Planning the Horticultural Sector
Managing Greenhouse Sprawl in the Netherlands

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Abstract
Greenhouses are a typical example of peri-urban land-use, a phenomenon that many planning systems find difficult to address as it mixes agricultural identity with urban appearance. Despite its urban appearance, greenhouse development often manages to evade urban containment policies. But a ban on greenhouse development might well result in under-utilisation of the economic value of the sector and its potential for sustainability. Specific knowledge of the urban and rural character of greenhouses is essential for the implementation of planning strategies. This paper analyses Dutch planning policies for greenhouses. It concludes with a discussion of how insights from greenhouse planning can be applied in other contexts involving peri-urban areas.

Keywords: greenhouses; horticulture; land-use planning; the Netherlands; peri-urban land-use

1 Introduction
The important role played by the urban-rural dichotomy in planning practice is a complicating factor in planning strategies for peri-urban areas, often conceptualised as border areas (the rural-urban fringe) or as an intermediate zone between city and countryside (the rural-urban transition zone) (Simon, 2008). However, "[t]he rural-urban fringe has a special, and not simply a transitional, land-use pattern that distinguishes it from more distant countryside and more urbanised space." (Gallent and Shaw, 2007, 621) Planning policies tend to overlook this specific peri-environment, focusing rather on the black-and-white difference between urban and rural while disregarding developments in the shadow of cities (Hornis and Van Eck, 2008). Planners who have to address issues in peri-urban areas cannot fall back on the preconceived urban or rural identity of typical land uses. Planning designates many land-uses a rural or urban identity, which determines whether these land-uses may be developed in a given area or whether they must be restricted by an urban containment policy. Most traditional urban containment policies are not tailor-made for hybrid peri-urban land-use.

As a result, peri-urban types of land-use are difficult to plan. Peri-urban areas are often institutionally fragmented with 'frontlines of separation, competition and conflict between the urban and rural spheres' (Zasada, 2011, 645). Land-use regulation is not always the most effective way to promote landscape values and economic development or to meet the needs of communities on the urban fringe. It is challenged by a 'blurring of the urban edge' (Gallent and Shaw, 2007, 620), characterised by interwoven urban and rural functions and specific land-uses. There are wide variations in peri-urban land-use and in the price and dynamics of hybrid land. Planning proposals may overlook current land-uses in peri-urban fringe areas (Randolph, 2004). Hybrid peri-urban types of land-

use, such as allotment complexes and caravan and greenhouse sites, have both urban and rural characteristics: though their function is often perceived as rural, their appearance is primarily urban. The price of land for these functions usually lies somewhere between the price of extensively used agricultural land and urban land (Van der Valk et al., 2009; Van Rij and Korthals Altes, 2010). Since changes in land-use often take place on the fringes of cities, hybrid peri-urban land-use tends to be highly dynamic and characterised in some cases by less structural continuity than in traditional urban development and a wide diversity of land-use and development patterns (Gallent, 2006). So, the identity of peri urban areas (and greenhouses within these areas) is not fixed. Planning and governance may relate to these changing identities (Paasi, 2010; 2012; Zimmerbauer, 2011).
This paper focusses on one particular important type of peri-urban land use: greenhouse horticulture. Greenhouses are a typical example of hybrid peri-urban land-use. On the one hand, greenhouse horticulture is a kind of agriculture, so it fits in with the rural domain. On the other, the urban appearance of greenhouses can undermine the quality of the landscape near cities. However, greenhouses can also reflect a dynamic and highly innovative form of land-use with the potential to support the economy and improve sustainability.

This paper examines the Dutch case in general and various subcases, areas where specific policies are applied, in particular. The Dutch case is chosen because the Netherlands have required particular experience with greenhouse planning in the last decades. Horticulture is a viable economic sector competing with many other types of land-use in the densely populated area of the Randstad.
The aim of this paper is to add to the knowledge of peri-urban planning by studying the planning of greenhouse sites in the Netherlands. It starts by introducing the characteristics of peri-urban land-use and greenhouses in particular. This section discusses the development of greenhouses cultivation and introduces issues of greenhouses in relation to planning and landscape change. After that, the Dutch case is introduced; the case study is separated in four subsections: (1) restrictive land-use plans to contain greenhouse growth, (2) economic instruments to dismantle existing greenhouses on unsuitable locations, (3) strategies to stimulate the development of greenhouse clusters and (4) Midden-Delfland, an area under heavy pressure for greenhouse development, which launched identity-based strategies to promote alternative development . The paper ends with a discussion and conclusion on how the lessons from the study of greenhouses can be applied to the planning of other peri-urban types of land use.

2 Greenhouses as lasting peri-urban land-use

Greenhouses are an example of a hybrid peri-urban land-use. The following section introduces the characteristics of peri-urban land-uses and greenhouses in particular. This section shows that greenhouse horticulture is presently not anymore being considered as a type of land-use from the past. Greenhouses cultivation is an innovative and increasingly sustainable sector which need to be addressed by land-use policies.

In many countries greenhouse complexes are situated on the periphery of large urban areas. Having acquired more of an industrialised appearance over the years, greenhouses

are a clear example of an originally agrarian type of land-use which has assumed urban features. Since many city dwellers work in greenhouses and many greenhouse products are consumed, redistributed or prepared in cities, there is a clear link between greenhouses and cities. In a way, greenhouses may fit in with the notion that 'the multifunctional development paradigm provides an approach that strengthens and modernises peri-urban agriculture.' (Zasada, 2011, 646) However, in other cases, such as the Westland in the Netherlands (Terhorst, 2006) and Almería in Spain (Aznar-Sánchez et al, 2011), theories on the development of industrial clusters appear to be more appropriate. In still other cases, such as the Ohio Greenhouse project (Gatrell et al., 2009) and Flanders (Rogge et al, 2011), cluster strategies have been launched to promote economic development.

Traditionally, many greenhouses were situated in areas with a moderate climate, mainly coastal areas near metropolitan hubs. Typical examples are the Westland in the Netherlands, the British Channel Islands and other greenhouse sites in North-West Europe. Greenhouses provided the domestic market with early fruit and vegetables that were difficult to grow in local climate conditions. Greenhouse horticulture supplied the city and its hinterland with fresh fruit, vegetables and flowers (Mackintosh, 1977; Van den Berg, 1993; Mendis, 2007).

Until recently, the professional ideas on how to deal with greenhouses as an unwelcome form of urban sprawl were based on the expected decline of the sector. Improved modes of transport and the emergence of a single European market prompted agricultural experts to predict the demise of the greenhouse industry (Sonneveld and Voogt, 2009). Field-grown products from Mediterranean regions could replace greenhouse-grown products in Western and Northern Europe and thus repeat the pattern observed in North America, where the north-east was supplied with produce grown in the southern states. These predictions proved unfounded and there are 'sufficient arguments' (Sonneveld and Voogt, 2009, 2) to suggest that greenhouse horticulture will continue to play an important role. At present, many horticultural products are transported over long distances and compete freely with field-grown products from all over the world. Tomatoes in the USA are no longer transported from the fields of California; most of them are imported from Canadian greenhouses in the summer (Mendis, 2007, 106).

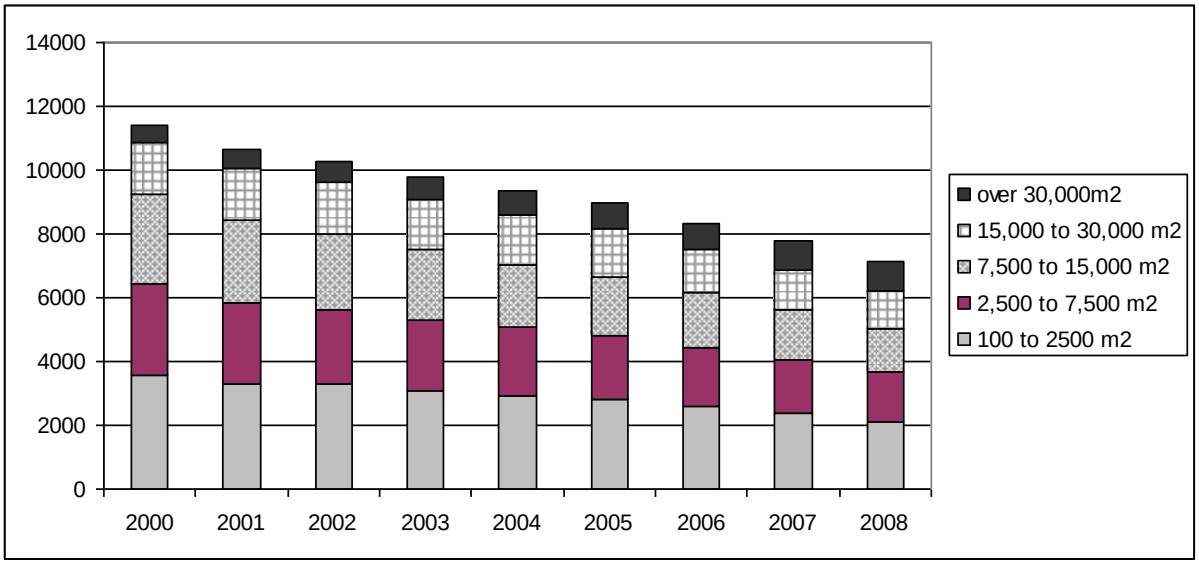
Worldwide, greenhouses are taking up more space. In more southern and arid regions such as Mexico, the southern US states, the Mediterranean and China, greenhouse and plastic-tunnel horticulture is a booming business (Yilmaz et al., 2005; Mendis, 2007; Bakker, 2009; Sonneveld and Voogt, 2009). And Japan and South Korea are following suit. In the latter country most of the 52,000 hectares of protected agriculture is in single plastic tunnels, and only a small, but growing part of the horticultural activities is accommodated in modern facilities with climate control, where the Dutch agricultural sector hopes to find export opportunities for its technology (Stallen and Van Uffelen, 2006). Greenhouses are also found in equatorial regions such as Tanzania (Msogoya and Maerere, 2006).

One important reason why greenhouses are taking up more space worldwide is that they lend themselves to sustainable technologies. The use of greenhouses dramatically reduces the need for water in regions such as Almería (Spain) and Israel (Sonneveld and Voogt, 2009, 395). Technological innovation is expected to enable the re-use of drainage water in substrate systems for a longer time than at present without disrupting growth. It may also be possible to close the water cycle on a regional scale in dense greenhouse areas (Sonneveld and Voogt, 2009, 402). Greenhouses are seen as a promising perspective for the realisation of urban agriculture (Ohyama et al., 2008). Research in Almería, the largest greenhouse area in Europe (Tout, 1990; Campra et al., 2008; Aznar-Sánchez et al., 2011), has reported a local cooling trend of 0.3˚C per decade, which shows no correlation with the trend in regional or global warming (Campra et al., 2008), and is attributed to the capacity of the greenhouses to reflect sunlight. This is contrary to the effects found near melting glaciers and urban heat islands.

The greenhouse sector has provided the setting for some major technological advances in recent decades – an extraordinary achievement, given that, in most countries, it is dominated by small family-owned firms. The general consensus is that local economies based on small and medium-sized enterprises (SME) are being challenged by an innovation gap because businesses lack critical mass (Parrilli et al., 2010). In the greenhouse sector, particularly in the Netherlands, there is no such innovation gap, presumably because greenhouse farmers operate in knowledge-sharing networks in which small companies collaborate rather than competing with each other (Terhorst, 2006). Regional concentration has enhanced this trend and delivered many patents for the Dutch horticultural sector (De Man and Van Raaij, 2008), dubbed "the epicentre of the world's commercial greenhouse research" (Mendis, 2007, 173). These innovations aim not only to improve the quality of production but also to raise efficiency and reduce environmental pollution from horticulture.

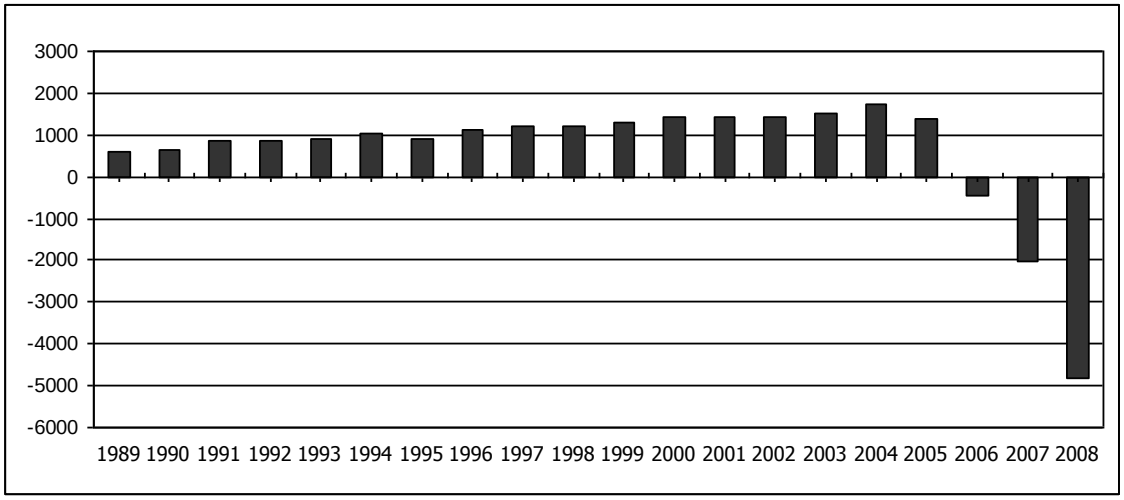
Greenhouse-based production has long been regarded as incompatible with sustainable development (Woltjer and Van de Peppel, 2003). But this image is changing. In the 1970s, greenhouses in the Westland (the Netherlands) consumed huge volumes of cheap natural gas for heating, leading everyone to assume that rising energy prices would spell the demise of the sector. This has not happened. Admittedly, no more land is being used for greenhouses in the Netherlands and there has been a drop in the number of horticultural farms, except for those above 3 hectares (Figure 1), which are growing by annual rate of almost 6%. There has, however, been a turnaround as far as energy is concerned. According to expectations, Dutch greenhouses will stop being net consumers of energy and become net producers. Other greenhouses in similar climatological locations may follow suit.

Figure 1: Horticultural farms and sizes (CBS, 2009)



The Dutch greenhouse sector is still exempt from the green energy tax of over €160 million a year. The European Commission (CEC, 2001; 2007a) was prepared to accept this exemption only in return for an ambitious programme to realise more efficient energy use. Market gardeners may decide for themselves when to deduct investments in more environmentally-friendly greenhouses from their taxable income (CEC, 2008). Under the Rural Development Programme 2007-2013, the state is allowed to grant aid to make the sector more energy-innovative (CEC, 2007b). Indeed, in the past few decades, energy consumption has been lowered by inter-seasonal energy storage, the use of residual heat, the use of geo-thermal energy (for which the CEC (2009) has approved a guarantee facility (see also CEC, 2007c)), and cogeneration systems that simultaneously generate electricity and useful heat (Bakker, 2009; Sonneveld and Voogt, 2009). Cogeneration is turning greenhouses into energy producers (Figure 2).

Figure 2: Impact of cogeneration: electricity consumption by greenhouses in the Netherlands in millions of kilowatt-hours (CBS, 2010a)



This energy is generated by natural gas. The next step is to become full-fledged producers. Evaluations of preliminary experiments with energy-producing greenhouses have been encouraging. The revelation that the heat which is stored in summer exceeds the requirements in winter has transformed the image of a greenhouse from a poorly insulated structure, inefficiently heated with fossil-fuel energy, to a kind of solar collector. Although the first commercial-scale 'energy-producing' greenhouse has not managed to achieve a net energy surplus (because the grower limits the heat harvest by using shades to minimise the perceived detrimental effects of overheating), the overall ambition is unchanged: from 2020 all new greenhouses in the Netherlands will be 'energy producers' (RDP, 2007; Bakker, 2009).

The biggest greenhouse complex in the Netherlands is located at 52˚ northern latitude. Here, the "incoming solar radiation represents about twice the energy used in the greenhouse itself", which "theoretically creates the possibility of using the greenhouse as a combined crop- and heat-producing system." (Bakker, 2009, 19). Most greenhouse complexes, such as those in Ontario in Canada, have a more southerly location and can afford to be less economical with solar energy by using plastic rather than glass for the roofs (Badgery-Parker, 2001, 15).

The image of sustainability has been further enhanced since greenhouses became part of the solution for the carbon dioxide problem. In the Netherlands greenhouses use carbon dioxide from a gasification hydrogen plant at Pernis (Rotterdam) to promote the growth of crops. Secondly, fewer chemical pesticides are being used as the closed greenhouse environment lends itself to the use of insects for pest control. And last but not least, the use of substrates instead of soil is expected to promote the biological control of root disease (Sonneveld and Voogt, 2009, 393).

In conclusion, greenhouse cultivation is an innovative and increasingly sustainable sector, which has been a driving force in horticulture for decades (Folley, 1975; Mackintosh, 1977; Robinson, 1983). The innovation has been impressive and has convinced

policymakers that the development of greenhouse clusters fits in with the strategies on both the Lisbon Agenda and the sustainable development agenda. It is therefore unlikely that greenhouses will go away as result of the restructuring of economies for sustainable development. Studies have indicated that Dutch horticulture has improved its competitive position on the back of more stringent environmental policy regimes (Van der Vlist et al., 2007). So greenhouse planning continues to be an important element in spatial planning.

Figure 3: Greenhouse for growing pot orchids with a cogeneration facility in Schipluiden (Midden-Delfland) built in 2007. The local land-use plan allows the following maximum heights: gutters 6 metres, greenhouse 9.5 metres and structures such as the cogeneration facility 12 metres. (Municipality of Schipluiden, 2000)

Greenhouse development raises certain planning issues. Greenhouses have a visual impact on landscapes; they are perceived as unsightly (Rogge et al., 2008; 2011). Often located close to urban areas, greenhouse sites come into conflict with urban uses (Van den Berg, 1993; Rogge et al., 2008). Developments in the sector itself (taller and larger greenhouses) have resulted in a physical appearance that does not blend easily into the landscape (Figure 3). The visual amenity of greenhouse sites is less than that of other kinds of agricultural landscape. Sprawling greenhouses rank as one of the worst blots on the Dutch landscape. Van den Berg describes the area between Rotterdam, The Hague, Zoetermeer and Delft ‘as a rural-urban no-man’s land’ (Van den Berg, 1993, 36), a combination of 3,000 hectares of greenhouses, multiple dwellings and major infrastructure. Large-scale greenhouse development may encounter opposition on a par with the opposition to wind farms (Rogge et al., 2011).

So, depending on the circumstances, policies might aim at developing new greenhouse sites or dismantling and containing greenhouse sites. By exploring the planning of greenhouse sites in the Netherlands, this paper analyses the way the development of greenhouses may fit into peri-urban planning policies.

4 Methodology

This paper is based on a case study on Dutch greenhouse planning. This case study is based on a variety of sources, such as, government reports and statutory plans, advisory reports, evaluation reports, statistics, interviews with stakeholders. Some of the material has been gathered in a broader research project on instruments for the planning of landscapes within the shadow of metropolitan areas (XXX: sources with author information to be added after the blind-review process). This material has been analysed to obtain the materials specifically for this paper. One of the case studies within this broader research project was Midden Delfland. This material combined with material provided for an advisory committee for this area, has been used in this specific case study. Using a case study has its peculiarities (Flyvbjerg, 2006). It can be established that Dutch greenhouse planning is an unusual case: the Dutch greenhouse sector is unique and provides no random sample of planning in peri-urban areas. It is also a critical case, as if there is no planning response to greenhouse development in the Dutch 'planner's paradise' (Faludi & Van der Valk, 1994), then where else such a response can be expected? It has, finally, the potential to become a paradigmatic case of identity planning in relation to local government formation. Its uniqueness has the disadvantage that what we find does not statistically relate to a broader class of practices outside the case. It has, however, the advantage that we can find developments that may not take place in other contexts, but which may contribute to the generation of land-use policies in these contexts.

5 Case study: Greenhouse planning policies in the Netherlands

In recent decades planning policies have been formulated for greenhouses in the Netherlands. As mentioned in the introduction, peri-urban land-use for the development of greenhouses and suchlike often has no pre-defined urban or rural identity. Defining the land-use for greenhouses is therefore being addressed in developing planning policies. Imaging is an important element in planning (Faludi, 1996). The images that figured in this process were: (1) greenhouses are a form of agriculture, i.e. a rural form of land-use outside the agenda for the containment of urban sprawl, (2) greenhouses are a form of urbanisation which is causing deterioration in the landscape and must be addressed like all other forms of urban sprawl, (3) greenhouses constitute an unsustainable sector that uses cheap energy and cannot survive the higher energy costs of tomorrow, and (4) the greenhouse sector is a highly innovative sector at the cutting edge of energy transition and is gearing up to harvest the potential of solar energy.

The policies use a specific mix of images to define the legal and economic instruments for greenhouse planning. Management via traditional urban or rural planning policies and instruments does not always suffice. For example, as the economic value and development costs lie somewhere between rural and urban levels, financial programmes for infrastructure that fits urban land-use are not feasible for greenhouse sites: greenhouse

owners cannot afford urban land prices. Hence, in addition to traditional instruments, more innovative strategies are being studied such as administrative restructuring, cross-subsidies and identity shaping.

This paper will continue with an account of Dutch national and provincial planning policies on greenhouse development (see MSP et al., 2004).

These policies set three main objectives: (1) protect existing green areas against new greenhouse sprawl, (2) dismantle existing greenhouses at locations where they undermine the quality of the landscape, and (3) stimulate the concentration of modern high-tech greenhouse complexes. The third objective might be combined with the transfer of dismantled greenhouses. In the following sections we discuss the implementation strategies for these planning decisions and the successful and unsuccessful elements within them. We also present a case study of an area under heavy pressure for greenhouse development and the policies to prevent it.

5.1 Restrictive land use plans to contain greenhouse growth

Containing greenhouse growth has been the first objective of land use policies. This section shows that traditional policies based on outmoded restrictive land use plans that did not address peri-urban types of land use as a specific category, were not very effective in containing greenhouse sprawl. Despite the scope in Dutch planning legislation to stop greenhouse sprawl, most land-use plans were unable to prevent the development of new greenhouse sites. Indeed, they allowed all manner of agricultural development – including greenhouses. Dutch planning law does not stipulate land-use classifications beforehand; these are defined in the land-use plans themselves. Many local authorities do, however, use standardised land-use classifications, based on provincial manuals or examples from the Association of Netherlands Municipalities. Up to the second half of the 1980s, most local land-use plans did not differentiate between types of agricultural use. Greenhouses could be built on all land that was designated for agriculture. Since the second half of the 1980s, the development of greenhouses has been considered inappropriate outside existing greenhouse areas and plans have distinguished more clearly between agricultural uses. Greenhouses were accorded a specific designation, as were agricultural areas with specific landscape and nature values.

This did not, however, stop the sprawl of greenhouses at that time. Many of the old local land-use plans stayed in force after the 1980s. Although planning law states that every plan must be renewed every ten years, this practice has not been commonly pursued, especially in areas with very little development. After all, new plans cost money. Under the new planning law (from July 2008) local authorities are obliged to renew their plans more rigorously, so the old plans will probably die out.

But there are other reasons why it took so long to contain the greenhouse sprawl. These are tied in with the protection of property rights. Usually, no compensation was required when greenhouse-free land that was situated in an agricultural zone where greenhouses were allowed was officially designated as greenhouse-free land. This is because, under

Dutch planning law, land-use plans had to be renewed. The local land-use plan regulates land-use for the next ten years. If an opportunity is offered by a plan, the land owner is responsible for utilising it (Hobma, 2010). Hence, if the zone designation is changed after ten years, the land owners may not get compensation unless they were using the land for greenhouses or unless they can produce detailed plans for new greenhouses on their land. This principle was recently reiterated in a case that came before the Dutch Council of State, the highest administrative court in this field (RVS, 2009b).

Figure 4: New greenhouses (back) are much higher than older ones (front)

Existing greenhouse owners are in a different situation. A land-use plan must take account of their interests. From a legal perspective, it is only fair to allow them some degree of space to extend their operations and introduce innovations. In the case of existing greenhouses the plans usually provide for a limited amount of space for growth (up to three hectares). This space is usually less (up to two hectares) in areas with specific landscape and nature values, where there is a different balance of interests between open landscape and market gardening. At present, objections are being raised to local land-use plans on the basis of the argument that three hectares is no longer enough, given that greenhouse facilities are now bigger than in the past. Greenhouse horticulturalists in places where both the size and the height (see Figure 4) of greenhouses were limited took legal action and successfully proved that these limitations restricted the potential for a profitable business (RVS, 2009a). The local authority was not allowed to limit the height if it could be proven that this would hamper operations.

The limitations to the restrictive land-use plans, i.e., the need to provide ample space for the operation of existing greenhouses resulted in complexes such as Voorne-Putten (see also the case previously mentioned: RVS, 2009a) and Hoeksche Waard, where old horticultural businesses were put on the market and sold to a new buyer who built a new, much higher structure up to the maximum allowed in the land-use plan. After the new investment was realised, the authorities complained about the development. By that time, buying the old property at a relatively cheap price was a foregone opportunity.

A study by the Spatial Planning Inspectorate on 'paper glass' – rights to extend existing greenhouses in land-use plans – in two areas yielded modest outcomes (Inspectie VROM, 2009); namely, that the land-use plans do not allow much scope for growth. In other areas, however, existing rights had a strong influence on planning policy: the local authority of Westvoorne decided to set priorities in their containment policies, after discovering that it would cost €2.7 million to compensate owners of 'paper glass' for loss of development opportunities (Municipality of Westvoorne, 2006).

All in all, reliance on restrictive land-use plans alone has serious drawbacks since existing property rights need to be taken into consideration. Restrictive land-use plans can only prevent new greenhouse development; they cannot enforce the removal of existing greenhouses. Moreover, given that businesses have a right to innovate and extend, restrictive plans may not even be able to prevent new greenhouse developments.

5.2 Dismantling existing sites

The second objective of these policies has been to remove sprawled greenhouse locations. This turned out to be costly. It is not easy to get rid of existing sites as it costs a lot to compensate the stakeholders for loss of value. Strong and weak economic functions coupled with high and low land prices are contributing factors. As stated earlier, the price of land for greenhouse development lies between the price of urban and rural land. It is therefore more difficult to transfer a greenhouse area to a green area than to an urban area. In other words, the revenues from urban land-use for houses, for example, can be used to dismantle the greenhouses whereas green functions such as dairy farming, nature conservation and recreation have lower values and external money would be needed.

In the Netherlands, greenhouse sites are often transferred to urban sites. Some provinces have used urban expansion as an argument for restructuring the sector. Apparently, the surplus value of house-building, as reflected in relatively high land prices, is enough to justify the purchase of existing greenhouses. Thus, since land designated for residential development is more expensive than greenhouse land, the difference in price can be used to move greenhouses somewhere else.

Policies to create open landscape from greenhouse land are, however, much more difficult to realise. Only in very few cases have funds been made available for the purchase of existing greenhouses to create an open landscape as opposed to urban development. The most prominent case is the reconstruction of Midden-Delfland, a project started in the 1970s to support the open landscape, whereby market gardeners could exchange their greenhouses for monetary compensation – until the policy became

so expansive that the government had to end it. Midden-Delfland holds a unique position in Dutch planning practice (Van Rij and Korthals Altes, 2008).

Though it is possible to change greenhouse areas into urban areas, it should be noted that, in some cases, the revenues from new housing projects were not enough to cover the costs. A case in point is the 7,700-dwelling 'Wateringse Veld' expansion area in The Hague which was developed on a former greenhouse site. The costs of compulsory purchases and soil clean-up were so high that government funding was needed to realise the plans. In this case, a combination of the market value and the 'policy value' of a new development project was high enough to warrant the re-use of horticultural land for housing.

In other cases, the surplus value of new housing projects was high enough to bring an end to more horticultural activities than those on the greenhouse sites that were used for such projects. In those cases, instruments were applied which catered for the cross-subsidisation of open spaces via built-up development (Van Rij, 2009). This arrangement can be conceptualised as non-financial compensation to stop the undesirable use of land in rural areas. One of the instruments is a 'space-for-space' scheme, which was originally developed to restructure areas with a surplus of landless farms for the livestock industry (Janssen-Jansen, 2008). The scheme involves non-monetary compensation whereby landowners exchange some of their property rights for other property rights (Janssen-Jansen et al., 2008; Van der Veen et al., 2010). One landowner who removed 5,000 square metres of greenhouses was allowed to build one dwelling that occupied a maximum of 2% of the volume of the greenhouses. The planning restriction on the existing dwelling as a farmhouse was then lifted in favour of general housing use (PZH, 2005).

Planners who work with compensation should consider the side-effects. Experience has shown that urban development in greenhouse areas may create situations where market gardeners, with their pockets filled with compensation money, look for investment opportunities in the region and put heavy pressure on land for new greenhouse development.

5.3 Stimulating the development of greenhouse clusters

A third objective is to develop new, fully equipped, greenhouse clusters. The development of clusters fits with the idea that greenhouses are a vital economic function and horticultural clusters can function as *greenports*, i.e., centres for high tech horticulture and agribusiness, in which the government aims to strengthen and maintain horticulture (Nijkamp et al., 2010). The development and implementation of regional spatial plans should facilitate both clustering at the existing clusters and the development of satellite locations.

National spatial policies from around 2000 aimed to develop ten cluster sites for all new greenhouses. These sites were allocated top-down by the national government, but not always on the basis of sound horticultural motives. The policy took insufficient account of the different facilities required by the many different types of horticultural cultivation.

It also failed to recognise that although the level of investment in greenhouse horticulture is high compared with other types of agricultural land use, it is still much lower than for an industrial estate. Accordingly, the concentration of greenhouse development was less feasible than expected. The layout costs of business parks were way too high for greenhouse sites. It took urban planners a while to realise that a more tailor-made planning policy was needed. The turning point came when the policy was evaluated in 2005 (Van Kessel et al., 2005). After that, the Minister of Agriculture (MANF, 2005) decentralised the decision-making and made the provinces responsible for the allocation of land for cluster sites. This resulted in many more sites, which were based more on actual developments (Figure 5). In his justification the minister referred to the Lisbon Strategy, as the policy supports a leading economic position in flowers and food, and therefore makes it necessary to facilitate development.

Figure 5: Concentration areas for greenhouse horticulture (PBL, 2009)

The agricultural census (Table 1) shows a net concentration of greenhouses, the result of a decline in dispersed greenhouses. So there is a certain conformity between planning and spatial development. However, conformity is a crude yardstick to measure planning success and it may not be the reason behind plans that work (Faludi, 2000; Korthals Altes, 2006). This picture only emerged after policymakers had redefined their concepts of concentrated versus dispersed development. When Table 1 refers to concentration, it includes areas that fell under the 'dispersed' category in the old policy. These complexities led to the abandonment of these concentration strategies (see Figure 5). The term 'concentrated deconcentration', well-known in Dutch urbanisation policy (Faludi and van der Valk, 1994), seems to have made a comeback, especially in the south and west of the Netherlands. Developments in areas that used to fall under 'dispersed' – for example, sites in the Green Heart and other areas of particular interest for spatial policies (Table 1) – are now part of a concentration area. The figures also show that no additional land is being used for greenhouses.

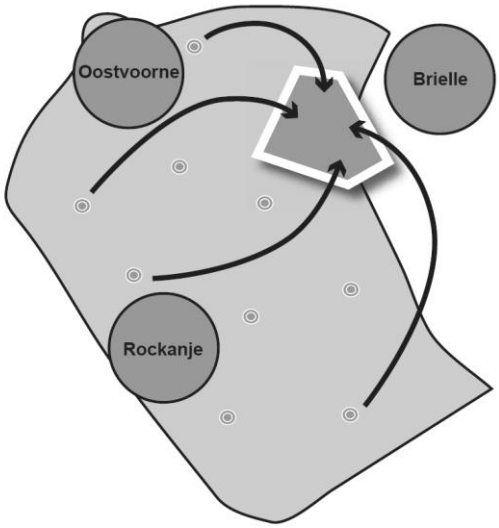
Table 1: Concentration of greenhouse horticulture, area in hectares and concentration percentage based on the agricultural census, 2000-2007 (Jeurissen and Gies, 2009)

	2000	2005	2007
Total Netherlands	10,402	9,825	9,606
Dispersed	4,353	3,822	3,512
Concentrated	6,049	6,003	6,094
Concentration (%)	58%	61%	63%
Areas of particular interest[1]	1,656	1,625	1,620
Dispersed	840	752	721
Concentrated	816	873	899
Concentration (%)	49%	54%	56%

1. Ecological Main Structure, National Landscapes (such as Green Heart), Natura 2000 (Bird Directive and Habitat Directive) areas, and buffer zones (such as Midden Delfland)

The current policy recognises that the development of greenhouse clusters will be a long-term process in which getting rid of greenhouses on inappropriate locations will prove a costly exercise (MSP, 2009). The Westvoorne case (Figure 6) demonstrates the idea behind this policy. The intention in Westvoorne was to move the existing sprawl of greenhouses to a large concentration site. The plan proved infeasible in practice. All the horticulturists outside the concentration site decided to shut down their operations when the bid arrived from the local authority (Municipality of Westvoorne, 2008, 15), even though claim arrangements were already in place for land on the concentration site. This incident illustrates the weakness of the policy. The investment level for many of the sprawled greenhouses is much lower than for large concentration sites, where the cost of infrastructure is offset by higher land prices. So, removing the sprawled greenhouses could more or less mean the end of the horticultural business.

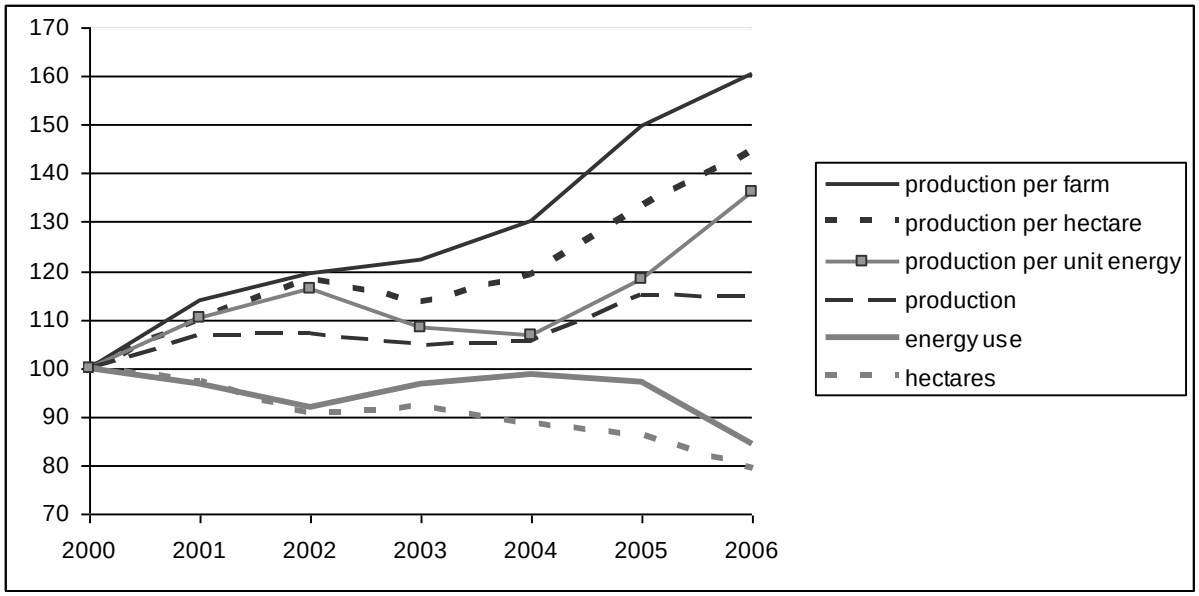
Figure 6: Vision on the concentration of sprawled greenhouses in Westvoorne (Municipality of Westvoorne, 2008, 13)



All in all, various lessons can be learned from initiatives to stimulate the development of greenhouse clusters. Policies to modernise greenhouse sites should pay particular attention to old existing greenhouses. It should also be borne in mind that existing greenhouse concentrations may fall into decay as the spatial lay-out is not always conducive to large-scale, modern production methods. New sites are therefore being sought for new large-scale development. Accordingly, it is only through specialisation and by providing extra added value that existing concentrations, which lack the economies of scale of new developments, can continue to compete. Moreover, it often costs too much to regenerate existing greenhouse sites for greenhouse development. These sites are susceptible to holdout problems and the prohibitive costs of rearranging infrastructure that ensue from the re-parcellation of land. Only plots of sufficient width are viable for new investment. Hence, despite the potential of new sites, old greenhouses stay put and planning targets remain unmet. New infrastructure is also needed at existing concentrations. Technological developments have improved the ratio between production and energy consumption (Figure 7). Electricity production via cogeneration in agriculture rose from 11 x 10^{15} joules in 2004 to 42 x 10^{15} joules in 2009, which is the equivalent of 10% of the electricity production in the Netherlands and far exceeds the output from waste incineration (3%) (CBS, 2010c). The growing energy-generating capacity of greenhouses is an important factor when planning the energy infrastructure. Robust growth in the Westland and other cogeneration hotspots is currently resulting in energy losses because the output is too heavy for the high-voltage grid to handle. It will take a decade to expand the capacity of the high-voltage grid in the densely populated West of the Netherlands (Daniëls et al., 2007, 25). Only in Midden-Delfland will the 380 kilovolt connection be realised below ground. This raises the issue of what Marvin and Guy (1997) call ‘a new logic of infrastructure provision’ in which the co-production of value from infrastructure networks may guide planning decisions towards cold spots in the network. Network congestion inhibits the possibilities of selling energy on behalf of market gardeners and others, such as home-owners with solar collector on their roof, who

find that the inverters stop working if the voltage is too high – which is inevitable if the grid does not have enough capacity to transport the energy to the source of the demand in horticultural clusters.

Figure 7: Developments in the Dutch greenhouse sector (2000=100) (CBS, 2009)



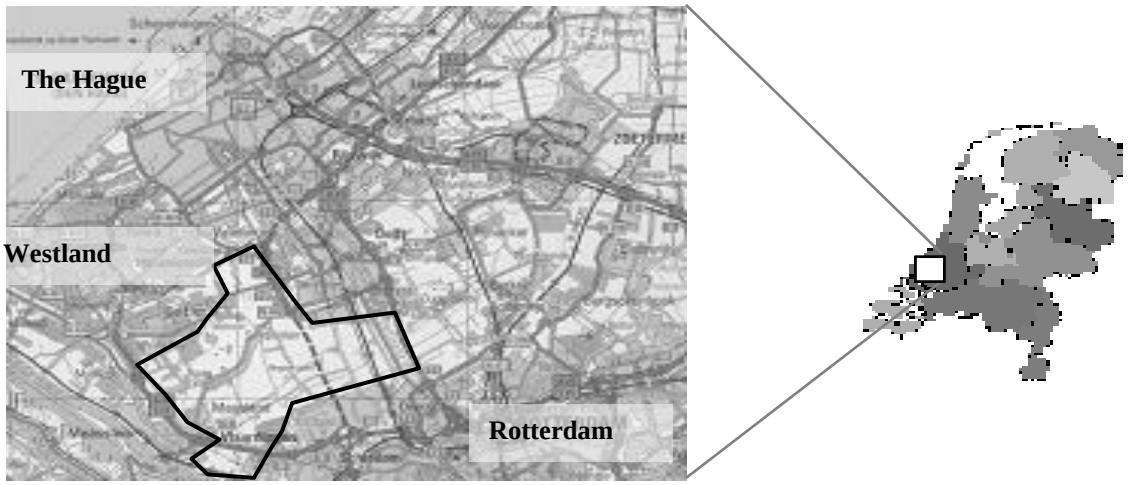
5.4 Local strategies against greenhouse development in Midden Delfland

Identity can play a key-role in the planning of peri-urban areas. The Midden-Delfland case illustrates how an identity-based strategy can promote alternative development to greenhouse horticulture. One important step in planning is to ascertain whether greenhouses fit in with the identity of a given peri-urban area. A green identity has been used to prevent the development of greenhouses on green fields and to attract state funding for dismantling old greenhouses. An identity-based strategy may help to create commitment in local and national authorities, an essential precondition for making budgets available. The differences between urban renewal and greenhouse planning are striking in this respect. Ideally, local authorities that make a genuine commitment to contain greenhouse development should buy old greenhouses that come up for sale, just as they buy old properties that fit into their redevelopment agenda (Korthals Altes, 2007). There is no such commitment in greenhouse planning. The institutional structure is much weaker than in urban areas where larger local authorities are prepared to make this kind of investment (Korthals Altes, 2007; Louw, 2008), even if it means sustaining a loss against the strategic relevance of the urban development of the city. Local authorities tend to utilise this opportunity in urban regeneration areas, even if the investment is not profitable (Korthals Altes, 2007), expecting to offset the losses with profits elsewhere (Korthals Altes, 2010). The institutional structure in green areas has not developed in a way that makes intervention more likely when, for example, rundown greenhouses are offered for sale and redevelopment.

Events took a different course in Midden-Delfland, where identity-based strategies played an important role. The scenic landscapes of Midden-Delfland were used as an

argument to prevent the expansion of the nearby greenhouse complex in the Westland. Midden-Delfland is situated between the agglomerations of Rotterdam and The Hague. The land is used mainly for dairy farming, which does not get the best profits from the peaty soil, but it does fit in well with the local authority's vision for the area (Van Rij, 2008). Midden-Delfland is feeling urban pressure from the Westland, an area to the immediate northwest, comprising approximately 2,500 hectares of greenhouses (Figure 8). Midden-Delfland is a buffer zone between the cities of Rotterdam and The Hague. In the 1970s, the Dutch government passed a special-purpose law to strengthen its status as such (Van Rij and Korthals Altes, 2008). We shall not focus on this period, but on the way in which visioning, identity and legitimacy played a role in the period that followed when the predominant idea was 'grass not glass'.

Figure 8: The reconstruction of the Midden-Delfland area. Unbuilt areas are coloured white



The reorganisation of municipal government marked a watershed in the development of the 'grass-not-glass' vision. Previously, there were seven municipalities in the region. The reorganisation resulted in two merged municipalities: Westland and Midden-Delfland, which were separated on the basis of land use: glass in Westland and grass in Midden Delfland (Table 2). Westland was the City of Glass and Midden-Delfland was characterised by meadows and grazing cattle. The municipal reorganisation strengthened the identity of both areas (Fraanje et al., 2008).

Table 2: Formation of new municipalities in the Westland region (CBS, 2010b)

New municipality (population – greenhouse area) 01/01/2009	Westland (99,436 –2,442 ha) Total area 9,059 ha	Midden-Delfland (17,598 – 256 ha) Total area 4,938 ha
Former municipalities (population – greenhouse area) 01/01/2000	's Gravezande (19,155 – 670 ha) Naaldwijk (29,092 – 995 ha) Monster (20,228 – 450 ha) Wateringen (15,262 – 219 ha) De Lier (11,190 – 326 ha) Total area 8,441 ha	Schipluiden (10,817 – 270 ha) Maasland (6,819 – 212 ha) Total area 5,446 ha

Note: Greenhouse areas in the municipalities of Maasland and Schipluiden were transferred to the new municipality of Westland if they were located adjacent to these areas.

Nothing came of the initial idea to merge all seven municipalities because Maasland and Schipluiden launched a lobbying campaign, arguing that if they merged with the rest of the Westland, a pro-glass municipal council would take office and sanction all kinds of new greenhouse developments. Since a great deal of time and money had been invested in the development of the green buffer zone, the preservation of grass in Midden-Delfland was an important issue and the Midden-Delfland municipalities were allowed to remain independent of the other Westland municipalities. Hence, their continued existence was legitimised by the preservation of the green area. Shortly after its formation, the local authority of Midden-Delfland swapped territory with the City of Delft: some open areas in the municipality of Delft were transferred to Midden-Delfland in exchange for some redevelopment areas on the boundary with Delft.

Midden-Delfland is a typical example of inverted urban-rural relationships, whereby the traditional idea of a city surrounded by an open landscape is turned around into a landscape surrounded by urbanisation. Greenhouse development is seen as one of the greatest threats to this open landscape, largely because of greenhouse clusters in Midden-Delfland, most of them outdated with relatively low gutters, but with the potential to make a much deeper impact on the landscape if reinvestment and expansion take place along modern horticultural lines. These greenhouses therefore still represent a threat to open space policies.

The marketing of landscape and local products offered an alternative to greenhouse development. The Cittaslow (slow city) movement is an international movement that stresses the living environment, the landscape, local products, hospitality, the environment, cultural history values and diversity. Specific to this movement is not only its agenda, but also its method in achieving this through a coalition with the local authorities, which is in contrast with the conventional idea that urban social movements are in conflict with the state (Pink, 2009).

The local authority applied for Cittaslow accreditation, which was granted in June 2008. As part of this strategy, for example, the mayor visits the regional market in Delft by boat to introduce the artisan products of Midden-Delfland. Mayer and Knox say that towns must already have ‘a well-defined alternative agenda’ (Mayer and Knox, 2006, 327) to qualify for Cittaslow status. Even the traditional small-scale greenhouse cultivation of grapes, which is virtually negligible, fits in with the Cittaslow strategy. Grapes are one of the traditional products of the Westland and have a Protected Geographical Indication under EU Law. In the Westland itself there is now a theme park dedicated to this product. The shape of the traditional greenhouse with its low gutters blends more gently into the landscape than modern greenhouses.

Cittaslow principles are used more often for identity-based strategies (Mayer and Knox, 2006). Pursuing a Cittaslow strategy involves “…practising alternative urban

development strategies that contest corporate-centred development patterns. What distinguishes the Slow Cities from other towns that pursue alternative agendas in some way or another is the cohesiveness by which a group of public and private actors are supporting a comprehensive alternative urban development agenda" (Mayer and Knox, 2006, 332). The slow city approach can be very helpful in the formulation of alternative urban development and provide a whole arsenal of tactics to define an alternative identity. The Cittaslow status can offer alternative income strategies for land owners which have less visual impact than greenhouse development.

The containment of urban sprawl, including greenhouse sprawl, starts with political commitment, which must be strong enough to deploy the legal instruments that are normally available to local authorities. Sometimes a price has to be paid for using these instruments, not only in monetary terms, i.e. in the form of compensation payments to landowners, but also in terms of economic development. Horticulture in the Westland is an innovative sector which may provide an economic lifeline for the local community. Dairy farming, in comparison, represents a marginal, low-density use of land and needs other economic activities to finance the maintenance of the landscape (Van Rij, 2008). The traditional use of land for grazing cows in green meadows is less lucrative than many other uses, not least 'horsiculture' (Gallent et al., 2006, 461), which comes not only with pastures for grazing horses but also with fancy white fences, training tracks and stables.

The economic position of the eighty families that work in dairy farming is crucially important to the identity of Midden-Delfland (Hagens et al., 2007). A bespoke Green Fund has been set up to fund contracts with these farmers for the provision of environmental and landscape services in return for up to €400,000 a year (CEC, 2006). The area was designated as a Less Favoured Area in 2007, which means that €94 per hectare (almost €0.01 per square metre or a little less than €3,000 per farm) per year may be granted under European State Aid regulations as compensation for the hard natural conditions caused by the deep peaty soil (RDP, 2010, 54-64). Although other authorities are free to top up this amount to €150 per hectare, none of them have the requisite budget. The national government explained that it had decentralised its funds to the provincial authority (TK, 2009), which stated, in turn, that it had run out of money since it had already invested extra resources in the development of recreational areas near cities and in the realisation of the ecological main structure (PZH, 2007).

The local authority of Midden-Delfland has been actively canvassing the support of provincial and national government for policies to retain its specific position. This has generated extra funds for acquiring greenhouses in Midden-Delfland and in some other prioritised areas, as indicated in a letter sent by the Minister of Spatial Planning (MSP, 2009) to Parliament. By 2025 the local authority hopes to have got rid of about 65 hectares of sprawled greenhouses that are still in Midden-Delfland. At the moment, national and provincial grants are being allocated for the purchase of 30 hectares of greenhouses up to 2012. The local authority will buy the land. The grants are based on the assumption that the local authority will itself contribute to the acquisition since the agricultural value of the land is still lower without greenhouses (Municipality of Midden-

Delfland, 2010). All of this is based on voluntary purchase. So, newly found identity paves the way for planning capacity.

6 Discussion and Conclusion

This paper analyses Dutch planning policies for greenhouses. Traditional policies and legal instruments may not succeed in realizing the potential of peri-urban areas. Greenhouse planning can teach us lessons that may be useful for the planning of peri-urban areas in general. To make these planning approaches successful, it is important to keep the institutional context in mind and to fit the approach to this context.

First, as explained in the introduction to this paper, it is well-known from previous literature, that the function and form of hybrid peri-urban land-use can vary widely. Notwithstanding its rural functions, such as recreation and agriculture, peri-urban land-use sometimes projects an urban image that may prove a challenge to the containment policies. If planning policies do not differentiate between greenhouses, allotment gardening and facilities for horse riding on the one hand and open-field horticulture on the other hand, because this is not considered relevant for planning or urban containment, policies for the preservation of scenic landscape will be ineffective.

Secondly, as in the case of greenhouses, the planning of many hybrid peri-urban types of land-use has to strike a balance between economic development, sustainability and landscape values. Given the many innovative new developments in peri-urban areas, planners can no longer argue that hybrid peri-urban land-use is a dead end and that dismantling is the only solution. New initiatives, such as recreation on the farm or the purchase of farm products, can provide an additional income for farmers which could be in line with strategies for landscape preservation. Hybrid peri-urban land-use is difficult to control. Land-use on the city periphery is dynamic and peri-urban development is diverse. For example, a tea house in an old haystack might fit in the landscape, but a large restaurant or a two storey pig shelter could hamper the scenery. Neither classic urban planning instruments nor classic rural planning instruments are capable of dealing with the hybrid character of this type of land-use.

Thirdly, insight is needed into the characteristics and dynamics of specific types of hybrid peri-urban land-use in order to deal with the complexities. The fit between land-use and the planning agenda has an impact on planning policies. Different strategies might be pursued for different types of land-use; for example, the owners of obsolete greenhouses will respond differently to policy than the owners of new high-tech greenhouses. The authorities often try to use planning agencies, grant systems and legal instruments to manage urban or rural tasks which do not fit into the hybrid peri-urban planning agenda. Not surprisingly, traditional urban containment policies may then fail. To complicate matters further, policies are often difficult to implement since the hybrid character of these types of land-use is frequently reflected in the price of the land, which lies between high city prices and low rural prices. As land for peri-urban land-use is more expensive than agricultural land, the land-use cannot always be redesignated as purely agricultural. Moreover, since the revenues from peri-urban land-use are often lower than those from purely urban types of land-use, people who earn a living in these areas might not have the

financial means to move to new and modern concentrated areas. Besides, concentrated areas may not provide better conditions for all peri-urban uses, which, for various reasons, may perform better at the current dispersed location. For example, a facility, like a canoe rental station, that promotes the enjoyment of unspoiled countryside close to the city, is not effective if the countryside is congested by a regional concentration of facilities.

Fourthly, the case of Midden-Delfland shows how the identity of an area can play an important role in the planning of peri-urban land-use. This is particularly important since small and originally rural local governments in peri-urban areas may not choose to apply the policy and instruments for containing hybrid peri-urban sprawl. The institutional structure of the authorities in these areas may not lend itself to direct intervention in development. Local authorities are often small and professionally ill-equipped to step in and take control. Identity is therefore important, since instruments only have value if the authorities are willing to deploy them. If local authorities are applauding the new peri-urban development, containment is unlikely. Zimmerbauer (2011) has analysed identity building in relation to the formation of sub-regions in Finland. In this case "…the outcome has been that the sub-regions are being promoted but not identified with. Had the formation of subregions been more bottom-up by nature, the situation might be different and their promotion simpler, as the identity would have been more attached right from the start." (Zimmerbauer, 2011, 256). The case shows a counter example in which the formation of a local authority has been guided by the will to form a 'grass municipality' of Midden Delfland next to a 'glass municipality' of Westland, which forms so an example of Paasi's observation that "…regions and their boundaries are also partly constructed in planning discourses." (Paasi, 2010, 2300). The basic principle in new peri-urban development is that identity can be shaped through institutional restructuring, visioning and membership of the Cittaslow movement.

If the continued existence of a municipality depends on the banning of 'glass' and the preservation of 'grass', a local authority may strive to contain the growth of peri-urban land-use, to gain funding to remove existing unwanted types of land-use, that is, types of land use that do not fit into the identity aspired by the local authority, and to promote a pastoral landscape. Landscapes, especially pastoral landscapes, develop slowly and are the result of many decisions by many players over a long period of time. A stable and consistent policy at different levels of government, 'slow planning' (Van Rij and Korthals Altes, 2008, 357), seems the appropriate means of achievement. In other words, a development is more likely to take effect if different tiers of government offer packages which contain different policy instruments for places that choose to develop themselves in a certain direction. Cittaslow might help to formulate this direction and might provide instruments to develop the area in this way.

On a more general level, it should be noted that policies which fail to contain urban sprawl cannot always be solved by new instruments. Solutions should be sought in the broader institutional setting; for example, in the way jurisdictions are organised within a region (Byun and Esparza, 2005). Authorities can be encouraged to pursue this policy if

an open landscape is part of the identity of the area and if key institutions feel – like Midden-Delfland – that it is also part of their own identity.

Identity-based strategies can play a key role in planning. They form part of all the place-making strategies employed by project developers and authorities in the development and redevelopment of urban areas. Similar strategies are adopted by activists who contest urban development in rural areas, usually people who have moved there to enjoy the quiet surroundings. For them, the countryside is a 'space of consumption', an 'idyllic notion of rurality', which they will fight tooth and nail to protect from perceived threats (Woods, 1998, 17). This, of course, is in stark contrast with the way in which many long-standing residents perceive rurality; for them, the countryside is a 'space of production on which the local economy (…) is dependent' (Woods, 1998, 17). Urban-rural fringe areas may have an even less coherent identity than rural areas (Woods, 2003). Identity-based strategies can be used by all parties interested in preserving the scenery. These can be residents, activists, but also planners and local authorities who want to gain support for their plans from stakeholders and higher tiers of government.

Identity-based strategies can be actively deployed in institutional development as they are often a precondition for lobbying higher tiers of government for financial support. They can enable local governments to contain sprawl by using the legal instruments at their disposal. Peri-urban land-use planning requires the planning stakeholders to reflect on the true nature of the land-use and on ways in which planning can enable, provide, guide, structure or prohibit the development of land for various peri-urban uses.

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