Environmental conflicts in compact cities
About complexity, decision making and policy approaches

S.1 Introduction
In Europe compact city policies have become a popular means of planning for sustainability. Dense, compact cities were seen as solutions to reduce the continuing expanding mobility. They are also seen as a way to avoid urbanization of the countryside. Lately planners are expressing their serious doubts about the impact of these positive effects of the compact city concept. Planners in The Netherlands are instead shifting their attention more and more to environmental dilemma's which are partly the result of compact city policies. A number of these dilemma's are caused by frictions between environmentally sensitive and environmentally intrusive functions in a compact urban setting. Traditionally these dilemma's or conflicts were solved by using a functional rationality approach, which means not much more than top-down policy urging local authorities to keep enough distance between conflicting functions. Unfortunately the compact city concept adds an extra dimension to the problem. Keeping distance can therefore no longer be the primary solution to environmental conflicts in urban areas. Environmental conflicts have become—so to speak—more complex due to spatial pressure and due to a number of different interests that have to be taken into account. To solve these complex dilemma's or conflicts functional rationality approaches might not be sufficient any more. Instead of imposing distance as the only option, in The Netherlands, local participation is also recognized as an effective approach in some of the more complex conflicts. This communicative approach is gradually gaining acceptance in The Netherlands and in other parts of the world as a promising approach of dealing with planning issues. In this paper functional rationality will be confronted with communicative rationality, using complexity as the key word to link the two together. This has lead to the following thesis: the most effective solution to urban environmental conflicts will depend on how the complexity of the conflict is regarded. Here, complexity is no longer seen as a metaphor, instead it is seen as the essence to look at planning issues, including environmental conflicts.
S.2 The compact city

In the early eighties the compact city was welcomed in The Netherlands as a planning concept, offering solutions to a number of urban difficulties. Periods of decentralisation and de-concentration had caused a tremendous pressure on the countryside. Also the availability of land became an ever growing issue due to the heavy claims made by the rapidly growing mobility. It was a period in which the Dutch population was growing fast. Later on, when the size of the population more or less stabilized, households were getting smaller and smaller, and as a result the number of households increased. Whilst the need for housing and the need for urban space kept on growing. The negative effects of decentralisation requested for a change of the outward oriented movements in the surge for urban space. The compact city concept was seen as an approach that could end 'the evil of urban sprawl'. The most sited advantages are less car dependency, low emissions, reduced energy consumption, better public transport services, increased overall accessibility, the re-use of infrastructure and previously developed land, the rejuvenation of existing urban areas and urban vitality, a high quality of life, the preservation of green space and a milieu for enhanced business and trading activities. The intensification of the use of space would also strengthen the self-containment, the diversity, and the multi functionality of the city.

The compact city concept was thought to be capable to do even more than this. At the time the World Commission on Environment and Development did put sustainability on the political agenda, quite a few spatial planners were convinced they already had an answer available. The concept of the compact city was thought to be a sustainable concept as well. The European Union became one of the vociferous supporters for sustainable urban development by using compact urban concepts, stating that the compact city leads to a superior quality of life for its residents. Although the compact city was initially not meant to be a blueprint for sustainability, the belief in the positive effects of this concept is widely spread.

These compact city related claims are at the very least romantic and dangerous. For example, the reduction of car mobility did not happen, and the enormous need for housing made urban claims in the countryside unavoidable. Compactness as a concept for sustainability seems most of all to be a belief in a simplicity that is not there. Compactness as a spatial concept is on the other hand a response to outward expansions which are for different reasons seen as unwanted. The compact city concept is therefore most of all a spatial concept with the intention of intensifying the use of existing urban space 'as much as possible', thereby improving the quality of urban life and sparing the countryside.
S.3 Dilemma’s of the compact city

The relationship between the compact city and the environment is for more then one reason controversial. Not only did the compact city proved to be less sustainable as some of us believed it was, but compact urban development will most likely have a negative effect on the quality of the 'grey' environmental as well. This is the environment which depends on intrusive emissions such as noise, odour, dust, toxic pollutants, calamites and so on. These emissions are caused by all kinds of urban activities, with industry and traffic as the main contributors.

These activities are responsible for the emission of environmental loads which can be seen as externalities with tapering effects. It means that there is a distance dependent relationship between environmentally intrusive activities and functions, and environmentally sensitive functions and areas. Therefore it seems logical to maintain a certain distance to contribute to the acceptable standards of the 'grey' environment. In the compact city however, distance is seen as a luxury.

Although the First National Environmental Policy Plan of The Netherlands supported the compact city concept, in the Second National Environmental Policy Plan the negative side effects of compact urban development were recognized as well. Increasingly different functions are concentrated in cities. On the other hand, also environmental problems are concentrated in the urban area, which can lead to conflicts between living and work functions. This dilemma is referred to as the 'paradox of the compact city'.

Most of the time, conflicts arise because of an 'environmental clash' between housing on the one side and industry and traffic on the other side. The majority of environmental conflicts to be found on or around sites within the urban area can be grouped into only a few categories. First of all, there are the industrial sites, then there are sites that are more-or-less out of use, abandoned or impoverished. In particular this concerns industrial sites, harbours, military compounds and railroad yards which are out of use. These areas are highly sought after by local authorities in order to transfer them into multi-functional or residential areas. Also contaminated sites (brown fields), sites around railroad stations and sites along traffic and rail networks are mentioned as locations where urban environmental conflicts often occur. On or around these sites the 'grey' environment is under pressure because of a concentration of functions or because transition of functions is taking place. These are functions which, for environmental reasons, do not go along well with each other.

By far the most of the dilemmas of the compact city are related to environmentally intrusive activities and their (environmentally sensitive) surroundings, or are related to (constraining) intentions to planning sensitive functions on locations baring a heavy environmental load. A number of developments which lead to an increasing density and/or a change of function or an expansion of activities, give rise to stagnation or cannot take place at all, because the actual or expected environmental quality is seen as unacceptable. Often these developments are desirable from a spatial point of view.
S.4 Environmental zoning, a traditional approach solving urban environmental conflicts

Traditionally environmentally intrusive activities are separated from environmentally sensitive areas by keeping enough distance between the two. Quantitative environmental standards were introduced by the central government to be translated relatively easy on a local level into spatial zones. These zones point out areas where the environmental load is seen as unacceptable (within the zone) and where environmentally sensitive areas and activities can take place (outside the zone). The use of standards as an environmental policy instrument became popular after a more or less successful introduction of the Noise abatement act in 1979. This act was a wonderful piece of work, not only because of the possibility to translate environmental standards into spatial zones, but also by mentioning spatial consequences which had to be taken into account when spillovers reach into environmentally sensitive areas.

In The Netherlands, environmental policy was, and more or less still is, initiated and worked out on national level. This does not mean the production of legislation and strategic policy documents only, but it was as well of a strong practical nature. Environmental standards are issued on national level, leaving the translation into spatial zones, the abatement of local intrusive sources, the issuing of permits and the implementation of these zones into the local land use plans, to the provincial and municipal governments. In this centrally oriented policy system environmental standards have a general use, without making hardly any distinction in differences between local situations, and without taking too much attention to local spatial consequences and local side effects. The centrally oriented system is a strict framework to other policy sectors such as spatial or physical planning. This hierarchy approach functions well as long as there is not too much difficulty on local level implementing the standards in order to get an acceptable separation between intrusive and sensitive urban functions.

In 1989 a major improvement to this centrally oriented standard approach was suggested. The Dutch ministry of Housing, Spatial Planning and Environment introduced a system for integrating sectoral environmental standards and their related spatial zones into one integrated environmental zone, around complex industrial sites. Integrated environmental zoning (IEZ) had to be a climax in environmental policy making. Some saw integrated environmental zoning as a natural ending of sectoral environmental legislation and a logical move towards integrated legislation.

Environmental zoning is an instrument that is a direct causal deduction from the ‘tapering’ cause/effect relation between the polluting source and its sensitive surroundings. Therefore it is a functional rationality approach based on direct causal thinking. It is a system that is one dimensional, taking not much more than distance into account. It is a top-down approach which hardly considers the side effects of its implementation, in the specific physical situation at local level and in the local needs, interests and wishes. It is above all a relatively straightforward approach, which takes local situations and its local conflicts as relatively uncomplicated. It is a simplicity that does not in all circumstances go along with the ideas of the compact city concept.

S.5 Differences

Although the number of research on urban environmental standards is rather substantial. Further more this conflicts the use of spillovers which take place which industrial sites in the surroundings. In terms of that are meant to use with multiple load, people or less people, environmental load of 50,000 people exposure for 50,000 people. In rather substantial, exposure from environmental impacts.

To answer this question have been selected emissions, including each of these we have different environmental spatial structure of a site, and the spatial structure are the area which included analysis resulted in different categories differentiation mainly between spatial structure of the integrated one (figure S.1).

We could identify industrial sites (A1) which have substantial impacts and environmentally sensitive functions. Within differentiation can sites (A1) which spillovers, which
S.5 Differences in complexity of urban environmental conflicts

Although the number of critics against the centrally oriented standard approach is growing, research on urban environmental conflicts made clear that in most of the cases the use of environmental standards can be implemented locally without a decline of spatial quality. Further more this research made clear, that in a small number of urban environmental conflicts the use of standards will give a negative result, due to the complex situation of the conflict.

This research focussed on conflicts around industrial sites where heavy industrial activities take place which are responsible for two or more environmental spillovers around the site. There are 1700 sites in The Netherlands where heavy industrial activities take place. 257 of these sites show two or more environmentally intrusive spillovers reaching out into their surroundings. In the majority of the cases noise and odour are included. It is these projects that are meant to undergo integrated environmental zoning. These sites are the most intrusive industrial sites in The Netherlands. A relatively rough estimation shows that 59 of these sites with multiple loads have a relatively low impact on their surrounding, burdening 1,000 people or less per site. Against this are 99 of the 257 sites responsible for excessive environmental load to 1,000 to 10,000 surrounding people, while 77 sites burden 10,000 to 50,000 people excessively. There are 22 sites in The Netherlands that effect more than 50,000 people. In general the environmental impact of these sites on their surroundings is rather substantial. It makes one wonder if distance keeping as a formula to end excessive exposure from environmentally intrusive loads is sufficient.

To answer this question, out of the 257 sites with a multiple environmental load, 35 sites have been selected in order to look at the spatial consequences of environmentally intrusive emissions, including 11 IEZ pilot projects. The other 24 sites were selected at random. For each of these we have looked at the number of sources per site, the spatial impact of the different environmental loads, the spatial structure of the surroundings of a site, and the spatial dynamics of the area which includes the site. This analysis resulted roughly in five different categories, which were differentiated mainly by the relation between spatial structure and the size of the integrated environmental load (figure S.1).

We could identify a group of industrial sites (A) with hardly any substantial impact of pollution and environmentally sensitive residential functions. Within this group a differentiation can be made; there are sites (A1) which have excessive spillovers, which are without impact
due to a lack of residential areas in the near distance. There are also sites (A2) which are surrounded by residential areas, but on the contrary have only minor spillovers outside the site itself. It is obvious that in these situations the use of centrally issued and boundary conditioning standards will create a ‘sustainable’ separation between these sites and residential areas without too much difficulty. With another group of industrial sites (B) that has been identified, it is more difficult to implement environmental standards. Environmental emissions from these sites will affect a relatively large number of environmentally sensitive functions. Implementation of environmental standards is still an option, and it will not effect the local spatial quality, it is however advisable to use some flexibility in implementing the standards. This means that somehow anticipation to the future environmental quality might be necessary, because of the costs to reduce the excessive environmental load in a short period. Furthermore local differentiation in the use of standards or compensation of excessive load might be one of the possibilities. The last identified group of industrial sites (C) are characterised by their extensive environmental spillovers in addition to a rather complex spatial structure, including a mix of residential and industrial functions. Within this group a few so called ‘hot spots’ can be identified. The urban environmental conflicts that these hot spots create are almost impossible to solve by implementing environmental standards. The side effects will be too substantial to take into consideration; factories have to close and neighbourhoods have to be demolished. Other solutions have to be found to get an optimum and realistic result.

Based on this distinction a differentiation is made between relatively simple (A), relatively complex (B) and relatively very complex (C) urban environmental conflicts. To get an idea about the ratio between the three types of conflicts the analysis on the 35 selected industrial sites with a multiple environmental load has to be extrapolated to the 257 sites. In that case, about half of the most polluting sites in The Netherlands can be viewed as relatively simple. About a hundred of these sites are facing a more complex situation. This means that about twenty five sites are left to be considered as very complex, with only a handful that can be called hot spots. These more complex environmental conflicts are however targeted by the critics. These conflicts have put the Dutch environmental policy structure and its environmental standard system under great pressure.

S.6 Towards more complex approaches of policy making

The centrally specified principles to be used in determining local environmental zones and its spatial consequences leave little discretion for local decision making. Since the local consequences can be rather substantial, environmental planners and policy makers in The Netherlands are therefore searching for additional and novel ways to solve urban environmental conflicts. A new environmental planning procedure is suggested for conflicts that are complex because of its size and the number of people and organizations involved. Instead of the conventional top-down approach to solve these conflicts with a major role played by the central government, decisions are left to the people who are directly involved in the conflict.
A procedure based on this consensus approach is called ROM, the Dutch abbreviation for spatial planning and environment. Experiments are having conducted with in eleven ROM projects distributed throughout The Netherlands. These projects have been undertaken in both urban and rural contexts, emphasizing the participation of all parties involved. The major purposes of this strategy are to recognize the unique characteristics of many spatial-environmental conflicts, to incorporate the local knowledge of the participants in this process, and to include the subjective judgements of affected parties concerning the degree of impact that environmental nuisances impose. Emphasis is put on participation and consensus.

This ROM approach is not intended as a substitute for the environmental standard and zoning system, but should be seen as a more procedural approach that puts environmental conflicts into a wider perspective. It tries to avoid some of the problems posed by separate uncoordinated policies dealing with various forms of pollution and hazard. But more than this, it also tries to solve environmental issues by reducing environmental load together with solving other (social-economic) difficulties in a predefined area. When taking the whole complex situation into account it might reduce the degree to which the environmental quality will meet the standards. In other words, the predictability that predefined environmental goals—the standards—will be met will decline. On the other hand it will increase the range of possibilities to solve environmental conflicts, and, if done well, solutions might be made on the basis of ongoing processes, making these processes beneficial to environmental issues.

The city of Amsterdam is one of the authorities that is aiming for broader objectives than environmental standards alone. With their so called 'stolp' or bubble concept the environmental quality of the municipality as a whole is taken into account. It should measure the environmental quality of the city as a whole, thus shifting the focus of attention away from specific sources of pollution. Although it has not been made operational, as an approach it can be an additional concept for balancing spatial and environmental concerns in a deliberate and purposeful manner.

![Diagram](image)

**Figure S.2a:** Four approaches in Dutch environmental planning.
These developments can be represented in a diagram in which the four different approaches we placed in extreme positions (figure S.2). These four approaches characterize the current Dutch debate on how to improve the effect of environmental policy making. 'Standards' and 'objectives' approaches are portrayed in figure S.2 as end points on the vertical axis, labelled as 'goal'. The 'standards' approach is based on single fixed targets, which can be achieved by functional-rational policy. The 'objectives' approach is based on multiple combined and interdependend targets, which can be achieved through the implementation of complex policy, and which are linked to on-going policy processes. The horizontal axis —labelled as 'interrelations'— is concerned with the institutional framework of decision making, it contains the 'hierarchy' and the 'consensus' approach as extremes. The 'hierarchy' approach is synonymous with top-down or central control, while the 'consensus' approach is based on participation and the more-or-less equil interactions between the people involved. Since the end of the eighties a shift from the hierarchy-standard quadrant (left top) towards the consensus-objectives quadrant (right under) is under discussion in The Netherlands.

Critics of a strict use of centrally defined environmental standards (these are mainly local authorities and industrial organizations) believe that a relaxation of the hierarchy-standard approach is needed to respond to the uniqueness and the complexity of local environmental conflicts. It took a while, but during the nineties the central government became more and more willing to share the vision of its critics. Subsidiarity, the idea that a conflict should be solved on the lowest operational level possible, and a fast growing believe in self-regulation, are arguments made by the central government to make a policy shift acceptable.
S.7 Complexity, a touchstone for decision making?

The question is however, are the arguments made indeed contributing to the effectiveness and the efficiency of the environmental policy making, or, is it that the proposed shift is caused by pressure from outside? Or is it something else? Is it maybe the trend of the time, now everyone —scientists included— is talking about participation, consensus and communication?

Another, more pressing question is if a shift from direct regulation to self regulation is an improvement of the quality of environmental decision making, and if so why? It is a fact that some of the local environmental conflicts are more specific, unique and complex than centrally defined solutions can resolve, and that another approach than centrally imposed regulation might be needed. On the other hand a complete shift towards self regulation ignores the fact that still by far the most of the urban environmental conflicts can be solved without too much effort by using centrally imposed standards.

Therefore, would it not be better to make a distinction between relatively simple and uniform conflicts, to be solved by implementing centrally defined standards, and far more complex conflicts which are strongly interwoven in the local context, a context which is better known to local authorities? If so, it would mean that decision making becomes complexity dependent (see figure S.3).

In that case, the element of choice becomes rather important. It will highly depend on how you regard the complexity of the planning issue or conflict. If an issue is seen as relatively simple, one will look at an issue, as divided into a number of distinct parts (reductionism). The mechanism between the identified parts is then seen as a direct causal relationship. It is a functional rationality approach as known in the standard oriented environmental policy of The Netherlands. It is a concept that has a high level of predictability in terms of the

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**Figure S.3:** Regarded complexity in relation to approaches in Dutch environmental planning.

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outcome. A consequence of rigid barriers is an almost mechanic procedure that will more or less automatically result in the goals which were set up at the beginning of the procedure.

In contrast one might choose to regard an issue as very complex, interwoven as it is in a dynamic context. No longer will all the attention go to the individual parts of the issue, but the relation between issue and context becomes far more important (expansionism). There is no longer a basis for certainty, and therefore the predictability of the outcome is rather low. Instead of a strongly guided process a more open form of planning will be taken into consideration. There will also be a shift from predefined goals to process related aspects. No longer will the issue or conflict itself be emphasized, but the way an issue is described and the support this description gets from everyone who is involved in the issue. It is a communicative approach which does not take logical deducted knowledge as a starting-point, but knowledge that is agreed upon by the parties concerned. Although there is hardly any certainty in this kind of process, it is a process that might lead to numerous possibilities. Instead of maximizing the outcome the planner’s task is to optimise the use of possibilities.

This theoretical discussion takes us to the issue concerning which direction developments in Dutch environmental policy making will go. Will there be a shift from one extreme —top-down regulation on the basis of environmental standards— to another extreme, which will depend entirely on self regulation? Or will there be a notion that differences between environmental conflicts demand a far more flexible approach of planning? It looks as if the Dutch have decided to go for this second option. Although this move might seem an acknowledgment of the idea of complexity dependent decision making, in practice this relationship to complexity is far from explicit.

**S.8 Every approach has its own sets of rules**

Developments in Dutch environmental policy show us a move towards a position somewhere in between the two extremes that have been identified here. Specifically proposed changes in noise and soil abatement legislation represent what is actually going on. The central government is still issuing environmental standards, although these standards are no longer the only possible way to go. A new aspect is that it will be the decision of local authorities to decide if they are willing to take on the national guidelines or not.

If local authorities decide to put the standards aside, than taking the complexity of the issue and the added value of a context related approach in mind, they have to compile a well thought out local policy themselves. This policy will not only exist out of a new set of standards that is better suited to local conditions, it has to be imbedded within a strategical concept as well (figure S.4). It should include a clear motivation as to why authorities have decided to go their own way. This is the extend of the official proposal, but there is more to it, when taking complexity into consideration.

As long as local authorities are in control over the rules set by the central government, the consequences are reasonable. Most policy makers are satisfied with the studied way the government has taken up a new policy.

This changes when policy makers take into consideration of what the local context is. Environmental conflicts demand a far more flexible approach of planning. A strategy with a more abstract view and which is more focused on the way this issue is perceived by the relevant authorities. No longer will the government lead the way, rather the men and women leading the process themselves.

Not least important is the question of whether a wider perspective is considered. The position to make these changes is, therefore other parties will be involved, who will have other views on effectiveness and impacts of the changes. These changes will have to be taken into account as well.

Their role will change if authorities accept a role more centralized approach of consensus strategies.

Figure S.4: Approach of consensus strategy

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As long as local aut...
As long as local authorities implement centrally imposed environmental standards according to the rules set by the central government, it is clear to everyone what the strategy is, what the consequences are, and which roles different actors have to play. In this case the central government has the initiative and is therefore responsible for the planning strategy and its consequences. Most importantly: the rules are explicitly clear to everyone.

This changes when local authorities decide they need a more flexible and locally initiated policy to solve the difficulties they are facing. When authorities want to see local conflicts in a wider perspective it will have consequences. First of all local authorities will have to set up a new policy framework which will replace the planning strategy of the central government. A strategy should be designed in a way that relates conflict related knowledge with a more abstract view on local environmental planning. It should also relate to other issues which are partially interwoven with the topic concerned, and objectives based on this wider perspective have to be well defined. Experiences in cities such as Amsterdam and Rotterdam show that local strategies which include the ‘grey’ environment require a rather substantial investments in knowledge, time and people.

Not least important is the change of thinking needed in the local organisation and the consideration of which other parties should be involved in the decision making process. One of the main reasons why a conflict increases in complexity is because the high number of people and organisations related to the conflict. In such cases governments are no longer in the position to make decisions entirely on their own. Many interests are involved, and therefore other parties need to be included in the decision making process to improve its effectiveness and its efficiency. Consensus and participation strategies are than taken in consideration. This will mean a change in the traditional role authorities are accustomed to. Their role will change from regulator to stimulator and participant. Authorities will have to accept a role more or less equal to the other parties involved. Also one of the unwritten rules of consensus strategies is that the interests of different parties should be proportionally more

![Hierarchy and Standard](Image)

**Figure S.4**: Approaches in relation to strategic planning.
or less equal, otherwise the strategy will fail. The desire of local authorities to create more flexibility should therefore not be mistaken with the desire to have less rules.

Every approach has its own rules, explicit or not. Every approach has its own possibilities and its own consequences as well. Therefore local authorities which are willing to take their own responsibility to solve urban environmental issues should be aware of the consequences of their decision.

S.9 Complexity as a bridge between extremes

Taking the idea of complexity dependent decision making in to mind, it would mean that changing the Dutch national environmental policy strategy from one approach to an entirely different approach is not an answer to difficulties concerning urban environmental conflicts. More interesting is a move towards a position in which authorities can make a decision determining which approach should be emphasized depending on the complexity of the issue, considering the options and the consequences. In practise this development is more or less taking place, although not explicitly on the basis of complexity. From a more theoretical point of view the option not to go from one extreme to another but to choose each time again how complex an issue is regarded means that there is a bridge between functional rationality and its opponent, communicative rationality. That bridge than is complexity.