EXPLAINER - THE INSTITUTIONAL AND FINANCIAL ARCHITECTURE OF BUILDING WITH NATURE IN THE DELTA

At the global level; and for the case of the Netherlands

Mainstreaming BwN in regular infrastructure planning begins with an understanding of the current institutional and financial architecture. In this document we explain how projects come into being in the markets relevant for Ecoshape's Building with Nature concepts: aquatic ecosystem restoration, coastal protection and port development & maintenance. Who are the key actors? What are their respective roles/ activities? We explore how building with nature concepts fit into this picture. After an introduction (section 1), we address two institutional contexts: international developing countries (section 2) and the Netherlands (section 3).

For who: anyone want to understand how the BwN concept fits in the bigger picture of regular infrastructure investment.

1 INTRODUCTION

Building with nature (BwN) is an alternative approach to conventional gray solutions to infrastructure, environment and climate challenges that proactively uses natural forces. BwN can be more cost-effective, more adaptive to climate change, and produce a range of co-benefits beyond their primary goal: their multi-functional character allows them to contribute to a range of SDGs simultaneously. Despite these attractive traits, BwN is not yet a mainstream solution: BwN is in most cases not explicitly supported in national or sub-national regulatory or planning frameworks and guidelines which shift the playing field in favor of BwN (Jongman et al., 2018). Although the number of BwN projects is increasing across the globe, most projects still have a strong innovative or pilot character, with corresponding one-off, non-structural funding.

BwN is never a purpose in itself, but rather an approach to integrate and design nature-based solutions. To understand how projects that make use of the BwN - philosophy could be better integrated in traditional infrastructure planning, we outline the existing institutional and financial architecture in key areas where BwN can be applied to set the stage for mainstreaming BwN. **What are the key markets relevant or BwN in the delta? Who are key players in getting such projects implemented? And where does the funding and financing for these projects come from?**

Key markets for Building with Nature in the Delta

Ports

With increasing global trade, containers, liquid cargo, dry bulk cargo transport approximately 90% of goods traded globally through thousands of large and small seaports ((ICS, 2020; Searates, 2020). Some key trends in past and coming decades include the growing market for cruise ships, the shift to a bio-based economy and sustainable energy, the increasing size of container ships to generate economies of scale (e.g. in so-called postpanamax ships) (Gallegos, 2008). This means that ports have to re-adjust to their size or be left behind. Particularly in East and southern Africa many new ports are being developed or existing ports expanded (PwC, 2018) and the global economic center of shipping trade is shifting towards Asia (Deloitte., 2015).

Coastal and riverine flood risk protection

In most cases protection against coastal and riverine flood risk is a public good, provided by a public actor. Current investment levels across the globe in disaster risk management and coastal protection are unknown. With increasing urbanization, coastal development, sea level rise and extreme weather events, the economic rationale to invest in coastal and fluvial flood risk protection across the globe will increase significantly: for coastal protection alone investments needs are $ 10 billion per year in the short term and up to $ 45-215 bln per year by 2100 (Nicholls et al., 2019).

Ecosystem restoration

With continuing degradation of ecosystems around the globe, the potential market and need for restoration - the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed – grows as well, spurred by environmental regulations. According to Bendor et al. (2015), this 'restoration economy' is a $25 billion industry, providing a significant 220.000 jobs. A significant part of this work ($ 9 billion) relates to restoration and management of aquatic, riparian and wetland environments.

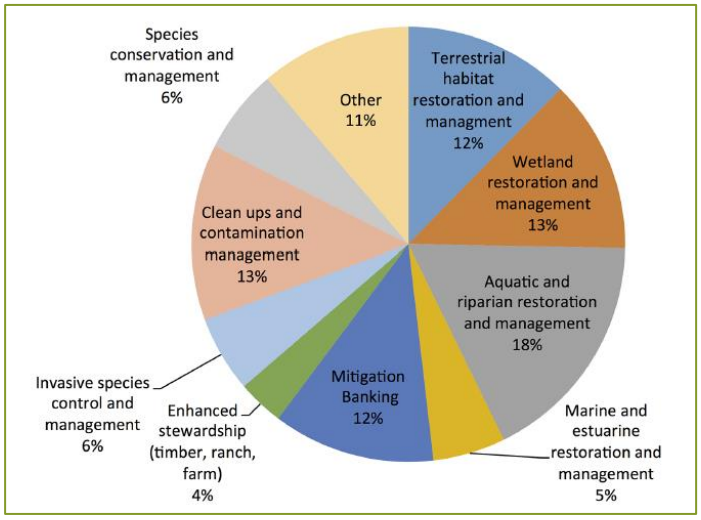


FIGURE 1.1 OVERVIEW OF KEY ACTIVITIES WITHIN RESTORATION ECONOMY. FROM: BENDOR ET AL. (2015)

2 INTERNATIONAL DEVELOPING CONTEXT

As projects in hydraulic infrastructure typically have high up-front investment costs, particularly in lower and middle-income countries some degree of finance is usually needed to raise the required capital. In these regions development finance institutes (DFI), direct foreign aid/ philanthropic grants or funds and adaptation funds play a key role in providing loans to support development in a context where public or private finance is not available or too expensive. These loans are often complemented with technical assistance for setting up the projects. In higher-income countries there is a large variation in institutional and financial models for flood risk reduction (Bisaro et al., 2020): understanding the financial and institutional infrastructure in flood risk reduction, port development and ecosystem restoration requires a per-country approach. For this reason, we choose to focus on the international developing country context, where DFI's and internationally active funds can play a key role in enabling and shaping investments in many countries simultaneously through their wide-spread (public) client base and technical support services.

2.1 SUSTAINABLE PORT DEVELOPMENT AND MANAGEMENT

2.1.1 THE WORLD OF PORT DEVELOPMENT

As ports are key economic drivers with clear revenue streams, port development, and consequentially key decisions in port design and layout, may be initiated and funded by either public (it is a form of infrastructure) or private actors, or a combination.

Key players/ institutional environment

Who the key players are in a port development or maintenance project and whether they are public, private or a combination depends on the administration model of the port: how the port is organized, structured and managed. The selected model depends on the socio-economic context, historical development, location and types of cargo handled by the port. Essentially, there are four administration models for ports that define what the actor constellation looks like, most of which are some form of public-private partnership (World Bank, 2010):

1. **Service port model:** the Port Authority is controlled by a ministry of transportation and chaired by a civil servant. The PA owns the land and all available assets and performs all regulatory functions in relation to port development and operational activities. Activities are publicly funded: there is a general absence of private sector involvement in this model.
2. **Tool Port model:** the port authority owns, develops and maintains the port infrastructure. Investment in infrastructure and equipment is provided by the public sector. Other activities such as cargo-handling are run by small private operators.
3. **Landlord Port model**: a public Port Authority acts as both regulatory body and landlord. The Port Authority is the owner of all assets and use of the infrastructure is leased to private operating companies. The port authority is responsible for economic exploitation, long-term development, maintenance of basic infrastructure. This is the most common model worldwide.
4. **Private Serviced Port:** in this model the public sector does play a large role: the land of the port is owned by the private sector, and all operational activities are performed by private companies and regulatory functions may also be transferred to the private sector.

In development of new or expansion of existing ports, the government or Port Authority takes the initiative. Financing for such activities may come from the Ports' own capital, loans or equity from investors, or the general infrastructure investment budget of the government. Depending on the credit rating of the Port Authority and the financial and risk profile of the project, investors may come from the private financial sector or development finance institutes. Generally speaking, private investors are looking for attractive risk-return profiles e.g. low/high risk, high return in short term; institutional investors look for low risk, low/medium return in the long time and development finance institutes also have broader underlying impact goals and typically provide finance in areas that are unattractive for private investors.

Key activities in relation to BwN

Key activities related to ports which have a potential for application of BwN concepts include the development of new ports in new locations, expansion of existing ports, and maintenance of existing ports. In port development or

expansion the concept can be applied in site selection, port layout and design of structures and materials (de Boer et al., 2019). Depending on the ports governance model, the initiator for new port development can be a project developer, government, private company or existing Port Authority. In essence, port development is a typical commercial activity with a clear revenue stream. Public authorities have to authorize the construction of the port and therefore can play a role in site selection and design of activities. The application of BwN concepts (see also Figure 2.2) can help reduce costs, bring additional benefits for society or nature (and in doing so increase the ports' license to operate) or even generate additional revenue streams.

Port maintenance activities such as dredging or maintaining key infrastructure is typically the responsibility of the Port Authority and funded through their own capital.

Public authorities may influence the location choice and requirements in port design though permitting. As capital expenditures in port development can be very significant, external financing is often needed, provided e.g. through regular financial sector and development banks.

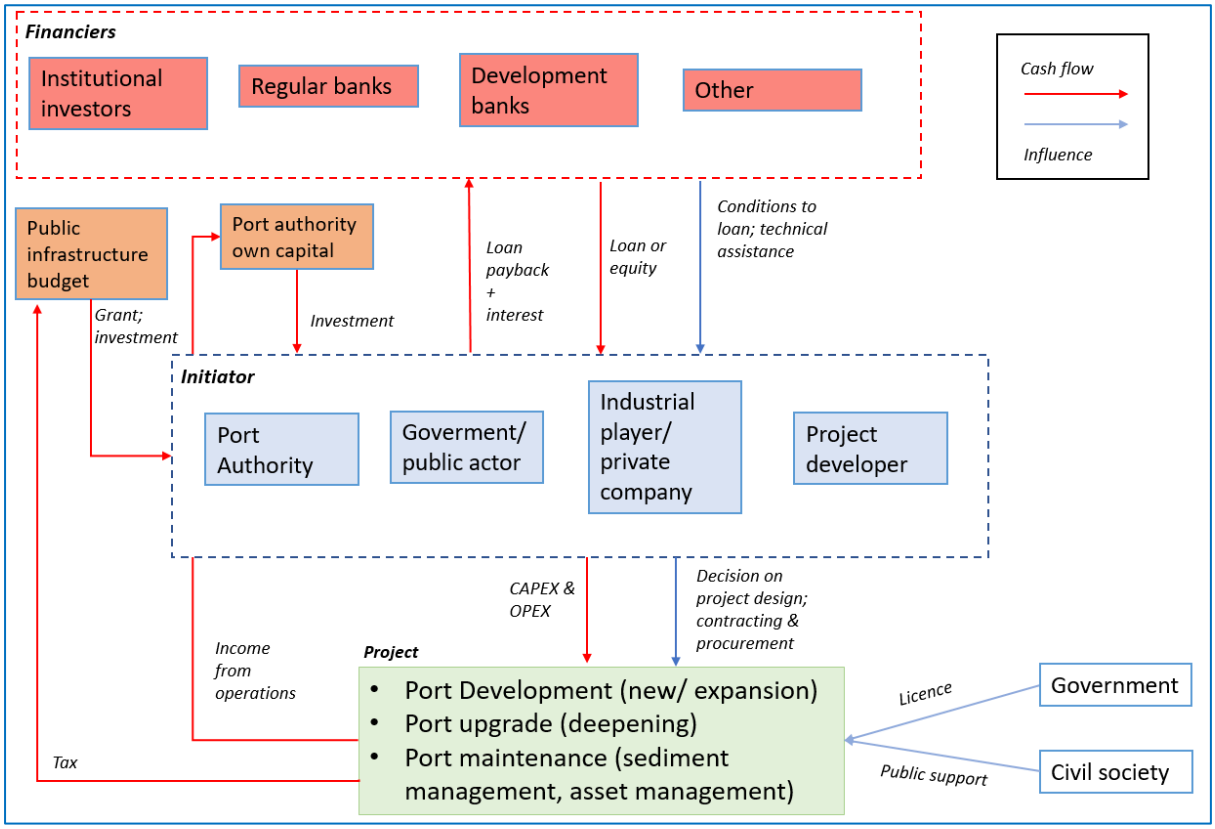
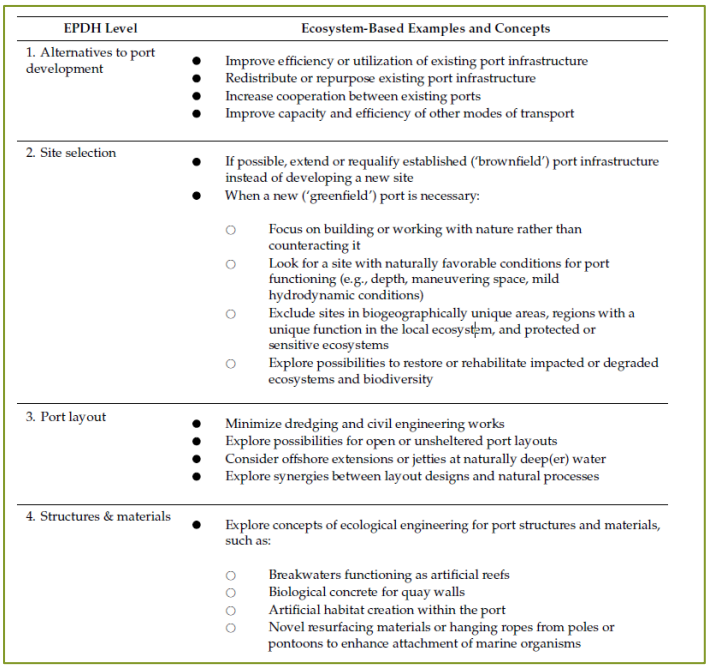


FIGURE 2.1 OVERVIEW OF KEY ACTORS, THEIR ROLE IN DECISION IN DECISION MAKING (BLUE) REGARDING PORT DEVELOPMENT AND THE CASH FLOW IN RELATION TO THESE PROJECTS (RED)

2.1.2 BUILDING WITH NATURE/ SUSTAINABLE PORT DEVELOPMENT

BwN options in port development

Figure 2.2 shows sustainable, ecosystem-based alternatives that can be considered in various activities related to port development. Specifically in relation to Building With Nature, evaluation of potential ecosystem services delivered by such alternatives (e.g. wetland restoration for nature development and wave protection) can help convince public decision makers and increase public support. Additionally, evaluation of potential collaboration with other local organizations (e.g. water authorities, nature organizations) can help reduce costs or attract co-investment, further improving the business case. A particular avenue in relation to port maintenance is the potential to re-use resources like dredged sediments.



EPDH Level	Ecosystem-Based Examples and Concepts
1. Alternatives to port development	● Improve efficiency or utilization of existing port infrastructure ● Redistribute or repurpose existing port infrastructure ● Increase cooperation between existing ports ● Improve capacity and efficiency of other modes of transport
2. Site selection	● If possible, extend or requalify established ('brownfield') port infrastructure instead of developing a new site ● When a new ('greenfield') port is necessary: ○ Focus on building or working with nature rather than counteracting it ○ Look for a site with naturally favorable conditions for port functioning (e.g., depth, maneuvering space, mild hydrodynamic conditions) ○ Exclude sites in biogeographically unique areas, regions with a unique function in the local ecosystem, and protected or sensitive ecosystems ○ Explore possibilities to restore or rehabilitate impacted or degraded ecosystems and biodiversity
3. Port layout	● Minimize dredging and civil engineering works ● Explore possibilities for open or unsheltered port layouts ● Consider offshore extensions or jetties at naturally deep(er) water ● Explore synergies between layout designs and natural processes
4. Structures & materials	● Explore concepts of ecological engineering for port structures and materials, such as: ○ Breakwaters functioning as artificial reefs ○ Biological concrete for quay walls ○ Artificial habitat creation within the port ○ Novel resurfacing materials or hanging ropes from poles or pontoons to enhance attachment of marine organisms

FIGURE 2.2 SUSTAINABLE DESIGN ALTERNATIVES FOR PORT DEVELOPMENT ACTIVITIES. FROM: (DE BOER ET AL., 2019)

Convincing decision makers

The port authority makes decisions regarding design of investment projects and maintenance activities. Depending on the port management model, key arguments to consider in selecting alternative (BwN) designs may be CSR/ license to operate (public support), meeting with environmental regulations, socio-economic benefits or cost reduction.

2.2 BWN IN FLOOD RISK REDUCTION

2.2.1 THE WORLD OF FLOOD RISK REDUCTION

Flood risk protection: a public good

The provision of flood risk protection is mostly a public service and therefore funded predominantly by public budgets – with exceptions from projects funded by philanthropic aid (Pauw, 2017). However, as these projects typically have high up-front investment costs, in most cases some degree of finance – the provision of monetary resources to be reimbursed over time with interest - is needed to raise the high up-front investment costs. Organisations that provide this finance often have some degree of influence in how their loan is spent. Key sources of financing for FRR infrastructure include domestic public finance, global and regional development finance, multi- and bilateral public funds and to a smaller degree the private sector (including e.g. institutional investors): see Figure 2.3. Private sector finance is particularly relevant if there is insufficient public finance (e.g. loans from WB) available to cover the financing needs. The disadvantage is that private finance is typically more expensive.

How each region approaches flood risk management investments and where the funding and finance is coming from depends on geographical factors, existing financial infrastructure and institutional set-up, and the capabilities of the local financial infrastructure – e.g. are there allotted funds for flood risk management investment.

Low-income economies

Particularly in low-income economies around the world, development finance institutes (DFI), direct foreign aid/ philanthropic grants or - funds and adaptation funds play a key role in providing loans to support development in a context where private or regular finance is too expensive or not available, often complemented with technical assistance for setting up the projects. As such, these actors can play a key role in enabling and shaping investment in FRR through their wide-spread (public) client base and technical support services. From the point of view of introducing NBFD in the investment portfolio for infrastructure projects, these are also relevant regions: there is often

relatively little infrastructure in place, leaving more room for integrating NBFD in infrastructure design from the onset.

Finance gap in flood protection; the role of private finance

With the investment gap in flood protection already large and expected to grow significantly with SLR, it is clear that public funding and finance alone will be insufficient to bridge the gap. Mobilizing private finance, e.g. by creating revenue streams in relation to co-benefits (ecosystem services) will be required, as well as strategies or innovations that may bring down the size of required investment. This is further explored in the white paper 'Paving the way for BwN' to be found on the website (expected January 2021).

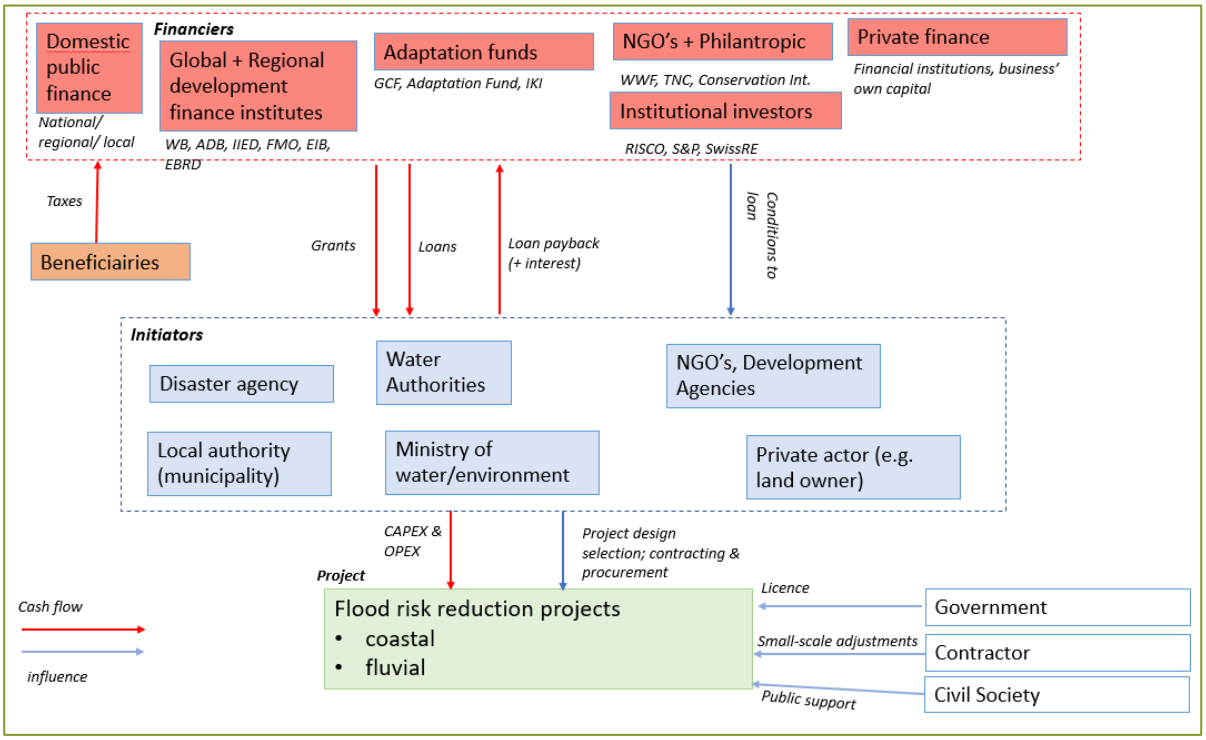


FIGURE 2.3 OVERVIEW OF FINANCIAL AND INSTITUTIONAL ARCHITECTURE FOR FRR PROJECTS WORLDWIDE.

2.2.2 BUILDING WITH NATURE IN FLOOD RISK REDUCTION (NATURE-BASED FLOOD DEFENSE)

Although BwN in flood risk reduction is not yet a mainstream approach, BwN concepts are increasingly applied across the globe. There are various barriers, one of which is that in order to apply BwN, the scope of FRR projects often expands across various authorities/governments or different departments, requiring new cooperation's. For example, flood risk and nature are often the responsibility of different institutes and different rules and regulations apply. It is not straightforward to link these in a NBFD project.

Key players in deciding whether or not to apply BwN in FRR, are development finance institutes. They can include the BwN approach as condition for their loans. They can demand to consider BwN as one of the options, or to apply a certain framework. That is already happening, e.g. by the World Bank, that state in the conditions of certain loans that the framework of 'Implementing Nature-Based Flood Protection' should be applied (World Bank, 2017).

2.3 ECOSYSTEM RESTORATION

2.3.1 THE WORLD OF ECOSYSTEM RESTORATION

Defining ecosystem restoration

Ecological restoration is the facilitation of recovery of an ecosystem following damage, degradation, or destruction most commonly resulting from human activity. The approach consists of creating the enabling biophysical and socioeconomic conditions necessary so plants, animals, and microorganisms can recover themselves. Facilitating recovery can be as "simple" as removing an invasive species or reintroducing a lost species or reintroducing a lost function (e.g. due to fire). Or it may be complex involving altering landscapes, replanting vegetation, changing hydrology, and reintroducing multiple species.

Restoration v.s. conservation

There is an important distinction between ecological restoration and conservation. Restoration can in many cases not succeed in re-establishing the full assemblage and functionality of the original ecosystem but rather achieve an approximation of that. Generally speaking, it is more cost-effective to prevent ecosystem loss than to lose and restore, but this is not always an option. Consequently, restoration is needed to recover damaged or degraded systems in many areas around the world and if done properly, it can provide substantive practical benefits such as food provision and flood prevention as well as the less quantifiable benefits including quality of life.

Funding of ecosystem restoration

Ecological restoration historically has often been separate from public works or landscape interventions and as such has historically been funded out of philanthropic altruism or regulatory compulsion. These projects often involve substantial financial and time investments with short-term returns being semi-tangible. There is also a significant measure of unpredictability in how planned interventions interact with the dynamic environment including unpredictable aspects such as climate events.

A central thought in qualifying ecosystem restoration lies in the reliance of our economies on the products and services generated by ecosystems so called ecosystem services. Ecosystems provide societies with services such as soil fertility, food, water, shelter, carbon sequestration, goods and services, medicines, stability, pleasure, knowledge and leisure. Since ecosystem services flow from natural capital, natural capital is the primary asset of any investor. This realisation has led to increasing collaborative structures being developed where synergy is actively explored between economically motivated investors and those interested in environmental restoration. More recently natural capital investment has been taken up by investors seeking fair returns while looking to improve environmental quality. These Impact investors are motivated by philanthropic goals but seek financial viability.

Institutional context of ecosystem restoration

The collaborations between the various actors, NGO's, investors, contractors etc. frequently require a facilitator or instigator. This is a role often taken up or fulfilled by governments or administrative entities which,have particular socio political mandates. Regional differences that motivate instigation of ecological restoration vary widely. Broadly speaking they can be categorised into political mandates (domestic, global or regional including multilateral and bilateral), socioeconomic interests (natural capital investment, development) and philanthropy. Often ecological restoration is tacked on to other socioeconomic investments, when it forms an essential component of the economic or social goal to be achieved or when restoration itself is a political goal.

Trends

More recently the introduction of the thought line "There are no economies without ecosystems, but there are ecosystems without economies..." (TEEB Report, European Communities (2008)), has meant that ecological restoration as a financially viable investment in, for example infrastructure projects, is becoming more commonplace.

2.3.2 BUILDING WITH NATURE AND ECOLOGICAL RESTORATION

Within BWN (or NBS) ecological elements are inherent. There are, however, two paths that can be walked. Ecosystem restoration and/or Ecosystem creation, with the former involving restoration of previously existing ecological processes and the latter involving the introduction of ecological systems that were not previously part of the regional or local system. The core principles of BwN do however involve a greater preference for ecosystem restoration since oftentimes use of native processes and species is more viable in the long term and often involves lower long terms risks e.g. invasive species

The barriers faced by ecological restoration in general are also the barriers that face BwN. Key players determining how ecological restoration can be included in BwN are often financial investors or investment institutions and governmental instigators, although it must be noted that financial investors often conditionalize loans or grants particularly when ecological systems are not among the principle motivations.

The growth of interest in BwN as a comprehensive solution to increasingly complex problems, as well as the increased attention to climate related issues has led to the an increased interest in ecosystems as both a component in creative solutions as well as a long term capital investment.

While oftentimes there is interest in ecosystems as a solution, their motivation and quantification of ecosystem services is difficult particularly since classical cost benefit analysis are made more difficult by the unpredictability of the systems. Particularly private investment is hampered by of unpredictability of solutions, which is related to limited understanding of the system and a lack of evidence based and proof of concept.

Ecosystem restoration as part of BwN solutions benefits greatly from collaborative approaches involving multilateral partnerships that are able to pool experiences and draw in risk investment or philanthropic interest. The equity generates becomes broader than he natural capital investment and comes to include knowledge equity potentially becoming a process enabler by bringing together process instigators with differing goals but mutual gains.

3 BUILDING WITH NATURE IN FLOOD RISK REDUCTION IN THE NETHERLANDS

3.1.1 INSTITUTIONAL AND FINANCIAL ARCHITECTURE

Finance of FRR in the Netherlands comes from National Public Funds (taxes) and the Water Authorities (fees)(Figure 3.1). Regarding fiscal control, authority is at the national level, which determines the Dike Account budget, the principal funding instrument for flood risk reduction. The Dike Account annual budget of approximately €1.2 billion in recent years covers fresh water and climate adaptation in addition to flood safety. It is funded 50% by the Delta Programme, and 50% by regional Water Authorities, whose individual contributions are based on number of inhabitants and property values determined by national regulations. The Dike Account funds the long horizon HWBP implementation programme, funding large investments to 90%. The remaining 10% is funded by the Water Authority in whose jurisdiction the project is implemented. The current dike reinforcement phase runs until 2030, with a committed national budget of €367 million a year, the total budget amounts to €3.8 billion (Bisaro et al., 2020). In the Netherlands, the National Water Law (2010) delineates public responsibilities for FRR to the national government through the Ministry of Infrastructure and Water (MIW) and its implementing agency Rijkswaterstaat (RWS), and the local Water Authorities Further, the 2012 Delta Law (2012) established a parliament-appointed Delta Commissioner to coordinate national policy on flood risk management and fresh water supply. Authority to set strategic goals is held at the national level. The Water Law establishes ownership of dikes with the national government, and requires these maintained to flood safety standards determined by national law. In January 2017, a new law regarding flood protection standards was adopted. The Delta Commissioner defines priorities for investment to ensure primary defences comply

with the new standards by 2050. Both the safety standards and the investment priorities are described in the national Delta Program.

Authority for designing actual measures is also held at the national level. FRR measures must meet Flood Safety Law and Delta Programme requirements. The contractor of the project can make small-scale adjustments. Implementation of the Delta Programme is carried out by the High Water Protection Programme (HWBP), a joint implementing organization from RWS/MIW and the Water Authorities. The Delta Commission, however, retains overall responsibility for coordinating activities of RWS and the Water Authorities, regularly reviewing whether current implementation programs are sufficient, e.g to account for sea-level rise, land subsidence or economic development.

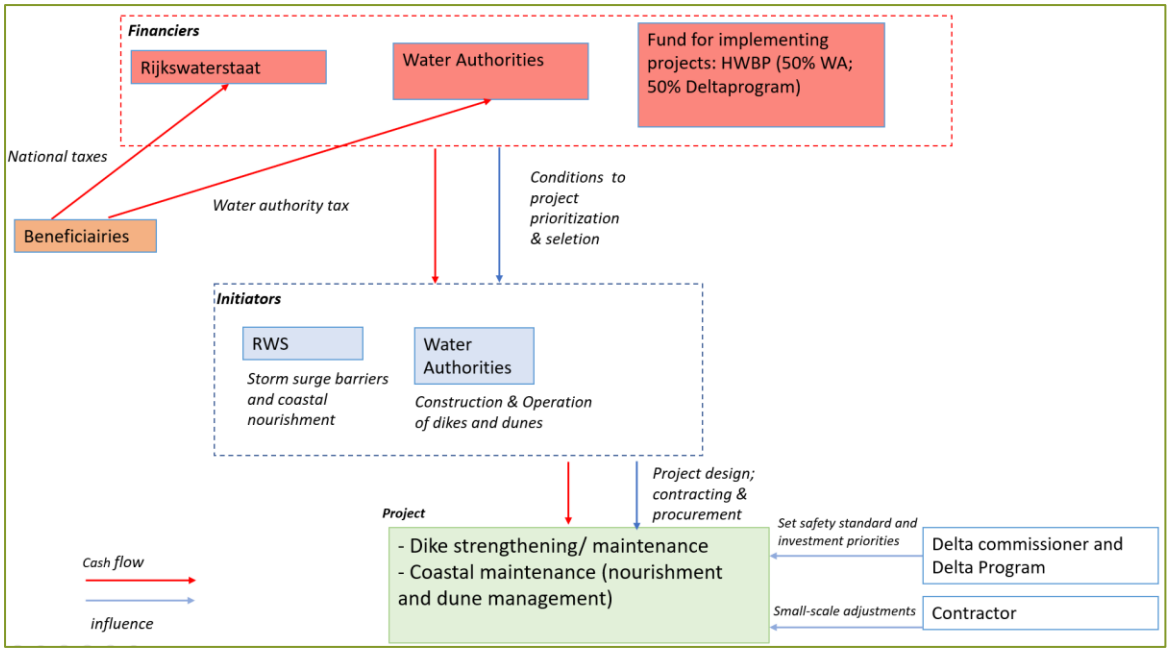


FIGURE 3.1 OVERVIEW OF INSTITUTIONAL AND FINANCIAL ARCHITECTURE OF FLOOD RISK REDUCTION IN THE NETHERLANDS

3.1.2 BUILDING WITH NATURE IN FLOOD RISK REDUCTION

Coastal FRR in the Netherlands has had a BwN approach since the '90s, when the 'hold the line' strategy was adopted and coastal erosion was halted through regular sand nourishment. Initially the approach was mostly beach nourishment, but in recent years foreshore nourishment is more common. Foreshore nourishment is cheaper and makes use of the natural processes of waves and streams. Recently, the Sand Motor is a new step in coastal protection measures. This mega-nourishment reduces the interval of nourishment from 5 to >20 years and combines functions such as recreation and nature development. The strategy of coastal management is 'soft (sandy) approach where possible, hard (stone) approach where necessary)'.

Room for the river has been a large scale BwN intervention in fluvial FRR. Along the major rivers of the Netherlands, flood plains were widened to reduce flood risk during peak discharges. BwN in combination with dikes (hybrid solutions) are currently studied in various pilot projects: e.g. salt marshes, sandy foreshores and willow plantations to reduce wave height. Before the update of the flood law in 2017, foreshores and vegetation could not be included in legal dike safety assessment instruments ('WBI') and thus BwN and hybrid solutions were not accepted as official flood risk reduction measures. WBI is a tool to assess the flood defense function of dikes against the safety standards In the updated WBI, the impact of foreshores on wave height and dike stability is taken into account. This only includes the sediment body, however, the effect of vegetation is not yet included. Research is being done to collect the necessary information about the effect of vegetation on dike stability and wave height reduction, also under extreme conditions.

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