There is already sufficient information available about the problems related to water basements and their management and treatments. The water basin management has been made a priority for the National Planification Department and can be a lucrative market for dredging and hydraulic structures.

Coastal Defence

See appendix IV.

Technical

\+ Colombia suffers a lot from coastal erosion most of the erosion is caused by the swell waves and the steady trade winds.

\+ Lots of sedimentation problems in the rivers causing the rivers to silt.

\- The projects are enormous, Oceanus does not have any experience yet with the construction of projects on such scale.

Markets

\+ A lot of possible research projects either at the coastline either at the rivers.

\+ Building with nature becomes more and more important, so artificial reefs can be good solutions as wave breakers.

\+ Lots of dredging projects in the rivers and on the shores. Dredged material in the rivers Possible market for geotextile fabric. can be used for the shores

\- Already a lot of competition in the dredging and hydraulic structures

Economy

\+ Colombia has a big tourism industry, so the coast is economically valuable.

\+ The Colombian government wants to increase inland transportation by water. To do so first the rivers need to be well managed, resulting in a lot of possible projects

Politics

\+ Almost no entry barriers for foreign companies/investments

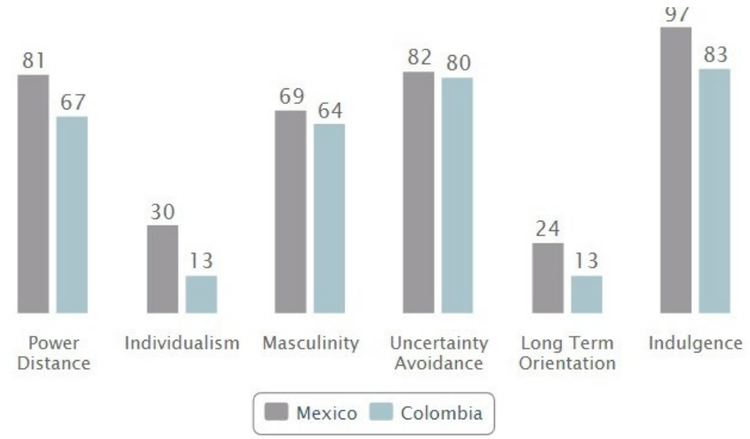
\+ A lot of funds and public investments are available for projects.

\+/- All the projects are public projects, therefor all the projects will be integrated research, construction and maintenance projects. But it makes the whole system slow

\- The responsibilities for managing water resources are fragmented and there is no coherent strategy

Cultural Level

Mexico in comparison with Colombia



Facts&Figures

2900 km coastline 30% coastal erosion

$5.7 billion size of tourism 5,9% of GDP

0-5% * import taxes

31$ average daily salary

Costa Rica

Costa Rica suffers a lot from floodings for various reasons, but primarily because of the floodings of rivers. The floodings of the rivers are caused by poor management of them and due to the lack of responsibility from authorities. Several of the solutions for the reinforcements of the riverbeds or the sedimentation problems in the rivers, are in line with the services of Oceanus. Think of the use of Geo Cylinders, gabions, building groynes, dredging etc. Therefore, Costa Rica might be an interesting country to expand to. Besides the problems with the rivers, Costa Rica also has problems at the coasts. A lot of the problems have to do with the climate change and the subsequent sea level rise. Unfortunately, the available information about this topic is limited.

Projects

	Technical	Markets	Economics & Politics
1.Rivers	*Since most of the Costa Rican rivers are very dynamic, it is hard to manage the rivers. Rivers change their course over different decades. Due to these course changes, dikes might fail after heavy rainfalls if it was designed at a different river course.*	*Gabions (prolypopylene and steel), Geocylinders, dredging, but also services or products that are quite similar to the products and services of Oceanus, like other products made of geotextile, or big concrete structures, building dikes etc.*	*Many different funds for river projects exist. Furthermore, it becomes more common for private investors to invest in governmental projects.*
2. Canals (Tortuguero)	*Most of the things said about the rivers also apply on the canals. But some of the canals suffer more from sedimentation and silting. This gives an interesting opportunity for a maintenance/ dredging contract. Also the canals suffer a lot from erosion.*	*See rivers.*	*The authorities admit that no one takes responsibility for the flooding and protection of canals and rivers.*
3. Coastal erosion	*There are multiple coasts in Costa Rica suffering from severe coastal erosion, for instance in Cahuita, Moin and Puntarenas City. Unfortunately we could not find that much of information about these coasts.*	*Due to the lack of information it is hard to say, but most likely this can be compared to solutions in Mexico or Colombia. Furthermore there are a lot of research opportunities in Costa Rica.*	*The coasts are important for the tourism industry, so since PPP's are common in Costa Rica, private investments should be an opportunity. There is a law, similar to the Mexican situation, which allows local coastal protection plans.*

National Level

In the Netherlands there is a lot of experience with dynamic rivers and its management. As such, a partnership could help Oceanus to obtain the required knowledge. Royal Haskoning DHV, Witteveen+Bos and Boskalis are some important parties involved. The best strategy for Oceanus to set foot on the ground in Costa Rica is to invest in a local network and try to win the bids for the research projects. After the research projects Oceanus should bring in their Dutch partners for the construction part of the projects.

Technical

+ Costa Rica has a lot of erosion, sedimentation and siltation problems. Several of the solutions are in line with the services Oceanus already offers.
- The rivers in Costa Rica are dynamic, ànd must deal with heavy precipitation in a short amount of time. Therefore, the protection of the river beds must be designed more robust than in normal situations, which requires more technical expertise.

Markets

+ Geo Cylinders, groynes, dredging, other geotextile products, gabions etc.
- Most of the markets involves the management of protection or reinforcements of rivers. Oceanus will be able to do a lot of it but it has to present itself as a company with knowledge and expertise in the river industry as well.

Economy

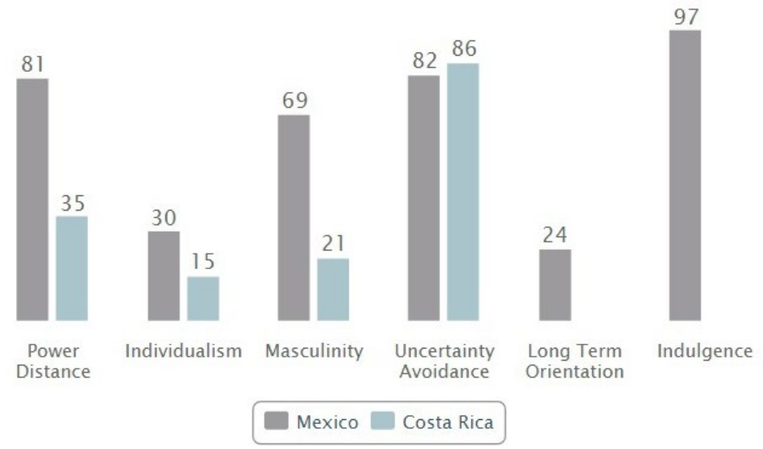
+ The tourism industry is quite big in Costa Rica
+ Several funds are available for direct public investments. Thereby PPP's are getting more and more common in Costa Rica.

Politics

+ The authorities see more importance in investing in flooding solutions. They acknowledge that the costs of preventing the floodings are less than the costs for restoring the damage. There is no clear political structure in the responsibility (e.g. financial) for projects, hindering the possibilities for collaboration with each other.
- There is no good political structure in the sense that it is unclear who is responsible for the projects, who should pay for them and which departments have to collaborate with each other.

Cultural Level

Mexico in comparison with Costa Rica.



Facts&Figures

1466 km coastline

$2.8 billion size of tourism 8,5% of GDP

0-9% * import taxes

20$ average daily salary

Ecuador

Ecuador has two interesting opportunities for Oceanus. First of all there is the Western coast of Jambeli Island, which suffers from severe coastal erosion. This erosion is a big problem for Jambeli Island and the inhabitants of the island are extremely concerned, since several of them already lost their houses. The whole project will probably stretch along 10 km of the shore.

In the city Guayaquil floods occur often and are caused by sedimentation of the outfalls, and floods from the river Daule and salt water coming into the city through tidal inlets. This project could be interesting for Oceanus, because a lot of dredging is involved as possible temporary barriers which could block the tidal inlet during high tide. A Dutch partnership with the city of Rotterdam would be a great support in this case.

Finally if the Jambeli project has worked out as a success, the Ecuadorian government could be motivated to do more projects to protect the coast from coastal erosion.

Projects

	Technical	*Markets*	*Economics & Politics*
1.Jambeli Island	*Matches previous project in Mexico, but than on a bigger scale.*	*Great potential for artificial reefs.*	*Private investors are willing to invest in tourism industry.*
2. Guayaquil, Flooding protection	*New challenges for Oceanus, but with good Dutch partnerships and advice it is feasible*	*Dredging is a big part of the project, so this could be interesting for the partnership between Oceanus and Dutch dredging fir*	*Project has a lot of overlap with the projects done in Rotterdam, meeting with Mayor Aboutaleb from Rotterdam should be a good start. The main stakeholder in Ecuador will be the National Water Authority.*
3. Shore of Ecuador as a whole	*The other project at the shore of Ecuador will probably show similarities of the project of Jambeli Island.*		*First the Jambeli projects needs to be a success but then the government/private companies could be motivated to invest in projects over the whole shore of Ecuador*

National Level

In Ecuador, limited public funding is available for coastal protection projects. Nevertheless, they are aware of the fact that the costs of restoring damage are higher than investing in preventive measures. However, for Jambeli and Guayaquil, there are one or two funds available. If those projects become a success it might be possible that the government will reserve more money for coastal protection.

Given that the government of Ecuador opened the door for private investors to invest in the public investments, the Ecuadorian market starts to look more promising. Since there is a stable growth in the tourism industry it is expected that private investors want to invest in attractive sustainable beach projects, as they already do in Mexico.

At this moment, the biggest challenge for the protection of coastal erosion on a national level is the lack of collaboration between several national departments.

Technical

\+ The coastal protection projects probably match the expertise of Oceanus in Colombia for the research and in Mexico for the construction.

Markets

\+ Dredging, coastal protection for Jambeli making use of artificial reefs and building with nature.

Economy

\+ The tourism industry in Ecuador is growing with a stable rate, so beach protection becomes more and more important

Politics

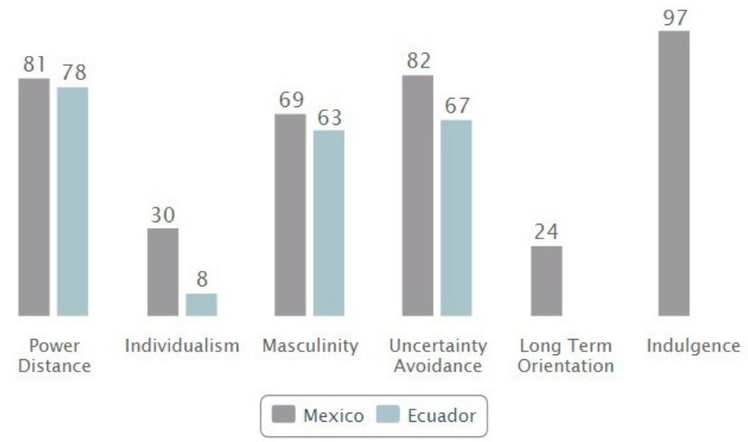
\+ A new law was adopted regarding direct public financing. This law introduced a number of tax benefits and regulatory safeguards for private investors and project developers.

\+ The world bank gave a loan of US$ 150 million for the Risk Mitigation and Emergency Recovery Project. The national government has contributed another US$18 million. The ministry of Finance is in charge of coordination.

\+ The government of Ecuador becomes more aware about their coastal and flooding problems and knows they have to take action to protect the country in the near future.

Cultural Level

Mexico in comparison with Ecuador.



Facts&Figures

2337 km coastline

$5,6 billion size of tourism 5,5% of GDP

7,6% import taxes

Mexico

Mexico suffers from severe coastal erosion along the shores of the Gulf of Mexico and especially in the Yucatan region. In Mexico it is sometimes unclear who is responsible for the protection/restoration of the beaches, the government or privates who own a residence at the beach. Due to this ambiguity, there are beaches where no action is taken or only local action which might harm neighboring beaches. Fortunately the Mexican government takes more and more responsibility and makes more sustainable and environmentally laws for the beach protection/creation.

Besides the coastal erosion problems, Mexico also suffers from floods of rivers. Due to the increased sedimentation in the rivers Mescalapa, Samaria and Carrizal, these rivers tend to flood much quicker, besides that the increased sedimentation is causing problems by blocking some water inlets critical for drinking water.

Projects

	Technical	Markets	Economics & Politics
1.Beach recovery/ protection/ creation small/middle level	*Natural Coastal Erosion but also due to human intervention(building ports, changing rivers, cutting mangroves)*	*This is the key business of Oceanus Mexico. Perfectly within their expertise and experience*	*Positive prospects for this projects. Stabile growing tourism industry and the main clients for these projects are hotels and resorts. The government is changing their way of giving permits. They become more aware about sustainability and integrated solutions. This might be a threat for these projects.*
2. Beach recovery/ protection/ creation big level	*Natural Coastal Erosion but also due to human intervention (building ports, changing rivers, cutting mangroves)*	*Oceanus does not have the resources nor the experience to do these projects. However, Boskalis does and has a partnership with Oceanus.*	*These projects either have to be financed by the government, PPP's or by a chain of private investors. Since the tourism industry is steadily growing these investment should be feasible, but it requires a lot of time and effort. Since the government becomes more aware about the importance of integral and sustainable beach recovery/ protection solutions, they support these projects more.*
3. Flood Protection/	*Increased sedimentation in the rivers Mescalapa, Samaria and Carrizal cause floods and block drinking water inlets. The increased sedimentation causes are unknown but explanations could be volcano eruptions or mangrove deforestation.*	*The solutions need hydraulic structures which are familiar for Oceanus. Probably a lot of dredging is involved. The research might be different than the research Oceanus is used to but a possibility could be hiring a river engineer*	*Conagua is the national state authority for rivers. So they should be responsible for the financing of these projects. No information was found if Conagua has enough money or funds available to finance these projects. Further research needs to be done to this topic.*

National Level

The Mexican government is changing its approach with respect to coastal protection. First small permits were given relatively easily to small and middle sized coastal defence projects. Now the government becomes more and more aware about the importance of integrated solutions and the building with nature principle. Conagua which has the responsibility about all the national waters is in a good relationship with the dutch water management sector. During a trip to the Netherlands Conagua saw dutch solutions to their water problems, like the Sand Engine, the Delta Werken etc. Also a team of dutch experts visited Mexico to give advise to Conagua about their problems. This collaboration seemed to have opened the eyes of the Mexican Government. The Sand Engine for instance could be a solution for the problems in the Gulf of Mexico. Oceanus should follow this trend, building with nature and sustainable integrated projects should be their image in Mexico. This will help Oceanus to get permits for all the projects more easily and to be more credible for big project bids. For more advice on Building with Nature and integrated beach recovery projects please be referred to the technical report (chapter 4).

Technical

\+ Oceanus is of course specialised in the small and middle coastal protection and beach creation projects

\+ For the bigger projects, Oceanus has the partnership with Boskalis

\+ The river sedimentation/flood protection projects, might bring new challenges for Oceanus but there are a lot of similarities

\-

Markets

\+ All the services and products of Oceanus are designed for the Mexican market

Economy

\+ Since it is possible for private parties to protect their own beach there are a lot of small and middle sized coastal projects for Oceanus. The tourist industry is really big and hotels are eager to safe/protect/ reconstruct their beaches.

\+ The projects in Mexico are relatively cheap and affordable for private investors.

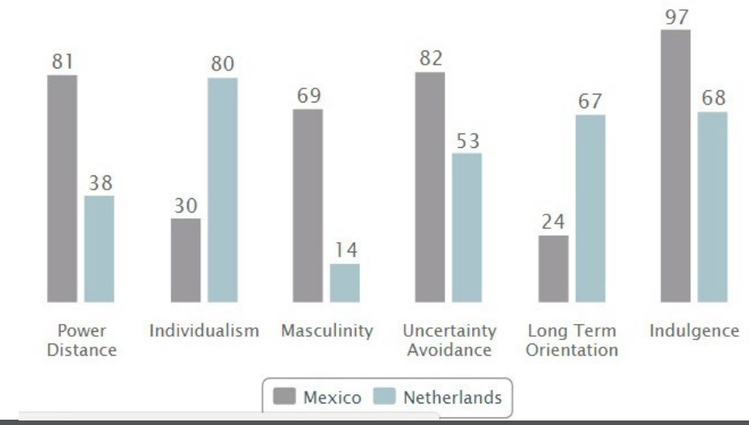
Politics

\+ The government wants to focus more on Building with Nature. The sand engine could be a solution for the coastal problems in the Gulf of Mexico.

\- Due to the awareness of environmental friendly solutions, getting permits can become harder and might take longer than before or in other South/Latin American countries.

Cultural Level

Mexico in comparison with the Netherlands.



Facts&Figures

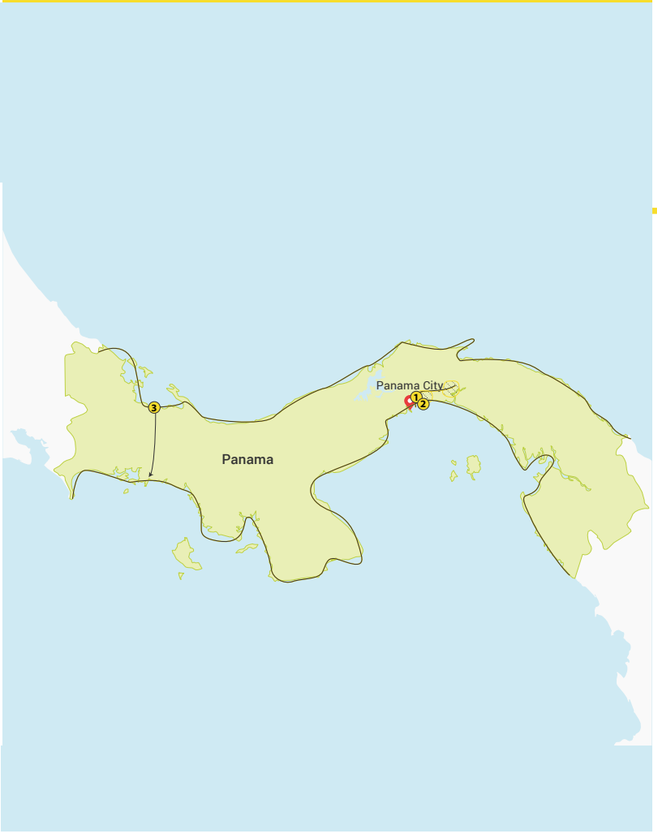
9330 km coastline

$13.3 billion size of tourism

10% import taxes

15$ average daily salary

Panama



In Panama, river related opportunities are present in the rivers Juan Diaz, Tocumen and Pacora. Due to several reasons these rivers tend to flood more often than before, causing significant problems for the urban regions within their river basins.

Estimations say that between 1990 and 2009 over 45.000 people were affected by these floods. Unfortunately, there is no single solution to protect these people for the floods. An integrated solution using riverbed protection, dredging, urban management and even garbage management is needed to ensure the safety of the people. In this solution, Oceanus can play a role.

Furthermore there are also problems and the coast of the Panama bay. Due to deforestation of the mangroves and increased urbanization there is more and more coastal erosion. Furthermore the predicted sea level rise can be a great danger for Panama as a whole, but Panama city in specific. Further research is required to check whether this can bring some interesting opportunities for Oceanus.

Projects

	Technical	Markets	Economics & Politics
1.Rivers/ catchments (Juan Diaz, Tocumen and Pacora) Research	*There is insufficient knowledge of the hydrological, hydraulic and morphological functioning of the three catchments. Modeling of the catchments is necessary.*	*Oceanus can do the research for these rivers if they find the right researcher for it. Just as the Cartagena project in Colombia*	*It is one of the top priorities of the Panama government There is insufficient coordination between all the responsible authorities for a proper integrated river management project.*
2. Rivers/ catchments (Juan Diaz, Tocumen and Pacora) protection	*Lots of the problems are caused by increased urbanisation, which needs a different approach on solving. For example a well functioning drainage, sewer and garbage system.*	*Dredging and hydraulic structures.*	*It is one of the top priorities of the Panamese government There is insufficient coordination between the responsible authorities for a proper integrated river management project.*
3. Coastal protection	*Due to the fact that Panama is relatively flat and a lot of the urban areas are at sea level, the rise of the sea level can be a great danger for these regions*	*Probably other markets than Oceanus has worked with before, like dikes. But with good Dutch partners this can be interesting too.*	*There is insufficient coordination between all the responsible authorities for a proper integrated river management project.*

National Level

In the end we would not recommend to expand to Panama at first. The possible projects are not completely in line with the expertise and experience of previous projects of Oceanus. Furthermore the political system for water management related projects is really complicated and there is no authority which takes the full responsibility.

However, if Oceanus in the future has more experience in integrated river projects Panama can become an interesting opportunity for in a few years. Because Panama has a nice and stable economic growth and invests a lot in infrastructure projects. On the other hand this economic growth makes labour in Panama relatively expensive, making the construction projects a lot more expensive in Panama compared to Mexico.

Technical

\+ Parts of the river projects might be interesting for Oceanus, dredging and riverbed protection.

\- The protection of the coast of Panama is probably of a different kind than Oceanus has its expertise in. Probably a solution with dikes is preferred for Panama.

Markets

\- There is already quite some competition in Panama, furthermore the relationship between Panama and the Dutch government is pretty strong. So if Panama wants to bring in Dutch knowledge they probably make use of this direct link.

Economy

\+ The economy of Panama has shown a growth with an annual average of 8%. This growth is particularly due to public and private investments in large scale infrastructure.

\- Labour is relatively expensive compared with other countries in Latin and South America

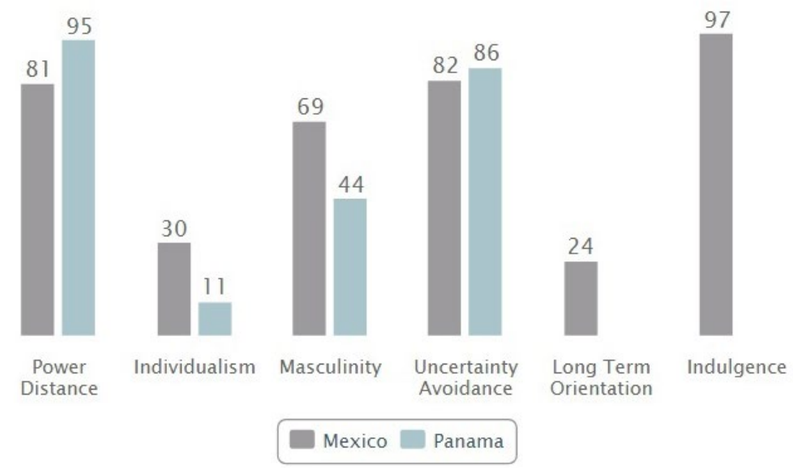
Politics

\+ The government of Panama is urgently seeking solutions to reduce their flood risks.

\- There are many authorities which have responsibilities towards water management issues. Which causes insufficient coordination between the different authorities for big water related projects

Cultural Level

Mexico in comparison with Panama.



Facts&Figures

2490 km coastline

$3,3 billion size of tourism

12% import taxes

Peru

The positive thing about Peru is that it has one of the most advanced general frameworks of public investment in public projects. Private companies are allowed of invest in public projects such as Risk Management projects. In return they receive tax benefits. Furthermore there are several funds available for Climate Finance projects. This is a good positive note about the market of Peru.
On the other hand, during this market research almost no information was found about coastal erosion.

What might be interesting in Peru are the river projects. Peru has a lot of floodings each year and especially during El Niño. Because of bad or even no management of the rivers, this is an increasing problem. Some of the solutions could match the expertise of Oceanus. This could mean that there is a lot of possible work for Oceanus in Peru. Question is if there is enough knowledge about river dynamics/erosion in Oceanus and - if not - if it is worth bringing it in.

Projects

	Technical	Markets	Economics & Politics
1.Rio Huallaga/ piura/chira/ Tumbes	*Groynes and sometimes gabions are being used at this moment to protect the riverbanks from erosion. But due to inefficient placement it makes the situation only worse. Oceanus with the right knowledge could enter this market. Also a lot of dredging is involved in these projects. Most important is that the solution is an integral scientifically proven solution for the whole river.*	*Research, Gabions, Groynes and dredging.*	*The government is more and more aware that the investment for flood protection is smaller than the recovery costs after a flooding. So the government is interested in investing in good scientifically proven solutions for their flooding problems.* *The government made it really easy and profitable for private companies to invest in these public projects.*

National Level

Peru can be a really interesting market for Oceanus, but to set foot in this market, Oceanus has to invest in its knowledge about the dynamics of rivers. In Peru projects will only happen if they are good substantiated. But this means that there are also nice budgets for doing research. So only the research part could be profitable for Oceanus. And with these researches and advices, Oceanus could bring in a lot of construction projects. Nearly all the rivers in Peru need to be managed in a better way, form the begin to the end.

Another positive note for the Peruvian market is that the current operators of hydraulic infrastructures are very diverse and scattered. So the market is still open for a new player with the right knowledge and expertise.

The reports and interviews do not indicate any coastal erosion problems.

Technical

\+ Solution for river problems could match the expertise of Oceanus, Gabions, Groynes, dredging etc.

\- Coastal situation unknown

\- Big parts of the coastline are desert

Markets

\+ In the river projects, they make use of gabions, groynes and dredging.

± No information about coastal erosion yet.

\- Oceanus has little knowledge about river dynamics so far

Economy

\+ The tourism industry grows with an annual rate of almost 25%

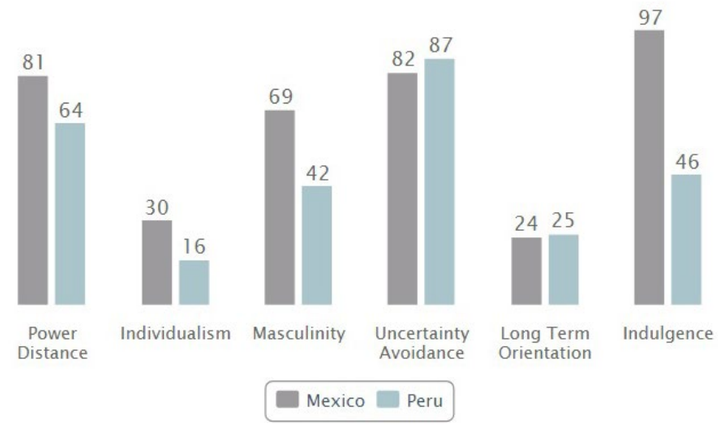
Politics

\+ Good framework for private investors. The government made it really easy and profitable for companies to invest in Risk and Management projects

\+ When you have a good contact in the ANA(Autoridad Nacional de Agua) you can possibly achieve a lot, since the have a lot to say on national and regional level.

Cultural Level

Mexico in comparison with Peru.



Facts&Figures

2500 km coastline

$19 billion size of tourism 9% of GDP

4. Technical Report

Photo: Project site, Puerto Aventuras, Mexico

This chapter discusses some background information on technical aspects related to the expansion of Oceanus International. This mainly concerns the expansion to Colombia, but is also relevant for other possible countries to expand to. The content consists of a summary of important information of the Masterplan Coastal Erosion (4.1), Building with Nature applications in river engineering (4.2 and numerical software products (for simulations and flood protection) available for these aforementioned applications (4.3).

4.1 Masterplan Coastal Erosion

Since 2013, the national government of Colombia has put coastal management high on the agenda and aims to find durable and effective measures based on a comprehensive understanding of the system. It is seeking to find solutions for the coastal erosion problems found along the coasts of the Pacific coast, the Caribbean coast and the Colombian islands. Dutch governments and companies cooperate closely with Colombian partners in this process to carry out advices, based on expertise on coastal engineering, building with nature and coastal zone management. This report is currently under construction and will be finished at the end of September. Besides our attempt to get Oceanus directly in contact with the relevant parties to benefit from this information, this chapter discusses some interim conclusions drawn from reports and interviews, specified for the interest of Oceanus.

Content

Together with the Ministry of Environment (MADS), Invemar, RVO, Deltares and Arcadis, the Masterplan Coastal Erosion is composed. The Masterplan presents an integral solution how to approach coastal engineering matter on a national, regional and local level. Furthermore, it indicates specific locations, which suffer from coastal erosion and a proposal how to solve these in a sustainable manner. The information is presented in a small summary, with information obtained from the Interim report from Deltares, delivered in January 2013 and the papers about sustainable hydraulic engineering through Building with Nature written by Dutch scientists:

- https://www.researchgate.net/publication/268221283
- https://publicwiki.deltares.nl/display/CEC/Home
- https://www.researchgate.net/publication/268221283_Sustainable_hydraulic_engineering_through_Building_with_Nature

The Masterplan is based on two concepts, which will be explained further in this report: Building with Nature and Integrated Coastal Zone Management. Ultimately, the results will be presented for the Colombian government and Dutch water industry respectively. Attending these meetings would be of great added value for Oceanus.

Philosophy
Building with Nature (BwN) is about meeting society's infrastructural demands by starting from the functioning of the natural and societal systems in which this infrastructure is to be realized. This implies not only complying with these systems, but also make optimum use of them while simultaneously creating new opportunities for them. In the end, the goal is to create multidisciplinary solutions, hence creating value for the entire system.
To achieve this, a different way of thinking, acting and interacting is required.

Thinking - Thinking starts from the natural system including its dynamics, functions and services and from the interest of stakeholders.
Acting - The project development process is more collaborative and extends beyond the delivery of solely the engineering object. Natural components need time to develop after the project is delivered. Monitoring and future projections are an integral part of the project. This also provides an opportunity to learn from projects more than traditional projects
Interacting – BwN project development implies more co-creation between experts from different disciplines, problem owners and stakeholders.

A project consists of the following phases. Although in theory a BwN design can be started in any of these phases, experience tells that the (potential) impact is greater when applied in an earlier phase.

Phase 1: Initiation
Phase 2: Planning and Design
Phase 3: Construction
Phase 4: Operation and Maintenance

Each project phase consists of the following design steps.

Step 1: Understand the system (including ecosystem services, values and interests).
Step 2: Identify realistic alternatives that use and/or provide ecosystem services.
Step 3: Evaluate the qualities of each alternative and preselect an integral solution.
Step 4: Fine-tune the selected solution (practical restrictions and governance context)
Step 5: Prepare the solution for implementation in the next project phase.

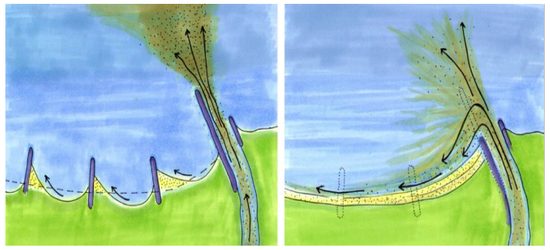
Applicability
Practical experience shows that four parameters span up a range of potential applications: bed slope, hydrodynamic energy, salinity and geoclimatic region (e.g. temperate or tropical), of which the first two are the most important (*Figure 16*).

Themes
For the Dutch engineering industry, the following themes are the most relevant, both for national as well as international use. From the embassy of Lime, under direction of Jurgen Bartelink, number iii and iv have the highest priority. This could also be interpreted as a rough division between coastal engineering (iii) and river engineering (iv).

i. Nature based flood defences
ii. Ecosystem restoration
iii. Sustainable Port Development
iv. Resilient Delta Cities

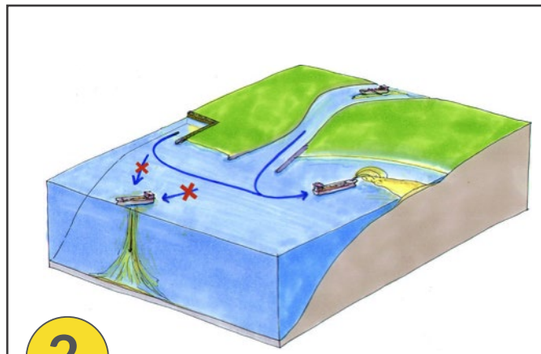
Possible applications in Colombia
From a joint study between Deltares and Invemar, the following nine Building with Nature applications in Colombia were determined, with respect to coastal erosion.

Figure 16 -Range of potential BwN applications along the main axes of given bed slope and hydrodynamic energy. Of course factors like salinity and geo-climatic region also determine potential solutions.



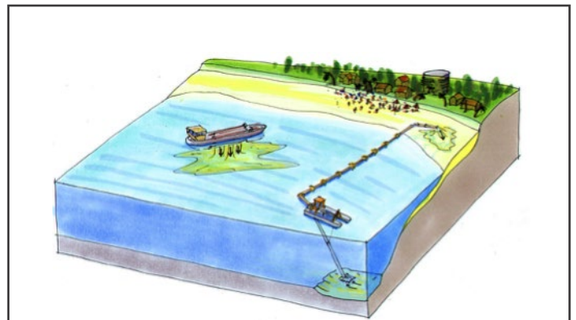
1

Restore natural sediment transport
With the restoration of the natural sediment transport, coastal erosion may be reduced or even reverted to accretion. This can be achieved by the removal of hard structures or alternatively sediment bypassing.



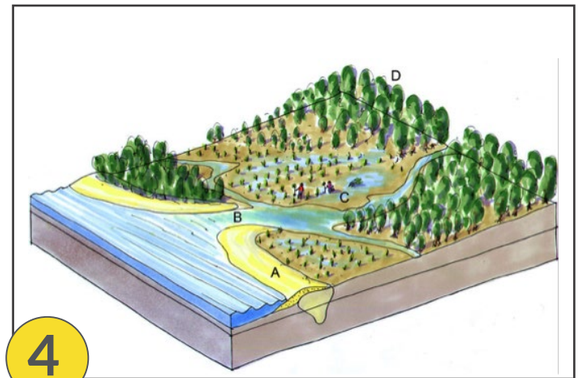
2

Re-use of dredged material
At this moment dredged material is often deposited into the deeper sea, where it does not contribute to the sediment balance of the coastal system. By depositing the dredged material near the coast, it supplies the coastal zone with sediment and reduces wave energy.



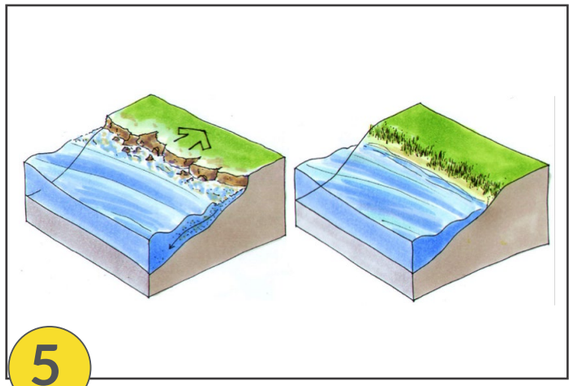
3

Sand nourishment
The sediment balance can be restored by sand nourishments. There is a preference to nourish the shoreface because of efficiency and costs. Sand sources can be found in rivers, the offshore sea bed or inland sandstone quarries.



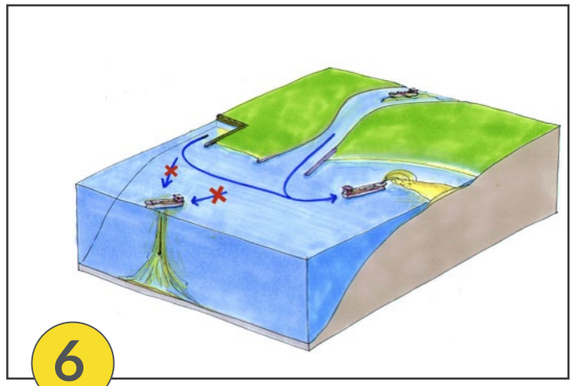
4

Mangrove rehabilitation
Mangroves are very effective in harnessing biodiversity and stabilizing (fine) sediments in the coast. They are important for fisheries, are a socio-economic valuable resource and contribute to carbon sequestration. Often mangroves are being destroyed to make space for infrastructure. In sheltered areas, clearing mangroves can change the salinity to unfavorable for mangroves. In exposed areas, loss of mangroves can be due to an initial loss of the sand barrier, sediment shortage, weakening of the barrier due to initial mangrove destruction or a combination of these processes. Rehabilitation is complex, but can be done by restoring the sand barrier and its sediment transport mechanisms (A), restoring the hydrology and salinity conditions through the exchange between river and sea (B), recreating tidal creeks (C) and replanting (D).



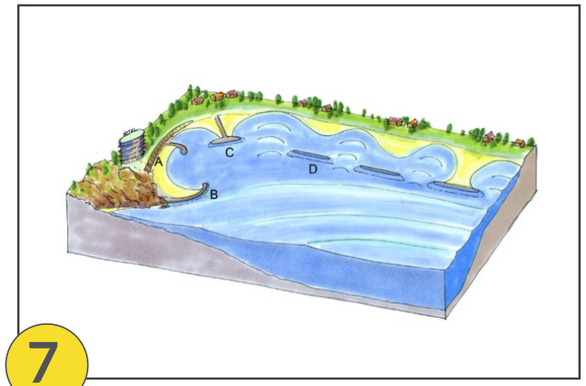
5

Re-shaping cliffs
Dissipating wave energy in a very small area, vertical cliffs can lead to wave-induced erosion (e.g. 1 m/year around the Cordoba coast). Reshaping the cliff down to tilt angle of less than 15° can help to gradually dissipate wave energy. This only works for relatively low cliffs (1-3 m). Also, the cliff should be covered with vegetation.



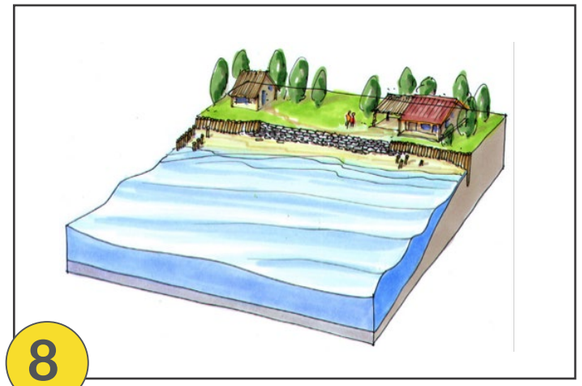
6

Development of coral reefs
Coral reefs have a very high biodiversity, provide shelter to fish, are attractive for divers and help dissipating wave energy. They can also provide the conditions for mangroves to exist. On several places along the Colombian coastline, coral reefs used to exist but have been destroyed by different causes. They can be restored by placement of hard structures (like wrecks) on the sea bottom. It will however take very long before it will contribute to wave dissipation, but other functions (ecological, tourism and fisheries promotion) can develop faster.



7

Smart use of hard structures
Along the Colombian coast, many hard structures, such as breakwaters or groins are found. An important setback is that accretion in this case leads to sediment starvation further downdrift. However, sometimes for various reasons hard structures can be a favorable solution.



8

Small scale protection measures
Many small scale solutions are found along the Colombian coast, which have a very local and short term effect. These solutions are not favorable, as they only serve to prevent the consequences of coastal erosion (high water) but do not mitigate the causes of erosion.

Integrated Coastal Zone Management (ICZM)

The second pillar of the Masterplan Coastal Erosion consists of applying integrated coastal zone management to regulate and coordinate the coastal zone and the subsequent human activities taking place. Although this section might be detailed at times, the Masterplan will focus on applying ICZM as well. Therefore, this information is meant to serve as background information to understand how projects or strategies will be organized on a political and decision-making level. Perhaps, Oceanus can also benefit from this knowledge for future strategic/ governance projects.
With the Masterplan, an advice is carried out to the Colombian government to have a national responsible party defining the long-term strategy of the coastlines, applied to three locations: the Caribbean, the Pacific Ocean and the Colombian islands. The responsible party will most likely be MADS, but this cannot be confirmed officially yet. This party will be responsible for the long-term strategy as well as the steps necessary to reach these goals. This party will however not act individually, but cooperatively with all relevant stakeholders. This goes according to ICZM.

Why ICZM?
Worldwide, the transition between the oceans and the earth's land surface – i.e. the coastal zone – is an important boundary, where the majority of the world's population lives and the majority of the world's marine life starts. The coastal problems that we are encountering now have often resulted from the unsustainable use and unrestricted development of coastal areas and resources. In the decades to come, climate change, population growth, contaminant accumulation, erosion, habitat and natural resource decline will further stress the coastal zone. The world's coastal zones thus face a multifaceted challenge, which will become apparent over various timescales (i.e. decades up to a century or two).

What is ICZM
To deal with these problems, the IPCC established the Coastal Zone Management Subgroup and organized the World Coast Conference – WCC'93, who defined ICZM as follows.

Integrated Coastal Zone Management (ICZM) involves the comprehensive assessment setting of objectives, planning and management of coastal systems and resources, taking into account traditional, cultural and historical perspectives and conflicting interests and uses; it is a continuous and evolutionary process for achieving sustainable development.

ICZM, the realm of politicians and decision makers, should not be confused with:

- Coastline management: a mainly technical type of management to keep the coastline in a good shape. This can be done by hydraulic structures, nourishments, but also by measures to allow a controlled retreat. This is the realm of the engineer.
- Coastal strip management: the legal and institutional management of the coastal area. Building permits, etc. belong to this domain. This is the realm of the lawyer and the administrator.

The coastal zone can be seen as the playing field for many social and economic developments and resulting conflicts of interest. The boundaries of the coastal zone can be defined by various points of view, such as the morpho dynamic, legal and biological. Combining these, a practical coastal zone exists extending from (i) where the land-connected marine life (including coral reefs) can be observed, (ii) coastal fishery is carried out (daily on small boats) and (iii) waves and seabed interact (closure depth). Coastal engineering itself plays only a limited role since the boundary conditions for any works seem to be dominated by economic, political and legal considerations.

The coastal zone under pressure?
For various reasons, which will be explained, the coastal zone experiences an increasing pressure. The growth of the world population is an important contributor, since not only in absolute numbers, but also in the percentage of the world population the coastal population is ever increasing. It also appears that the natural resources of the coastal zone are not sufficient to cope with the growing demand. The rich resources of the coastal zone are being rapidly depleted which endangers the sustainability of the unique ecosystem both on land and in the water. In order to safeguard the sustainability of the coastal zone the only remedy is to include the interests of the ecosystem in the spatial planning considerations. This is coastal zone management. Sustainability is defined as the possibility for future generations to use the resources to the same extent as we have been using them to date.

Furthermore, climate change and sea-level rise contribute to additional pressures of this zone. Besides the predicted sea-level rise, extraction of groundwater (for drinking water or drainage) in the coastal zone causes further land subsidence, hence supports the relative sea level rise. Moreover, river discharges could intensify and storm surges could increase.

The emission of greenhouse gases is only one of the type of pollutions. Industrial wastes, such as heavy metals, polychlorinated hydrocarbons and nuclear waste material discharged into open waters cause serious contamination. Even though legislation and restriction limits this more and more, it does not always solve the problem of contaminated sediment, which requires special cleaning operations and deposit locations (e.g. the Slufter in the Netherlands).

All the aforementioned aspects, come together in the socio-economic system. Human well-being depends directly or indirectly on the environmental conditions in the broadest sense, making the problem very complex. The following table illustrates the functions and consequences further. Furthermore, over time our priorities of the coastal zone have changed.

What does it do?

- ICZM can provide for coastal societies an opportunity to move towards sustainable development. Integrated management of conflicting uses and activities is essential for this goal.
- CZM enables current and future interests in coastal areas and resources to be taken into account. Through the consideration of short-, medium and long-term interests, ICZM can stimulate economic development of coastal areas and resources, while reducing the degradation of their natural systems. Given the inherent uncertainty of the future, including rates of climate change, ICZM can provide a framework within which flexible response to deal with this uncertainty can be developed.
- CZM can provide coastal states with a process to enhance economic development and improve the quality of life.

How does it work?
The comprehensive list of elements of a ICZM has been listed in the conference statement of WCC'93. A national ICZM programme should facilitate integrated decision making through a continuous and evolutionary process for cooperation and coordination among sectors (versus sectoral based management). ICZM results in the integration of

- The responsibilities of agencies at different governmental levels ('vertical integration')
- The responsibilities of different governmental sectors ('horizontal integration')
- The responsibilities of government and local groups
- Policies across sectors of the economy
- Economic, technical/scientific and legal approaches to coastal problems
- A basic element of an ICZM programme is the arrangement of management responsibilities. Management arrangements comprise institutional arrangements and management instruments. Institutional arrangements provide the framework within which the management tasks are carried out and the management instruments applied. This framework encompasses:
- The structure of government and non-governmental organizations including the mechanisms for linking responsible agencies and organizations
- The set of laws, conventions, decrees and standards for environmental quality
- The set of traditions and social norms such as customary laws

Each of the responsible agencies has a set of management instruments in the form of structural, regulatory and incentive-based measures. These instruments need to be supported by legislation or other types of authorization. Examples of structural measures are beach nourishment, protection infrastructure, and land use plans; examples of regulatory measures are licences and fines; and examples of incentive based measures are tradable permits, taxes and subsidies. Decision making under uncertainty can be facilitated by formal and consistent evaluations, incorporating cost-benefit analyses, resource and land use and environmental impact analyses.
Although there is no set recipe for ICZM, the following aspects are necessary to include:

- Initial leadership
- Institutional arrangements
- Technical capacity
- Management instruments

The time frame that a ICZM plan describes should be extended beyond the typical 5 years. ICZM can form a bridge between the two different time scales (short and long term), hence making sure that even short term goals can contribute to the long term solution. It may thus

provide an effective framework for long-term strategies that would not normally be justified given current discount rates.

Possible applications for Oceanus

Based on the content of the Masterplan Coastal Erosion Colombia and its focus on Building with Nature and Integrated Coastal Zone Management, we indicate the following opportunities for Oceanus in Colombia.

L ocal network
The concept of co-creation and cooperation between companies, governments, experts and local citizens is an integral part of the Masterplan. Considering the expertise of local networks in Mexico and the current presence in Colombia, we indicate an opportunity to take an active role in bringing these parties together in the Colombian coastal engineering market. The Netherlands Enterprise Agency confirms that Dutch companies experience a significant cultural barrier significant, especially with governmental projects. Therefore, they recommend a b-to-b strategy for Dutch companies doing business in Colombia. Oceanus International would be a convenient partner to bring these groups together. Strenghts: political network, cultural knowledge, contact with foreign companies (experts)

Artifical Coral Reefs
In the preliminary studies, the relevance of preserving coral reefs is stated several times. Coral reefs have a variety of functions. They have a very high biodiversity, provide a shelter to fish and are attractive for divers. Moreover, they can dissipate wave energy, reducing coastal erosion rates and allow for instance mangrove forests to exist.

On the long term (i.e. 100-1000 years) coral reefs could be restored and thus contributing to an effective natural coastal protection. This process can be enhanced by using hard structures, such as artificial coral reefs and fish shelters. Although the erosion reduction is a long term goal, on the short term these methods can contribute to stimulate ecology, fishery and tourism.

The preliminary studies indicate opportunities near Cordoba. Possibly more opportunities are mentioned in the final version of the Masterplan.

Technical studies
The Building with Nature method requires a thorough understanding of the system. Therefore, in every phase of the project, there is a need for engineers and technical studies, for instance for an engineering masterplan, a detailed design or maintenance and monitoring of existing systems. Oceanus already makes use of the same engineering expertise and could relatively easily apply this to the Colombian market.

Spatial planning
Due to economic developments, the urban environment along coasts is expanding rapidly. Coastlines however, are retreating because of poor sediment management and climate change. This is called the coastal squeeze. An effective measure is defining setback lines, which means a minimum distance from the shoreline prohibited for new building or infrastructure. ICZM can deal with this strategy in an effective way (see *Figure 17*).

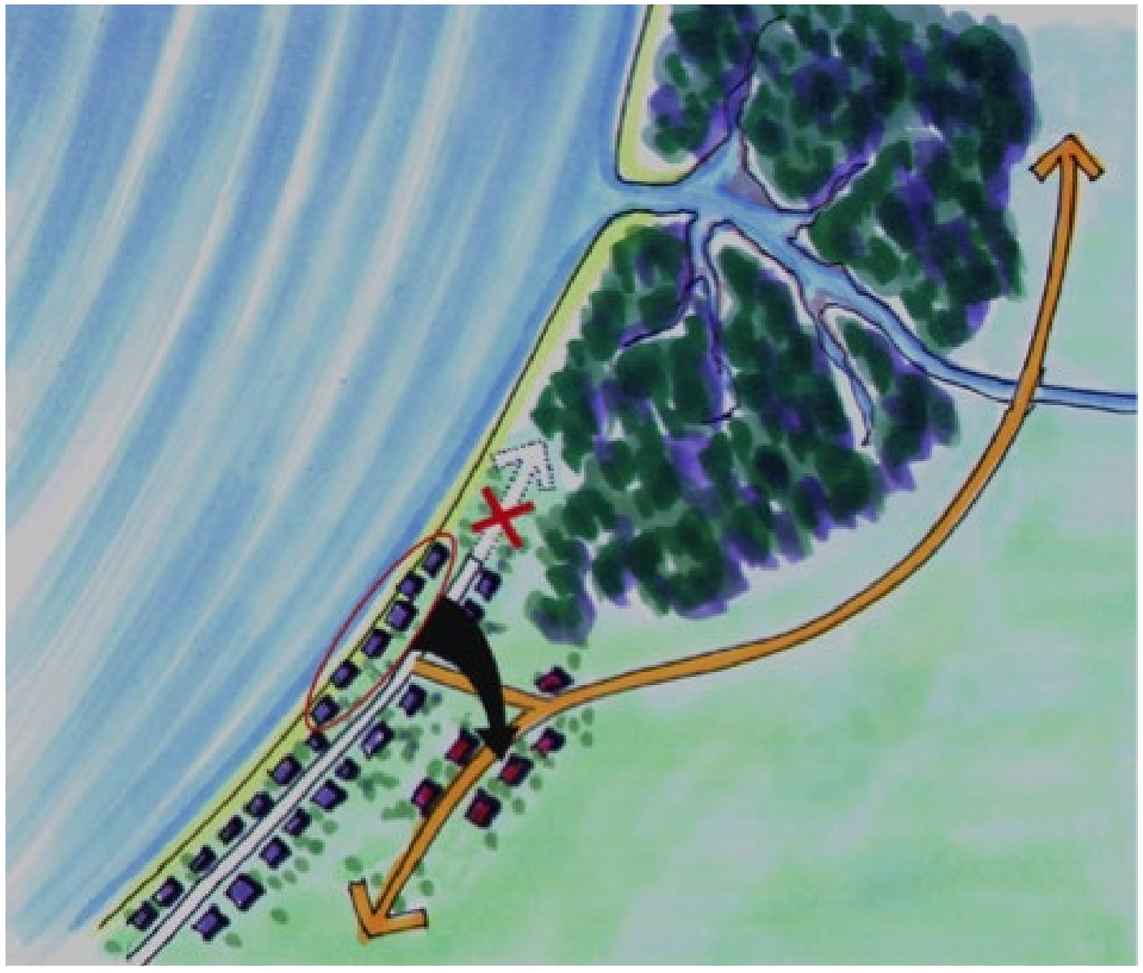


Figure 17 - Building with nature solution: spatial planning

4.2 Building with Nature

Since the market research discusses several opportunities for rivers, this section discusses some applications of Building with Nature solutions in river engineering. The following paragraph shows such an application of a program ´room for the river´, which is a masterplan to manage the rivers in the Netherlands.

Cyclic Floodplain Rejuvenation

Along rivers, floodplains are an attractive area to for developments. Therefore, this area has been used intensively in the past centuries. Traditional river management is almost exclusively based on building dikes along the river to claim the floodplain as permanent land. However, limiting the floodplains of a river results in a reduced storage capacity, flood waves (which are the most dangerous ones) become higher and proceed faster. Furthermore, it increases the hydrodynamic load of flood defenses, which leaves less time for evacuation measures. Due to increasing rain and melting water, rivers convey larger amounts of water. Raising the dikes often does not sufficiently solve the problem of dealing with peak flows. Therefore, nowadays river management is increasingly refraining from these 'hard' measures of building dikes. The BwN approach focuses more on the cause of the problem: the lack of storage capacity. This is solved by give more room for the river, i.e. restoring the floodplains to increase their conveyance capacity.

The restoration of floodplains contributes to nature rehabilitation as well as flood safety. Natural growth of floodplain vegetation increases the hydraulic roughness and the sedimentation rate of the floodplains. Therefore, an interesting mix of vegetation, hydraulics, sediment transport and geomorphology can be created. This roughness (Nikuradse roughnes k (m)) is a function of the height of the grassed floodplains. However, one problem still sustains: as long as the rivers are confined by dikes, vegetation will have a tendency to develop towards older stages. Natural processes to remove the older vegetation, such as erosion or ice scour will not occur anymore, thus an ongoing sedimentation

The dilemma between flood protection and nature rehabilitation can be solved by applying Cyclic Floodplain Rejuvenation (CFR) and consists of the recurrent removal of vegetation and/or sediment (see *Figure 18).* Introducing large herbivores slows down the vegetation succession, but floodplain vegetation may still form the bottleneck for flood protection.

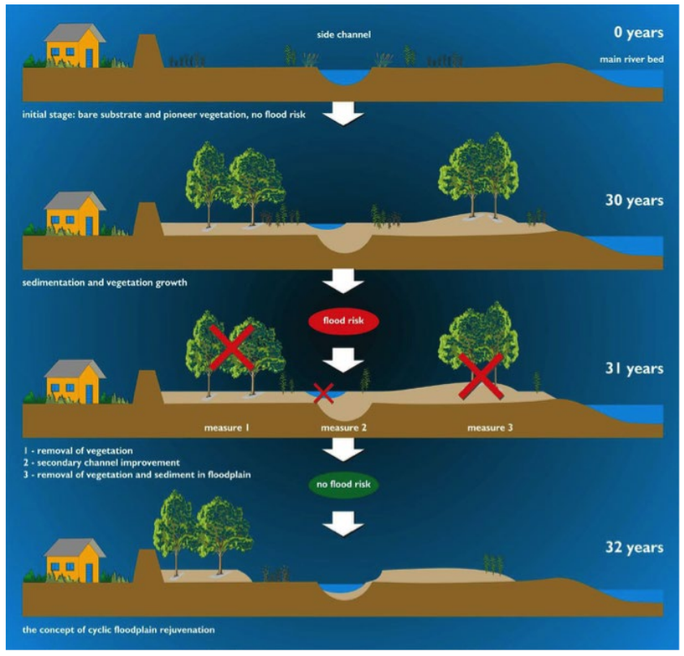
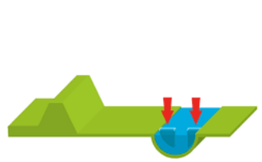


Figure 18 - Cyclic Floodplain Rejuvenation

Room for the River

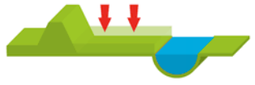
The possible interventions that are part of the Room for the River Program are the following:



1. Lowering groins and longitudinal trailing dams

2. Lowering summer bed

3. Increasing water storage



4. Lowering floodplains

5. Depoldering

6. Removing obstacles

7. Flood trench

8. Dike relocation

9. Dike improvement

More information about the room for the river program can be found on

- https://www.ruimtevoorderivier.nl/english/

4.3 Modelling & Flood safety

To simulate flow patterns of water and sediment, numerous models exist. In some cases, relatively simple 1D models are sufficient, whereas more complex situations can be solved by 3D modeling. In these more complex situations several (subjective) choices must be made about which physical processes need to be considered. To deal with this complexity, the shallow water equations are an important part, as many (nearshore) processes can be described by these equations. These equations consist of two conservation laws: mass and momentum. This section will not describe the physical background in more detail, but more the application and limitations of numerical methods.

Discretizing these shallow water equations in space and time creates a horizontal sheet, spanning a calculation grid, consisting of calculation cells. A relation exists between calculation distance and calculation time with accuracy and speed of the calculation. In general, a higher resolution results in an increase in overall calculation time.
For modelling flood risks, this leads to a dilemma, since the computation time forces flood risk models to be dependent on flood scenarios known in advance. Normal computation time simply takes too long (e.g. several hours) for crisis partners to respond in time. The problem is that these scenarios are difficult to predict, hence the applicability is limited.

Methods
Although the mathematical background of the methods is often the same or very similar, the outcome can vary. To give a small example, river simulation models often give an optimization of the waterdepth and flow velocities, whereas for coastline models, cross- or longshore sediment transport patterns are often leading.

1. 3Di
Specifically for flood safety modelling, currently a new model is developed that decreases the computation time significantly. The method that the 3Di method is based on the independence of the spatial resolution of the calculation grid and the spatial resolution of the digital elevation model (which is common for software such as SOBEK or Delft3D). Furthermore, the grid does not have to be uniform, so in locations with little height elevation difference, little variations in the waterdepth are expected (in case of a flooding), allowing larger cells to represent a certain area. This saves the number of cells for which the shallow water equations need to be solved, hence overall computation time. Near important hydraulic structures, dikes or waterways, the resolution can be kept high.

This method is applied in a consortium called 3Di, of which Deltares and the TU Delft are two of the three partners. The goal is to make an instrument not only accessible for engineers, but also for managers. For flood risks, the computational time is the driving force. It should be determined per city, region or country, what the acceptable computational time is. In a flood scenario of the Netherlands, a maximum of 20 minutes (for a 24h flood) was set.

In the national flooding model, three elements were set, of which two must remain constant and one can be changed. This allows users to understand how the flood safety will change or can be mitigated. The details of how these elements influence the flooding event can be found in the Master thesis of Louise Klingen.

- Landscape features
- Type of dike failure
- Water level outside the dike

- http://www.3di.nu/en/international/
- https://repository.tudelft.nl/islandora/object/uuid%3A6aa64233-5a7c-4174-a059-865ca2590e95?collection=education (Dutch)

2. Delft3D
Another product of Deltares is the Delft3D software.
In the Netherlands, this software is widely used, among others because it continuously includes new insight gained by knowledge institutions as TU Delft and Deltares.
It contains a variety of modules for rivers, coasts and ecology and its mathematical computations are relatively fast. Furthermore, a useful helpdesk is at hand. The FLOW module is designed to deliver the water depth and velocities (hence the flow) as an output and is therefore applicable in rivers. For coastlines, an additional WAVE module should be used. The disadvantage is the relative high price (if not used in the open source version). One of the latest version contains a more user-friendly interface and a flexible mesh (grid) option.

- https://oss.deltares.nl/web/delft3d/about;jsessionid=15F6204DC842A585AFC91502CBB0AA4B.v-oss002.dlt.proteon.nl

3. SOBEK
Deltares also delivers a 1D hydraulic tool used to monitor long-term or long-distance effects of certain systems.
SOBEK uses a coupled 1D/2D solver and is a powerful for flood forecasting. There are several modules of SOBEK available, SOBEK Rural, SOBEK - Urban, and SOBEK - River. The River module is entirely 1 - dimensional and can solve for water quality, morphology and sediment transport. Both the Rural and Urban modules link the 1DFLOW element to the 2D Overland Flow Module, however only the Rural module contains a water quality solver.

- http://www.svasek.com/modelling/sobek.html

4. Xbeach
XBeach is a two-dimensional model for wave propagation, long waves and mean flow, sediment transport and morphological changes of the nearshore area, beaches, dunes and backbarrier during storms. It is a public-domain model that has been developed with marjor funding from US and Dutch parties.

5. SWAN
SWAN is a state-of-the-art third-generation wave model which computes random, short-crested wind-generated waves in coastal regions and inland waters. It is fully spectral in frequencies and directions. It is continuously being developed by TU Delft.

- http://www.svasek.com/modelling/swan.html

6. SWASH
SWASH is a general-purpose numerical tool for simulating unsteady, non-hydrostatic, free-surface, rotational flow and transport phenomena in coastal waters as driven by waves, tides, buoyancy and wind forces. It provides a general basis for describing wave transformations from deep water to a beach, port or harbor, complex changes to rapidly varied flows, and density driven flows in coastal seas, estuaries, lakes and rivers.

- http://www.svasek.com/modelling/swash.html

7. WAQUA – TRIWAQ
The system “WAQUA in SIMONA” is used for two- and three-dimensional hydrodynamic and water quality simulation of well-mixed estuaries, coastal seas and rivers. WAQUA in SIMONA contains the fhallow water flow models WAQUA and TRIWAQ, which are intended to solve the shallow water equations in 2D (WAQUA) and 3D (TRIWAQ).

- http://www.svasek.com/modelling/waqua.html

5. Contact List

Photo: Project site, Cartagena, Colombia

The following contact list was made during our project. Most of them were contacted to gather information about possible opportunities for Oceanus in certain countries, to create awareness that Oceanus is bringing in Dutch knowledge, or for any other information.

Appendix

I. Organogram Colombia

II Appendix Ecuador

III. Appendix Costa Rica

IV. Appendix Colombia

V. Appendix Mexico

VI. Appendix Argentina

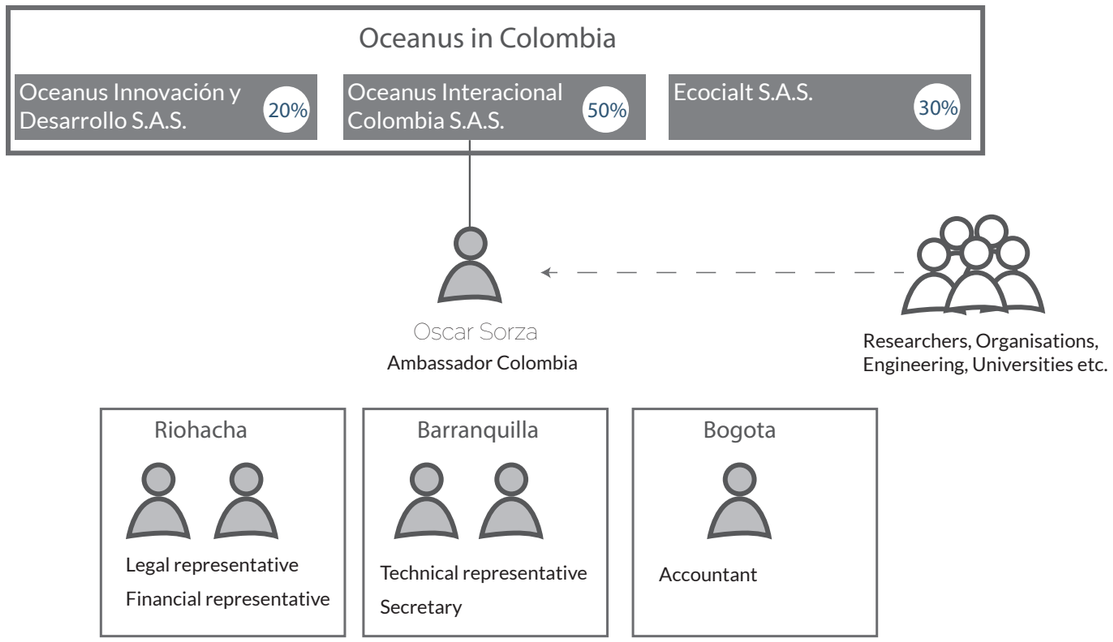
VII. Appendix Peru

VIII. DRR Team

IX. Hofstede Model

1. Organogram Colombia

Structure Oceanus in Colombia



Parteis involved in the Masterplan Colombia

Acronym	Name	Role	Country	Level of participation	Perspective
VP	Vice president	Government (1)	CO	Empowerment	The Vice President of Colombia is elected together with President and has no personal agenda or preferences. The Vice President is important for the project to consider all aspects and make a final political decision.
MT	Ministerio de Transporte	Government (2)	CO	Collaborate	The ministry of Transport aims at developing and improving the transport system that allows the integration of regions, economic growth and social development. Their relation to the Master project is to keep the existing road and future investments safe and provide a long-term solution to maintain and improve connectivity along the Caribbean Coast of Colombia.
MADS	Ministerio de Ambiente y Desarrollo Sostenible	Government (2)	CO	Collaborate	The ministry of Environment and Sustainable Development is a public entity responsible for defining the National Environmental Policy and promote recovery, conservation, protection, planning, management, use and exploitation of renewable natural resources to ensure sustainable development and guarantee the right of all citizens to enjoy and inherit a healthy environment.
ANI	Agencia Nacional de Infraestructura	Government (3)	CO	Collaborate	As part of the ministry of transport ANI is responsible for the concessions for the design, construction and operation of infrastructure. The RN90 is under concession by concesionaro "Ruta del Sol". The erosion is now directly threatening the road and action is required to protect the road and keep a connection by road available between Barranquilla and Santa Marta. This problem initiated the project making ANI an important stakeholder.
PNN	Parques Nacionales Naturales de Colombia	Government (3)	CO	Collaborate	PNN operates on a national level with parks throughout the whole country. It is directly related to MADS. The mission statement of the PNN is: Preserve in situ biodiversity and ecosystem representative of the country, provide and maintain environmental goods and services, protect the cultural heritage and natural habitat where traditional cultures as part of the National Heritage develop and contribute to sustainable human development.
DIMAR	Direccion general Maritima	Government	CO	Consult	DIMAR is a research institute, advising the government on maritime activities. They are responsible for the installation and maintenance of navigational aids, hydrographical surveys and nautical cartography. Together with the navy they coordinate the control of maritime traffic.
INVEMAR	Instituto de Investigaciones Marinas y Costeras	Research	CO	Consult	INVEMAR is a research centre to observe and systematically describe climate, geology, flora and fauna of the region, centred mainly in the Sierra Nevada. Knowledge with regard to ecosystems and the impact of proposed measures is necessary to complete the impact considerations of measures and the evaluation of alternatives. Linked to MADS it has been active in environmental research for both coastal and marine ecosystems.
RVO	Rijksdienst van Ondernemend Nederland	Research	NL	Inform	A governmental research organisation that supports Dutch international entrepreneurs with subsidies, networking, regulations and knowledge transfer.

II. Appendix Ecuador

Regional level

First for both problems, big research projects are needed, Oceanus has already have a lot of experience in these big researches in Colombia and a bit in Mexico. Thereby the funding of both projects should not be the biggest problems because there is already a big fund available to use, according to the DRR report.

Jambeli Island

Since Jambeli wants to invest in the tourism industry and wants to create a sustainable image, it would be a great to use the artificial reefs in this project.

As said before, the situation in Jambeli Island is really critical, some of the citizens already lost their houses and others are afraid that they will lose theirs too. The total shore which suffers the most of the erosion has a length of 10 km. First for Jambeli a morphological study has to be done. Probably Dr. Wang has the right experience to take the lead in this investigation. The investigation can be done using the data from the ESPOL(Escuela Superior Politecna de Litoral, the university of Guyaquil). This data was achieved for a previous study to protect Jambeli Island. A construction project was started to protect the coastline, but due to mistakes during the building period and a lack of finance, the project was cancelled halfway done and made the situation even worse.

The positive thing about the Jambeli Island project is that there are funds available for the project. The WB Ecuador Risk Mitigation and Emergency Recovery Fund (US$150 million), which is a loan from the world bank to Ecuador, can be used for this project. Also if a environmental friendly and sustainable solution is applied to Jambeli Island, the Green Climate Fund can also be used. Besides there might be several private investors interested to invest in the project in order to invest in the future tourism in Jambeli Island.

Guayaquil

Guayaquil suffers from floodings due to several factors, sedimentation of the outfalls, floods from the rio Daule, salt water coming in the city through the ' esteros'(a tidal tunnel which connects the sea to the city) and lack of retention and discharge capacity of the city. The challenge is that to solve this problem a collaboration is needed between all the different departments, which can be a big challenge.
But in Rotterdam we have experience with almost the same problem. So the idea is to set up a meeting with mayor Aboutaleb to Ecuador, because probably without some government to government support it is not very likely that this project will start. To make this happen, Pablo and Maurits need to make this happen. Probably Boskalis will do a big part of the project but Oceanus will receive the fee, set food on the ground in Ecuador and can show to the government where it is able to.
Oceanus could help with the dredging of the river and maybe with the closing of the esteros.

Further coast of Ecuador

If Oceanus succeeds to do one of the two projects above, a bigger market opens up for them. Because of the new law, the government allows investment of private investors in the coastal area. Since the tourism industry will have a stable growth over the next 10 years, this is very likely to happen.
Thereby if Oceanus did a good job in one of the projects above, it is likely that the government wants to invest more in coastal erosion problems in Ecuador.
Further research needs to be done to this part of the market research of Ecuador.

w

1. Jambeli Island

Technical
Matches expertise of Oceanus. The big research part will match the research projects Oceanus has done in Mexico. The construction part of the whole project will probably have some similarities with construction projects completed in Mexico but due to the scale of the project there also might be new techniques involved.

Economy
Jambeli Island wants to invest in the tourism industry, so there might be private investors which are interested to invest in Jambeli Island.

Markets
Artificial reefs would be great if they work for this project. Because of the fact that Jambeli wants to become sustainable, so artificial reefs would be great for their image.
About other products, we are not sure. In Colombia we have heard some negative opinions about for instance Geobags, so a local research has to be done about the image of these products. Furthermore there is probably a lot of dredging involved.

Politics
Jambeli Island can make use of the Risk Mitigation and Emergeny Recovery fund, Furthermore the Government can apply for the Green Climate fund to support this project.

2. Guayaqui, Flooding protectio n

Technical
New challenges for Oceanus, but with good dutch partnerships and advise it is feasible

Economy
A possible visit from for instance Mayor Aboutaleb from Rotterdam to start a collaboration, could be a great start for public and private companies to invest in Guayaquil. Since the city has a lot of similarities with Rotterdam with respect to the water situation.

Markets
Dredging is a big part of the project, so this could be interesting for the partnership between Oceanus and Boskalis. Furthermore there are probably a lot of new markets which can be discovered or can be carried out by Boskalis.

Politics
To make this project successful, there should be a large collaboration between the different departments in Guayaquil. At this moment The main stakeholder for solving the problems in the city is the National Water Authority.

3. Shore Ecuador as a whole

Technical
Hard to say in this early stage. But probably will be the same as with Jambeli Island.

Politics
First the Jambeli projects needs to be a success but then the government/private companies could be motivated to invest in projects over the whole shore of Ecuador

III. Appendix Costa Rica

Regional level

The Costa Rican river market can be a real potential market for Oceanus because most of the solutions are the same as their current services and projects or are quite similar. The only difference might be the research part. The dynamics of coastal and river erosion could be really different from each other. To investigate the similarities and differences between coastal and river behaviour, further research/advice should be done/given by experts.

Rio Chirripo

The river Chirripo or Matina river had a big flooding a few years ago due to the effects of bank erosion at a dike. Because of this flooding, a village and several fruit plantations were flooded. There can be several improvements to the flood defence of this river, for instance the dikes can be placed further away from the river, the slopes of the dikes could be make less steep or they could make use of the dutch system with summer and winter dikes. Furthermore there are several dredging projects along the whole river.

Rio Bananito

The Bananito river is very important for the abstraction of drinking water. The river banks suffer from erosion and need to be protected in such a way that it does not pollute the water.

Canal Tortuguero - Canal Tortuguero is from economical importance because it connects several lagoons. The canal has a big problem with the sedimentation which silts the canal. At this moment every month 20.000 USD is being payed for the dredging of the Canal but they are looking for a more long lasting alternative. Furthermore the canal suffers from erosion and it threats certain buildings along the canal.

Coastal region

With the rising of the sea by climate change a lot of problems are expected at the coastal regions. There is not that much information available so it is really hard to give a good advice on this. One thing which is sure is that Oceanus could do a lot of research to the coastal zones. Furthermore in Costa Rica it is possible for small private investors to get permits for coastal protection projects. So Costa Rica is quite similar to Mexico on this part. A good advice would be for Oceanus to hire a legal consultant for the possibilities in Costa Rica.

IV. Appendix Colombia

Regional level

In this paragraph a few possible interesting projects for Oceanus are being highlighted. For the governmental structure of the water management please see the Colombian Government structure for water management.

Magdalena

There is a big plan for the Cauca basin. It is a big integrated management plan with a total estimated budget of $US 500 million over 12 years. In this plan a lot of dikes and other hydraulic structures have to be build. A lot of dredging has to be done and reinforcements of the river beds have to be applied.

Canal de Dique

Due to the current sedimentation along Canal de Dique in Cartagena the inland water transportation is under pressure. This canal is vital for the economy of Cartagena as for the source of water and nutrients for the neighboring wetlands. Urban planning, dredging and proper canal management is crucial for the future of the canal

Barranquilla

The port of Barranquila suffers a lot from the massive deposition of sediment from the Magdalena river making it difficult to access the port. Besides that the coastal erosion has a devastating impact in landscape and tourism in urban areas like Baranquilla and Puerto Colombia.

Coast of Colombia

There is a collaboration between Arcadis(Dutch Engineering company) and MADS(department of Environment of Colombia). To make a master plan for the coastal protection of all the Colombian coasts. The deadline for this plan is at the end of september and we are trying to get Pablo invited for the presentation in Colombia and Maurits and Wouter for the presentation in The Netherlands.

V. Appendix Mexico

It is difficult to give extra information for the market research on regional level in the country where Oceanus has its core business. The most important advice we could give Oceanus for Mexico is to bring in more Dutch knowledge in the company to do the research and engineering of the projects. This can be achieved by hiring a dutch engineer, or maybe even better bring in Msc. students who want to graduate on a certain project. These students don't need to be paid and are really motivated to deliver an advice at the best of their capabilities.

For the river sector, further research has to be done but this sector also seems really promising for Oceanus in Mexico.

VI. Appendix Argentina

Interviews have to be done with local authorities or experts on the topics of coastal erosion or floods.

VII. Appendix Peru

As said before the ANA has a lot of the saying in the water management projects. They work on National, Regional and Local level. ANA is responsible for:

- ANA provides general rules and the authorisation for the conduction and execution of the management in and around the watercourses but lack capacity and power to control all the activities in and along the rivers/ watersheds.
- ANA is involved only in the evaluation of the projects in pre-investment phase.

VIII. DRR Team

Dutch Risk Reduction Team: reducing the risk of water related disasters

Many countries around the world face severe water threats. Often, these countries are in urgent need of expert advice on how to prevent a disaster or how to recover from a calamity. For instance, when a country has been struck by severe flooding and the first emergency relief workers have gone, the need for advice on how to build a sustainable and safer water future arises. To meet these needs with a swift response, the Dutch government has initiated the Dutch Risk Reduction Team (DRR Team). This team of experts advises governments on how to resolve urgent water issues related to flood risks, water pollution and water supply, to prevent disasters or to rebuild after water related disasters. With climate change and a fast growing world population, water issues are becoming more urgent. As a country renowned for its' expertise on water and delta management, the Netherlands feels a responsibility to share its' knowledge worldwide. That is just what the DRR team does; sharing expertise with governments to come up with the best possible approach/solutions for tackling urgent water issues. Because of the unique cooperation between government and sector, the best experts can be fielded quickly. The Dutch government offers a specific number of advisory missions each year.
Advice for all water issues

The Netherlands has brought its best water experts together in the Dutch Risk Reduction Team. It consists of high level advisors supported by a broad base of technical experts who can provide top quality and tailor made expertise to governments that are confronted with severe and urgent water challenges. The Dutch are experts in adapting to water in a changing world; from delta management to water technology, from urban planning to governance, public private partnerships and financial engineering.

How does the DRR team work?

Governments that have to deal with an urgent water issue are encouraged to contact the Dutch embassy in their region. The embassy will liaise quickly with the Dutch government. Interventions will only take place after a request from a central government has been received by the Dutch government, and after a recent calamity or to prevent a threatening disaster. The DRR team does not focus on emergency relief, but on sustainable solutions. If the decision to respond to the request is made, relevant Dutch experts will be rapidly fielded to the area that is under pressure. Together with the government and local experts, the situation will be assessed and analyzed after which the team will come up with a set of recommendations. For example advice on technical interventions including immediate measures and long term sustainable solutions, advice on governance and advice on financing options. The DRR team enables a foreign government to take action on the basis of sound advice and expertise.

IX. Hofstede Model

In the market research we also included the Hofstede model. The Hofstede model can help you to get an idea on how a culture in a certain country is different than from another. This knowledge can help you if you want to expand to this country and how.

The Hofstede model is a model which represents how values in the workplace are influenced by culture. The model makes use of six different dimensions of national culture. The scores a country receives at each dimension has to be intrepid as a relative score, as if all humans are the same. The different dimensions are.

Power Distance Index This dimension expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. People in societies exhibiting a large degree of Power Distance accept a hierarchical order in which everybody has a place and which needs no further justification.
In societies with low Power Distance, people strive to equalise the distribution of power and demand justification for inequalities of power.

Individualism

An individualistic culture can be defined as a culture in which individuals are expected to take care of only themselves and their immediate families. The opposite is collectivism in which individuals can expect their relatives or members of a particular group to look after them in exchange for loyalty.

Masculinity

Masculinity represents the preference in a society for achievement, heroism assertiveness and material rewards for success. You can compare it a bit with competitiveness. On the opposite you have femininity which represents more the preference for cooperation, modesty and caring for the weak.

Uncertainty Avoidance Index

The Uncertainty Avoidance dimension expresses the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen?

Long term Orientation

Societies who score low on this dimension, for example, prefer to maintain time-honoured traditions and norms while viewing societal change with suspicion. Those with a culture which scores high, on the other hand, take a more pragmatic approach: they encourage thrift and efforts in modern education as a way to prepare for the future.

Indulgence

Indulgence stands for a society that allows relatively free gratification of basic and natural human drives related to enjoying life and having fun. Restraint stands for a society that suppresses gratification of needs and regulates it by means of strict social norms.