Extended abstract ERSA Conference 2017, Groningen, The Netherlands, Social Progress for Resilient Regions

# Integrating Renewable Energy Development With Infrastructure Networks: An Institutional Analysis Of The Case Of Rijkswaterstaat In The Netherlands

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**Keywords:** Renewable energy; Infrastructure planning; Integration; Institutions; IAD

## Introduction and contribution

The binding climate agreement of Paris from 2015, shows that worldwide there is an increasing sense of urgency to reduce the amount of greenhouse gasses emitted into the atmosphere. The transition towards a more renewable energy supply forms an important contribution to reducing these greenhouse gas emissions (Sijmons & Vermeulen, 2017). However, compared to most fossil-based energy generation, renewable energy generation requires extensive amounts of space and is highly visible in the landscape which makes many renewable energy projects highly contested and prone to societal resistance (Strunz, 2014). In the Netherlands, initially the energy transition was treated as a technological transition accompanied by economic measures to alleviate consequences and support technological changes. However, the lack of attention for the socio-institutional side of the energy transition currently appears to be the main factor limiting opportunities for renewable energy development. Moreover, due to the large spatial impact of renewable energy, integration of renewable energy production with other functions in an area might prove necessary if the Netherlands wants to overcome the challenges related to the energy transition (De Boer & Zuidema, 2015). In this paper, the focus will lie on the institutional developments surrounding the integration of renewable energy generation with a specific type of spatial function, namely the main infrastructure networks managed by Rijkswaterstaat (RWS) in the Netherlands.

Currently, not only Rijkswaterstaat, but also for example the Federal Highway Administration in the US and the highway administration in the UK, are searching for opportunities integrate opportunities for renewable energy development on, or adjacent to the transportation networks they manage (FHWA, 2012; HighwaysEngland, 2016). Examples of such opportunities include more mature technological options such as wind turbines or solar panels in left-over spaces along highway (nodes), and solar panels in sound screens, or the growth of energy crops along roadsides (FHWA, 2012). Moreover, future opportunities also include technologies that are currently in various stages of development such as energy dikes, water turbines underneath artifacts such as bridges, (micro) wind turbines harvesting energy from passing vehicles, or energy harvesting from roadway vibrations or the braking of vehicles (FHWA, 2012).

Although many of these public organizations are looking into these opportunities, the number of actual projects remains limited. One of the main challenges appears to be the adaptation of institutional frameworks that have traditionally been developed to accommodate safe and reliable transportation across roads or waterways, or to ensure safety against flooding, to also accommodate renewable energy functions. Moreover, these integration efforts require the inclusion of a number of additional sectors (e.g. spatial planning, or the energy sector) that have their own institutional frameworks, developed for their own specific purposes, and that might be contradictory to each other. As Grotenbreg & van Buuren (2016) explain, there is both an institutional overload due to conflicting regulation in various involved policy

sectors, as well as an institutional vacuum due to a lack of rules regarding the integration of energy and infrastructure.

This paper aims to analyze the institutional barriers and opportunities for integrating renewable energy development with the main infrastructure networks by RWS, as well as the manner in which RWS attempts to address these barriers. These insights can be helpful in determining possible starting points for institutional configurations that enable the realization of renewable energy projects along infrastructure networks.

## Theory

As explained above, a wide variety of often conflicting institutional frameworks is applicable to projects and opportunities for integrating renewable energy with infrastructure networks. In order to analyze the institutional barriers and opportunities to this integration requires an explanation of how the term 'institution' is used in this paper. Institutions are most commonly referred to as 'rules', which is how the term will be applied in this paper. North (1990) defines institutions as "the rules of the game in a society, or, more formally, […] the humanly devised constraints that shape human interaction" (p.3). Commonly, a distinction is made between formal and informal rules (North, 1991; Ostrom, 2005; Kingston & Caballero, 2009). Formal rules are usually described as explicit, written down and/or enforced by actors with specific roles, including for example constitutions, laws, and policies. Informal rules are implicit, lack clear specification, and/or are enforced endogenously, including for example conventions, norms, and codes of conduct (Kingston & Caballero, 2009; North, 1991). The institutional framework is formed by interaction between these formal and informal rules (North, 1991), which according to Ostrom (2005) form a multi-layered, nested hierarchy of rules. This institutional framework determines the choice set open to actors and thereby the context in which actors assess choices and make decisions regarding strategies and actions (Ostrom, 2005; North, 1991). Creating an understanding of how the various applicable institutional frameworks in the case of renewable energy along infrastructure networks influence the choices of actors with this regard to these projects, is a crucial first step to finding institutional configurations that increasingly enable such integration efforts.

The Institutional Analysis and Development Framework by Ostrom (1990, 2005, 2011) is applied to systematically analyze the rules that influence decision making by a variety of involved actors and their related institutional frameworks. The unit of analysis for the IAD framework is a certain 'action situation', which is defined as "the social spaces where individuals interact, exchange goods and services, solve problems, dominate one another, or fight" (p.11: Ostrom, 2011). By defining an action situation, it becomes possible to examine the important aspects of multiple institutional frameworks that are applicable to this action situation. In this paper, two interrelated action situations are being examined: (1) on the policy level, and (2) on the project level.

The IAD framework identifies seven types of rules that determine the structure of an action situation. These include: (1) Boundary rules determine who is involved, how, and when; (2) Position rules determine what positions held by actors and the wants or need of these actors; (3) Choice rules determine the (perceived) choices for actors in certain positions and thereby their strategies for actions; (4) Information rules determine which information is shared between actors, and how and when this happens; (5) Scope rules determine the types of outcomes or results that are considered; (6) Aggregation rules determine how decisions are made and the control of actors over these decisions; and (7) Payoff rules determine the distribution of costs and benefits among actors. This framework is applied to identify barriers to integration efforts, as well as possible starting points for improving institutional configurations that enable these integration efforts.

## Methodology

This paper is based on qualitative data gathered through a mixed-method approach consisting of policy document analysis, in-depth interviews and focus groups. Policy documents included national level policy documents issued by the Ministry of Economic Affairs, the Ministry of Infrastructure and the Environment, Rijkswaterstaat, as well as the policies with regard to energy issued by the three Northern Provinces. A total of 16 in-depth interviews were conducted in the second half of 2016 and early 2017. Respondents included officials from the Ministry of Infrastructure and the Environment, Rijkswaterstaat, and the regional department of Rijkswaterstaat in the North of the Netherlands, officials from the three northern provinces, as well as representatives from the private sector including a large consultancy firm, an energy company and an energy utility company. Interviews were based on informed consent, recorded and transcribed. Focus groups including officials from Rijkswaterstaat were held at the beginning and towards the end of the data gathering process (May 2016 and December 2016) to triangulate findings with practitioners. The transcripts and policy documents were coded using the software Atlas.ti. Codes were ordered according to the seven types of rules of the IAD.

## First results

The first results illustrate a number of important barriers to integrating renewable energy with the main infrastructure networks managed by RWS in the Netherlands.

There are no clear boundary rules determining who needs to be involved when on the project level. A variety of parties needs to give consent to these projects, but not all these parties are always involved in the project from the beginning. For example, provinces and municipalities are important for giving spatial planning consent for renewable energy projects (mainly solar and wind energy). However, unless these governmental parties initiate the projects themselves, they are often involved only in later stages of the planning procedure. Moreover, on the project level, progress only seems to occur when a strong actor with a large network and much resources takes up the task.

The above discussion illustrates that it is unclear who is, or should be responsible for initiating these projects regarding renewable energy along main infrastructure networks. On the policy level there appears to be a lack of position rules.

On the policy level, choices are limited because of the strong risk-avoiding character of prior policies and regulations, with a focus on absolute safety. On the project level, this is translated into a risk avoiding attitude by many employees, who do not, or only to a very small extent perceive ideas for integrating renewable energy and infrastructure networks as feasible. This attitude is supported by payoff rules that create incentives aimed at remaining within the initial time, scope and budget, that thereby actively discourage integration efforts.

Although there is increasing attention for the opportunities for integration of renewable energy and infrastructure networks at the policy level, the translation of these ambitions in programs and plans is limited. This seems to be related to the strong compartmentalization of responsibilities for energy and infrastructure in separate ministries; energy is a responsibility of the Ministry of Economic Affairs and Infrastructure of the Ministry of Infrastructure and the Environment (ministry of I&E). Moreover, the Ministry of I&E is compartmentalized in separate directorates for different infrastructure networks and for sustainability and environment, which is again reflected in a compartmentalized structure within of Rijkswaterstaat. The scope rules of the department responsible for infrastructure network development therefore are almost solely aimed at infrastructure development, thereby creating barriers for integration efforts.

These first results already demonstrate how the focus on the policy as well as the project level provides insights into possible starting points for institutional configurations that increase the coordination between these two levels and thereby help create integrated projects regarding renewable energy and infrastructure

networks. Taking the example of the boundary rules, a more strategic cooperation between involved parties on the regional level, could help streamline the planning procedures by creating consent about certain types of development at certain locations in an early stage in the planning process. This might lower the boundary rules, and creating opportunities for more parties to participate in this action situation, thereby increasing the opportunities for integrating renewable energy and infrastructure networks.

**Sources**


De Boer, J. & Zuidema, C. (2015). Towards an integrated energy landscape. Urban Design and Planning. http://dx.doi.org/10.1680/udap.14.00041.

FHWA (2012) Alternative Uses of Highway Right-of-Way: Renewable Energy Technologies in the ROW. Available through: http://www.fhwa.dot.gov/real_estate/publications/alternative_uses_of_highway_right-of-way/rep03.cfm [visited 21-12-2016].

Grotenbreg, S. & van Buuren, A. (2016) Realizing innovative public waterworks: Aligning administrative capacities in collaborative innovation processes. Journal of Cleaner Production (in press).

Heeres, N., Tillema, T. & Arts, J. (2012) Integration in Dutch planning of motorways: From "line" towards "area-oriented" approaches. Transport Policy, 24: 148-158.

Highways England (2016) M40 Photovoltaic Noise Barrier Project – Stakeholder Q&A. Beschikbaar via: http://www.m40-chilterns.org.uk/docs/m40-noise-barrier-scheme.pdf [geraadpleegd op 21-12-2016].

Kingston, C. & Caballero, G. (2009) Comparing theories of institutional change. Journal of Institutional Economics 5: 151-180.

North, D.C. (1991) Institutions. The Journal of Economic Perspectives 5 (1): 97-112.

Ostrom, E (1990) Governing the Commons – The Evolution of Institutions for Collective Action. Cambridge: Cambridge University Press.

Ostrom, E. (2005) Understanding Institutional Diversity. Princeton, NJ: Princeton University Press.

Ostrom, E. (2011) Background on the Institutional Analysis and Development Framework. Policy Studies Journal 39 (1): 7-27.

RWS (2016) Energie winning. Available through: http://rijkswaterstaat.nl/zakelijk/innovatie-en-duurzame-leefomgeving/duurzame-leefomgeving/energie-winnen.aspx [visited 26-04-2016].

Sijmons, D. & Vermeulen, M. (2017) Next Energy: Energie-transitie, de ruimtelijke ratificatie van het klimaatbeleid. Wij maken Nederland. Available through: https://wijmakennederland.nl/bijdrage/next-energy-longread [visited 10-02-0217].

Strunz, S. (2014). The German energy transition as a regime shift. Ecological Economics, 100: 150-158.