The paradoxical role of infrastructure in the use of metropolitan green areas by urban residents

dr. Catharinus Freerk Jaarsma
Land Use Planning chair, Environmental Sciences Group
Wageningen University, *rinus.jaarsma@wur.nl*
+31-317-483552

dr. Terry van Dijk
Land Use Planning chair, Environmental Sciences Group
Wageningen University, *terry.dijk@wur.nl*
+31-317-486082
and
OTB Institute for Housing, Urban and Mobility Studies
Delft University of Technology, *t.v.dijk@otb.tudelft.nl*
+31-15-275514

Abstract
In industrialized countries the cohesion between cities and surrounding green areas in a so-called metropolitan landscape ('MetroLand') is essential for sustainable urban living conditions. Within this context infrastructure has a paradoxical role: it enables city dwellers to travel to and within attractive landscapes, where, at the same time, it causes constraints to visitor experience of that landscape.
This paper aims to reflect on the interaction between transportation infrastructure and enjoying MetroLand. We therefore highlight three interrelated topical issues from the Netherlands. Firstly, when the use of metropolitan green areas by urban residents relies on a road network originally developed for mainly agricultural access, opportunities to roam that landscape are vulnerable to changes in the network, reducing the accessibility of green areas. Secondly, the attractiveness of some picturesque rural areas and/or nature reserves can cause traffic flows to grow too big to be acceptable. Thirdly, increasing traffic flows due to 'new' rural land uses, replacing traditional agricultural land use, can be a threat for the attractiveness of present low volume roads.

Keywords: metropolitan landscape, infrastructure, outdoor recreation, traffic flows, local roads

1 Introduction

The green and open space surrounding and dividing city regions is no longer regarded as undeveloped space, but as an important asset for sustainable urban living conditions. Current standards of wealth, dynamics, leisure time and mobility that characterize the Western metropolitan population generate the need and the possibilities to enjoy the presence of green open space. In fact, the landscape in metropolitan areas, although not urbanized in a physical sense, has become part of the urban domain in a functional sense; urban claims influence processes of change in the landscape at an increasingly long range. Ironically, the same processes that give rise to the growing importance of the green open space for metropolitan residents endanger that very landscape: a paradox that can be observed from various perspectives. On the one hand, infrastructure enables city dwellers to travel to and within attractive landscapes, while on the other hand infrastructure and related mobility cause constraints to visitor experience of that landscape.
This paper aims to reflect on the interaction between transportation infrastructure (and its traffic flows) and enjoying the metropolitan landscape ('MetroLand'). In section 2, we analyse the new meaning of rural areas and what this means for the role of infrastructure. Three interrelated topical issues from metropolitan landscapes in the Netherlands are highlighted in section 3: vulnerability of recreational networks, emergence of 'nature transfer points' and dealing with changing traffic volumes and traffic characteristics in former predominantly agricultural areas. Finally, section 4 presents a discussion and some conclusions.

2 New concepts of rurality

2.1 Landscape beyond production

The concept of MetroLand underscores that we have left behind the modernist development trajectory in which the function of rural areas was to provide food for the expanding cities, making the spatial category 'rural' equal to the sectoral category of agriculture (Lowe *et al.*, 1998). Rural areas no longer represent the space that agricultural enterprises use to provide food for the society (production-space). The production of food is no longer an uncertain and carefully safeguarded issue. Instead, overproduction and management of surpluses have

become important agricultural and political problems. Rural areas have made a perceptional turn from production-space (a utilitarian or modernist discourse) into consumption-space (an arcadic or pastoralist discourse). Both discourses exist for over a century and although Murdoch *et al.* (2003) stress the fact that either discourse might prevail, depending on the local situation, others seem to agree on a general shift toward the arcadian line of thinking (for instance Newby, 1985; Lowe, 1989; Buttel and Newby, 1980; Bunce, 1994).
Driving force behind this transition is that people now have the possibility and the drive to enjoy rural space. The possibilities obviously lie in the fact that (1) people have much leisure time that they want to use to the full, (2) car-mobility provides the means to swiftly travel large distances against low prices, enabling (3) ever more people to choose for commuting to country houses or villages and/or for driving to and through the countryside. Rural areas thus are no longer the countermold of the urban environment, but a consumable for all civilians.
The motive of this living and relaxing in the countryside may be the hectic educational and professional carriers that Western European people now have. The rural living-environment is a welcome compensation for the stress and chaos of daily life. Villages appeal to the need for space, to being in control and to being part of a stable situation. Living in a village provides chances for self-fulfilment as one can give his house a personal signature as well as his role in the local community (see Heck, 1990). It is a place reassuring to the middle class, where gender and ethnic identities can be anchored in traditional ways, far from the fragmented, mixed up city (Murdoch and Marsden, 1994).

Figure 1. A recently constructed main arterial highway, intersecting MetroLand and its local roads and paths

But both despite and thanks to the assumed uncomplicatedness of rural areas, they are no longer subject to the imperatives of one single sector (*i.e.* agriculture) and therefore the development trajectories of rural areas are diverging, leading to a differential countryside across Europe (Lowe *et al.*, 1998). Dutch and German rural areas have to an important extent become metropolitan landscapes: open and green but within the influence of urban concentrations, thus under prevailingly preservationist ideology. The prognoses are that there will remain a considerable demand for rural living in the next decades (the Netherlands: Van Dam *et al.*, 2003; Germany: Schrader, 1997), apparently representing a process of deconcentration (Gatzweiler, 1999), since surprisingly, the growth of the total Dutch population is modest and declining (CBS, 2003) and in Germany even negative (Schmid *et al.*, 2000), although migration toward big-city regions results in a patchwork of growing and shrinking regional populations (Kocks, 2003). Even under circumstances of small or falling population growth do smaller households and increasingly space-consuming ways of dwelling lead to a rapid decline of open space: for instance the Chicago population grew by 38% between 1950 and 1990 while the built up territory went up by 124% (O'Meara, 1999).
The result of this trend towards MetroLand is fundamental, building a gap between societal objectives for rural areas and the interests of landowners. The objectives and interests on a local level of scale no longer correspond. In addition, there is a multiplicity of social spaces for one and the same geographical area, each of them having its own logic, its own institutions, as well as its own network of actors (Mormont, 1990). No single view is able to encompass the whole rural sphere, the outcome is a greater potential for conflict in and around the countryside (Murdoch *et al.*, 2003).

2.2 Infrastructure in a ‘consumption-landscape’

Enjoying MetroLand requires two conditions to be met. In order to be able to reach the surrounding area from the urban residential environment at all, sufficient connections between both parts of the metropolitan landscape are required. This positively includes connections for cyclists and pedestrians. Once arrived in 'his backyard' (the

green areas surrounding the city), the urban dweller wants to pleasantly spend (a part of) his leisure time there. In order to accommodate this, the presence is necessary of a cohesive network of so-called local roads (Jaarsma *et al.*, 2005). This network consists of "quiet" minor rural roads, with a maximum speed of, say, 60 km/h and paved or unpaved pathways, open for – at least – cyclists and/or pedestrians. Such a network is already present for agriculture and forestry and may be co-used for recreational purposes.
As recreational behaviour typically consists of making short, daily trips, mostly by foot or bicycle, to be attractive and relieving, the possibility of taking various routes through the local road network is desirable, in particular the opportunity for making trips around (in stead of trips to and fro along the same route). In combination with the short duration of the majority of the trips, only a dense network of local roads can satisfy these requirements. As a consequence, every removal of a link in this network leads to a decreasing quality of MetroLand (Jaarsma *et al.*, 2005).
The co-use of networks of low volume roads and paths makes recreation in rural areas vulnerable to changes into these networks by autonomous developments as well as developments within the network of main infrastructure (Figure 1). To illustrate the latter, the construction of motorways and high speed railways inevitably reduces the number of crossings for the local networks, because level crossings are no longer possible and it is much too expensive to replace them all by bridges and tunnels (Jaarsma and Westdijk, 2000; Jaarsma *et al.*, 2005). The same problem appears where the number of level crossings of existing railways is reduced for reasons of railway safety (see section 3.1). In both cases the opportunities to making attractive dwellings in MetroLand decrease. Dwellers must make detours, usually along less attractive parallel roads in a “transportation landscape”. Further, the roads with the remaining crossings show a concentration of (motorized) traffic, making these connections less attractive for recreational use.
The vulnerability of the local network by autonomous developments is related to growing volumes of motorized traffic. First, there is a growth by societal developments in general, which, by increasing congestion on the network of motorways is expected to appear on the network of lower order roads (see, for example, Stokes, 1991; Bovy, 2000). This paper focuses on two other driving forces behind the growth of volumes in MetroLand: (1) increasing motorized recreational traffic flows, visiting MetroLand and especially nature areas for leisure activities (see section 3.2) and (2) the consequences of changes in land use, especially in the case of former agricultural buildings, used by non-agricultural residents and business now, that appear to generate volumes and nature of vehicles that cannot be accommodated safely by the present network (see section 3.3).

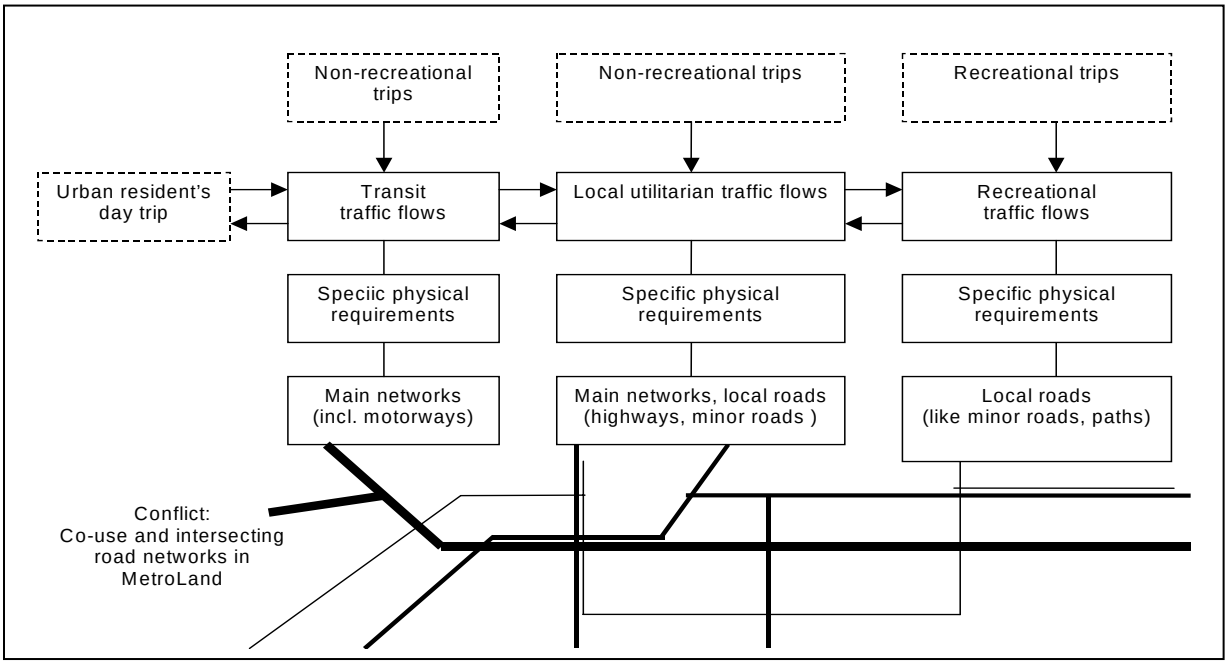

Figure 2. Conceptual model representing three types of motives for traffic flows, each of them having specific physical requirements and therefore demand their own main networks. Conflicts occur when various traffic flows co-use the same road section or when they intersect.

2.3 Towards a conceptual model

When making a trip into the country, a metropolitan resident seeking relaxation in the countryside takes part in various traffic flows. In other words: one person can have different ‘roles’, even on one single day; he may travel through area A in search for area B (taking part in a transit traffic flow, being non-recreational traffic for area A), once arrived in area B he may want to find a parking spot to start his walking or cycling tour (taking part in a local utilitarian traffic flow), and eventually he joins the recreational traffic flows in area B.

Depending on the part of the trip, this traveller has other wishes for the infrastructure he is using. Table I presents an overview of the consequences for the road network, distinguishing between a subdivision of local and main roads.

	Local roads		Main road networks	
	Road/path serving recreational traffic	Road (co-)used by recreational traffic	Road serving local utilitarian traffic	Road serving transit traffic
Modus	*Walking, cycling*	*Walking, cycling*	*Motorised*	*Motorised*
Objective	*Enjoying the landscape*	*Enjoying the landscape*	*Travelling to a destination within area*	*Travelling through to another area*
Road itself	Opportunities of crossing other road networks	Appealing view on road and adjacent landscape	Functional design with little disturbance	Functional design with little disturbance
Traffic flow on road	Low intensity, thus easy to cross, little noise and movement	Low intensity, low speed, few heavy vehicles	High capacity, little congestion	High capacity, little congestion
Parking facilities	Not visually disturbing	Situated close to interesting sites	Situated close to relevant destination	Not applicable

Table I: Tabular overview of types of traffic and prime road-parameters in relation to their particular objective. Do note that one person may take part in any of these types of traffic flows on one single day in the countryside.

Figure 2 presents a conceptual model, based on the three motives mentioned above. In MetroLand, outdoor-recreational activities experience barriers when crossing road networks home to non-recreational traffic (in case of intersection) and these activities lead to conflict because of unreconcilable demands on infrastructure (in case of co-use by coinciding incompatible types of traffic).
Although each type of traffic requires other physical aspects and therefore in theory every network can be adapted to perfectly suit the traffic that it accommodates, the highly intensive use of infrastructure around big cities makes it quite impossible to fully separate these types of traffic into their own physical road networks. The use of space is too densely mixed to allow such a separation. Thus each piece of road network is used by traffic flows with different demands on physical lay out, and therefore each road represents a trade-off between conflicting demands. Conflicting demands can be expected especially on local roads, while here both recreational and non-recreational trips coincide.
In essence the paradox is that enjoying MetroLand

- requires (1) sufficient connections between the urban and the green part and (2) the presence of a cohesive network of local roads, where, at the same time,
- the arising traffic flows threaten these requirements by (1) a barrier effect where the various networks intersect and (2) a decreasing attractivity where different activity patterns coincide (figure 2), especially on local roads loosing their character by high traffic volumes.

And what makes the paradox is even trickier: the conflicting demands do not represent conflicting groups of people, but conflicting demands within one person!

3 Concrete examples of conflicts

Three concrete Dutch examples are shown in this section, demonstrating how infrastructure leads to conflicts in outdoor recreation. The examples show some newly emerging problems in the ever more intensively used Dutch open space, that in one case already have resulted in hands-on solutions.

3.1 Recreational network intersected by main infrastructure

As said, recreational landscape value is quite vulnerable as outdoor recreation, especially for hikers, bikers and driving for pleasure, primarily depends on co-using networks of low volume roads and paths that are already created for purposes of agriculture, forestry and other utilitarian traffic flows. The dependency on the co-use of physical networks makes recreation in rural areas vulnerable to changes in those networks that are made in favour of non-recreational traffic flows coinciding or intersecting the recreational road network. For instance, a picturesque sandy curved road may be straightened and paved in order to accommodate an increased flow of motorised traffic. And a road intersecting a recreational path may become increasingly intensively used and therefore harder to cross safely. Newly constructed highways (figure 1) obviously also have severe effects on accessibility of the landscape because they are hard to cross (Van der Voet and Haak, 1989).
Currently, there is concern on Dutch recreational networks in landscapes adjacent to railways. Rail-track manager Prorail for safety reasons is planning to ban level crossings of small rural roads and foot paths with railroads. There is a fear that the recreational value of adjacent landscapes will suffer serious damage due to

closing down the currently existing rail crossings (Jaarsma *et al.*, 2005). One of the recreationally valuable landscapes is situated between the cities of Nijkerk and Putten (figure 3). It has a dense network of curved roads on which several national long-distance walking tracks and cycling routes depend.

Figure 3. Example of a sandy walking trail intersecting a main railway. The rail manager is planning to close down small level crossings for rail safety reasons (Bakker *et al.*, 2005)

GIS-based simulations were conducted in order to quantify what the barrier-effect on walking and cycling would be (Bakker *at al.*, 2005): figure 4. On the left side you see the present situation (each colour represents 10 minutes of walking; we used 6 colours) in which it is obvious that despite the railway track it is possible to cross on various locations within short range. However, on the right you see the situation in case crossings that are not vital to motorised traffic would be closed down. That would cause the hiking network to fall apart as in the middle the two crossings are separated 2 hours walking, thus making it less attractive to explore the middle area, knowing that you have no other option than to return to the crossing you initially used.

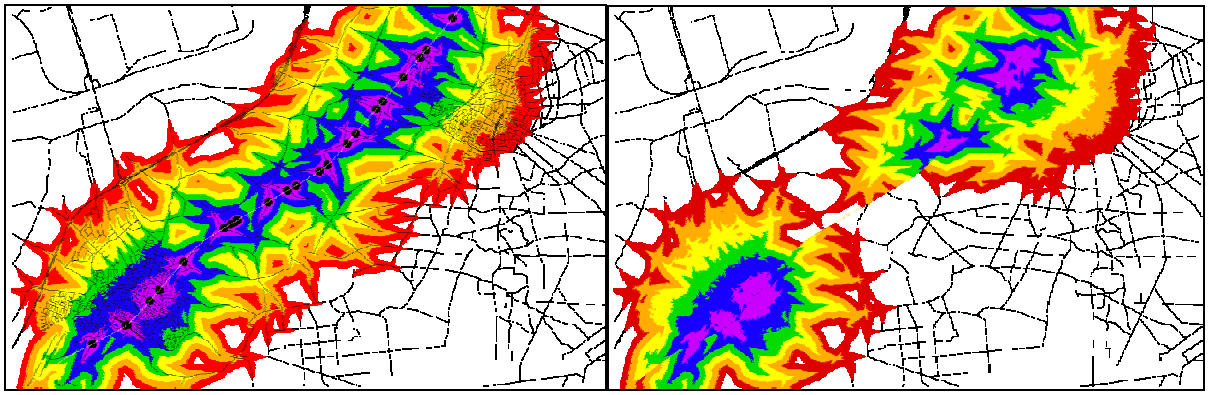

Figure 4. Simulation of the time needed to walk away from a railway-crossing, each colour representing 10 minutes of walking. Left: present situation with all existing crossings between Nijkerk and Putten. Right: only crossings with importance for motorised traffic remain open (Bakker *et al.*, 2005)

3.2 Diffuse parking of cars in forests

Road infrastructure enables urban residents to visit nature reserves like forests. Whereas in general the balancing of human impacts on the environment is a concern for managers of nature reserves (Cope *et al.*, 1999; Reynolds and Elson, 1996), visits for which urban residents rely on their cars are particularly conflicting (Cullinane, 1997), not only because of the traffic they thus generate, but by the subsequent parking problems as well.
The central forested area in the Netherlands (the 'Veluwe') provides a welcome opportunity for a Sunday stroll. Visitors typically drove into the forests and parked their cars wherever they cared to take a walk. The effects were twofold, (1) this behaviour led to car traffic on otherwise quiet forest-roads (disturbing wild-life as well as other visitors), and (2) it led to diffuse parking throughout natural landscapes, thus diminishing the recreation experience.

A practical answer to this diffuse parking problem was the emergence of so-called 'nature transfer points'; parking lots at the entrance roads into national parks that aim to reduce car mobility and parking within those areas, thus relieving the negative impacts of car mobility from city to landscape. In fact, strategically situated parking facilities not only solve diffuse parking but can be a welcome tool in managing flows of recreational visitors, as they allow informing the public on the amenities in the area and may support a zoning policy with regard to intensity of recreational use. A number of these facilities have already been established in the Netherlands and there are plans for more.
The village of Nunspeet is home to one of the nature transfer points since a few years. Monitoring the use of this specific facility showed that there is a clear relation between the visitors and the facilities and activities present at the transfer point. Children are an important reason for many visitors to come to the area; 60% of the visitors come with children. The children can play, look around in the visitor centre or do all kind of activities walking the “dwarf-route”. Also the availability of toilets at the transfer point is considered an advantage by many parents. Another group of visitors are the people who use the transfer point as a starting point to cycle in the wider Nunspeet area. For them the fact that they can safely leave their car at the transfer point is important (Beunen and Jaarsma, 2004).
Both visitor groups find exactly what they are looking for and therefore it is clear why they are attracted to this place. However, people with other wishes most likely go somewhere else, for instance to walk the dog. So, to be an effective solution a transfer point should by taylor-made designed, based on motives and requests of the visitors aimed at.

3.3 Intensified traffic due to new industries in former agricultural buildings

Agricultural buildings in MetroLand are increasingly being used by non-agricultural residents and businesses. Sanders *et al.* (2005) distinguish between three types of developments: (1) replacement by a residential function; (2) replacement by a new business function; and (3) adding an additional function to the agricultural function, for example a camping site. All these developments generate new car traffic. Especially new business functions may attract considerable new traffic flows of heavy vehicles to and from the former farm building (Figure 5).

Figure 5. A former farm building, place of business for a transportation-service now (Sanders *et al.*, 2005)

These developments cause the rural road infrastructure to accommodate a volume and nature of vehicles it was originally not designed for, which has negative impacts on safety. In addition, growing motorized flows of utilitarian traffic with relatively high speed levels on the local network diminish the attractiveness of these roads for recreational purposes, especially for hikers and bikers. Recreational paths, intersected by such roads may become increasingly harder to cross safely. Further, these developments may become a driving force to “improvements” of these roads, for example by widening the pavement or straightening the curves. In the recent past also the pavening of unmetalled roads was a usual measure to facilitate motorized traffic flows. However, such measures may improve traffic safety, but generally not the recreational attractiveness of MetroLand.
In practice, spatial developments by a shrinking agriculture and their consequences for rural traffic in MetroLand are approached by the municipalities involved on a rather re-active way, based on complaints of inhabitants. For a pro-active approach there is a lack of quantitative knowledge on the impacts of changes in land use on traffic flows. Further, a much better coordination between municipal policy on rural land use planning and rural traffic and transportation is needed (Sanders *et al.*, 2005).

4 Discussion and conclusions

Allowing urban residents to consume the amenities of MetroLand requires a dense network of local roads and paths and a main road network to reach the area. But as the examples demonstrate, this requirement for outdoor recreation is a threat at the same time; behold the paradox of MetroLand infrastructure. We argue that (1) the various incompatible types of traffic all have a right of existence, and (2) they cannot be physically separated due to spatial constraints.

Unlike a problem, a paradox by definition rules out finding a solution because it is about wanting two things that simply are not possible to realise at the same time. This particular paradox is about the various types of traffic flows in MetroLand, each with specific physical requirements with respect to infrastructure (table 1), and conflicting where the activity patterns, i.e. the traffic flows, intersect and/or coincide (figure 2). Each type of traffic requires another road design, but it is quite impossible to fully separate the types of traffic into their own physical road networks.

Conflicts due to intersections and coinciding incompatible flows will have to be accepted as a fact of life. The challenge is how to cope with them. In general, underscoring Jaarsma and Beunen (2004), we argue that network design and road section layout should be approached within a wider perspective as a subject of spatial planning. The concept of rural traffic calming (Jaarsma, 1997) can be helpful for such an approach. Spatial planning can deal with undesired effects in the future and search for opportunities to optimise the road network within the spatial development of MetroLand.

More specifically, coping with the paradox may benefit from certain tools. This paper concretely introduces:

- developments in the main road (figure 1) and rail networks (figure 3) that decrease the opportunities to be crossed by local traffic and therefore to making attractive dwellings on local roads; the GIS analysis for rural accessibility presented in section 3.1 provides a tool that may support the land use planner with insight into the impacts of a measure,
- traffic flows and related parking problems generated by urban residents visiting MetroLand that decrease the attractiveness of local roads; the taylor-made design for transfer points based on motives and requests of the visitors in section 3.2 may help planners in how to reach effective solutions,
- the same holds for changing traffic flows resulting from the decaying importance of agriculture (figure 5) that leaves a void that is filled by non-agricultural enterprises; a pro-active approach to the impacts of changes in rural agricultural land use on traffic flows (section 3.3) may help avoiding developments with unforeseen consequences of land use changes for traffic flows.

Further enhancement and extension of these tools and the underlying theories are necessary. In particular on the issue of accessibility of MetroLand: how to quantify accessibility and what is the link with quality and quantity of the local network (including the explaining factors for quality and the most relevant measures for quantity). More research is also needed on the overall effectiveness of ‘nature transfer points’: the effects on diffuse parking and their side-effects. The same holds for the size and nature of the additional traffic generation by new land uses in former farm buildings, how to control such developments.

The wide range of literature mentioned in section 2.1 illustrates that the concept of MetroLand is an international one. So, the paradoxical role of infrastructure, illustrated with three examples in chapter 3, is not a specific Dutch problem, nor is the necessity of a further enhancement and extension of tools. We therefore propose to develop an agenda for further research in this field on –tentative and at least- a European scale, for example under an AESOP umbrella.

References

Bakker, K, Dijkman, E., Jin, W.F.K., Könst, A., Lokman, K. and Lopez Vazquez, R. (2005) Vulnerability of recreational networks. AMC II course, Wageningen University

Beunen, R. and Jaarsma, C.F. (2004) Het recreatief gebruik van het Veluwetransferium in Nunspeet. Wageningen: Wageningen University, Studies in planning, analyse en ontwerp 1.

Bovy, P. (2001) Traffic flooding the low countries: how the Dutch cope with motorway congestion. In: Transport Reviews 21, pp. 89-116

Bunce, M. (1994) The countryside ideal. Anglo-American images of landscapes. London: Routledge

Buttel, F.H. and Newby, H. (eds.) (1980) The rural sociology of the advanced societies: critical perspectives. London: Montclair

CBS (2003) Actuele bevolkingstrends. In: Bevolkingstrends, statistisch kwartaalblad over de demografie van Nederland. Vol. 51 (2)

Cope, A., Doxford, D. and Millar, G. (1999) Counting users of informal recreation facilities. In: Managing Leisure 4, pp. 229-244

Cullinane, S.L. (1997) Traffic management in Britain's national parks. In: Transport Reviews 17(3), pp. 267-279

Gatzweiler, H.P. (ed) (1999) Perspektiven der künftigen Raum- und Siedlungsentwicklung. In: Informationen zur Raumentwicklung, number 11/12

Heck, L. (1990) Humanes Wohnen im ländlichen Raum. In: Glück, A., & Magel, H. Das Land hat Zukunft: Neue Perspektiven für die ländlichen Räume. München: Jehle-Verlag

Jaarsma, C.F., (1997) Approaches for the planning of rural road networks according to sustainable land use planning. In: Landscape and Urban Planning, 39(1), 47-54

Jaarsma, C.F. and Beunen, R. (2004) Regional road networks in planning of metropolitan landscapes. Paper presented at the AESOP congress 2004, 1-4 July, Grenoble (France)

Jaarsma, C.F., Heijman, W.J.M. and Van der Voet, J.L.M. (2005) Lokale verbindingen: het handhaven waard! In: Verkeerskundige werkdagen 13, CROW, Ede

Jaarsma, C.F. and Westdijk, E.C. (2000) Motorway construction and secondary rural road networks: a method to compare alternatives for reconnecting interrupted local road links. In: Jaarsma, C.F. &. Michels, Th. Final Proceedings Third International Workshop on Secondary Rural Roads, Józefów (Poland), 19-21 May 1998, CROW Report 00-07, Ede (Netherlands): 103-114

Kocks, M. (2003) Demographischer Wandel und Infrastruktur im ländlichen Raum – von europäischen Erfahrungen lernen? In: Informationen zur Raumentwicklung, number 12

Lowe, P. (1989) The rural idyll defended: from preservation to conservation. In: Mingay, G.E. (ed.) The rural idyll. London: Routledge

Lowe, P., Ray, C., Ward, N., Wood, D. and Woodward, R. (1998) Participation in rural development: a review of European experience. Newcastle upon Tyne: Centre for Rural Economy

Mormont, M. (1990) Who is rural? Or, how to be rural. In: Marsden, T., Lowe, P. and Whatmore, S. (eds.) Rural restructuring: global processes and their responses. London: Fulton

Murdoch, J. and Marsden, T. (1994) Reconstituting rurality. London: UCL Press

Murdoch, J., Lowe, P., Ward, N. and Marsden, T. (2003) The differentiated countryside. London: Routledge

Newby, H. (1985) Green and pleasant land? Social change in rural England. Middlesex: Wildwood House

O'Meara, M. (1999) Reinventing cities for people and the planet. Worldwatch paper 147. Washington DC: Worldwatch Institute

Reynolds, G. and Elson, M.J. (1996) The sustainable use of sensitive countryside sites for sport and active recreation. In: Journal of Environmental Planning and Management 39, pp. 563-576

Sanders, H.J., Jaarsma, C.F. and Beunen, R. (2005) Modderige bermen? Hoe gemeenten omgaan met verkeerseffecten van nieuwe functies in het buitengebied – een verkenning. Verkeerskundige werkdagen 13, CROW, Ede

Schmid, J., Heigl, A and Mai, R. (2000) Sozialprognose. Das Schicksal der nachwachsenden Generation. München: Olzog

Schrader, H. (1997) Entwicklungstendenzen ländlicher Räume in Deutschland und ihre Förderung durch die EU-Strukturpolitik. In: Rostocker Beiträge zur Regional- und Strukturforschung, H. 6, Universität Rostock, S. 7-35.

Stokes, G. (1991) The effects of the current trends in transport on the countryside in Great Britain. Oxford: University of Oxford, Transport Studies Unit

Van Dam, F., Jókövi, M., Van Hoorn, A., and Heins, S. (2003) Landelijk wonen. Rotterdam: Nai Uitgevers

Van der Voet, J.L.M. and Haak, M.Th. (1989) Op weg naar een recreatief toegankelijk landelijk gebied? In: Landinrichting 29(5), pp. 31-40