
MANABAS COAST

Baseline Assessment for all pilots

An initial activity of WP2 is a description and baseline assessment of each study pilot that will be used as baseline to assess progress during the project and can aid in the future cooperation between the study pilots. The assessment also serves to establish the status of mainstreaming of NbS into the pilots. The assessment survey is divided up into three parts: 1) Description of the pilots, 2) Questions concerning how the enablers are currently addressed in the pilots, and 3) Brief questions about the MANABAS framework (inspired by ISBAM).

Part 1: Pilot description

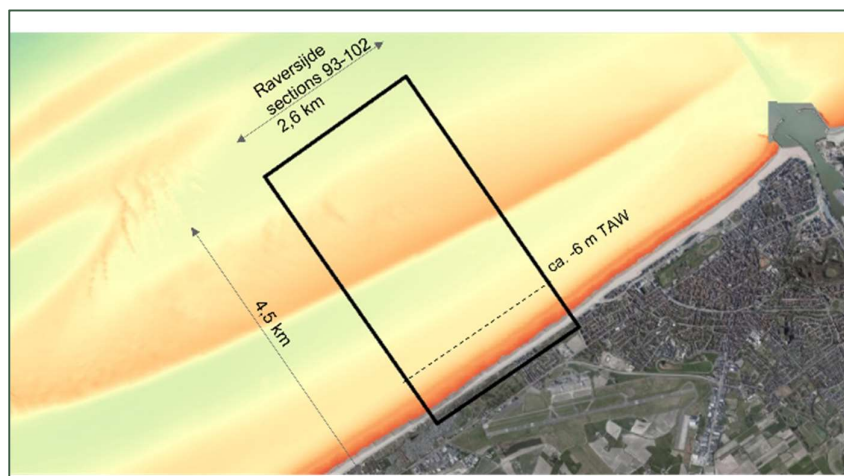
Our aim is to mainstream nature-based solutions on the different coasts of northwest Europe. Therefore we need a description of the coastal system. This is divided into two sections: A) description of the coastal (natural) system of the pilot, and B) description of the governance system.

Name of pilot: Raversijde (Living Lab)

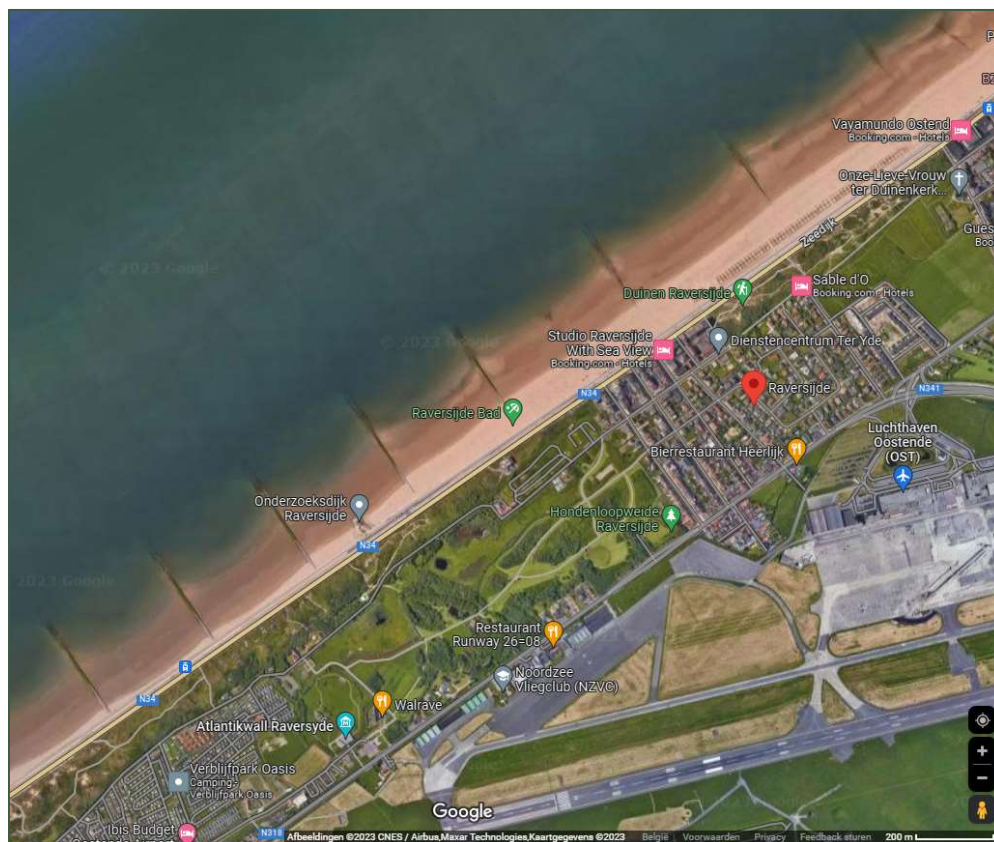
Location of pilot:

Please include a satellite map/orthophoto or aerial photo of the area in order to see vegetation, houses, gully's, bars etc. Provide coordinates for the center of the map and the corresponding coordinate system

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pilot Raversijde (2.852845°, 51.208548°), city Ostend, region Flanders, Belgium



pilot Raversijde – land use coastal strip

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Pilot aims/objective: the main aims are to intensely monitor the sandy coastal defence system in the area, including a dune for dike test area installed in 2021 along a stretch of 750 m, and to facilitate partners to add to the monitoring efforts in the area, as well as to research the data collected in order to improve the understanding of the sandy coastal defense system. It is a Living Lab environment also open to private companies e.g. wanting to test innovations.

Which nature-based solutions will you be working with in MANABAS? A dune in front of the existing dike on the dry beach that was enlarged by beach nourishment in 2021. Apart from that also beach nourishment to maintain the coastline might be needed during MANABAS project period (until 2027).

A. Description of the coastal system

Please briefly describe those areas that are relevant for your pilot:

1. The landscape including geology, morphology, and biology.

The study area is part of the sandy coast in Flanders, which is part of the larger sandy coastal system stretching from Calais (France) to Skagen (Denmark). Protected habitats (NATURA 2000) are present both above water (dunes part of “Duinen inclusief IJzermonding en Zwin” [EUNIS -Site factsheet for Duingebieden inclusief Ijzermonding en Zwin. \(europa.eu\)](#)) and below water (shallow sea bottom “Vlaamse Banken” [EUNIS -Site factsheet for Vlaamse Banken \(europa.eu\)](#)).

2. The hydrodynamic forcing from tide, water level, wind and waves. If possible, include some statistical values

Tidal range is ca. 4 m (water level 2 times / day varying typically between +1 m TAW and +5 m TAW). As a consequence tidal currents along are relatively strong ~ 1 m/s daily peak values. Wave heights are average due to fetch being limited (UK protects from the Atlantic) and the presence of a shallow sea bottom (not flat but with presence of a complex sand banks system). Average significant wave height in front of the coast is 60 cm. 10% of the time 2 m is exceeded. Design value for coastal protection (with return period 1000 years) is ca. 5 m. The coast is exposed to dominant

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winds from the southwest. Only one third of the time, wind speeds exceed 6 m/s, which is sufficient to initiate aeolian sediment transport.

3. Which current NBS solutions are already present (it can be a non-engineered original landscape)

Beach nourishments have been carried out at several occasions. In 2021 a small dune row was created over a length of 750 m by installation of osier hedges (a kind of natural fence) and plantation of marram grass. This was carried out to reduce aeolian sand transport blown over the crest of the sea dike to the coastal road including tramway.

In the first 2 years this small dune proved to be an effective sand catcher; aeolian hindrance on the coastal road was much reduced. As a consequence the dune has grown in height. The expectation is that this dune will continue to grow in the coming years, providing increased protection against extreme storms. However, beach nourishment to maintain the coastline might be needed in some years. Also in 2023 marram grass was replanted because most of the marram grass planted in 2021 died off due to the burial of sand (~height of 1,5 m, which is the height of the osier hedges).



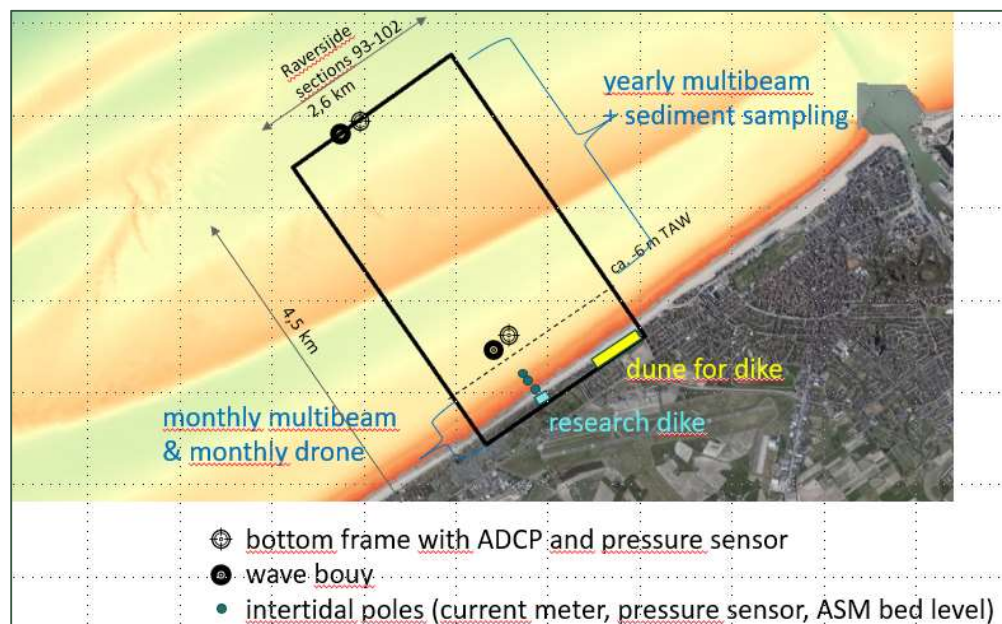
initiated dune after 1 year of development

4. Describe how study pilot is monitored.

Baseline monitoring is carried out by MOW. The baseline monitoring consists of monitoring of hydrodynamics and morphodynamics at locations

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and in subareas. Waves and currents are measured along a profile at 5 locations (2 wave buoys and 2 bottom frames off-shore + 3 pressure sensors and 3 current meters attached to fixed poles on the intertidal beach). The beach and active dune in a subarea of 750 m long is measured monthly using drone photogrammetry providing data on topographic evolution as well as on vegetation cover. The foreshore in that same area is also measured monthly with multibeam to monitor bathymetric evolution. Additionally, beaches and foreshores are measured 2 times per year as part of the coast-wide monitoring program using respectively LIDAR from an aeroplane and single beam echosoundings (profiles every 150 m). Continuous beach level monitoring will be possible at the 3 poles on the intertidal beach (e.g. using ASM sensors).



Baseline monitoring carried out by MOW - overview

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Baseline monitoring carried out by MOW – intertidal measurement poles

Additional monitoring is carried out by partners of MOW as part of research projects. At present 2 research projects are ongoing that include additional monitoring at the site. A first research project studies infragravity waves in front of the coast, which are measured using frames equipped with innovative sensors at 2 locations off-shore (1 location seaward and 1 location landward of the shore-face connected ridge in the area, called Stroombank) (by VLIZ, Flanders Marine Institute). A second research project studies processes controlling the evolution of the dune for dike on the beach. Two university research groups do measurements: a research group from KU Leuven measures aeolian sand transport (and related parameters), and a research group from UGent measures the dune vegetation (and related parameters).

5. Describe the sediment dynamics: Macro or micro sediment budget, conceptually or detailed volumetric monitoring. Include any dredging

On a large scale the coast Raversijde is part of the coastal cells in the central part of Belgium (from Nieuwpoort to Wenduine) that suffer from erosion. Sand budgets have shown that in the past decades the active profile (from the dunes to the closure depth ca. -5 m TAW; a stretch with a width of ca. 500 m; profile slope 1/50) has lost sand with an average rate of -5 mm/year. Obviously, this results in lack of resilience to sea level rise (+ 2

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to 3 mm/year in the past decades) for this part coast stretch . The impact of sand loss in the central part of the Belgian coast will become more severe with the expected acceleration of sea level rise. The decadal time scale morphodynamics of the gully-bank systems in the area, with deepening gullies near the beaches and some landward movement of the coastal banks, is one explanation to this observation of structural sand loss from the active zone. Another part of the explanation is the dredging in access channels to harbours (of Ostend and Nieuwpoort): this material ~ 150.000 m³/year is dumped at sea at dumping sites outside the active zone. A research project called MOZES (lead by MOW) is ongoing on this topic.

On the smaller scale of the 750 m long dune area, detailed monitoring since the creation in 2021 has shown a clear increase of the dune volume, and simultaneously a decrease of the beach volume. One can understand this as a sand transfer upwards in the profile. Nevertheless also a seaward sand transfer is observed within the beach (from the dry beach to the intertidal). More sand budgeting analyses will be carried out to also include the wet part of the profile.

6. Long term trends. These could be chronic erosion, long-term subsidence or trends in mean sea level.

As mentioned above a sand loss of 5 mm per year is observed for the active zone in the larger area. Relative sea level rise in the area (+ 2 to 3 mm/year in the past decades) is explained as the result of primarily eustatic sea level rise but also subsidence (at a rate of ca. – 1 mm/year). In addition to the rise of the mean sea level also the tidal range at the Belgian coast is slowly increasing. This results in high water levels rising faster as mean sea level, and low water levels rising slower than mean sea level.

7. Describe the current coastal protection being used in the study pilot.

The current coastal protection is hybrid (hard+soft): a sea dike is present as main element for protection in the coastal cell considered (stretching from the harbour of Nieuwpoort to the harbour of Ostend); groynes are also present every ca. 300 m to stabilize the beaches; landward of the coastal sea dike an interrupted dune row is present (interrupted in the coastal towns where dunes have been destroyed to enlarge coastal towns ~ past centuries) which contributes to reduce the probability of breaching and flooding of the low-lying polder area behind the coastal protection line. In the past decades the main coastal protection measure was to nourish the beaches; very recently (in 2021, as mentioned before) a new dune was initiated on the dry beach, which is considered to be an important

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coastal protection measure for the decades ahead (to cope with accelerated sea level rise ahead).

8. Describe the current risk of flooding and erosion.

Flood protection level is to be protected against a 1000 year storm surge. This is the standard policy decided by the Flemish government in 2011. An erosion protection standard does not exist but in practice a “hold the line” policy is applied. A new Flemish policy is being prepared (~Kustvisie project) in which it is considered to adopt a seaward development “advance the line” strategy, however at a modest size : order of magnitude 100 m seaward advance during 21st century. The basic reason for this new policy would be to create space for strengthening the coastal defences (preferably using nature based solutions) as well as for additional values such as biodiversity, tourism and recreation. Decision on this new policy is expected in 2024.

9. Which human activities impact your coastal system?

Many human impacts are relevant for the Belgian coastal system. It is a heavily used coastal area where uses are plenty. It is the living area of a large number of people, residents and many more visitors during holidays. In peak periods during holidays the number of people present is 4 times more compared to the rest of the year. The Belgian coast can be considered as one large city area. Nevertheless natural values are also numerous (as mentioned before both above and below water). Economically the touristic sector is very important for all coastal towns. This is very visible on the beaches which can be crowded, and also in the coastal towns many apartment buildings facilitating holiday stays and second homes. An important coastal road including tramway is present at the crest of the sea dike. This coastal road is affected by aeolian sand blown from the beach during storms. The harbours are important, for example in Ostend the harbour significantly contributes to local and national economy (e.g. being a chain in the realization of renewable energy off-shore such as wind farms, fisheries, aggregates from sea mining, factories using the inland waterway connection, business parks connected to the harbour...) as well as for recreation by offering two marinas (and one extra foreseen in the urban spatial planning).

10. Describe important culture and historical aspects in the study pilot

The city of Ostend was a small village at the eastern end of a peninsula (called Testerep) from the year 1000 onwards and it became a city in the 13th century. The most seaward part of the city was destroyed (the seaward

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part of the Testerep peninsula drowned), but the city re-developed landward and along the coast. During 18th century city of Ostend gained some international importance referring to the Ostend trade company that shipped goods from/to far away parts of the world. Urbanisation continued most of 20th century, simultaneously losing dune areas (and polder areas). Only in the 1990's a Flemish decree was accepted to stop further losing dune areas. Historic expansion of the coastal town increased the coastal protection needs, because more and more people and infrastructure became in need of being protected against flooding and erosion.

B. Description of the governance context

Please briefly describe those areas that are relevant for your pilot:

11. Who are the landowners of the land?

It is public domain. Different governance levels have different competencies e.g. the Flemish region is responsible for coastal protection and biodiversity above the low water line, the federal Belgian state is responsible for biodiversity below the low water line, the coastal community (Ostend) has responsibilities for local town planning and touristic infrastructure.

12. What are the main land uses in the pilot area (ie agriculture, nature reserve, infrastructure)

The sea dike and the groynes are for coastal protection, the coastal road including tramway is part of the traffic infrastructure, apartment buildings are for housing of residents as well as holiday makers, the dunes landward of the coastal road are partly protected for nature conservation but no nature reserve, landward of the dune one can find a big park for recreation and touristic infrastructure in the polders such as campings, also the local airport of Ostend is present (which is a difficulty when organizing beach drone monitoring).

13. What are the current laws and regulations that govern the use of nature-based solutions in the pilot (i.e Natura 2000, planning)?

In order to create a dune system on the dry beach one has to get a building permit from the local city council (Ostend). Beach nourishments to maintain the erosive coastline can be carried out without building permit.

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14. What is the current status of using nature-based solutions in your pilot area (ie to what extent are they mainstreamed into existing policy?)

The dune that was initiated on the dry beach in 2021 in the 750 m long zone between the built-up areas of Raversijde and Mariakerke. The reason being that it was foreseen that in this area not much complaining would be received from local people. After all, it is a change in the living environment of the local people, e.g. changing the views from the apartments on the sea dike towards the sea, also changing the possibilities for walking on the dry beach. The next level of mainstreaming NbS in Raversijde would be to laterally extend the dune on the dry beach, meaning to include it in the area just in front of the built-up area with the apartments on the sea dike. In this area more care will have to be taken to organize spatial co-use on the dry beach: the dune and the touristic-recreative activities have to find the necessary space for their activities. For this a beach nourishment would have to be done to create a dry beach with enough width.

15. What are the current goal conflicts (ie protecting cultural vs natural areas, or protecting private land vs municipal-owned land, or agricultural uses vs nature preservation?) How are these dealt with?

The most important goal conflict is on the use of the dry beach by on the one hand a dune (for coastal protection as well as for biodiversity increase) and on the other hand touristic-recreative use of the dry beach. The coastal town of Raversijde is relatively quiet town (compared to other coastal towns in Belgium) but nevertheless in summer a lot more people are present for holidays in addition to the residents. A way to solve this goal conflict is to widen the dry beach by beach nourishment. To create a dune belt that can withstand the 1000 year storm standard a footprint of the dry beach of ~25 m is needed. Widening the dry beach with 25 m needs a beach nourishment of order of magnitude 300 m³/m (~active height 12 m).

16. How are the stakeholders identified and involved

Part of the stakeholders are well involved, namely policy makers and researchers. They are invited on a yearly workshop to discuss with them about the progress of MANABAS COAST (first meeting held in June '23). Another part of the stakeholders is not yet involved in a strong way: the local residents and the local touristic entrepreneurs. Their involvement is limited to reading some information boards which are installed at the site. Ideas to increase their involvement are welcome!

17. Briefly describe the socio-economic development in the area.

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No information is available for Raversijde coastal town, but some general aspects for the Belgian coast as a whole also valid for Raversijde: the turnover of the touristic sector is 3 billion euro/year, some 350.000 people reside in one of the 10 coastal communities (relatively a lot of 65+ persons), during peak holidays the number of persons present can be 4 times as large.

18. What do you experience as the main barriers to mainstreaming NbS in your pilot?

The multi-stakeholder approach can be approved, namely to more involve local residents as well as local touristic entrepreneurs. This way more dune for dike NbS can be realized. A challenge for dune for dike NbS is the limited space available on the dry beach, but for this the solution is well known: it is another NbS namely beach nourishment.

A second barrier is the limited knowledge on the coastal morphodynamics. We have gathered a lot of knowledge already but still important knowledge gaps remain.

C. Implementation scheme

Please describe your timeline for implementing NbS during MANABAS and beyond (i.e. starting point, estimated finalization, monitoring period)

2021: works carried out: beach nourishment creating a large dry beach + dune initiation by installing osier hedges and planting marram grass (replanted in 2023). Monitoring started.

MANABAS COAST 2022-2027 : continued monitoring as well as facilitating research by partners and increasing stakeholder involvement

? : extension of the dune towards Raversijde built-up area

Part 2: Enabler Assessment

Please consider the barriers identified in Part 1B (question #18). The enablers below are meant to be ways to overcome these barriers. However, these enablers are not set in stone and will be further developed, augmented and /or changed during the MANABAS Coast project. There may be other enablers that are more important in certain pilots or for mainstreaming NBS. We will explore these during our project. In this assessment we want to get an initial idea of

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how these proposed enablers by EcoShape play out in your pilot and for mainstreaming NBS on a large scale.



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Enabler 1: Technology and system knowledge

- Which types of technology or systems knowledge are important in your pilot? (i.e. Sediment cell, salt marsh protection, salt marsh dynamics, sand nourishment, enhanced dune development)

Coastal morphodynamics including dune development and sand nourishment. Adaptation to accelerated sea level rise.

- Are there any knowledge and technology gaps in your pilot that need to be addressed? Please briefly describe.

Several processes that drive coastal morphodynamics are not well understood, namely the cross-shore sand transport on different time scales (recovery of the profile after storm erosion, natural feeding from off-shore to the coastline via shoreface-connected ridges), the decadal scale morphodynamics of the gully-bank system and its morphological relation with the coastline (and how it depends on sea level rise), how low-crested groynes are functioning to stabilize the coastline (and how fast they will lose their functionality with sea level rise).

Enabler 2: Multistakeholder approach

- Who are the main stakeholders in your pilot?

As mentioned before here are policy makers and researchers, as well as local residents and touristic entrepreneurs.

- How will you engage your stakeholders in the project?

As mentioned before the policy makers and researchers are involved at yearly workshops to discuss the progress of MANABAS COAST. On the other hand local residents and local touristic entrepreneurs are at this moment only informed via boards on site. Suggestions how to increase involvement of residents and touristic entrepreneurs are welcome!

Enabler 3: Management, monitoring, and maintenance

- What routines does your pilot have in place for management, monitoring and maintenance of the NbS?

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Main monitoring action is monthly drone-flights. A working group consisting of policy makers and researchers discusses the evolution and maintenance needed several times per year. MOW writes a monitoring report once a year.

- How do you measure the success of your pilot? Do you have any indicators for successful mainstreaming of NbS?

A relevant indicator for mainstreaming dune for dike in Belgian coastal towns would be to monitor e.g. from year to year the extent (footprint) of the dunes seaward of the dikes (one can probably use free satellite data for that). On the smaller scale of the pilot in Raversijde itself the volume of the dune is an important indicator, which is monitored in detail. Another relevant indicator is the perception of the public towards dune for dike in Belgian coastal towns, which is not (yet) planned to be measured however.

Enabler 4: Institutional embedding

- How do current institutional arrangements already facilitate mainstreaming of NbS? Please describe and mention the key institutions

Flemish region is the main driver for NbS for coastal protection because it holds competences on coastal protection as well as on biodiversity (although limited for the above water part). Coastal communities together with the province of West-Flanders are an important driver for dune creation seaward of the dike on the dry beaches because in they can organize the spatial co-use with residents and tourists on the dry beach (and the sea dike).

- How committed is your organization to mainstreaming NbS within MANABAS Coast and after the project ends?

MOW is very committed. One of our mottos is “soft were possible, hard were needed”.

Enabler 5: Business Case

- Do you face problems with funding in your pilot? Please briefly describe, including the general sources of funding.

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Funding for coastal protection has to be provided by the Flemish government (policy domain MOW). This budget is under pressure (yearly small % reductions). Co-funding from other sources can be looked for when together with strengthening the coastal protection one improves the conditions for the local residents, the local entrepreneurs, the biodiversity. Last but not least European co-funding has to be mentioned.

- How will your pilot and/or continued mainstreaming be funded after the MANABAS Coast project?

Idem

Enabler 6: Capacity building

- What types of capacity building would your pilot need in order to facilitate mainstreaming of NbS?

It is important to explain to local residents and local entrepreneurs about coastal protection and biodiversity at the site. This way the capacity increases a bit, but more importantly these local stakeholders have to be involved (cf. multistakeholder approach).

Enabler ranking

To what extent are the above enablers important for mainstreaming NbS in your region? Please rank (1 is least important, 10 is most important)

Enabler 1: Technology and system knowledge

1 2 3 4 5 6 7 8 **9** 10

Enabler 2: Multistakeholder approach

1 2 3 4 5 6 7 8 9 **10**

Enabler 3: Management, monitoring and maintenance

1 2 3 4 5 6 **7** 8 9 10



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Enabler 4: Institutional Capacity

1 2 3 4 5 6 7 8 9 10

Enabler 5: Business case

1 2 3 4 5 6 7 8 9 10

Enabler 6: Capacity Building

1 2 3 4 5 6 7 8 9 10

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Suggestion for additional enablers

Are there any aspects of mainstreaming enablers from your pilot that you can already suggest? If so please briefly state these:

NbS like “dune for dike” need more space on the dry beach, compared to a hard infrastructure e.g. seadike. Often it is the case that NbS have a larger footprint compared to hard infra. For this reason an additional enabler can be “space”. This links with spatial planning but also with the strategy to create extra land by progradation of the coastline towards the sea (this is under consideration by the Flemish government as a new policy).

Part 3 MANABAS mainstreaming framework (inspired by earlier work e.g. ISBAM)

Within MANABAS Coast we are working on a framework that helps in mainstreaming NBS. To develop this framework, we need information on the pilots as well as the ambitions and goals of the different organization involved. We build on work already done in the past such as the ISBAM approach, which was developed in the Interreg BwN project (see also the brochure in the appendix for a further explanation or online). Just as the enablers, the MANABAS mainstreaming framework is still a work in progress.

As a starting point for the MANABAS framework, 3 leading principles from ISBAM are evaluated. We would like to know if these principles can also be applied across the entire northwest Europe coasts and how they can be improved.

Three leading principles have been identified that are deemed important to enable mainstreaming of NBS:

MANABAS Coast principle 1: “Act at a landscape (system) scale, including both the natural and socio-economic system/context”

- Do you identify with this principle? Yes.
- Is this principle applied (to a certain degree) within your pilot? Yes. The Living Lab Raversijde is a relatively small location for research and innovation but the results are meant to be applied at the wider scale of similar sandy coasts with coastal towns to be protected against storms, sea level rise, erosion. The way to do that is by better understanding of the system. At present focus is on the natural system, but in the future the socio-economic system can be included.

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And within your organization? If yes, how? Yes, partly. We are aware of the importance of the natural system as a boundary condition for coastal protection. Nevertheless still a lot is unknown especially regarding the coastal morphodynamics of the system => need for research. Currently, the success of a coastal protection measure is strictly evaluated based on the decreasing the risk of erosion/flooding. NbS have to be evaluated from multiple points of view: safety, creation of opportunities (economic, ecology, social etc.), costs, sustainability. The historic and socio-economic points of view are considered but with less scientific depth compared to the natural system.

- In managing your assets, how are the system-wide effects and benefits taken into account? See the answers above and below.
- On a scale from 1 (room for improvement) to 10 (superb), do you think your organization adheres to this principle? Why? To develop the new coastal protection policy to adapt to accelerated sea level rise (~Kustvisie) one takes a wide perspective but there is room for improvement: the natural system is considered as a boundary condition but it is not so straightforward to take into account the fact that coastal morphodynamics (especially on the longer time scales) is not well understood; as mentioned before historic and socio-economic points of view are taken into account but with less scientific depth.

1 2 3 4 5 6 7 8 9 10

MANABAS Coast principle 2: "Integrate management of multiple assets and functions within the landscape system context"

- Do you identify with this principle? Yes.
- Are relevant organisations/institutions efficiently cooperating to jointly address system-wide challenges? If yes, which challenges and how? Cooperation with other authorities active in the coastal strip is intensified in the framework of the development of the new coastal protection policy to adapt to accelerated sea level rise (~Kustvisie). A co-creation approach is followed in which one starts with the coastal protection challenges and tries to find adaptation measures that have additional value for other functions e.g. biodiversity, touristic value.
- If you see room for improvement in the integrated management of multiple landscape assets, what would be the necessary steps to take according to you? Briefly state. Stronger cooperation would be possible by starting with a multi-functional problem statement, including coastal protection,

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biodiversity challenge, economic development visions (including mainly harbour development and touristic development), and water management in the hinterland (cf. issues of salinization and reduced gravity drainage due to sea level rise). Such approach would however lead to a much more complicated and costly governance, because instead of one authority leading the collaboration process, a multitude of authorities should co-lead because they all have responsibility for solving part of the problem stated. The end result can only be positive if win-win actions can be realized.

- On a scale from 1 (room for improvement) to 10 (superb) how much is this principle applicable to your organization?

1 2 3 4 **5** 6 7 8 9 10

MANABAS Coast principle 3: “Embrace and leverage upon the natural dynamics of the system”

- Is this principle applicable to your situation/organization? Yes
- What are the main natural processes that should be considered? Are these well-known with all the stakeholders? Most important is the coastal morphodynamics, including dune genesis in interaction with vegetation (biogeomorphology). These processes are considered but due to lack of fundamental understanding, especially on the long time scales, in practice one can only take it into account partially.
- How are using natural processes incorporated in the management practices within your organisation? Nowadays soft solutions for coastal protection are preferred compared to hard solutions for coastal protection. Previously (~50 years ago) hard infra was the preferred option e.g. building of sea dikes and groynes. As a result at present a hybrid coastal protection system exists along the Belgian coast.
- On a scale from 1 (room for improvement) to 10 (superb) how much is this principle applicable to your organization?

1 2 3 4 5 6 7 8 **9** 10

Additional MANABAS Coast mainstreaming questions:

- In your view, what is essential in the mindset or way of working of people (policy makers, managers, professionals, general audience) to promote mainstreaming of NBS? Most important are to strengthen the multi-

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stakeholder approach (stronger collaboration aiming for win-win actions) and to deepen the system knowledge (especially on coastal morphodynamics because at the Belgian coast NbS sustainability rely on it: sand dynamics is a critical component of all NbS at the Belgian coast).

Do stakeholders need more information on mainstreaming? Yes, it is helpful for stakeholders to understand the reasons why they are involved in a process dealing with coastal protection and other challenges in the coastal strip.

- What other leading principle(s) would you suggest? “Learning by doing”: large scale pilots can be a good way to increase knowledge and to test a measure in many of its aspects.
- How can we make these principles more applicable to the context of pilots? This is off course completely depending on the pilot => to be answered by each pilot responsible separately.
- **Finally: What does mainstreaming mean for your pilot? Please briefly describe.**
 - at Raversijde Living Lab we gather system knowledge in order to be able to better design NbS (e.g. dune for dike) for coastal protection in coastal towns.
 - at Raversijde Living Lab we connect to stakeholders that have overlapping goals (e.g. research groups from universities, policy makers from other authorities) to realize collaboration, resulting in more NbS in the future.
 - in the coming years at Raversijde Living Lab we aim to enlarge our scope by connecting to more stakeholders (e.g. touristic entrepreneurs, local people) maybe also enlarging the size of the dune for dike pilot (towards the built-up part of Raversijde).
 - we aim to improve the stakeholders acceptance and understanding of the NbS at the coast by using Raversijde evolving show case.