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WHAT IS NEXT ?

LOOK, THINK, AND ACT CONTEXTUALLY

When reflecting on the themes, case studies, and featured designs discussed in this design guide, the meaning and impact of infrastructure clearly appears to go beyond functionality and performance. The spatial and system integration of infrastructure is shown to have positive but also negative effects on society, the environment, and the economy. From a historical perspective, most Dutch infrastructure for urban and regional development had to be newly built in the post-World War II period, as a (re) construction task on all governmental levels. On top of this, the Netherlands had to respond to the 1953 flood disaster by building new flood defences.

The growing population and rising welfare led to suburbanisation, the growing need for mobility and related congestion and environmental pressure, like air pollution and degradation of the landscape. The government responded by regulations, norms, adaptation of infrastructure, and system optimisation. In the near and mid-term future, the maintenance and/or replacement of a vast amount of current infrastructure is necessary; this is a challenging task, which can lead to availability issues.

At the same time there is a high housing demand, society and the economy must keep going and the effects of climate change challenge the present system and planetary boundaries. Governments at various levels are responsible for infrastructure, yet they often lack sufficient budgets for asset management. The question then arises if successful planning and intervention approaches from the past can be applied in an uncertain future under new and ever-changing conditions, while the need for action is obvious.

GOAL-BOUND PARADIGM AND VALUE-BOUND PARADIGM

From a conceptual point of view, the postwar reconstruction period was dominated by a *goal-bound paradigm*, in which goals and means, efficiency, and blue-print planning for urban and infrastructure development were centrally led and developed (see table). The Oosterschelde-kering, part of the Delta Works, marked a new juncture since social protest in the 1970s put ecology and social involvement more prominently on the agenda. This led to the present advanced design beyond ‘sober and efficient’. When looking at the featured designs and case studies in this guide, like the transformation of The Hague’s city centre, the urban development of Spoorzone Delft, the reinforcement and renewal of the Afsluitdijk, and early stakeholder participation for the Blankenburgverbinding, another paradigm appears, reflecting other tangible and intangible values than strictly economic: the *value-bound paradigm*. This includes infrastructure interventions that not only focus on transport or flood protection but also consider various social and environmental values as a starting point to create significant benefits for the region, city, or landscape. Well-accessible, attractive urban and regional locations lead to higher land value and therefore to development prospects. Making better use of these mechanisms can redefine infrastructure as an investment tool, instead of only a financial burden. This creates value for the long term: a balance between city and landscape, accessibility and liveability, flood protection and freshwater availability, and in the end benefits society, economy, and ecology as a coherent whole.

Paradigms are conceptual frames of thought and action to coherently describe and explain a subject and its related practice, beliefs, attitude, body of knowledge, and working methods. The two previously distinguished paradigms are not normative moulds in which everything must fit; they are not ‘good’ or ‘bad’, or mutually exclusive. They emphasise a different context to start, focus, and act, but they share economic, environmental and sustainability aspects – as principles or boundary conditions – and several methods. Due to the problem situation and its contextual complexity, one may suit one particular project better than the other. The value-bound paradigm, including integrated approaches, fits better in a plan-like setting for system transition, while the goal-bound paradigm, including systems engineering, is more applicable if the purpose is fully clear, like technical replacement. However, in the latter case, we must also consider a number of different values as boundary condition. Both paradigms must deliver feasible prospects in a desired and likely future; both require appropriate modes of task engagement, expertise, and competences, within a more collaborative or competitive context. While the goal-bound paradigm is institutionalised in present practice and education, the value-bound paradigm still needs to be better defined, recognised, and established.

Governmental clients are key in this, since they define and put a problem situation on the political agenda. The involvement of other stakeholders, including citizens, in the early planning phase is not widespread in practice. Taking this route can lead to a different problem definition and solutions informed by a variety of values, which makes it possible to move beyond just solving a problem. This also applies to other client-contractor relationships. Collaboration between developers, designers, engineers, and other experts in the early planning stages can introduce the benefits of design and system thinking, in which stakeholders’ viewpoints, aspired values, and interests can be translated into plausible solutions and positive effects. For education, it is necessary that students in an early stage engage in interdisciplinary collaboration and design within a transdisciplinary context. Research can contribute by providing more factual evidence for the paradigms and their constituent aspects, as context-related and valid representations of the present and future practice for infrastructure development and management.

Table. Contextual paradigms as conceptual representation of infrastructure development and management practices.

	GOAL-BOUND PARADIGM	VALUE-BOUND PARADIGM
Problem definition & Agenda setting	• problems are unambiguous and clear to define and delineate within a mono- or multidisciplinary and sectoral context • single-focus within a defined scope • economic and/or technical reasons are seen from a sectoral perspective	• problems are open, ambiguous, and vague, within an inter- or transdisciplinary and cross-sectoral context • multi-focus within a broad scope • social and/or environmental reasons are seen from a cross-sectoral perspective
Beliefs & Attitude	• economic growth for a prosperous society • sober and efficient design and realisation • single-purpose; a specific object for problem-solving codified in a fixed programme of requirements, fit for purpose • various values as boundary conditions • technology as enabler • decomposition of problem and solution in parts from an analytic perspective • a managerial and hierarchical approach, objective and result-oriented, with emphasis on time, costs, capacity, risks, and deliverables • dominant lenses: functionality, performance, complexity (technical, legislative)	• broad prosperity within planetary boundaries • sustainable social values within their economic, social, ecological, and cultural-historical context • multi-purpose; system level for problem identification within a multitude of contexts • various values as principles • infrastructure as a means to various ends • a developing and heterarchical approach; explorative, future-oriented problem-solving and value creation from a design thinking and system perspective • focus on purposes and processes with emphasis on social and/or environmental values, impact, and stakeholder commitment • dominant lenses: added value, collaboration, spatial quality, sustainability, adaptivity/resiliency
Knowledge & Competences	• information/data: sufficiently available or easy to gather to define problem, conditions, and effects • knowledge: vast and mature disciplinary knowledge, expertise, and experience • structure: sectoral, compartmentalised, and institutionalised knowledge and competence development by governments, companies, and knowledge institutes • education: formal and disciplinary in BSc major programmes, MSc programmes or tracks and graduation specialisms • research: thematic programmes within established disciplines and fields	• information/data: insufficiently available to define problem(s), conditions, and effects univocally • knowledge: not widely spread, immature inter- and transdisciplinary knowledge, expertise, and experience • structure: dispersed, fragmented, and thematic coalition-based knowledge and competence development by governments, companies, and knowledge institutes • education: elective inter- and transdisciplinary education in various BSc en MSc programmes, courses, projects, and (graduate) studios • research: small-scale, dispersed, and individual PhD research
Methods, Techniques, Strategies	• e.g. social cost-benefit analysis, multi-criteria analysis, environmental impact analysis, systems engineering, asset management • project management focusing on project and outside communication • monofunctional design by (multi)disciplinary and sectoral collaboration	• e.g. research by design, integrated transition strategy, benefit-oriented design, integrated infrastructure design method, transit-oriented development, plan review, life cycle management • process management focusing on participation, cocreation, and interaction with stakeholders • integrated or multifunctional design by interdisciplinary and cross-sectoral collaboration
Performance practice	• public funding and public-private beneficiaries, making trade-offs/compensation, business case • construction- and cost-driven, transactional relationships, risk transfer	• public-private funding and public-private beneficiaries, making equal exchanges, add-on projects for added value and/or cost reduction, value- and business case • opportunity- and value-driven, collaborative partnerships, proportional risk distribution
Community	• sectoral and institutionally organised with a clear division of roles: client (governments), contractor (companies), knowledge institutes (universities, governmental institutes) • client and expert driven • promotion and communication by scientific journals and professional magazines	• loosely and temporarily organised within a network setting of initiators, designers, engineers, constructors, agents of governmental, knowledge institutes, platforms, and stakeholders, without a strict hierarchy between participants • initiator(s) and designer driven • promotion and communication by platforms and professional associations

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Backcover: Harderwijk, Gelderland: Aqueduct Veluwemeer crossing the N302 motorway. [© Sébastien Nagy]

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