

Building with Nature perspectives

This publication offers an overview of the latest cross-disciplinary developments in the field of Building with Nature (BwN) for the protection of coastal regions. The key philosophy of BwN is the employment of natural processes to serve societal goals, such as flood safety. The starting point is a systems-based approach, making interventions that employ the shaping forces of the natural system to perform measures by self-regulation. Initial pilots of this innovative approach originate from coastal engineering, with the Sand Motor along the coast of South Holland as one of the prime examples. From here, the BwN approach has evolved into a new generation of nature-based hydraulic solutions, such as mangrove forests, coastal reefs, and green dikes.

As exemplified by the body of knowledge expressed by academic literature (see graph below), the first generation of BwN pilots created valuable links between coastal engineering and ecological development. However, a link with the spatial domain of urban and landscape design remains underdeveloped. This publication aims to contribute to filling this gap. Now that BwN has proven itself as a new flood protection strategy, the time has come to investigate the new boundaries between BwN-based hydraulic solutions, ecological, urban and, landscape design to develop a new series of dynamic coastal landscapes, connecting the different disciplines. Ecosystem services and nature-based solutions already express this integral potential of BwN, showing that the reinforcement of supporting services (BwN management of f.e. soil and ecology), not only safeguards regulating services (such as flood protection) but also feeds provisioning (f.e. harvest, wildlife) and cultural services, such as recreation and landscape scenery. Another characteristic is the time aspect of

This publication aims to explore Building with Nature as new dynamic, spatial strategy for coastal regions. It illustrates the main drivers for the next generation of BwN to evolve as well as key factors for its embedding in its physical and societal context; integrating multidisciplinary perspectives to offer more than the sum of its separate solutions. This new way of cross-disciplinary thinking and designing is illustrated by a series of projects and research, divided in four perspectives (figure 2).

Infrastructures discusses the altered perspective of large-scale infrastructural interventions in the Delta, based on the new Building with Nature approach. These artefacts incorporate forces of nature to deliver ecosystem services for coastal safety or energy, whilst incorporating other services such as nature or recreation. This asks for an interdisciplinary approach, and this chapter discusses various methods to achieve it. With dynamics as a driving force, BwN starts with understanding the system, that reaches from a local to regional (De Vries et al) and from a multi-layered to integrated design (Brand et al). Within this context, the definition of multifaceted design objectives, as well as design roles (Klaassen et al) are necessities for addressing the complexity of the BwN systems approach.

Building with nature creates new dynamic, adaptive landscapes based on a synthetic, engineered and modelled nature. This challenges **spatial design** to translate and incorporate these landscapes into their socio-economic reality, not just by addressing safety and ecology, but transforming it into a cultural landscape, offering new living environments that mediate between floods and waterfronts. This asks for *transitional design*, transferring nature-based principles to support new adaptive waterfronts, as illustrated in 'Urban dunes' by Van Bergen et al.. Van de Velde et al. address the link between BwN and landscape architecture. Landscape methodologies can support the next generation of BwN projects in the way interpretation or *mappings* of nature are made; functions are integrated by *layering* in various spatial, cultural and temporal scales; and *narratives* can stimulate the social acceptance of BwN. Heerema concludes with the role of art in the social embedding of BwN; her 'Satellite' program offers a cultural community of practice to critically investigate the Sand Motor; not only for the landscape to become part of the collective memory, but also as a reflective practice towards the artefact and technology itself.

The **Ecology** chapter discusses the correlation between BwN, ecological and anthropological regeneration. BwN not only offers engineering solutions, but also reintroduces natural processes back into the delta, creating buffer zones that restore the valuable ecosystems between water and land. This gives

potential to redevelop a powerful estuary landscape with flexible transition zones between land and water for multifunctional flood protection, for nature and humans, generating new forms of amphibious living and an alternative agriculture. Cook discusses the fundamentals of the ecological approach by the work of E. Odum. It stresses the importance of understanding the 'nature' of the system before intervention; including the anthropological perspective. Van Stiphout illustrates how nature is employed for biodiversity in inhabited landscapes, adding multiple values, beauty and stewardship.

Modelling discusses the representation of Building with Nature processes by computer and governmental science. These processes can be represented as algorithms and interactive data in programs and decision models. They have great meaning in the design, prediction and incorporation of BwN solutions. Luijendijk discusses how virtual morphodynamic forecasting, crucial for the application of BwN, has benefitted from the real-time and interdisciplinary findings of the Sand Motor pilot project. The development of process-based landscaping tools can stimulate the further integration of BwN related disciplines. By virtual modelling, spatial & temporal conditions can be simulated, prescribing natural and urban processes for the landscape to evolve. These digital simulations are important for design processes, but still need their physical counterparts to calibrate and bridge the knowledge gaps, as described by Wijnberg et. al.. Ruijgrok concludes with cost-benefit models for documenting the ecosystem benefits of BwN compared to traditional measures, an important tool for integrated decision making.

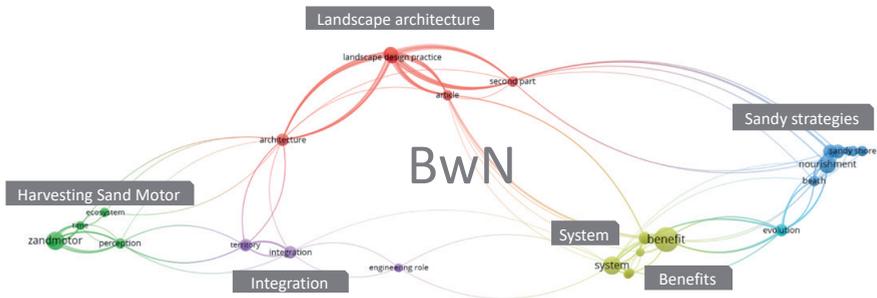


Figure 3. Mapping of Building with Nature themes added to the academic landscape based on the scientific contributions from this publication (Vosviewer image: J.v.Bergen & D.J. Ligtenbelt). The mapping shows the clusters of interest, including: continuation of sandy strategies (right); the harvesting of the Sand Motor (left); the introduction of landscape architecture (top) and shared ambitions for integration and benefits. Although connected, the future challenge will be to bring these clusters closer together.

Altering the BwN perspective

This next generation of BwN research has created a body of knowledge for the application and integration of BwN techniques. They not only show the range

in which BwN solutions develop, but also introduces a new integrated scope for BwN in the spatial domain, as shown by Vosviewer-analysis (figure 3). They confirm that sandy BwN solutions will remain one of the major strategies in response to sea level rise. Now with the first pilots, like Sand Motor, operating for almost 10 years, these projects produce vital sets of data to create better understanding of the coastal dynamics involved. Furthermore, they show that the gap between BwN and landscape architecture is dissolving. A natural bond, since landscape architecture is based on the understanding and manipulation of natural systems, and offers design tools to embed BwN artifacts in their physical, cultural and societal landscape. With the emancipation of landscape architecture and art as contextual and reflective disciplines for BwN, greater integration can be achieved, raising the benefits and social acceptance of any BwN solution.

The publication was concluded with the symposium BwN Next (February 2020), collecting, disclosing and evaluating lessons learned from BwN from an interdisciplinary and international perspective to a broader audience and setting a framework for the application of BwN as a spatial strategy for urban delta landscapes. It discussed an outline of the agenda to work on: towards a deeper understanding of the systems involved; from amalgam towards a clear definition of BwN; and the set up of BwN as a learning community for generations to come.

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