

## COMPLEXITY, SCALE AND PRAGMATISM IN SUSTAINABLE URBAN REDEVELOPMENT

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### Abstract

*In complex cases of sustainable urban development, particularly in high-density, mixed-use areas, it is argued that (inter)nationally issued environmental standards may be too restrictive and that, instead, local stakeholders must negotiate joint objectives to meet all of their interests, including an adequate environmental quality. In this contribution, we present two case studies examining the practical outcome of trade-offs between environmental standards and other objectives in highly complex inner-city redevelopments. These networked decision-making processes, involving multiple stakeholders in multiple arenas, can be classified as aggregate complexity. Complexity science has contributed modelling methods to try and understand how stakeholders interact in such intricate networks. In practice, we found a great deal of pragmatism with stakeholders taking sides in an argument which transcends the simple conflict between environmental quality and other interests. Rather, economic interests of stakeholders at higher spatial and temporal scales, local residents' health and the environment's quality on the one hand conflict with the municipality's (and the area's) economic and social interests on the other. Highly pragmatic attitudes of stakeholders in decision-making arenas at different spatial scales appear to defy theoretical modelling and justify the conclusion that trade-offs involving environmental quality standards cannot be left with municipal authorities. Higher tiers of government play a necessary role in safeguarding both environmental and economic interests that transcend the local scale.*

### 1. Introduction

Sustainable urban quality is the outcome of a decision-making process in which economic, social and environmental interests are weighed (Campbell, 1996). Environmental quality – in a strict sense, namely the level of pollutants, noise and risk – is an integral part of this negotiating process. Particularly in cases where land is scarce, where different types of land use are in close proximity to one another and where many stakeholders have claims on the little space that is left amidst a host of activities, environmental impacts are usually high and cumulative and desired spatial development may be hampered by environmental standards that put limits to the levels of noise and pollution in the area (Howley, Scott, & Redmond, 2009; Van Rij & Korthals Altes, 2014; Van Stigt, Driessen, & Spit, 2013). As cities all over the world respond to the challenge of sustainable urban development by converting previously developed land into high density and mixed-use urban areas (e.g. Chen, Jia, & Lau, 2008), such conflicts between environmental quality and urban development are widespread.

Generally, as a way out of the aggregate complexity (Manson, 2001) of which this type of conflict is an example, administrative powers are devolved from the central state upon lower levels of government – typically municipalities – and upon non-governmental institutions, in a process of decentralization (De Roo, 2000; Lane, 2003), often in combination with deregulation, understood as the deliberate relaxation or complete abolishment of (environmental) regulations.

As some aspects of decision-making about spatial plans are left to the discretion of municipal authorities, all within certain limits and under certain substantive and process conditions, other aspects remain within the competence of higher tiers of government. Thus, an intricate legal framework is created, in which rules, laid down by national government are interpreted and implemented by lower levels of the state to create their own, local, decision-making framework.

Decentralization and deregulation originate not only from the necessity to improve decision-making in highly complex societal contexts, but demonstrably also from a neoliberal political agenda (Lord & Tewdwr-Jones, 2014). It can be argued that, as a result, in spatial planning *inadequate weight is given to pollution prevention* (C. Miller & Wood, 2007). Similar fears have been uttered in Scotland (Prior & Raemaekers, 2006) and the United States (Allison & Lents, 2005).

In this paper, we illustrate how decentralisation and deregulation may work out in the Dutch context, where municipal authorities are allowed more room for manoeuvre in cases where, in the pursuit of sustainable development, urban space is used in a particularly efficient and economical way. In the Netherlands, policy instruments have been implemented that permit local governments to make trade-offs between environmental quality and other interests (Glasbergen, 2005; Runhaar, Driessen, & Soer, 2009; Verschuuren, 2010).

We examine how one of these policy instruments is used in practice and how trade-offs are made, i.e. what interests are at stake, who is involved in weighing them and how they interact. More particularly, as it can be expected that economic interests prevail over ecological considerations (Hofstad, 2012), we are interested in the level of environmental quality that results from these trade-offs. The research question that is being addressed in this paper therefore is: in what way is environmental quality influenced by allowing local authorities to make trade-offs between environmental interests and other interests in pursuit of efficient and economical land use?

The paper is constructed as follows: First, we look at the interactions among scales in environmental governance. Second, we discuss the Dutch approach to enlarge local governments room for manoeuvre. In section 4, the paper describes the research method used, after which the case study is presented. The paper then discusses these results and draws conclusions about the effectiveness of the approach and how this is influenced by the complexity of the issue.

## 2. Dynamic interactions among scales

### 2.1. Scales, levels and cross scale dynamics

Cash et al. (2006) define scale as the spatial, temporal, quantitative, or analytical used to measure and study any phenomenon and any point on such a scale is termed a level. Here, we are interested in the *ecological* or geographical (Cumming, Cumming, & Redman, 2006) and *jurisdictional* scales (Cash et al., 2006). The geographical scale is determined by the spatial and temporal extent of the bio-geophysical processes that underlie an environmental problem and by the resolution of our observations (see also Görg, 2007). Typical levels on this scale are local, regional, fluvial, continental and global. The jurisdictional scale is a social construct (Bolin, Collins, & Darby, 2008) describing the institutions and social processes involved in managing the ecosystem's resources (Cumming et al., 2006). On this scale, e.g. municipal, provincial, national and supranational levels can be distinguished.

To avoid scale mismatches, i.e. a misalignment of geographical and jurisdictional scale (Cumming et al., 2006; Termeer, Dewulf, & Van Lieshout, 2010; Young, 2006), environmental governance can be rescaled from the national level, either upwards or downwards. Authority is devolved upwards to the supra-national tier in order to deal e.g. with trans-boundary air pollution at the level of the European Union (EU) or with climate change at the level of the United Nations Convention on Climate Change. It is devolved downwards to regulate regional and local environmental problems (Van Rij & Korthals Altes, 2014), such as odour nuisance and traffic noise.

If, however, a phenomenon occurs at multiple scale levels, there also will be multiple interactions between geographical and jurisdictional scale. Noise, for instance, is considered to be a local phenomenon, yet it is influenced by local environmental policy e.g. permitting industrial

activities as well as regional policies regarding infrastructure or even national policies concerning aviation. Cash et al. (2006) term this *cross scale, cross level dynamics* or *multiplicity*. Termeer et al. (2010) argue that these cross-scale and cross-level issues are dealt with by increasing the fit between scales and improving the links between administrative levels.

## 2.2. Repairing scale mismatch: devolution and subsidiarity

Which government tier is most suited to secure environmental quality? And how should securing environmental quality be institutionalised? In the scientific literature about environmental governance, these questions are addressed from different frames, invariably involving both devolution and participation. Newig and Fritsch (2009, p. 197) frame the debate as a response to insufficiently effective environmental policies. They argue that one response is to adapt the level of governance to the spatial scale of the environmental problems to be solved. Such devolution addresses scale mismatch quite in accord with the subsidiarity principle, which states that *decisions within a political system should be taken at the lowest level consistent with effective action* (Jordan & Jeppesen, 2000, p. 66). This principle can be traced back to political theories from the second half of the 19<sup>th</sup> century, in relation to efficiency of government action, but has gained a more specific meaning in the context of the European Union (EU), where it pertains to the allocation of national and supranational responsibilities (Jordan & Jeppesen, 2000).

The other response observed by Newig and Fritsch (2009) is to enhance participation of non-state actors in decision-making about solving these problems. Participatory governance *is expected to contribute to improving the quality of decisions by incorporating locally held knowledge and opening up the political arena for environmental interests* (Newig & Fritsch, 2009, p. 198).

Lord and Tewdwr-Jones (2014) observe the same trend towards downwards devolution of authority and involvement of non-state actors, but frame it, in contrast, as part of a neoliberal agenda in western countries that, at least in England, was motivated by a necessity to *fix the system on grounds that it is a chronic obstacle to growth* (Lord & Tewdwr-Jones, 2014, p. 346).

Thus, subsidiary devolution and participation of non-state i.e. civil society and business actors lead to a multi-level governance landscape, in which lower tiers of government, rather than replacing higher levels of the state, execute the authority that was devolved onto them, in deliberation with civil society and business actors and all within certain limits and under certain conditions set by higher tiers of government (Hooghe & Marks, 2003; Steurer, 2013). These conditions can be either substantial or procedural. In the case of substantial rulings, the result of participative deliberation at the lower-level must comply with regulations issued at higher government tiers. This may cause friction between objectives of authorities at different levels, sometimes referred to as cross-level issues (Cash et al., 2006; Termeer et al., 2010), that may lead to stalemate in local development.

That is why Garmestani and Benson (2013) argue that environmental law and institutions are too rigid to account for scale and to accommodate experimental solutions at the local level. They suggest *legal reform by identifying the principles of reflexive law as a possible mechanism for achieving a shift to resilience-based governance and leveraging cross-scale dynamics to provide resilience-based responses to increasingly challenging environmental conditions* (Garmestani & Benson, 2013, p. 1). In such a decentralised reflexive setting, national government merely establishes procedures in order to secure that all relevant interests and actors are involved in the conclusive deliberations (Gaines, 2002). Thus, the required level of environmental quality results from a deliberative process, conducted at the appropriate scale, and aimed at finding a tailor-made solution.

Decentralized reflexive environmental regulation, however, is not uncontested. First, Moss and Newig (2010) conclude that participation introduces difficulties of legitimacy and power (see also Richardson, 2005). In much the same vein, Cumming (2013) worries that the interests of actors in colloquial terms: the interests of polluters and those impacted by pollution are fundamentally

too far apart to be negotiated about in a reflexive law setting; he therefore advocates implementing reflexive law arrangements in tandem with conventional regulation.

Moreover, in cases of environmental dispute, actors are known to rescale an issue by linking it to issues at other, higher, spatiotemporal scales (Bolin et al., 2008). In doing so, they also link to the matching governance levels. As a result, an intricate web of governance relationships is created which easily complicates decision-making (for an example see Bolin et al., 2008).

### **2.3. Is devolution the solution to pollution?**

In sum, instead of facilitating decision-making in environmental governance and enhancing considerations of environmental aspects, downward devolution, together with deregulation that often accompanies it, can be expected to result in quite the opposite. However, deciding about environmental quality at higher tiers of government may paralyse local decision-making. Different elements of urban development appear to require decision-making at distinct levels of governance, introducing a problem of co-ordination between these levels. In the remainder of this paper, we will investigate how devolution and participation work out in cases of inner-city urban redevelopment where desired spatial development is hampered by environmental standards that put limits to the levels of noise and pollution in the area (Howley et al., 2009; Van Rij & Korthals Altes, 2014; Van Stigt et al., 2013).

### **3. Addressing cross-level issues: a Dutch approach**

The Dutch City and Environment (C&E) approach (Eerste Kamer, 2005) is a decentralized reflexive approach that allows local stakeholders to set aside regulations issued by higher tiers of government and to renegotiate the desired level of quality locally. The C&E approach is intended to promote efficient use of space and reaching an optimal quality of the urban environment in highly-burdened mixed-use developments (Boeve & Van Middelkoop, 2010; Evaluatiecommissie Stad en Milieu, 2004; Van Staalduine & Simons, 1999). In cases where, demonstrably, state-issued legal environmental quality standards cannot be met, it offers local administrations the opportunity to define their own quality standards, deviating within certain limits from the generic legal framework. Accompanying this relaxation of standards is a procedure regulating deviation, ensuring compensation of quality loss and ensuring participation of all stakeholders.

The procedure consists of three steps: First, environmental aspects must be considered from the onset of plan making. Second, in case national environmental quality standards are expected to be violated, the urban design must be tailored to prevent non-compliance. Thirdly, and only after it has been demonstrated that neither the usual measures nor tailor-made creative solutions can secure compliance with national environmental quality standards, deviation from these standards is in order. If lower, local environmental quality targets are set, compensation must occur in such a way that the total urban quality of life is optimized, i.e. turns out to be higher of the plan. Such an optimum quality is not determined by individual standards for air, water, soil, noise et cetera, but is the result of a trade-off among the stakeholders preferences regarding whole range of quality aspects, including architectural design, urban landscape, the presence of amenities, the proximity of public transport facilities and so on. Deviating from national environmental standards requires a formal decision by the municipal government. This so-called step 3 decision must be underpinned by the municipality's vision on the level of life being pursued, the way in which compensation is offered and the way in which stakeholders have been involved in the deliberations.

Driessen et al. (2012) have characterised several modes of environmental governance according to three basic types of features: policy content, institutional features and actor features. In much the same way, we characterise the C&E approach, based on the prominent perspective on urban environmental quality, the role of law, the way in which responsibilities are allocated to actors and the interaction among these actors. Table 1 summarises these main characteristics.

Table 1. Characterization of the C&amp;E approach

Perspective on urban environmental quality	Holistic; focus on urban quality of life. Accounting for objective as well as subjective quality aspects.
Role of law	Reflexive, i.e. regulating procedures for establishing quality objectives as a last resort, ensuring compensation and participation.
Allocation of responsibility	Devolved onto local state and non-state stakeholders.
Interaction among actors	Local government, market parties and civil society interact in open planning process, arriving at broadly supported urban environmental quality objective.

### 3.1. Perspective on urban environmental quality

The literature about urban environmental quality recognises that it is multidimensional and multifaceted (Moore et al., 2006). Depending upon the disciplinary perspective taken, urban environmental quality may comprise merely the classical environmental aspects noise and industrial safety or include aspects that belong to the domain of urban design, such as the vicinity of amenities, the availability public transport, the amount of open and green space or the identity of the built environment, conveyed by e.g. architectural features and cultural heritage. From a reductionist point of view, each of those aspects must meet a certain criterion, e.g. an environmental quality standard for water or air (Davis, 2005; Davis, 2007) or for the area of green space per dwelling (VROM, 2006). In the literature about urban quality of life, a more holistic approach is taken, in which the quality of the urban environment is explained to some varying extent by individual quality indicators.

Some of these urban environmental quality indicators can be expressed in objective terms, often using some quantitative measure like microgram per cubic metre or decibel. Other quality indicators take into account the perception of these objective conditions; when assessing noise, for instance, it is the degree of annoyance that is relevant, rather than the objectively measured sound level. These indicators are fundamentally subjective in nature and, thus, are highly dependent upon the preferences of the people involved (Howley et al., 2009).

In the C&E approach, the central concept is urban quality of life, which amounts to a holistic and predominantly subjective approach.

### 3.2. The role of law

States seek to protect weak interests, such as environmental quality, biodiversity and other aspects of sustainable urban development, by law. National environmental standards, however, by definition do not provide enough flexibility to adapt the level of protection of the environment to the particular circumstances at the regional or local level. Furthermore, issuing national standards may well provoke evasive behaviour on the part of those regulated. In order to amend these shortcomings, reflexive law (Teubner, 1983) proposes the establishment of legal procedures that assure adequate deliberation amongst stakeholders, rather than issuing substantive norms in advance (Dernbach, 2008; Dorf, 2003; Gaines, 2002).

In Step 3 of the C&E approach, clearly there is procedural, rather than substantive regulation. The C&E approach can therefore be characterised as reflexive. This third step clearly is a last resort and can only be taken after it was proven, in both preceding steps, that standards cannot be complied with, not even through tailor-made solutions.

### 3.3. Allocation of responsibility

From the 1990s and, more pronouncedly, from the 2000s, Dutch environmental policy has shifted from a centralised to a more decentralised and interactive mode of governance (Driessen et al., 2012). This is not to say that one mode has completely replaced the other; rather, the new mode has gained prominence, whereas the existing mode still prevails.

The C&E approach has several features of decentralised interactive governance: in Step 3 of the C&E approach, responsibility for establishing urban environmental quality objectives has to a large extent been devolved onto the municipality. In an open planning process, civil society as well as market parties involved can have their say and, if they feel unheard, have a right to court appeal. Ultimately, it is the municipal Council that has to validate the outcome of this process in a formal Step 3 decision. Although there is no formal new jurisdiction, this governance does remind of what Hooghe and Marks (2003) describe as Type II multi-level governance, where authority is distributed among different state and non-state actors.

### 3.4. Interaction among actors

In the C&E approach, local government, market parties and civil society interact in an open planning process, to arrive at new urban environmental quality objectives that can count on all stakeholders support. Such a process of interactive governance requires legitimacy (Driessen et al., 2012) which, in theory, is conferred by the legally established process ensuring compensation and participation. Here, trust is also important (Lange & Gouldson, 2010).

## 4. Method

Only a handful of Step 3 decisions have been made in the Netherlands under the Interim law C&E. We selected two cases in which municipalities made use of Step 3. Table 2 provides the important features of each of these cases.

Table 2. Characterization of the cases used in this study

Case	Type	Problem	Status
Roosendaal	Mixed-use development in railway and industrial zone.	Industrial noise above maximally allowed level.	In part being executed; rest on hold due to economic crisis.
Vlaardingen	Mixed-use waterfront development near industrial zone.	Industrial noise above maximally allowed level.  Flood risk; increasing due to climate change.	Overtaken by appeal court.

Our analyses are based upon desk research into the underpinnings of the step 3 underlying documents (land use plan, master plan) and, in case an appeal was filed, the appeal court rulings. Desk research was complemented by interviewing representatives of stakeholders.

Spit and Zoete (2006) distinguish three types of actors: those with only a private (business) interest in the development as such, those with an interest in the solution the development offers in a societal problem and those who have an indirect interest. We had interviews with representatives of the first two groups: municipal project leaders, their political administrators, their environmental advisors, the developer and, if applicable, representatives from local and regional industry. Interviews were conducted either face to face or by telephone, in a five-month period (January through May 2015). Interviews were semi-structured, lasted between half an hour and an hour and a half and were digitally recorded. A summary was prepared in writing and sent to individual interviewees for approval.

## 5. Case descriptions

### 5.1. Roosendaal

In Roosendaal, a former industrial estate near the train station has gone derelict. It is situated in between the historic city centre (on the other side of the railway) and, since the late 1950s, a residential area. Transformation into a mixed-use (amenities, education, offices, including a new city hall, and residential) area was thought to improve the city's spatial structure. Acquiring and remediating the land would be costly; a relatively high number of houses and apartment buildings was planned in order to optimize the proceeds of the real estate.

The remaining industry causes levels of noise that exceed national standards and, in one small corner of the area, odour nuisance. The odour problem was solved by repositioning vulnerable real estate and planning less sensitive buildings instead. Railway noise falls below national norms; rail transport of dangerous substances causes a high level of societal risk for which type of risk, however, no compulsory national norm is in vigour.

The urban planners, realizing that the noise resulting from the remaining industry was severe, had optimized the positions of the residential buildings. However, some dwellings could not be made to comply with regulations concerning industrial noise. Noise reduction at the source had been accomplished at an earlier stage and, after extensive deliberations with the companies concerned, it was concluded that any reduction of source levels at the time would be offset by the desired future expansion of the industry. The obvious solution to accommodate future expansion would have been to fit the buildings design with a so-called deaf façade (i.e. a façade that is soundproof and as such does not have to comply with noise regulations).

For some of the buildings, the view of the surroundings was thought to contribute much to their specific quality and the idea of a deaf façade was rejected (Gemeente Roosendaal, 2008). The C&E approach was therefore deemed necessary to alleviate the restrictions due to excess industrial noise. Affected buildings will be equipped with an extra insulation. In dwellings where noise was particularly problematic at night, bedrooms were situated at the least impacted side of the building. Possible damage to residents' health was deemed negligible (Gemeente Roosendaal, 2008). A relatively small excess of noise was compensated for by an unusually high quality design and layout of buildings and public space. A step 3 decision to deviate from national standards and guarantee compensatory measures was taken by the city council and approved by the provincial authorities. During preparation of the plans, deliberation with the companies in the area and public participation was secured through the usual channels.

One of the remaining industries just outside the area filed an appeal to the court, arguing that insufficient compensation was offered to potential residents and that compensatory measures were not legally secured. The court ruled that compensation was indeed in accordance with the C&E approach. It also ruled that some of the compensatory measures were not firmly established and ordered repair of the decision in this respect. The appeal was unsuccessful.

## 5.2. Vlaardingen

Vlaardingen is situated near the River Meuse, close to extensive industrial estates on either side of the river. Over time, the historical centre has been cut off from the river bank by an industrial area that recently has become derelict as some plots were abandoned. The municipality arranged for the few remaining industries to be located on a new industrial estate elsewhere within municipal boundaries, so as to restore the connection between the river and the city centre. The area, that is bounded by the historical harbour, will be redeveloped allowing amenities and high density residential use. Users and residents are expected to have a great view of the river, while enjoying the proximity of the city centre.

The area is surrounded by several industrial complexes, including the Port of Rotterdam, a petrochemical industry and therefore considerable noise and odour nuisance exist. It is also prone to incidental flooding, which is expected to be worsened by climate change. It is, however, the last available piece of municipal territory where a new residential area can be developed within the framework of a larger plan to modernize outdated neighbourhoods consisting mainly of galleried flats. Developing the area would not only upgrade it, but also improve Vlaardingen's structure, reducing the current barrier formed by the river dike and the road on top of it.

The area is heavily impacted by industrial odour and noise (Gemeente Vlaardingen, 2004). Dutch environmental law limits exposure of residential buildings, with an exemption for existing homes and small extensions of residential areas situated near a sea port (where noise levels may be up to 5 dB higher). However, the Vlaardingen development did not qualify for this exemption because of its size, about 2000 dwellings, which was not regarded as a small extension of a pre-existing residential area.

During a previous regional remediation programme, emissions of industrial noise had already been cut back, so that further limitation was deemed unfeasible. Yet, as the area was deemed to be attractive, a participative process was initiated to systematically assess environmental threats and opportunities (Gemeente Vlaardingen, 2006). With respect to noise, highly impacted residential buildings were designed in such a way that bedrooms were at the side of the building that, at night, was least burdened. A Step 3 decision was necessary because at some points, emissions were 5 dB above permitted levels and the project did not meet the criteria for the sea port exemption which would have allowed for such high levels (Gemeente Vlaardingen, 2003).

There is a high amount of tension between the intentions of the Port of Rotterdam to expand on the left bank of the river, to expand and the municipalities in the area, on the right bank, to build adequate housing for their residents. At the regional level, Rotterdam, and other municipalities, the industry and the province had jointly established a framework for further local agreements about building and industrial noise. The framework stated that no new development would lead to further restrictions on industrial noise emissions and that municipalities would communicate to prospective residents about the level of noise they were about to be exposed to. Vlaardingen, acting in accordance with the framework, expressly opted for a Step 3 decision in order to meet permitted noise levels that would not further restrict industrial emissions. Compensation was offered to residents through providing extra insulation up to 5 dB and situating bedrooms on the quiet side of the building; other compensatory qualities include the river view, the proximity of the train station, the city centre and other amenities.

Nevertheless, the Rotterdam area industry's organization Deltalinqs and a number of industrial companies filed an appeal because they feared that future extension of activities would be limited by the piecemeal encroachment on the area by apartment buildings. The appeal court ruled that this particular objection by Deltalinqs was inadmissible. Although the court was given a favourable opinion to advise about the underpinning by its technical advisor, it overturned the Step 3 decision on the grounds that in preparing it, the municipality had failed to assess compliance with the limit for the

daily average concentration of particulate matter (although it did assess compliance with the yearly average limit, as was common at the time).

There is also friction between national resilience policy and local trade-offs between flood risk and cost. The municipality intended to level up the area, looking ahead 50 years. The national authorities demand considering a longer time frame of 100 years. This, however, would bring extra cost and change the area in what one interviewee termed a *fortress*.

## 6. Discussion

### 6.1. Perspective on urban environmental quality

Both municipalities that took a Step 3 decision substantiate it by meticulously underpinning the necessity of the area's development and by detailed calculations of environmental impacts. Although environmental impacts, particularly industrial noise, are relatively high, exposure is deemed limited because of extra insulation and smart layout of homes. Yet, we found neither the actual exposure of residents nor the compensation of this loss of quality to rest on any scientific assessment of overall quality in the area. In other words: a holistic vision could not be observed.

### 6.2. The role of law

The Roosendaal and Vlaardingen cases illustrate the reflexive role of law (Gaines, 2002) in relaxing national standards in favour of a more integrated perspective on urban environmental quality. However, such a relaxation is not necessarily in the interest of industry. Rather surprisingly, we found that surrounding industries, in fear of future conflicts with the new residents' interests, argue against the relaxation of standards, intended to residential areas in their proximity. This illustrates that law also plays the traditional role to protect citizens against undue use of authority by the government.

Particularly the Vlaardingen case makes clear that state-issued standards serve to protect not only environmental interests, but also economic interests i.e. of the regional industry at higher geographic levels and interests at higher temporal levels i.e. flood risk in the area.

### 6.3. Allocation of responsibilities

The C&E approach in Vlaardingen shows that devolution and participation only in part solve the problem of scale mismatches, precisely because urban environmental quality dimensions of a local development are manifest at multiple spatial levels. This is in line with other research that found no significant correlations between governance effectiveness and decision-making scale, nor between policy delivery and institutional fit to ecosystem scale (Newig & Fritsch, 2009). In Sweden, the results of the so-called Constructive Dialogue were disappointing (Smedby & Neij, 2009) in terms of environmental quality reached.

### 6.4. Interaction among actors

Both cases show that trust is important. Neither in Roosendaal, nor in Vlaardingen, extensive deliberations with industry could ultimately prevent all parties from filing appeal. In Vlaardingen, the harbour industry's lobby organization, despite the acceptance of high levels of noise and smell through the Step 3 decision, industry felt that planning residential buildings in the area was against the agreement framework to respect the industrial noise contours. Playing the public health card, industry expects provincial government to draw clear borders between zones of industrial activity and areas with sensitive types of land use in the greater Rotterdam area; this is in line with findings by Bolin et al. (2008). This seems to be highly pragmatic behaviour, as ultimately the appeal court based its ruling on formal grounds that were brought forward, rather than considering the

municipality's perspective on urban environmental quality. Unfortunately, there is no way to know whether this particular trade-off between economic use of space, and urban environmental quality would stand up in court.

In both cases discussed here, participation was carried out following the elaborate procedural regulations prescribed. This is quite according to the principles of reflexive law. Yet, concerns of abuse of such a reflexive approach cannot be totally dismissed by our results: in both cases, municipalities are known to have invested a great deal of money in acquiring land in the area; one way or another revenues must come from these investments. Communications about the new residential areas (in area visions and plans) stress that noise standards are exceeded to merely a small extent and a quality discourse (Hofstad, 2012) highlights the unique features of the place: view, the character of the area, amenities, proximity of public transport and the city centre, and the like.

Meadowcroft (2007) argues that participation of actors who have no democratic constituency like, in our cases, industry introduce the question of legitimacy and that, therefore, there is always a role for the state. Aspects of that role could be clear guidelines for municipalities with regards to goals and means, hierarchical regulation of polluters and better alignment of policies among government sectors (Hanssen, Mydske, & Dahle, 2013).

## 6.5. Dealing with complexity

The type of issue discussed here is complex because of multiple interactions among multiple actors in multiple decision-making arenas, trying to achieve distinct objectives that impact environmental quality at various spatial and temporal scales. Manson (2001) terms this aggregate complexity. Complexity theory offers modelling methods to try and understand how stakeholders interact in such intricate systems. Theoretically, a combination of development scenarios, environmental impact models and an agent based model (cf. B. W. Miller & Morissette, 2014) could support planning in the face of uncertainty and complex interactions. In practice, however, we observe that municipal decision-makers act in a highly pragmatic way: they slice up the complex issue of urban environmental quality into separate quality aspects, such as noise, and focus on local rather than regional or even wider ranging effects as well as on short-term rather than long-term impacts. Furthermore, actors who fear that their future interests are compromised, may pragmatically fight local decisions.

## 7. Conclusion

We conclude that trade-offs leading to stretching environmental limits cannot be left with local authorities alone and that higher tiers of government play a necessary role in safeguarding both environmental and regional economic interests at higher spatial and temporal scales. Admittedly, environmental standards here were exceeded only to a small extent. However, in rapidly growing megacities in newly industrializing countries situations much worse than those in relatively quiet and well-regulated cities and towns in the Netherlands can be expected to occur, both in terms of affected population density and of noise levels.

In both cases, but more pronouncedly in Vlaardingen, we observed a conflict between the surrounding industry's economic interest, local residents' health and environmental interests on one hand and the municipality's (and the developer's) economic and social interests on the other. This conflict is shaped by the complexity of the issue, resulting from the fact that a single urban development has environmental impacts at multiple spatial and temporal scales and therefore requires attention in multiple decision-making arenas at multiple administrative levels. Although, obviously, we merely explore the issue here and more research would be needed to come to grips with it, our findings provide a first suggestion that a wide gap exists between complexity theory and the practice of governing sustainable urban redevelopment and its impact on environmental quality.

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