

Infrastructure - the design, construction, operation and maintenance of infrastructure - is about creating value.

Creating value for society. Infrastructure is not a goal in itself. The fact that we, as infrastructure providers, are used to expressing our goals in terms of infrastructure projects, is distracting us from what infrastructure is about.

Infrastructure is not only about asphalt, railroads, pipelines, harbours and airports. Infrastructure enables people to move around, to reach their work, to visit family and friends, to recreate and enjoy their environment, and it is about enabling companies to move their goods to customers.

Therefore infrastructure is a comprehensive concept, that requires a multi-scale approach, with an integrated perspective that includes all modes of usage, and that acknowledges not only the economic value of mobility, but also its social value and its wider effects on the environment.

With our partner organizations in Next Generation Infrastructures we commissioned the Netherlands National Bureau of Statistics to measure the value added of our national infrastructure base. Our partner organizations represent a substantial part of the national infrastructure base, as owners and operators of the flood protection and water management system, the national network of highways and waterways, the national railway network, the port of Rotterdam, Schiphol airport, and regional networks for the distribution of gas, electricity, heat and water.

At the start of the project we had a crucial discussion about the definition of infrastructure. Physical assets are essential parts of the infrastructure system, but as such they are not enough to produce the essential services that the infrastructure system provides to society. As essential services we defined: flood protection, water management, transportation of people, goods and data, the supply of telecommunication services, energy and water, and the safe removal of waste and waste water. We defined the basic infrastructure system as everything that it takes to provide these basic services to society.

Throughout the years 1995-2015, the basic infrastructure system contributed 12% on average to the total value added created by the Netherlands economy, which equals 10% of the Gross Domestic Product of the Netherlands. You might say that the other 90% of the GDP could not have been produced without the services provided by infrastructure. You are right, but - you could also argue

that the infrastructure system services we defined could not have been provided without, for example, the financial infrastructure or the education system. It just shows how infrastructure is interconnected with each and every activity in society and the economy. It can hardly be isolated as a sector, which is the main reason why we opted for a minimalistic, yet functional, system definition.

As we speak, the Dutch Bureau of Statistics is working on an international analysis. At this point, however, we lack data on the value added by infrastructure in other countries, so we do not know whether 12% of the total value added is high or low in comparison with other advanced economies.

What we do know, however, is that the econometric approach to value added denies the value of infrastructure services as it is perceived by society. Let's take the example of drinking water supply. According to the econometric analysis, the provision of clean tap water contributes less than 2% of the total value added by the infrastructure system. Apparently, the econometric analysis cannot express the value of clean drinking water for society. However, as we all know, safe drinking water clearly makes a crucial contribution to public health and wellbeing, and consequently brings economic value as well.

The point I would like to make is that our current methods of analysis fail to measure the true value of infrastructure for society. Not all of this true value can be quantified. Think, for instance, about the esthetical quality of infrastructure works, such as bridges and railway stations, and how they contribute to the particular identity of cities and infrastructure hubs. Highlights of infrastructure engineering, such as Brooklyn bridge, Sydney harbor bridge, and the Golden Gate bridge have become icons for their cities. For the residents of New York, Sydney and San Francisco, these historical infrastructure works contribute to a sense of place, a sense of belonging.

But the value of infrastructure for society goes deeper than landscapes and cityscapes. In the design and management of infrastructure, also social values are embedded. For example, in our electricity infrastructure, criteria such as universal access and affordability, and the socialization of infrastructure costs, represent important social values, such as social inclusiveness and energy justice. As such, electricity infrastructure, like transport infrastructure, has contributed significantly to social cohesion, to fair chances for all to participate in society. Universal access to safe and affordable drinking water, to sanitation

and waste management infrastructure has likewise created the basic conditions for public health and wellbeing, for the rich as well as the poor, for the young and the old, for city dwellers and the residents of rural areas.

This is what infrastructure is about. About equal opportunities for all to participate and thus create economic and social value for society. The challenge now is how to express this comprehensive concept of societal value creation in our decision making on infrastructure development.

I see three major challenges for the future:

1. The methods for societal cost/benefit analysis that currently support infrastructure decision making, only recognize value aspects that can be monetized. In practice, this implies that they focus on direct economic effects of infrastructure investment, and on environmental externalities, positive or negative. Social values are not a part of the equation.
2. Another challenge is the devolution of spatial planning and infrastructure planning from the national level to local governments. As this brings infrastructure decision making closer to the people who directly benefit or who are otherwise affected, it creates better conditions for inclusion of social values into the decision making.
3. The third challenge I see stems from the trend towards decentralization of infrastructure services. Especially in energy infrastructure we see technological developments towards infrastructure independent renewable energy supply. For more and more people who enjoy the availability of space, knowledge and means to invest, autonomous energy supply is an option that may come within reach. In the framework of climate policy, many governments subsidize such investments in clean and renewable energy technologies. At the same time, there is an evident risk that such subsidies may erode the public support for renewable energy, as autonomous energy supply is out of the question for the less wealthy and for most city dwellers. It is perceived as energy injustice, if only the rich can go off-grid, while the rest of the population remains infrastructure dependent. Which brings us to the infrastructure cost. Should we adhere to the principle that the costs are socialized, even if not everyone is connected?

As mentioned before, social values as solidarity, inclusiveness and fairness are not an explicit part of the decision making on infrastructure projects. Neither

are they expressed in the national accounts. Yet, the embodiment of such values is an important feature of our national infrastructure base, that is at risk of being eroded if we reduce infrastructure decision making to values that can be monetized.

The appreciation of infrastructure-based services by society is not only a matter of costs. As mentioned before, infrastructure also contributes to social cohesion, to public health and safety, to the quality of our living environment. It contributes to a sense of place, while it also enables communication and mobility. All these values are vital for our wellbeing, at a personal level and at the level of society as a whole. And that is what infrastructure decision making is about: it is about the infrastructure that we need to serve society better in the future.

The challenge that we see as Next Generation Infrastructures is to engage the public in a new debate on infrastructure. A debate that is not driven by infrastructure service disruptions, but a forward-looking debate that focuses on the society that we want to be in the future, on the values that define it and the infrastructure that is needed to support that society.

Such a debate needs to be fed with new data and new insights. Recognizing infrastructure as a system that is more than cables and pipelines, but a system that provides services, is a first step. Such a definition of infrastructure, however, turned out to be lacking in our national accounts. Infrastructure is not included as a category of economic activity in the standard classification of industries and services. In our work with the Dutch Central Bureau of Statistics, the infrastructure category needed to be constructed from a multitude of activities in the standard index of industries.

Our ambition now is to expand the econometric analysis of the value added by infrastructure to Europe and the OECD. That requires first of all that we agree on the definition of infrastructure. It also requires that we agree on the selection of industries and activities that fits within that definition. That definition may have to be adapted to the granularity of data available in Eurostat and other relevant databases. We will form an international expert group to arrive at an accepted and workable definition, that allows us to compare the contribution of infrastructure to the value added of a range of national economies.

The next challenge then is to relate the outcomes of this international analysis to the performance and the appreciation of the national infrastructure system in different countries. How does the contribution of infrastructure to the total value added of different economies relate to subjective and objective measurements of infrastructure performance in those countries? And more importantly, does it relate to the appreciation of infrastructure by society? What are the values that really count for different societies? And how are these values then acknowledged in infrastructure policy making and in the decision-making on infrastructure projects in different countries?

My goal today is to convince you to join us in this new approach to infrastructure. To recognize infrastructure as a system-of-systems that is providing essential services to society, as a system that supports us in the creation of societal value, and as a system in which important social values are embedded. Infrastructure is deeply political. Therefore, infrastructure policy making and infrastructure governance call for a political debate on principal values to be respected in the design and management of infrastructure, and on the type of value to be created for society.

This debate is urgent, given the challenges that society is confronted with: the energy transition, urbanisation, the data revolution, demographic change, scarcity of water, materials, arable land, et cetera. Whether or not we will deal with these challenges successfully, to the benefit of society, will to a large extent be determined by the infrastructure of the future. In the world of infrastructure, which is characterized by capital intensity and path dependency, the future begins today.

If we are serious about COP21 and the Sustainable Development Goals we should not shy away from disrupting traditional development paths. If we keep doing things the way we are used to, we will not be able to reach our goals!

We see a strong increase in the interdependence of infrastructure systems across sectors. Digital information infrastructure, smart grids and smart mobility systems are converging into a true cross-sector infrastructure system, that defies established legislation and regulatory arrangements which are still silo-ed. This mismatch poses the risk of serious delays in the innovation of our

infrastructure base, which may, in turn, hamper society in timely responding and adapting to the new challenges.

So my call on you is to act today rather than tomorrow, and join us in accelerating the development of new knowledge, new definitions and new methodologies to improve the decision making on infrastructure policy, planning, management and construction. The future decision making needs to cater for cross-sector co-ordination, and acknowledge a richer perspective of the value that infrastructure creates for society.

I do realize that this might be frightening. Innovating requires us to discard established practices and explore uncharted territory. But more frightening than this, is failing to innovate. All of us can picture how society will be affected if we fail to innovate our infrastructure practices.

In my opinion, there is no choice at all!

Thank you for your attention.