

Environmental  
Sciences

2013

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examples of research and education



WAGENINGEN **UR**  
*For quality of life*

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Environmental  
Sciences

2013

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**WAGENINGEN UR**  
*For quality of life*



# Foreword

**This is the 2013 yearbook of the Environmental Sciences Group at Wageningen UR, a selection of projects and activities of the Wageningen University Department of Environmental Sciences, Alterra research institute and ISRIC.**

This report reveals the value of our knowledge domain. Clearly, challenges such as the food supply, climate change and the functioning of the market are increasingly demanding attention. These challenges are about the quality of life on Earth in general. The solution to many problems is, at least in part, anchored in the domain of our research on topics including soil, water, the atmosphere, the landscape and biodiversity – on a global scale as well as regionally, from the Achterhoek to America and from Zeeland to Zimbabwe. More than ever, this makes our domain the binding factor in the public debate. In the chapters which follow, you will be reading about this and more.

Or are you more interested in the structure and management of our organisation? Flip or scroll to the last part, where you can read about such topics as our presence throughout the world and our sustainability achievements. There you will also find the most important facts and figures on our organisation, including academic publications and characteristics of our personnel.

Wishing you an enjoyable read,

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Green space,  
nature and  
rural areas

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# Green space, nature and rural areas

If the economic crisis has made one thing clear, it is that conservation interests and economic interests are not diametrically opposed. While entrepreneurs long claimed that the Netherlands was locked up tight due to strict European environmental laws, now businesses are taking the initiative to integrate nature into their construction plans or operations. And whereas governments and civic organisations are among the steadfast consumers of academic research, the commercial sector is increasingly seeking out ecology research conducted by Alterra and Wageningen University.

After years of budget cuts and harsh language directed at conservationists, Frank Berendse of Wageningen University is cautiously optimistic. 'I see a great deal of eagerness; once again, there is a state secretary who is enthusiastic'. Conservation efforts had been rather firmly focused on static goals. 'Now we know that, due to such factors as climate change, the situation is very

dynamic'. The upside is that new species are showing up. Berendse mentions the bee orchid, which has moved northwards, and also the little egrets in the Dutch Wadden Sea region: 'We used to have to travel to the Camargue to find them'. Even the sea eagle, and the cranes in the Fochteloërveen, have relocated to the Netherlands, though due to causes other than climate change.

*'Issues concerning climate change, water, nutrition and nature should be tackled in context.'*

**Annemarie Groot** | Alterra  
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Still, the Netherlands needs large natural areas, says Berendse, because nature must have enough room to react to climate change and to the many other kinds of changes in our environment. 'It is especially important to restore the adaptive capacity of natural areas by reserving sufficient area, and by satisfying such essential conditions as reductions in both nitrogen deposition and pesticide emissions. This is why you have to protect natural areas at a high level of spatial scale. Furthermore, it is essential that we provide a sustainable future for all types of nature that grace our country: not just for wilderness, but also for nature in semi-natural landscapes with their fields of heather and coppiced woodlands, and even for the nature in farming areas. Only then can you preserve the entire spectrum of wild plant and animal species.' Ecological research from Berendse's chair group reveals that the of species is the essential ingredient for preserving major ecosystem functions.

Berendse thus argues in favour of a new kind of spatial planning: regional environmental networks with large natural areas, surrounded by areas with environmentally friendly agriculture and recreation and, further on, intensive agriculture and industry. 'You have to link it directly to a new financial structure', says Berendse. He sees a future for regional natural-resource investment funds, funded not only by nature conservation organisations and the government, but also by payments from entrepreneurs for the ecosystem services supplied by those natural areas.

In accordance with a comparable philosophy, Alterra's Annemarie Groot is bundling research at that institute into the strategic programme called 'Green climate solutions': solutions in which nature serves as an ally to the development of resilient and climate proof areas and businesses. Groot gives the example of the Frisian coast of the IJsselmeer near the Workumer buitenwaard, where scientists are looking at the potential of the sand motor for employing morphology and hydrology to link coastal protection to nature development in the *buitenwaarden*. These efforts seek to stimulate natural growth in pace with any rise in water levels. 'Our society not only affects the natural system; it also makes use of it', says Groot. 'The hypothesis is that this can be less expensive, but also better for the environment'.



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*'Conservation efforts must not be focussed on static goals, but on dynamic processes.'*

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Like Berendse, Groot sees here the possibility of connections to financial resources. 'The Delta fund was established to guarantee water safety in the Netherlands. You can link that to regional initiatives for nature, recreation or agriculture'. Characteristic of the approach championed by Alterra is that issues concerning climate change, water, nutrition and nature are tackled in context. Good examples are the 'Climate Smart Agriculture' projects being prepared for Africa and Asia. Adaptations to increasing drying, involving new measures for soil and water conservation, yield benefits for food security and help decrease greenhouse gas emissions. Berendse concludes, 'The challenge for science is to make clear that there is no such thing as a free pass for unbridled activities'.





*'Safety measures and nature conservation can go together, taken into account geomorphology and riparian processes.'*

## Towards more dynamic riverine nature

**After 2015, the major rivers in the Netherlands will be modified to be able to safely accommodate increased water flows associated with climate change. At the same time, European regulations are requiring measures to improve the quality of surface water and riparian nature. Dynamic riverine nature that is compatible with natural riparian processes are best suited to the future river system, say Bart Makaske and Gilbert Maas. They searched along the IJssel river, for instance, for the best locations at which to develop secondary channels and natural banks.**

According to Makaske and Maas, safety measures and nature conservation can certainly go together, as long as you take into

account the geomorphology of the river landscape and the riparian processes. For example, the investigators encountered 'hot spots' along the IJssel where natural processes which lead to the formation of natural river forelands were already active. That is precisely where there is potential for habitat development, natural banks and the development of secondary channels. For the Vecht as well, a small river in Germany and the Netherlands, these scientists have documented the possibilities for giving natural processes more of a chance to unfold naturally.

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*'Better plantation management results in reduction in greenhouse gas emissions and water pollution.'*

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## Sustainable production of palm oil

The production of palm oil goes hand in hand with hefty discussion. While palm oil is used in many food products found in supermarkets in the Netherlands, this leads to serious environmental problems in such countries as Malaysia and Indonesia. Rain forests are cleared and peatlands are drained in order to install palm oil plantations, resulting in biodiversity loss and extra greenhouse gas emissions. The establishment of palm oil plantations, large and small, can trigger unrest and conflicts between local and other parties. This makes palm oil a controversial product.

Scientists from Alterra and Wageningen University are working with colleagues from Malaysia and Indonesia to study these problems. Aspects being examined include how the loss of rain forest can be compensated through the establishment of 'high conservation value areas'. In addition, research is underway on how better plantation management can result in reductions in greenhouse gas emissions and water pollution. Further investigation focuses on how to better protect local interests, to allow the population to profit more from palm oil plantation revenues, and to reduce the probability of conflicts between groups. Ultimately, this research should yield better criteria and indicators, so that palm oil buyers can determine with more certainty whether their palm oil has actually been sustainably produced.

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# Climate-neutral beer



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*'Linking industrial production to natural ecosystem services will turn a business park into a catalyst, enhancing sustainability for the entire region.'*

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The Heineken company aims for its Zoeterwoude location, the largest beer brewery in Europe, to be climate neutral by 2020. Alterra is collaborating on this project with Heineken and the province of South-Holland in the partnership called 'Groene Cirkels': Green Circles.

Groene Cirkels combines sustainability improvements to the Heineken brewery – thanks to Alterra expertise – with the ambitions South-Holland has for the province in the areas of spatial planning, water, mobility and the economy. The result will be an economically sound business in an attractive environment for living, working, business and recreation. This move will turn a business park into a catalyst, enhancing sustainability for the entire region. To this end, researcher Eveliene Steingröver is looking for ways to link industrial production at Heineken to the region's natural ecosystem services.

The partnership focuses on closing industrial cycle loops, both large and small. One example is the research on a process to purify waste water from the brewery by using it to grow algae. The nutritional value of algae makes it possible for dairy cattle owners to use it for feed, together with brewers grains (a by-product of the brewing process), instead of soybean meal. Dairy cattle owners in the area can supply manure for biogas production. Together with roadside biomass, the manure can then be converted into gas to supply energy for the brewery. In addition, the partnership is investigating more efficient drinking water production for the brewery, and climate-neutral logistics for transporting the beer. The landscaping of the hundred-hectare brewery will be adapted, with flowers and bees, as a link in a regional 'bee landscape'.

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*'Brooks should move through the landscape, but not too rapidly. Small overflows are important for seed distribution.'*

## The redevelopment of brook valleys in view of climate change

**A meandering brook isn't necessarily a natural brook. This, according to Piet Verdonschot, can be safely concluded from research on the many projects for the re-meandering of brooks in the Netherlands and Europe. Many brooks were straightened in the course of the twentieth century; this led to sediment deposition and the loss of nature values, and also caused flooding and water problems downstream. Verdonschot is now investigating, together with Stowa, how re-meandering can also be ecologically effective. This is necessary in order to achieve the goals set by the European Water Framework Directive.**

Brooks, research shows, should move through the landscape, but not too rapidly. Until now, in re-meandering, the focus was on the structure of the brook. However, research indicates that its hydrological processes play an especially important role. It turns out, for example, that small overflows along the length of the brook bring about the distribution of plant seeds. A natural brook can succeed with little, yet continuous water flow and occasional inundations. For this hydrological and morphological equilibrium, it is necessary to examine not only at the brook itself, but also to include the entire brook valley, starting with the basin.

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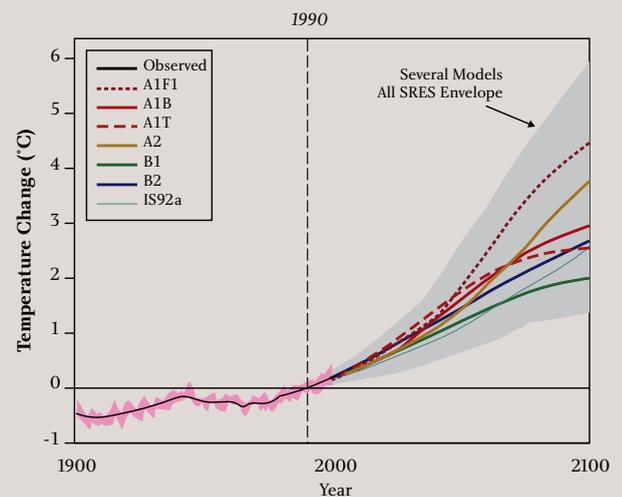
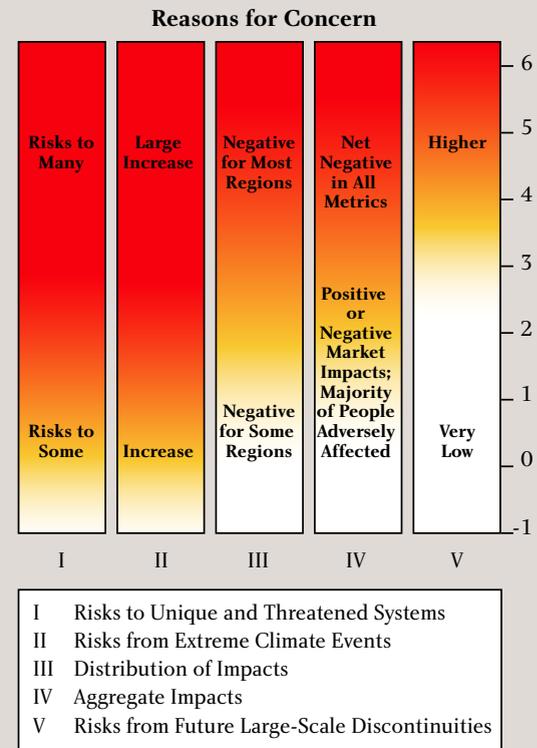
# How dangerous is climate change?

Spontaneously, Rik Leemans takes the 2001 report of the International Panel on Climate Change (IPCC) from the cabinet in order to explain exactly what kind of research his chair group is doing on climate and climate-related diseases, types of pollution, and so forth. The problem with complex, global processes such as climatic change is that so very many different aspects, jointly and synergistically, are pivotal for the development of changes which could eventually lead to disastrous consequences.

Leemans developed for the IPCC the now nearly famous – with its more than fifteen thousand citations – ‘burning embers’ diagram. In this diagram, climatic scenarios on the left are linked to five different categories, each of which are more or less at risk due to climate change. As the temperature increases, the embers burn from white and yellow to red, into the danger zone. In a nutshell, this illustrates the focus of Leemans’ scientific work: estimating, on the basis of reams of academic research, which risks certain systems – ecological, hydrological or human – face in each of the future scenarios, developed by scientists, for a particular activity. The most recent IPCC report, released in April 2014, again made use of this diagram. Next to its red, a purple colour has been added to signify irreversible effects. This recent diagram also indicates that the vulnerability is greater than was previously thought.

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*'On the basis of academic research we can estimate which risk society faces.'*

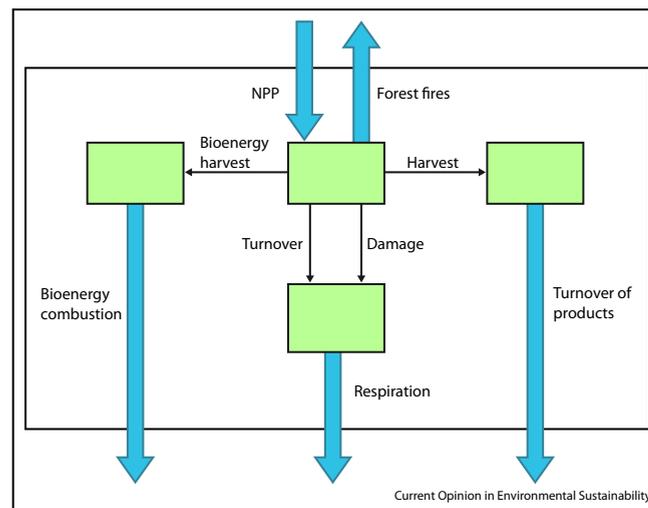
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# The relation between forest management and climate change

Forests can be put to use in many different ways to decrease the greenhouse effect. With wise forest management, forests can take up greenhouse gases while wood can be used as a renewable energy resource. Through the project 'Forest management options for enhancing the mitigation potential of European forests' (FORMIT), Wageningen University – together with eleven other European universities – will chart the potential of European forests for reducing greenhouse gases.

On the project, researchers examine not only how much carbon the forests can retain, but also what the effects are of the various forest management methods. Carbon, for example, is stored not only in wood and wood products, but also in the soil. The researchers study the interchange between forest management, the production of wood and bioenergy, and such other products and services as food production, nature conservation, soil conservation, water management and recreation. In light of these, they will investigate how forest management can be structured for optimal mitigation of the greenhouse effect.

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*'Forest management can be structured for optimal mitigation of the greenhouse effect and wood production.'*

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*'In order to build with nature we must possess essential knowledge of the historic and prehistoric development of the landscape.'*

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## Building with nature

**Fifty per cent of the earth's land mass has been changed and adapted by humans. Nature, however, 'fights back'. Accordingly, we should not wage a battle against nature, but rather collaborate with it. This was the message Jakob Wallinga communicated on 5 September in his inaugural speech as professor of Soil geography and landscape.**

We humans have not been very successful in our management of the Earth, Wallinga contended. People often opt for short-term solutions. Even the Netherlands' centuries-old water management has not created universal safety for its citizens. Furthermore, problems such as flooding are increasing worldwide. In order to build with nature, Wallinga argued, we must possess essential knowledge of the historic and prehistoric development of the landscape. Within this history, the soil tells of past developments, and also gives insight into the future. The developments of the past demonstrate how resilient a soil or landscape can be under extreme conditions. This yields knowledge for such tasks as estimating how minor antecedents can cause complex systems such as landscape and soil to respond with sudden and extreme change. With these insights, Wallinga would like to improve the ability to estimate how systems can be deliberately tipped towards a desirable state.

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# The influence of light on nature

**Just like all densely populated regions of the world, the Netherlands have become increasingly brightly lit at night. Until now, the effects of this artificial light on flora and fauna have been unknown; now, Elmar Veenendaal is leading a large study of the phenomenon on behalf of Wageningen University. The project 'Impact of artificial light on flora and fauna in The Netherlands' has been launched in order to learn more about the effects of artificial light in our country.**

At a number of locations in the Netherlands, nature will be illuminated experimentally in various colours, and the reactions of plant and animal species will be precisely observed. This design will allow the effects of not only artificial light to be investigated, but also of colour. This study is being carried out in collaboration with sixteen partners, including Philips, NAM (Nederlandse Aardolie Maatschappij) and the NIOO (Netherlands Institute of Ecology), and sponsored by Technical Foundation STW.

The preliminary results demonstrate that the light itself, and its colour as well, have an effect on nature. It was already evident, for example, that light attracts moths. However, the research now demonstrates that the production of sex pheromones in female moths is decreasing. A study on the winter moth reveals that this decrease has led to less mating near street lights. Toads appear to avoid green and white light during their spring migration, yet they cross roads where there is either red light or no illumination. The investigators are observing birds, bats, mice and plants. The results will be used in the future to apply – or to omit – more nature-friendly lighting.

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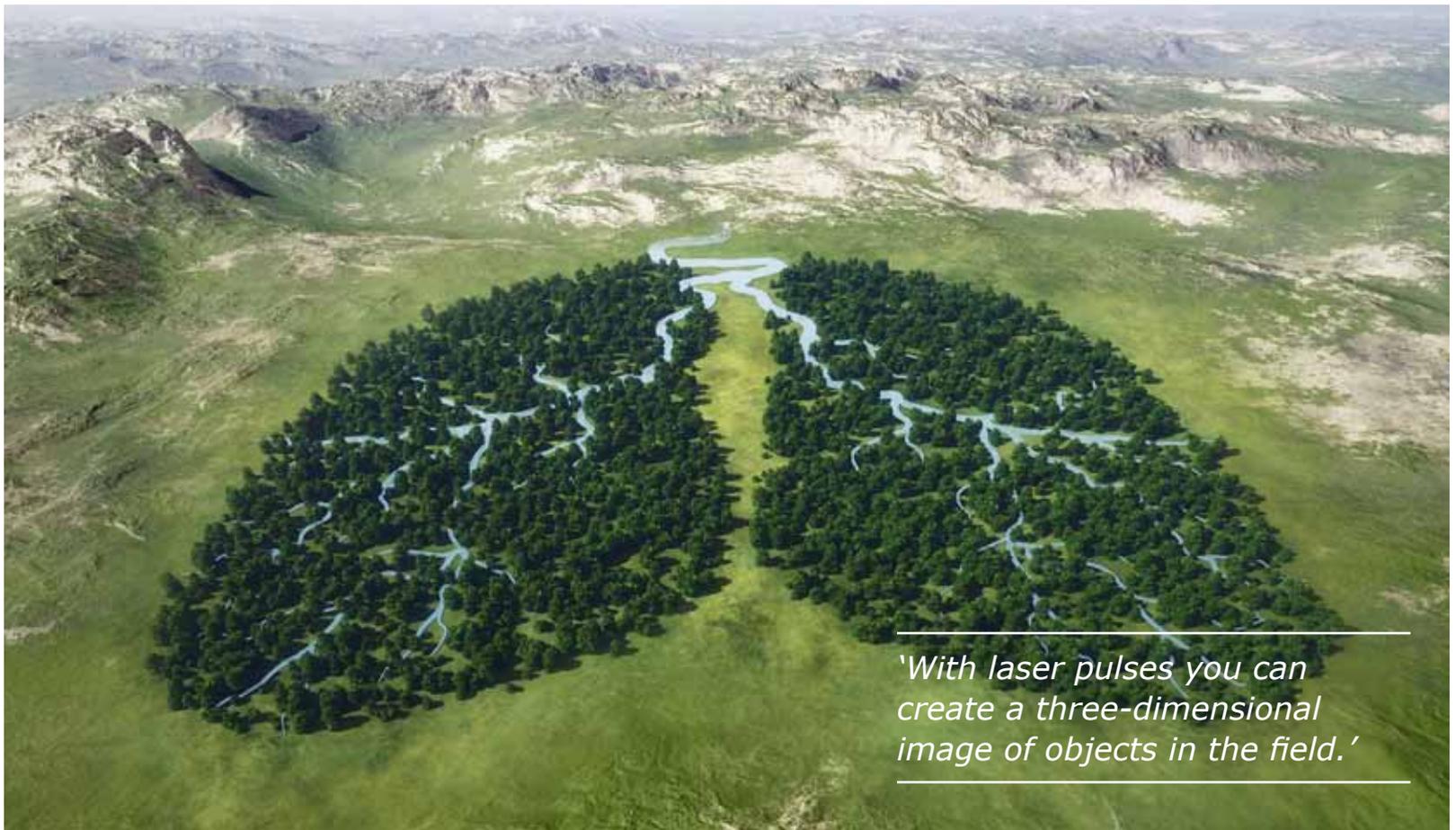


Photo: Kamil Spoelstra / NIOO-KNAW

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*'Not only artificial light by itself, but also the colour of the light influences nature.'*

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*'With laser pulses you can create a three-dimensional image of objects in the field.'*

## Monitoring the 'lungs of the earth'

**LiDAR (Light Detection And Ranging) is a technology which determines the distance to an object or surface using laser pulses. A LiDAR instrument sends out laser pulses and receives back the reflection of those pulses, making it possible to create a detailed, three-dimensional image of objects in the field. The system was tested during the opening of the new Orion building on the Wageningen Campus, with a scanner mounted on a tripod; this made it possible to digitise the building.**

Wageningen University and Alterra use this technique to map landscapes and vegetation in 3D, with LiDAR measurements taken

both from aeroplanes and on the ground. A case in point are the efforts of Harm Bartholomeus and his colleagues from Wageningen University: they are mapping out the structure of tropical forests. LiDAR ground measurements make this possible, as they are detailed enough to measure the biomass as well as the height and diameter of the trunk and crown of every individual tree. It thus becomes possible to make accurate estimates of parameters such as biomass, and of their changes.

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Green space,  
liveability  
and the city

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# Green space, liveability and the city

Central government planning appears to be a relic of the past. Cities are increasing in importance for planning and design according to Adri van den Brink, professor of landscape architecture and use planning. National borders are waning in importance. 'A city such as Amsterdam no longer refers to itself as part of the conurbation called the Randstad. Rather, it identifies itself as the centre of the metropolis Amsterdam-Brussels-Cologne'. And Amsterdammers experience their city and the green of the city in a new way. 'They no longer sit in the park in order to rest, but to celebrate the city. They want WiFi in the park'.



*'We no longer sit in the park in order to rest, but to celebrate the city – with WiFi.'*

**Adri van den Brink** | Wageningen University  
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Green in the city is becoming increasingly important, says Wim de Haas, who is coordinating the research on the green city within Alterra. This is because, today, urban development is about the capacity for renewal. 'Particularly for that reason, green is essential.' Green space makes for a good living and working climate, and a robust urban system. Green space is a means for achieving objectives in such areas as health, social cohesion, industry, climate and biodiversity. Possibilities include the installation of green roof landscaping, the greening of the water system, the creation of meeting parks, and so on. Research is to lead to practical recommendations and design solutions.

Planning is increasingly becoming a societal issue, a fact which Van den Brink believes is yielding innovative research. Specifically, he names Claudia Basta's study on technical interventions in the landscape, such as the CO2 storage near Barendrecht or the shale gas exploitation near Boxtel, which has stirred quite a societal uproar. Though the interventions take place outside the city in the strict sense of the word, it is very much about their influence on the urban environment and the people who live there, about the moral considerations underlying technical interventions. Consider, for example, the increasingly visible resistance to wind turbines; this is why the energy transition poses great challenges for landscape design and planning, as shown by Renée de Waal's research. Van den Brink does not believe that the disappearance of the traditional top-down planning will lead to the fall of urban planning. As a matter of fact, he sees all kinds of new possibilities. 'I find it



*'Green space makes for a good living and working climate, and a robust urban system.'*

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fascinating. In the new structure vision for Amsterdam there are no prescriptions, but rather a context within which decisions can be made. It is process-oriented, with the aim of making initiatives possible. It is an *uitnodigingsplanologie*, planning by invitation, that requires a different stance of planners and designers than does the traditional public-private collaboration. We will have to position ourselves more externally, and will have to learn to collaborate with many more parties. Diverse issues will be linked up in new ways. It will surely take getting used to."

The research, according to De Haas, will be increasingly more focused on organisational and social innovation, and also on the relation between green and the social climate, such as the study on the

influence of green schoolyards on bullying at school. Also fitting this bill is an investigation such as FoodMetres, by Dirk Wascher at Alterra, in which the food chain is used to make the city more sustainable. Van den Brink points out that such research also leads to new alliances and a different research approach. He names the example of the collaboration that landscape architect Sven Stremke seeks with the energy world. 'They speak an entirely different language than we do; we will have to learn to understand each other'.



*'Amsterdam is becoming an experimental space for researchers, students, businesses, administrators and residents.'*

## Amsterdam as a living laboratory

**Metropolitan agglomerations throughout the world are facing challenges, each of which can quite possibly be solved individually. Yet addressing these challenges in relation to one another could lead to revolutionary changes. This, in fact, is the fundamental idea behind the Amsterdam Institute for Advanced Metropolitan Solutions (AMS). Alterra and Wageningen University are among the instigators.**

TU Delft, Wageningen UR and Massachusetts Institute of Technology (MIT) are the core academic partners in a collaboration with public and private parties: Accenture, Alliander, Cisco, IBM, KPN, Shell, Waternet, Amsterdam Smart City, ESA, TNO, Waag Society and the city of Boston. Together these partners will be using the city of Amsterdam as a living laboratory for innovations and education concerning traffic flow, food, waste, energy, climate and health. Amsterdam is becoming an experimental space for researchers,

students, businesses, administrators and residents. One element of the new institute will be a platform created to facilitate the exchange of acquired data, knowledge and experience: the Value Platform. The education arm will be embedded in a master's (MSc) programme called Metropolitan Solutions. From Wageningen, our primary contribution is knowledge about enhancing liveability in metropolitan environments, knowledge of how to provide the city's population with its daily food, and also knowledge of the circular economy involving water, energy and waste

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# Social innovation changes government policy

**In recent years, Roel During and his colleagues have been investigating the significance of social innovation and social media for public policy. With increasing frequency, citizens themselves – as opposed to the state – are taking care of matters revolving around liveability and sustainability.**

On the island of Texel for instance, residents organised cooperative energy production; in Oostburg, residents work together to manage the green areas around their homes; and everywhere, people are active in town councils, neighbourhoods or special interest groups. Social media plays an important role in all of these because, as During says, the distinction between offline and online is fading. The state could be more responsive to this trend, he believes. By taking on a listening, stimulating, facilitating and networking role in the background, government authorities could be more in step with what is going on in the community than when they base their goals on traditional problem assessments. All too often there is still evidence of an uneasy relationship arising out of an inability to let go of frameworks into which each and every initiative is supposed to fit. A participatory government authority that employs social media is a better match to a creative and enterprising community: government policy becomes more of a co-creation, exploring with others what needs to happen, and sharing ideas, experiences and resources. The authorities can play an important role in activating and supporting those who want to set up a citizens' organisation, especially in terms of the integration of private initiatives into both society and policy.

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*'Government authorities should realize that the distinction between offline and online is fading.'*

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# Climate Proof Cities



**Cities are dynamic systems in which people live and work. They are vulnerable to the effects of climate change: flooding, heat and drought. Adaptation of public space and the water system, and of homes and buildings, is necessary in order to maintain a pleasant social environment in the future, and – as far as possible – to prevent societal distress.**

In the Climate Proof Cities project, research is being conducted on how cities can best deal with this reality. How can you strengthen cities' adaptive capacity and mitigate their vulnerability to climate change? The density of urban development causes cities to retain heat. During the increasingly frequent hot summers, entire neighbourhoods can become 'heat islands' – a dangerous development, especially for the elderly. Thanks to the project, heat maps have been generated for several cities. It turns out that the percentage of hard surfaces in an area determines, to a large extent, the accumulation of warmth. Green areas, and sometimes water, are inhibiting factors which can be employed to limit the heat island effect. Research indicates that this often requires customised solutions.

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*'Heat islands are mainly the result of a high percentage of hard surfaces.'*

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*'Local climate proof water management:  
collect water during wet periods to store  
it for times of drought.'*



Photo: Peter Jansen

## Climate proof water management for Park Lingezegen

**Even in the water-rich Rivers region, the Freshwater Delta Programme tells us, future periods of water shortages and drought are possible. Under those circumstances the new Park Lingezegen, between Arnhem and Nijmegen, will no longer be able to benefit from the inlet water from the Pannerden Canal. This is why Alterra is investigating how this park can be designed so that there is not only enough space to collect water during wet periods, but also enough space to store water for times of drought.**

Park Lingezegen is being developed as a regional recreation area with plenty of room for nature and agriculture, yet it will also be an important hydrological buffer for both the residential areas in the south of Arnhem and Bemmel and for Bergerden, the greenhouse

agriculture area. Alterra is studying, together with MeteoConsult and Eijkelpark company, how management of the water system in the park can be made climate proof. Together with Radboud University, a way is being sought to purify water in order to produce biomass for green energy. The opportunities for water storage and water conservation in the park are being delineated with the aid of integrated models. The web tool WaterrijkWeb is being developed for the park's water managers; it will allow them to respond optimally during wet times and dry times.

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# The consequences of population decline for citizens

**The residents of the northern Groningen village of Kloosterburen are pioneers in the realm of citizens' initiatives. For the past ten years they have been united under the banner of the SintJan Foundation to undertake all kinds of activities addressing health care, ecology and culture.**

Their goal is to keep their village in this northern depopulation region vital and liveable. On behalf of the Wageningen Science Shop, Alterra evaluated this citizens' initiative and lent them its support. The success of SintJan, Bas Breman concludes, ties into the prime movers' knowledge of how to mobilise social and cultural resources. At the same time, these people and their initiatives are in keeping with the 'systems world' of the public sector and institutions.

The research shows that, above all, the foundation should continue to operate on the basis of its own strength, as the systems world is often not yet ready for the innovations that citizens' initiatives generate. Sinking too much energy into getting players from that

world 'on board' often leads to more frustration than success: ignorance, helplessness, and sometimes even unwillingness can make these players unable to move in concert with the private initiatives. At times, the foundation has even been viewed as competition by care providers or the housing agency. The investigators conclude that these kinds of organisations actually should give citizens' initiatives like SintJan Foundation more space, and accept that pioneering is always a question of trial and error. It is worthwhile for such organisations to look at how they can align themselves with the mentality and dynamics of such citizens' initiatives.

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*'Governments and institutions are often not yet ready for the innovations that citizens' initiatives generate.'*

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# Energy landscapes are the future

**Windmills, biomass-fields, solar power plants and other forms of renewable energy will have an unmistakable influence on the landscape of the future. The 'NRGlab' provides a platform for Wageningen landscape architects to explore the possibilities for energy transition and its effects on the landscape.**

The aim is to create designs for sustainable energy landscapes in which renewable energy production also results in landscape improvements. In the words of Sven Stremke, 'reintegrating renewable energy into the existing landscape – that which people want to keep – in a socially, ecologically and economically acceptable manner'.

Within the NRGlab, landscape architects conduct empirical research and research by design, using mapping and modelling in order to investigate energy landscapes and their potential future. A realistic ambition is being sought for the energy potential in Parkstad Limburg. Also under examination is trade-off renewable energy in ecosystem services in Zeeland, and research by design on solar farms in Noord Brabant. Additional exploration is underway to see which design principles and concepts are useful, and which research and planning methods are suited to them. The research is strongly interwoven with education; publications from researchers and students alike are disseminated via the website [www.nrglab.net](http://www.nrglab.net), creating an international virtual community concerned with sustainable energy landscapes.

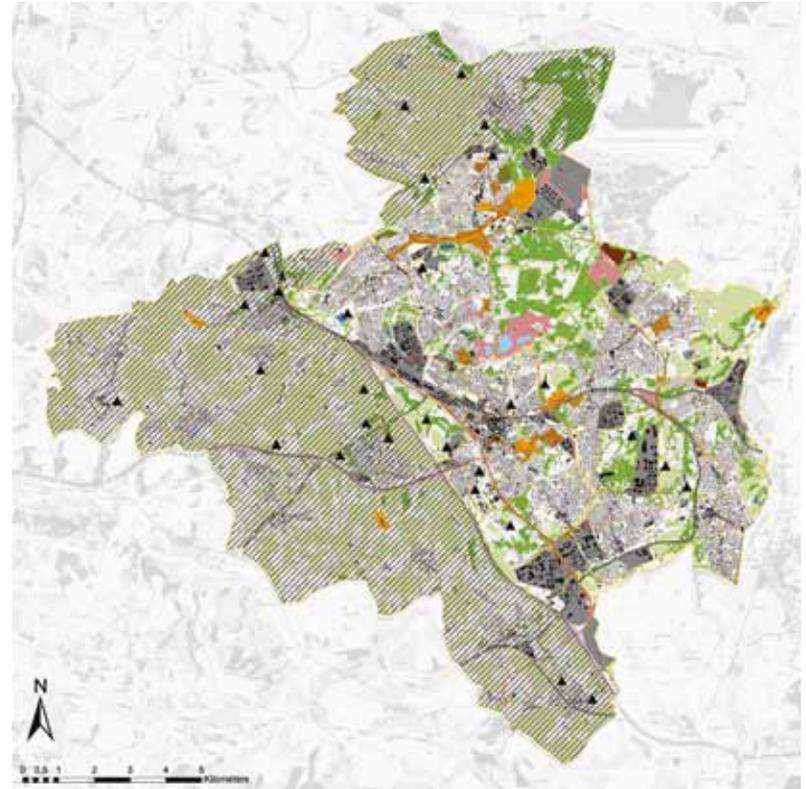
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*'Renewable energy will improve the landscape of the future.'*

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# Redevelopment of the Athens city centre

On 27 February 2013, landscape architect **Wiebke Klemm** of **Wageningen University**, in a team with **Okra landscape architects** and **Mixst Urbanisme**, won the **Onassis Foundation's prestigious international competition 'Rethink Athens'**. This competition was organised and funded for the redevelopment of the urban heart of Athens, where work is in progress on the busy transport system. Motorized traffic is to be reduced, and a new tram line will augment public transport in the city centre.

The winning plan ('One step beyond') outlines a resilient, accessible and vibrant city, and factors in the southern European urban climate by including a strong network of green and urban spaces.

In the design, green elements and light paving materials contribute to both the reduction of heat stress during the summer months and the improvement of thermal comfort and liveability in Athens. This involves an inventive water management system for scarce summer water, with underground storage and reuse for irrigation of the green spaces. As requested by the Onassis Foundation in 2013, the designers, together with the international team comprised of Studio 75, Werner Sobek Green Technologies, LDK, NAMA en Atelier Roland Jeol, have further developed the ideas into an execution plan. In 2016 the Panepistimiou street area in the centre of Athens is to be transformed into a green, pedestrian-friendly and vital boulevard, to become the heart of a new city centre.

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<http://youtu.be/kWXTtdZLj9U>



Beeld: OKRA Landschaparchitecten

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*'Water and green urban spaces reduce heat stress in summers and improve thermal comfort and liveability in cities.'*

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# Spatial planning is not democratic

**'Systematic use of this questionnaire for spatial planning purposes in the Netherlands shall, with 100% certainty, lead to crises, and will most likely result in a more democratic and streamlined planning system – sometimes, perhaps, to the chagrin of the experts.'** Though this statement resembles the text of an information leaflet enclosed with a dangerous product, it is actually a call, by Martijn Duineveld and Kristof van Assche, for further democratisation of spatial planning in the Netherlands.

One often speaks with pride of the planning system in the Netherlands, but Duineveld maintains that planning in the Netherlands and Europe is not always adequately democratic. This is because an elite group of experts dominates planning, even with the current trend, through citizen participation, of involving and

activating other people in real estate development and other projects. The knowledge and values of non-experts, he contends, are systematically undervalued in the planning system. In order to engage citizens more in the design of the environment, all kinds of new theories and models are being developed. Although citizens may have a voice, Duineveld believes that another aspect must first be seriously investigated: who actually determines the defining values in spatial planning? In other words, who has the power in the world of planning? These questions are elements of the list, referred to above, of what can lead to more democracy in planning.

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*'The knowledge and values of non-experts are systematically undervalued in the planning system.'*

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# Measuring city climate with smartphones

**Researchers at Wageningen University are the first to use smartphones successfully to measure the temperature in the city. The battery of a smartphone has a temperature sensor to prevent overheating. The data is stored by way of the free app, 'OpenSignal'. This is how, on the basis of 1.3 million battery temperature measurements, daily average temperatures have been calculated for Buenos Aires, London, Los Angeles, Paris, Mexico City, Moscow, Rome en São Paulo.**

The new method is a promising technique for measuring city climate. Roughly twenty per cent of the earth's surface has smartphone coverage, and hundreds of millions of these devices are in use. Especially densely populated areas, such as large cities, represent great potential for use of this new technique. The investigators see it as a first step to gaining more relevant information about the temperature in the complex and diverse microclimates of the city. The measurements are consistent with in

situ city weather measurements recorded by Wageningen research groups. In addition, they are working on methods to acquire better rainfall information from mobile phone network masts: rain weakens the signal between the masts, making it possible to derive detailed rainfall maps from this signal attenuation.

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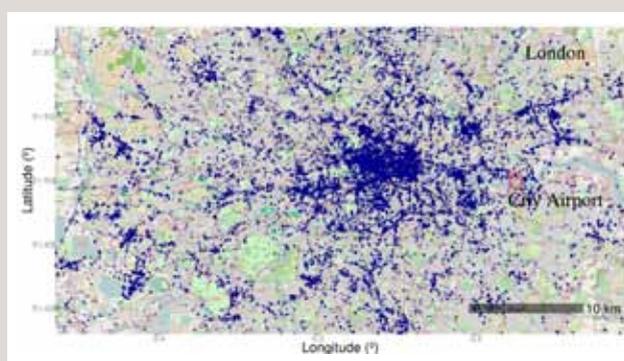
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*'The use of smartphones is a promising technique for measuring city climate.'*

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# The road of the future

**On Sunday 8 September 2013, provincial road N329 was opened festively. This thoroughfare through the city of Oss is the 'Road of the future', with several energy-saving and energy-producing techniques, reuse of materials, and an innovative design.**

Landscape architect Paul Roncken of Wageningen University developed, in collaboration with artist Wim Korvinus, an 'idea generator' in order to incorporate art along the route as an integral element of this road of the future. Roncken and Korvinus made suggestions for sites where art could provide not only an aesthetic, but also a functional, complement. One of those design suggestions – also realised – is the 'self-cleaning road', with roadside vegetation and clever waste water processing. Furthermore, the longest (organic) permanent plant border in the Netherlands has been planted in the median along a stretch of 3 kilometres, to emphasise the character, both robust and poetic, of the road of the future.

According to Roncken, the goal was not to produce a 'James-Bond road' with all kinds of technical tricks. The road was to be as normal as possible. This meant that he was faced with functional challenges in which technology and ecology had to be integrated into a whole. Such as an information point about the region complemented by a charging station for electric cars. A rail crossing required an acoustic fence that was as green and sustainable as possible. The idea generator turned out many innovative suggestions for functional artistic applications, such as combining the noise barrier with a bee hotel, or permeable and animal-friendly material, and a 'balcony hut', an animal shelter that leans over the road like a balcony, with an illuminated artwork on top. If it's up to Roncken, there should also be a car-free Sunday. Then, he thinks, you look at a road like this in an entirely new way. That, as well, is a prospect for the future.

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Photo's: v.d. Bijl & Heierman



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*'A very normal road with special technological and ecological aspects – also suitable for a car-free Sunday.'*

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Green  
economy  
and food  
security

3



# Green economy and food security

'Landscape', Lijbert Brussaard asserts, 'that is the level at which the problem of food security must be tackled'. The soil biology professor makes a further plea for ecological intensification instead of the traditional intensification of farming. His approach is in no way esoteric, he believes, as it only involves making sure that food production does not overexploit natural capital. 'Food production should be the interest on that capital'.



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*'From soil to plate, linking local food chains with international markets and logistics.'*

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The ecologically intensive agriculture that Brussaard propagates is a form of agriculture that learns from nature. Intensive monoculture, for example, is not natural, while mixed crops can be advantageous. His chair group is conducting research on agroforestry farmers who cultivate different crops for different markets: coffee for the global market, food for personal consumption, medicines and fruit for the local market. The various crops benefit, which results in increased production. 'The challenge is to produce food where people need it', argues Brussaard. 'That is an enormous scientific challenge. We must learn from nature. For example, how does nature sustain protracted processes in the soil? We can apply all of that knowledge in agriculture. In part, it's already being done. Take functional agrobiodiversity for example, in which field margins are seeded in order to attract predatory insects.'

An important issue involved is the fertility of the soil. In the Netherlands, Brussaard points out, 'we import soil fertility' in the form of fodder, but in the rest of the world this leads to big problems for agriculture. It bothers Brussaard that the political community did react in 2008 when food prices rose, yet very little attention is paid to soil degradation through the erosion and salination about which Brussaard and his soil science colleagues have been warning for decades. The population increase is expected to be the largest in the tropics and subtropics, and that is exactly where soil degradation is the most serious.

Soil fertility is also the approach route of research on food production coordinated by Christy van Beek of Alterra. In food production research, she says, there are two camps. Some do field experiments but do not take the supply chain into account. Others look at the national level, yet are much less sensitive to local involvement. 'You have to connect these issues with each other', Van Beek argues. 'That brings about increases in resource use efficiency'.

One way to provide transparency for supply and demand within the food chain is to express food production in an ecological footprint. Van Beek would like, within Alterra and also in collaboration with the university and other Wageningen institutes – she already works with Brussaard – to arrive at a comprehensive study of the ecological footprint of food production. That involves investigating the entire food chain, from soil to plate, and linking local food chains with international markets and logistics. Research like that is in keeping

with the case made by Brussaard because a description of such an ecological footprint would reveal what influence the food on our plate has, for example, on the soil in which it is grown.

Brussaard finds the criticism of opponents, that ecologically intensive agriculture will produce too little to feed nine billion mouths in 2050, unwarranted. 'Mainstream agriculture in the Netherlands has benefited from scientific research for more than a hundred years; the research on ecologically intensive agriculture has just begun'. But if we keep saying it can't be done, it certainly won't happen.



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*'The challenge is to produce food where people need it.'*

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# Sustainability as core business

More and more, multinationals are concerned with sustainability. Food giants such as Nestlé or Unilever are working on making their production chain more sustainable. The question is then: how do such large firms take up sustainability as a core business? Alterra can provide the knowledge needed, according to Jochen Fröbrich, on topics such as sustainable soil use, water use, climate or biodiversity. Making use of the principles of 'Green Economic Growth', Alterra offers guidelines for facilitating green business models, and a strategy for stimulating economic growth in rural and urban areas.

'Sustainability', according to Fröbrich, is about eradicating poverty and about quality of life for everyone, without overexploitation of natural resources: soil, water, biodiversity, energy and cultural capital. For a comprehensive approach, ecology expertise must be assimilated into 'green business plans', perhaps with the assistance of digital maps and map tables developed by Alterra. These allow visualisation of land use in various future scenarios, and of the impact of green initiatives. The objective of the Green Economic Growth programme is to bring businesses to the table (such as the Map table) with government authorities, NGOs and research organisations in order to collaborate on greening the economy – for example, by providing an impetus for the transitio

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*'Sustainability is about eradicating poverty and about quality of life for everyone.'*

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*'Understanding of the environmental impact of food production helps to make responsible choices.'*

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## Food-production footprints quite varied

**The growing global population makes necessary a commensurate increase in food production, preferably without as much increase in environmental effects. Jan Peter Lesschen is working on the ecological 'footprint' of agriculture, and has done so for greenhouse gas emissions from livestock farming and for nitrogen from agriculture and livestock farming in Europe.**

A footprint is the ratio of the input, the output and the mass of the product; the reality, however, is not as simple as this arithmetic formula. Many uncertainties remain, partially due to the limited

availability of data. The results demonstrate that there are large differences amongst food products. Nitrogen losses per unit of protein from beef, for example, are 25 times higher than those from grain. Additionally, the present average nitrogen footprint varies with a factor of 2 – 4 amongst European countries, in part because of differences in patterns of consumption. Understanding of the environmental impact of various food categories can help to arrive at responsible dietary choices.

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## Food for regional development

**Some regions in the Netherlands are faced with economic and social decline, related to population contraction and ageing, but also due to the decreasing economic significance of agriculture. In order to curtail this deterioration, all over Europe investments are being made in the development of regional food chains. Alterra is investigating how these things stand in the Achterhoek region, in the east of the Netherlands, and has discovered that less than twenty per cent of businesses are involved in food production.**

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*'Regional development is about food production in relation to landscape preservation.'*

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Entrepreneurship is crucial, the research reveals. Together with scientists from Alterra, LEI and regional parties, Robert Jan Fonteijn analysed the present and future value of food chains for the Achterhoek. The analysis revealed that the value of food chains is high, but it also became clear that such value is under strain, which triggers not only economic, but also social and landscape consequences. The researchers developed strategies for preserving or fortifying the value of the Achterhoek, including recommendations for entrepreneurs, government authorities and educational institutions to strengthen the value of food chains.

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# Metropolitan Food Clusters

**There is growing demand for food in the city due to urbanisation and increasing food intake. This is a challenge for the agro sector: more and better production, even though many rural regions where food production has traditionally been based are becoming marginalised. Alterra, with other institutes, developed the concept of Metropolitan Food Clusters (MFCs): an integral systems innovation which reshapes agriculture into a network focused on sustainable food supplies for the world's progressively growing urban regions.**

For large-scale food supply, agro parks are being introduced as high-tech, sustainable production systems in which processes are clustered in order to make exchange of streams possible. Closed systems make possible optimal efficiency and emissions reduction.

In agro-logistics, as well, the Netherlands' model can provide great gains. Substantial steps are possible for technology, clustering and exchange of waste streams. MFC-projects are now operating in China, India and the Philippines. Presently, Alterra is working on five MFC-projects in Mexico. Two projects, in the states of Aguascalientes and Nayarit, are in the implementation phase. Within Europe as well, the approach is being embraced. At present in the Netherlands and Germany, the first innovation phases are being implemented in order to realise large-scale, climate-friendly food production in Europe.

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[www.metropolitanfoodclusters.wur.nl](http://www.metropolitanfoodclusters.wur.nl)



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*'An integral systems innovation reshapes agriculture into a network focused on sustainable food supplies for urban regions.'*

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# Towards less pesticides in Africa

**Ethiopia is working to increase agricultural production, not only for the growing national demand, but also for export. In order to prevent related inappropriate and ineffective pesticide use, Alterra, the FAO and the Ethiopian Ministry of Agriculture began the Pesticides Risk Reduction Programme - Ethiopia (PRRP) in 2010. This programme was designed as a pilot for other African countries and regions.**

Within the PRRP - Ethiopia, work is in progress on an integrated management system for the use of pesticides. The entire life cycle of pesticides is to be included, from the import or local preparation of the agents and their registration, via the sales and distribution, to the monitoring of their use, including quality controls and the prevention of losses. The PRRP sees to further development and implementation of the laws and regulations for pesticides in Ethiopia. This includes further development of both a legal framework and a well-functioning registration system. In order to ensure that this actually works, large investments are being made in capacity development. Alterra trains and supports staff members of various Ethiopian institutions. Other activities include the training of three PhD students and the upgrade of a laboratory.

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*'In order to prevent inappropriate and ineffective pesticide use, work on an integrated management system is in progress.'*

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# Knowledge base for soil degradation

**Soil degradation is a serious threat to future food production. Data on soil degradation is often based on qualitative estimates by experts or large-scale remote sensing, and is thus difficult to translate into a practical approach for the problem at the local and regional level.**

Researchers of both ISRIC – World Soil Information and Wageningen University, together with others, are developing an online system through which officials and scientists from all corners of the world can learn from each other about approaches to soil degradation. New software and techniques offer a better way to collect, interpret and present soil data. According to Godert van Lynden of ISRIC, these make up the knowledge base that makes it possible to work collaboratively on the worldwide problem of soil degradation.

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*'An online system through which the whole world can learn about approaches to soil degradation.'*

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# 'Water grabbing' in Africa

**'Land grabbing' is the controversial practice, often engaged in by big international investors, of large-scale land acquisition by buying up large parcels of land in developing countries – for agricultural purposes, for example, or for the extraction of minerals.**

Often, land grabbing is defended by pointing out that it makes it possible to tap unused resources. This was the case when flood plains and terraces along the Tana river were designated as 'unused' by the Kenyan government, despite the fact that for many small farmers, fishers and herders, this water-rich land is their livelihood.

Research by Gert Jan Veldwisch of Wageningen University demonstrates that land grabbing is often about water, and that makes the problem, legally, much more complex. Water, after all, is not bound to one place, to one owner. That is why traditional agreements about water rights, such as those between farmers, fishers and herders along the Tana, are relatively easily brushed aside by the national government in favour of agricultural production by the investors. It isn't illegal by definition, says Veldwisch, but the social and ethical problems here require urgent attention.

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*'Water rights of the local population are relatively easily brushed aside in favour of investors.'*

Photo: Pierre-Yves Babelon / Shutterstock.com

# Healthy soil for food supply

**The world population, in the coming decades, will increase primarily in the tropics and the subtropics, and in places where farmers have yet to benefit much from the most important technological developments in agriculture. And yet the Dutch model for intensive agriculture is not a good fit, according to Christy van Beek of Alterra and Coen Ritsema of Wageningen University; it can even lead to complete exhaustion of the soils that are generally already poor.**

For agriculture in the tropics and subtropics, less suitable land will also be pressed into use. This will require a comprehensive and, in many cases, small-scale type of agriculture, one that takes the soil and water into account and keeps the mineral cycle closed. In addition, it will be necessary to look at potentially contaminated land in and around cities for urban agriculture. Van Beek points out that this will require sophisticated knowledge of soil quality, water management and the soil-plant system. Alterra and Wageningen University are working on gathering that knowledge in a toolbox.

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*'The Dutch model for intensive agriculture is not a good fit for the tropics and subtropics.'*

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*'Manure policy should be organised more regionally and locally, and it necessitates more flexible regulations.'*

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## Five-point plan for better manure policy

**Manure policy in the Netherlands should be more specifically aimed at closing the cycles of feed and manure at the regional level, and less generically organised. This statement was put forth last year in *Nieuwe Oogst* (a farmer's magazine) by Oene Oenema, Alterra researcher and professor of nutrient management and soil fertility, together with dairy farmer Jan Cees Vogelaar. They made this case on the eve of the implementation of the Netherlands' Fifth Action Programme for the Nitrates Directive, in which manure policy is also described for the period 2014-2017.**

Agriculture must change in order to create more room for new development to be possible. For this reason, Oenema makes a plea for a five-point plan which will ultimately make it easier to comply

with objectives for health and the quality of air, water and nature, and which will lead to less rules for businesses that comply with the objectives. These points concern the closure of feed-manure cycles by making manure production dependent on such measures as the soil type (the Danish Model), a derogation of 200 to 350 kg of nitrogen per hectare per year (depending on soil type), crop-yield-dependent application standards for nitrogen and phosphate, and complementary measures at the farm level. This means that manure policy will be organised more regionally and locally, and it necessitates more flexible regulations than the present generic laws allow.

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# Agricultural nature conservation requires more land

**Increasing strain on the nature we still have left, along with limited conservation budgets, has brought about the desire to safeguard a portion of that nature through agricultural conservation. The question then arises: how much natural area is necessary in agricultural landscapes to guarantee a sustainable existence for the wild plants and animals present? The EU Common Agricultural Policy aims to stop the loss of biodiversity by having five per cent of agricultural land managed naturally, in the form of 'ecological focus areas'.**

For the first time, Alterra and Wageningen University have now investigated empirically the effect of the density of natural elements in agricultural areas on diverse species of vascular plants, breeding birds, butterflies and grasshoppers. Anouk Cormont discovered that the required proportion of ecological focus area varies depending on the species, the nature element and the location. The only effective way to conserve nature within agricultural landscapes, then, consists of customised solutions on a regional scale. The general conclusion of the investigators is that the designation of five per cent of the agricultural land as ecological focus area is not – or barely – enough to achieve the desired level of biodiversity conservation.

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*'The only effective way to conserve nature within agricultural landscapes consists of customised solutions on a regional scale.'*

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The environment,  
humans  
and health

4

# The environment, humans and health

Health is a relatively new topic in green research. For Alterra it has been a focus of research since 2000, and now there are far-reaching initiatives for collaboration with the health sector on the use of green for improving human health. The integrative approach chosen is well suited to the citizen science of the Environmental Systems Analysis chair group.



Nature is healthful. Those researching nature have been saying that for quite some time, and increasing scientific evidence continues to support that claim. Still, the public at large seems to be more interested in the dangers of nature than its health aspects. When biologist Arnold van Vliet launched his 'mosquito radar' on January 10, 2014, he could not have imagined receiving more than 1500 mosquitoes within two weeks – in the middle of the winter! Previously, Van Vliet had already developed such popular observation systems as the Nature Calendar and Nature messages, and also Tick Radar, through which citizens report tick bites, the cause of Lyme disease.

That, according to Rik Leemans, professor of the Environmental Systems Analysis chair group, is the nice thing about these public warning systems. 'It is citizen science. Because you could never catch and study that many ticks and mosquitoes yourself, you tap the public'. This is quick and easy with modern internet technology, and it also generates unexpected results. 'People think that you are most likely to get a tick bite in the woods, but most of the observers on Tick Radar were bitten in their own garden'. Logical, when you think of it: people sit in their own garden more often than somewhere in the forest.

*'What makes our work unique is that we look ahead, that we can estimate what will happen in nature.'*



**Rik Leemans** | Wageningen University  
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'What makes our work unique is that we look ahead', says Leemans. The data that people send in for the Nature Calendar, the Tick Radar and the Mosquito Radar are used, for example, to estimate when plants and animals will have spring fever, if there is a hay fever peak approaching, and if there is a risk of tick bites. In a similar fashion, other scientists in Leemans' group are studying pathogens on vegetables, the relationship between pathogens and floods in Bangladesh, or fertilisers in the larger rivers of the world.



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*'We want to help health-care professionals, such as family physicians and physiotherapists, to make use of green and nature in their practice.'*



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Tia Hermans of Alterra is working on the question of whether nature generates health benefits for humans. She maintains that, especially for businesses, much is to be gained by utilising green to make people feel better. 'In the corporate world, health is an earnings concept. Sustainable availability of personnel is crucial. Quite rightly, this is one of the three areas of concern in the report from the Ministry of Health, Welfare and Sport called "Alles in Gezondheid (All is Health), The National Prevention Plan 2014 – 2016". Then, however, you have to provide hard evidence of the link between nature and health, for instance by substantiating the relationship between absenteeism figures and green'. That is difficult, as industry and the health sector often put the burden of proof on the green sector regarding health gains related to green. And by no means do the – largely psychological – studies provide the hard evidence that doctors require. Both Hermans and Leemans know from experience that the culture of health research still differs substantially from the culture of green research.

Hermans is working on bundling health-related 'green' research within Wageningen UR because, she points out, much is already being done: research on the mechanisms of the relation between green and obesity; on the effects on city climate and human health of

the presence and absence of green in the city; on the effects on humans of animal disease in the livestock sector; and on troublemakers such as mosquitoes, ticks, rats, mice and the oak processionary caterpillar, research which, in turn, is in keeping with the work of Leemans and his chair group. 'We not only want to conduct research ourselves', Hermans says, 'we want to do it together with other disciplines and sectors'.

At this point, Tia Hermans is working together with the National Institute for Public Health and the Environment (RIVM) on a large national project, in which health data from the Doetinchem region is linked to nature data from Alterra. This can allow a link to be established between overweight and obesity, or psychological symptoms, and the presence of public green spaces or nature reserves. The other line of investigation in this study is, says Hermans, even more important – if that is possible: 'What do health-care professionals, such as family physicians, physiotherapists or public health workers, need in order to make use of green and nature in their practice?' Perhaps the citizen science of the Environmental Systems Analysis chair group can be of help.



## Green schoolyards better for children

**Nature is healthy; green relieves stress. This idea has fuelled the greening of twelve schoolyards in Rotterdam. That it helps combat bullying, Sjerp de Vries noticed during his research amongst the pupils. More green means not only a prettier schoolyard for the children, but also more variation in play opportunities. The social climate improves: children are nicer to each other and quarrel less. Eventually even the pupils' well-being was shown to have improved.**

More green does not always yield such effects. The green must be carefully chosen and skilfully installed, preferably in consultation with the users. If, for example, a popular piece of play equipment is not re-installed, or if the school doesn't see its input reflected in the final results, De Vries' research showed, the effects can even be counterproductive. Thus it is important to have the green reconstruction designed and implemented by experts, together with the school and the children.

**Sjerp de Vries** | Alterra | [sjerp.devries@wur.nl](mailto:sjerp.devries@wur.nl)

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*'The welfare of school children improves with the greening of schoolyards.'*

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# Spreading manure spreads Q fever

**Between 2007 and 2010, many people in the Netherlands contracted Q fever. From the beginning it was obvious that the disease was traceable to goat farms: the source of the illness was found in pregnant goats in which the Q fever caused spontaneous abortion.**

Between 2007 and 2010, many people in the Netherlands contracted Q fever. From the beginning it was obvious that the disease was traceable to goat farms: the source of the illness was found in pregnant goats in which the Q fever caused spontaneous abortion. The conclusion was thus drawn quickly that goat farms were the main source of contamination, and that aerosolized bacteria were dispersed through the air. Tia Hermans suspected involvement of another route of transmission as well, as not all contaminated goat farms were surrounded by clusters of cases of the illness. Patients with Q fever were seen more frequently near dry and bare land.

Given this evidence, Hermans conceived the idea that the illness could actually have something to do with land application of contaminated manure. Further analysis brought into focus the fact that goat farmers remove the manure out of the deep-litter stables only a few times a year. Springtime is lambing season for goats, in February and March. During this time the manure and afterbirth, which contain millions of Q-fever bacteria, are deposited in the deep litter of the stable. In March and April, this contaminated manure is applied to the land. The peak period for human illness is April and May. The time between land application of the contaminated manure and onset of illness in humans matches the incubation period for Q fever, and manure applied in September does not result in cases of the illness. The conclusion is that lambing season is the main source of infection, although humans themselves, by spreading manure, play a crucial role in the transmission of the disease. According to Hermans, there are plenty of options for curbing infection risk in the land application of manure, beginning with better monitoring and maintaining the regulations which prohibit spreading manure from contaminated farms within the first 90 days following lambing.

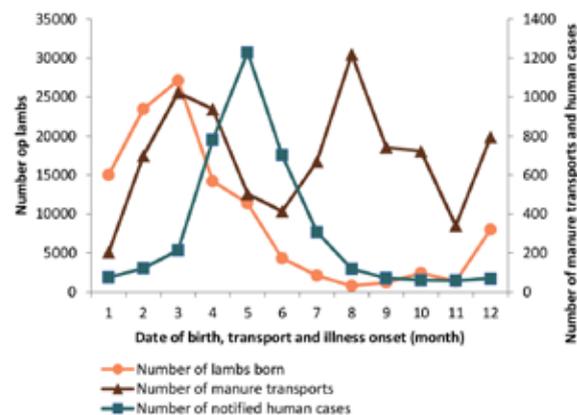
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[www.wageningenUR.nl/alterra/qkoorts](http://www.wageningenUR.nl/alterra/qkoorts)



Photo: Christian Hoebe



*'The time between land application of contaminated manure and illness in humans matches the incubation period for Q fever.'*



*'Green neighbourhood projects are not only about greening the neighbourhood.'*

## Nature Nextdoor

**'Groen Dichterbij' – Nature Nextdoor – is an initiative of IVN (Dutch nature education institute), the Oranje Fonds, Buurtlink.nl and SME Advies, and is made possible by the Dutch Postcode Lottery. The initiative is based on the idea that, with more green in the neighbourhood, people are happier and healthier. The campaign supports green neighbourhood projects by providing both money and advice. Alterra is conducting a study for Groen Dichterbij to investigate factors for success and failure, and the social effects of these green citizens' initiatives.**

Groen Dichterbij manages a knowledge base, and organises events for people who themselves are interested in taking action. Alterra

lends support in the form of knowledge gained from its research. During the Great Groen Dichterbij Event in Amersfoort, Carmen Aalbers and Joke Luttik gave a workshop, attended by four hundred people, on citizens' initiatives. The leaders and participants discussed the effects of green neighbourhood projects – which clearly go further than just greening the neighbourhood. These projects are also about meeting each other, showing understanding, collaborating, and exchanging experience and knowledge about nature. Alterra comes at research on these kinds of issues from not only an ecological, but also a social-economic angle: this is not only about nature, it is also about 'nextdoor'.

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# Diarrhoea and climate change in Northern India

**In Northern India, climate change has a profound impact on the hydrological system. The amount of precipitation is changing, especially during the summers, and the region's glaciers are also subject to the consequences. These changes threaten the population's water supply. In the HighNoon project, researchers are examining not only the physical changes in the environment, but also the consequences of these changes for the population. Among other aspects, Tanya Singh and her colleagues have investigated the influence of climate change on the health of residents. How can people defend themselves against something like an infectious disease such as diarrhoea, caused by changing climate conditions?**

Child mortality as a consequence of diarrhoea is higher in India than elsewhere in the world. Further temperature increases related to climate change will only make matters worse – yet the influence of other climate factors has scarcely been researched. Alterra developed a conceptual framework which includes temperature and also (extreme) precipitation, (extreme) drought and humidity. The framework demonstrated that the risk of diarrhoea epidemics can increase as much as 20 per cent as a result of climate change. Singh will be continuing to investigate how the population can protect itself from this risk, and what the Indian government can do.

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**Eddy Moors** | Alterra | eddy.moors@wur.nl

[www.eu-highnoon.org](http://www.eu-highnoon.org)



Photo's: Tanya Singh



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*'Diarrhoea epidemics can increase as much as 20 per cent as a result of climate change.'*

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# Going abroad for medical care

**For millennia, people have travelled long distances to improve their health and well-being. Now, however, more and more people around the world are crossing international borders in pursuit of timely, quality medical care not accessible to them in their home countries. Indeed, many of us have friends and family who have received treatment or undergone procedures in other European countries and in Asia.**

This phenomenon is popularly referred to as 'medical tourism'. Dr Meghann Ormond of Wageningen University studies this phenomenon in Southeast Asia and the Caribbean. Ormond focuses on how medical tourism destinations are developed and also promoted beyond their borders as therapeutic locales. In addition, she examines the effects of medical tourism on the quality and continuity of patient care in countries that both generate and receive medical tourists. Her work provides insight into how shifting visions of citizenship and national belonging transform countries' social and economic development agendas and impact their healthcare systems.

**Meghann Ormond** | Wageningen University | [meghann.ormond@wur.nl](mailto:meghann.ormond@wur.nl)

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*'More and more people are travelling to other countries for medical treatments.'*

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*'Migraine attacks can be predicted if research to the tipping point succeeds.'*

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## Searching for the migraine tipping point

**In 2009, aquatic ecologist Marten Scheffer met neurologist Michel Ferrari and nanotechnologist Albert van den Berg, when they were all rewarded a Spinoza prize by the Netherlands Organisation for Scientific Research (NWO). That meeting led to such an interesting exchange of scientific insights that the three went on to bundle their knowledge in a joint study of migraines.**

Scheffer is one of the pioneers of the idea of tipping points in complex ecological systems. One example is a pond, which can 'tip' from clear to murky. Their joint migraine research revealed that a similar mechanism is at work in a migraine episode: it starts with a wave of spontaneous nerve cell activity that spreads like wildfire through the cerebral cortex. Scheffer, Ferrari and Van den Berg demonstrate in their research how the sensitivity of nerve cells gradually increases until the moment when even a small stimulus,

such as an odour or flash of light, can set off the wave. Apparently crucial is the recovery time of the cortex after a disturbance. The scientists expect that, just as in other complex systems, cells that are near the tipping point recover more slowly from minor disruptions. With this information, measurements could be taken to predict how far an individual is removed from the onset of a migraine. The more slowly the brain recovers from a small stimulus, the closer the attack. The Spinoza laureates are continuing their study of this phenomenon.

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# Clean air for all

**In the Netherlands nowadays, we look with some astonishment at reports of heavy smog in large Chinese cities or, early this year, in Paris. And yet the air quality in the Netherlands is not optimal either, says Maarten Krol of Wageningen University. Under the auspices of the European project 'Pegasos', he conducted research on air quality, including measurements taken in a zeppelin in order to gather data in the layers of air from 200 to 2000 metres.**

Air quality is influenced by particulate matter and gaseous compounds. Dust particles are known to be hazardous to our health and also to affect our climate: some of them lead to cooling, others to warming. These interactions are the reason that policy measures are being sought that have a positive effect on both air quality and the climate. The Netherlands is among the countries in Europe with the most air pollution, as has been demonstrated in satellite nitrogen dioxide measurements. This is why Krol believes we should continue to be concerned about air quality. Specifically, Krol is studying the interaction between air quality and the weather. In western Europe, episodes of poor air quality are related to the weather conditions. Measurements such as those taken in the Pegasos project are necessary in order to better understand the relationship between weather and air pollution. Increasingly, emphasis is on personal exposure to air pollution in large cities such as Amsterdam and Rotterdam. Needed for this task are fine-mesh models of distribution and emissions in which the influence of the weather can be included.

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**Laurens Ganzeveld** | Wageningen University | [laurens.ganzeveld@wur.nl](mailto:laurens.ganzeveld@wur.nl)

<http://pegasos.iceht.forth.gr>



Photo's: Bart de Gouw



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*'The Netherlands is among the countries in Europe with the most air pollution.'*

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*'The 'responsible' in  
'responsible tourism' is  
debatable.'*

## 'Going local' isn't always responsible

**Many people desire to escape mass tourism, choosing instead 'responsible tourism'. They seek the ideal of authentic contact with local communities without adversely affecting these communities. Claudio Minca studies this 'going local' phenomenon in the Pattaya Elephant Village in Thailand.**

His research suggests that the 'responsible' in 'responsible tourism' is debatable. The interaction between tourists and the local population is usually rather uncomfortable. Tourists often do not know, for instance, how to thank locals for their hospitality: with 'thanks very much'? Money? A gift?

The more the tourists stay in accommodations closer to the locals, the more difficult it becomes to be a responsible tourist. It is possible that, with tourists staying overnight in the camp, the local population becomes witness to, or involved in, alcoholic or sexual extravagances. With this research, Minca calls into question the phenomenon of responsible tourism. Often, tourists unconsciously take along their own habits; these habits can be quite irresponsible in the new context. Good communication and more clarity in agreements on rules and conditions are essential to making sure that encounters between tourists and the local population proceed more smoothly and harmoniously.

**Claudio Minca** | Wageningen University | [claudio.minca@wur.nl](mailto:claudio.minca@wur.nl)



# About the Environmental Sciences Group



# Profile

## **Environmental Sciences Group**

The Environmental Sciences Group (ESG) is one of the five science groups at Wageningen UR (University & Research Centre), which is the partnership between Wageningen University and the Wageningen research institutes. The ESG is made up of the university's Department of Environmental Sciences, the ISRIC foundation and the specialised research institute, Alterra.

The focus of the ESG is on the broad domain of environmental sciences, including the fields of sustainable soils, nature & biodiversity, spatial planning & land use, water management & governance, and climate & the living environment. Our strength lies in the collaboration among varied disciplines, specialised research institutes and the university, resulting in swift practical application of scientific breakthroughs.

## **Department of Environmental Sciences**

Fundamental research and education are provided by the chair groups of the Environmental Sciences department. Each of our 19 chair groups is headed by a professor and has its own expertise.

*For more information and an overview of our chair groups, see [www.wageningenUR.nl/en/wageningen-university.htm](http://www.wageningenUR.nl/en/wageningen-university.htm)*

## **ISRIC**

ISRIC – World Soil Information is an independent science foundation. The institute was founded in 1966 following recommendation by the International Soil Science Society (ISSS) and the United Nations Educational, Scientific and Cultural Organization (UNESCO).

The ISRIC mandate is to provide the international community with information on soils in order to address solutions for large-scale, worldwide problems such as the global food supply. Since 1989, ISRIC has had formal status as an International Council of Science World Data Centre for Soils.

*For more information on ISRIC, see [www.isric.org](http://www.isric.org)*

## **Alterra**

Alterra is the research institute for our green environment. Alterra provides expertise on issues of green space and its sustainable, public use. We conduct strategic and applied research to facilitate policy, management and design of green space on a local, national and international scale. On the one hand, this concerns innovative, interdisciplinary and interactive research on complex problems in the realm of green space; on the other hand, we deliver ready-to-apply knowledge and expertise for solving practical problems quickly and appropriately. We can pursue meaningful research thanks to our access to a broad palette of expertise and a range of facilities including laboratories, databases and DNA techniques.

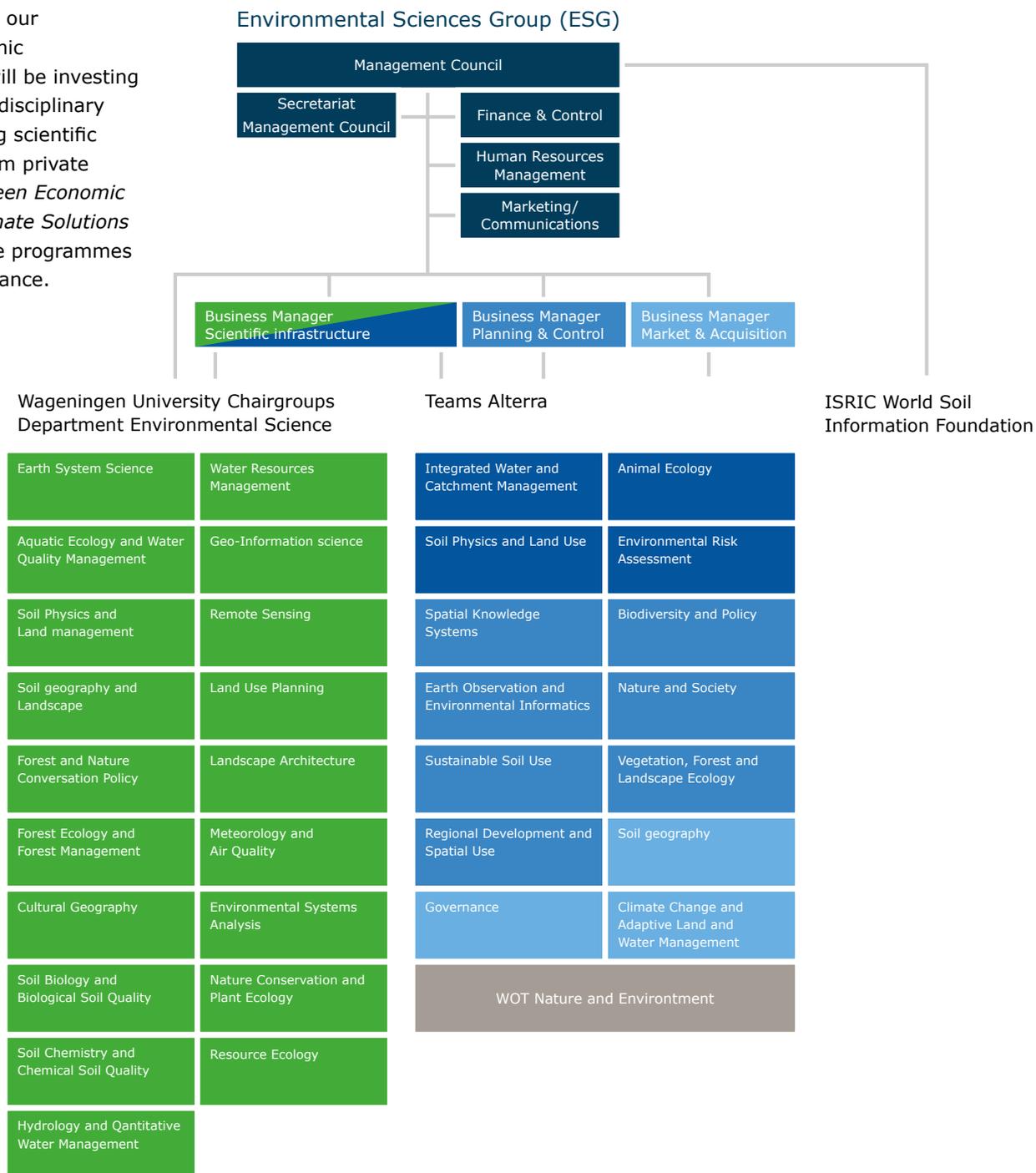
*For more information about Alterra, see [www.wageningenUR.nl/en/alterra](http://www.wageningenUR.nl/en/alterra)*

## **Strategy**

Worldwide developments generate many sustainability issues in our domain and call for innovative and sustainable solutions, both regionally and on the world stage. As a World Class Research Institute, and through its expertise and knowledge, collaboration with other parties, and creative and enterprising approach, Alterra delivers lasting added value for government authorities, organisations and businesses.

In the Netherlands, we are the market leader in our field. In order to retain our position nationally and to expand it internationally, we strive for further growth and a greater international market position. To this end we place special emphasis on a physical presence in the regions and provinces of the Netherlands, in other Western countries and in developing countries.

For the purpose of strengthening our contribution to social and economic developments in the world, we will be investing in the coming years in four multidisciplinary thematic programmes, combining scientific knowledge with contributions from private parties. The programmes are *Green Economic Growth*, *Green Cities*, *Green Climate Solutions* and *Food Security*. In 2014 these programmes will gain further shape and substance.



# Sustainability

**We assume our social responsibility by aiming for a balance between economic, ecological and social interests. Our ambition is to contribute to a high-quality, sustainable, green environment in which to live.**

In conducting fundamental and applied research, and in providing academic education, the quality of our work is paramount – work in which the interdependent interests of both humans and the environment are considered. In policy decisions, personnel, students, clients and other stakeholders can count on the inclusion of such aspects as safety, health, welfare and the environment.

## **Social Responsibility in accordance with ISO 26000**

By adopting the international standard NEN-EN-ISO 26000, we are shouldering our social responsibility in a positive and transparent fashion. The principles and topics described in this standard are important points of departure for decision-making at the ESG.

By means of a self-declaration (following the method of the NPR 9026+C1:2012), we periodically assess the degree to which the standard is met.

Main points of focus for the near future are: active engagement of stakeholders, the civic role of the ESG vis-à-vis policymakers, and social responsibility aspects in the preparation of international project proposals.

The ISO 26000 self-declaration has been assessed and posted on the NEN publication platform.

## **Quality management in accordance with ISO 9001**

Throughout the organisation we are working actively on quality improvement. Points of focus are satisfied clients and high-quality research. Alterra works with a quality management system according to the norm ISO 9001:2008.

## **Environmental management in accordance with ISO 14001**

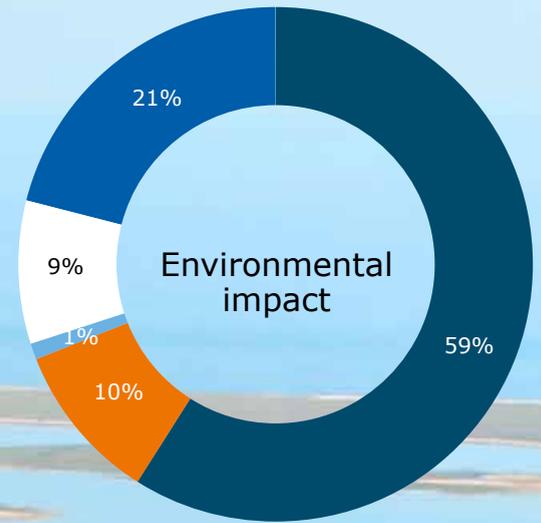
Stewardship of green space also play a central role in our organisation. We strive for continual improvement of our environmental performance. A proactive environmental policy is an integral part of our operations management and strategy. The ESG meets the requirements of all applicable environmental laws and regulations, as well as the Wageningen UR environmental policy and relevant covenants. The ESG works with an environmental management system that satisfies the requirements of ISO 14001:2004.

## **Social responsibility activities of 2013**

2013 was an important year for our social responsibility programme. We transitioned from the formulation of policy (2012) to the implementation of that policy. In activities such as workshops in which personnel from all tiers of the organisation participated, existing projects were charted and new projects launched.

Activities of note in 2013 included CO2 emissions offset for air travel, and the installation of LED lighting in our office building, Gaia. In 2013 we reduced our absolute CO2 emissions by approximately 9.5%; this was partially due to a decrease in the area of office space we used on the Wageningen Campus.

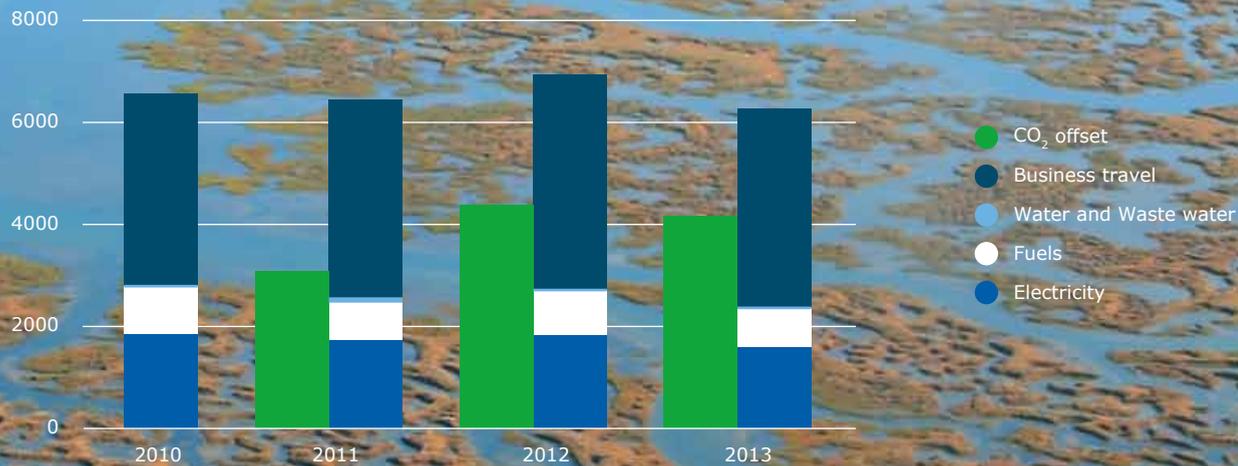
- Business travel
- Waste
- Water
- Fuels
- Electricity



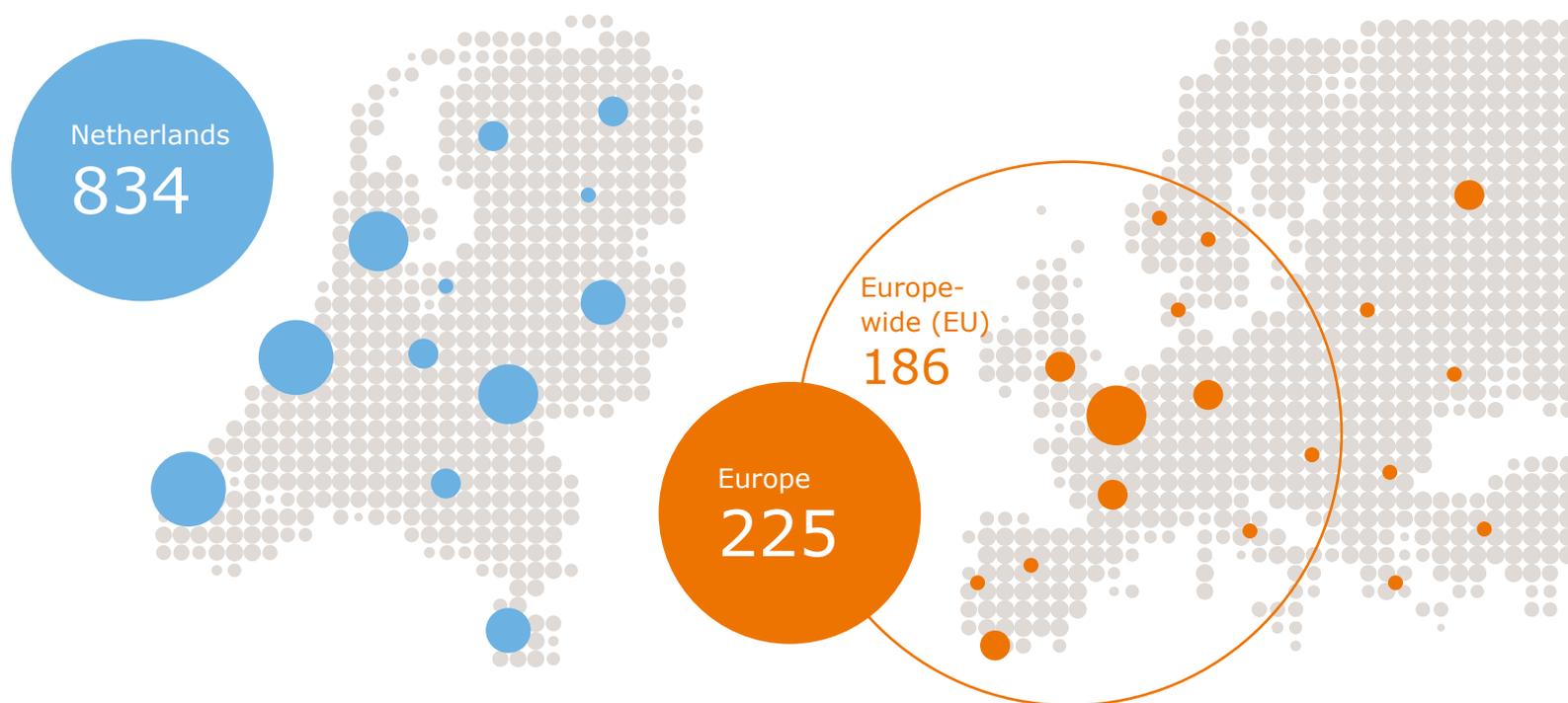
## CO<sub>2</sub>-footprint

Environmental Sciences Group, Wageningen UR

Graphic representation of the CO<sub>2</sub> footprint in tons of CO<sub>2</sub> annually. The larger a theme in this diagram, the greater its contribution to the emissions of greenhouse gases. No CO<sub>2</sub> figures have been assigned to waste. Since 2011 we compensate our CO<sub>2</sub> emissions as much as possible; the compensation amount is in the green columns.



# Our worldwide presence



## Distribution of projects in the Netherlands

In 2013 the ESG ran 834 projects in the Netherlands, of which 705 were nationwide and 129 regional. This is approximately 5% fewer than in 2012, and approximately 3% fewer than in 2011.

The ESG implemented about 1230 projects in 2013, spread over nearly 60 countries. This is a decrease of about 6.5% with respect to 2012. Nearly 70% of the projects took place in the Netherlands – roughly the same number as in 2012. Of the projects in the Netherlands, about 85% were national, and the rest regional. Most of the regional projects took place in the provinces of South Holland and Zeeland (the southwest delta), Gelderland (our 'home base') and North Holland.

## Distribution of projects in Europe

In 2013 the ESG ran 225 projects in Europe, of which 39 were in individual countries and 186 Europe-wide (EU). This is approximately 10% fewer than in 2012, and approximately 5% fewer than in 2011.

Of the international projects, 57% took place in Europe, 13% in Africa, 11% in Asia and 7% in North and South America. That is more or less comparable to previous years, with marked growth in Africa (from 10 to 13%). Roughly 11% of the projects were either international or not confined to a specific location, such as projects in the areas of climate change and biodiversity.



**Distribution of projects in Africa, Asia, North and South America and Oceania**

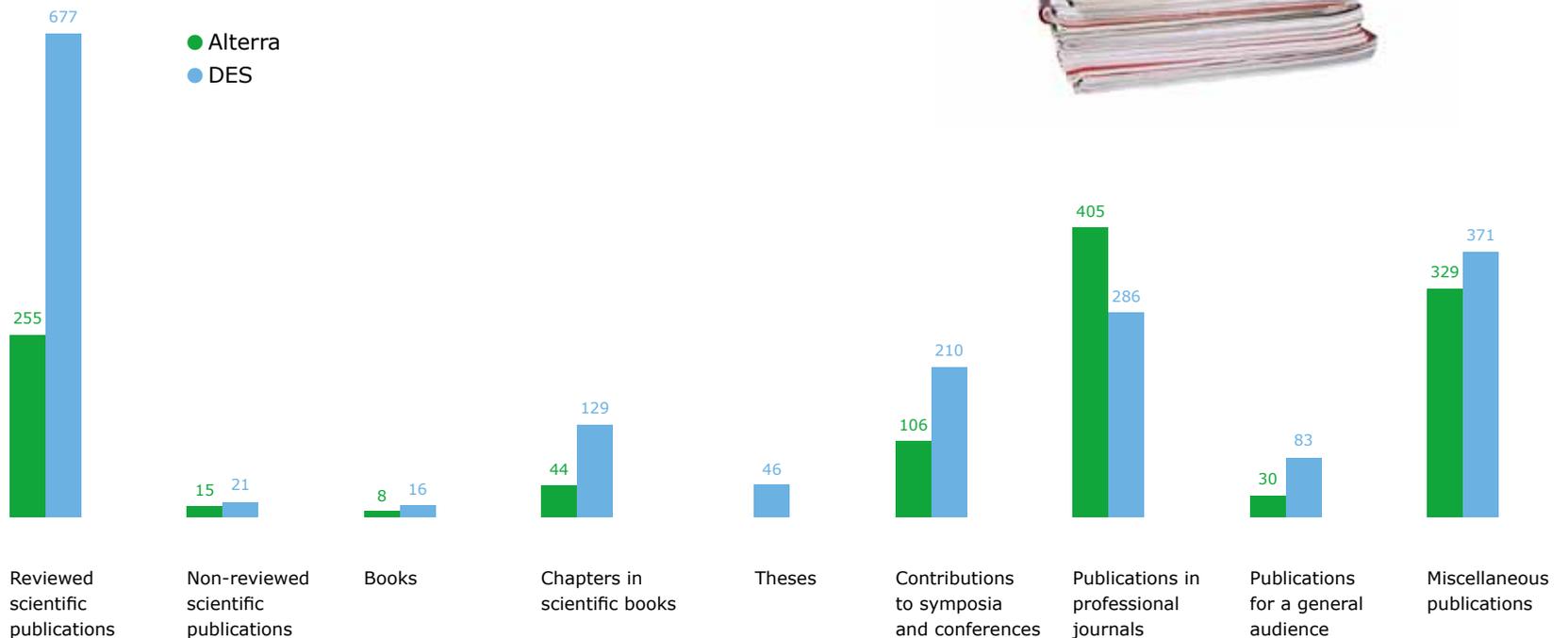
In 2013 the ESG ran 51 projects in Africa, 45 in Asia, 27 in North and South America and 47 worldwide. This is approximately the same number as in 2012 and 2011.



# Scientific output

## Publications

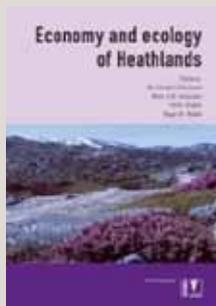
Naturally, academic organisations like Wageningen University (department of Environmental Sciences, DES) and Alterra publish fundamental science publications. They also produce specialist publications, and publications – including books – intended for a broader audience. In addition, we regularly assist with publication in the media: in newspapers and magazines as well as on radio, TV and social media.



## Books

### **Economy and ecology of heathlands**

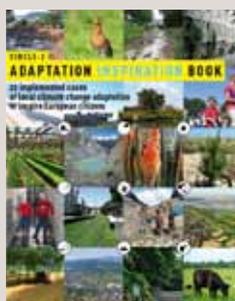
The diversity in the use of heathlands has created a cultural diversity over the whole Atlantic area of Europe, from Portugal and Spain in the south to Norway in the north and from Germany in the east to Ireland in the west. 'Economy and ecology of heathlands' shows us both the diversity in use all over Europe and combines this information with the newest insights in the ecology. Central theme is how to cover the costs of maintenance of these heathlands. Is their future in new types of commons, or do other types of land ownership, using the revenues of heathland ecosystem services, give better opportunities? The editors combine a broad variance in knowledge of heathlands varying from all aspects of ecology, land use, as well as economy.



*Herbert Diemont, Wim Heijman, Henk Siepel & Nigel Webb (eds.): Economy and ecology of heathlands. KNNV Uitgeverij*

### **The Adaptation Inspiration Book**

Policy makers tend to frame climate change as an energy problem, and turn to solutions such as energy efficiency and reducing greenhouse gases. However, adaptation has become increasingly important. But what is adaptation to a changing climate? What observations can be drawn from the survey of 22 implemented adaptation measures in Europe? The new Adaptation Inspiration Book provides a great overview of practical and early examples of actual adaptive actions already taking place across Europe. This book will not only provide inspiration to all practitioners at regional and local level working on adaptation to climate change, but also provide policy makers, researchers and governments with a feel of the possibilities of adaptation across the continent.



*Marjolein Pijnappels and Philip Dietl: The Adaptation Inspiration Book. Circle-2, European Union.*

### **Ethics, Design and Planning of the Built Environment**

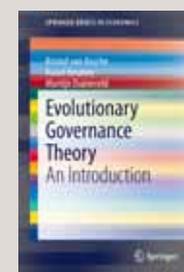
'Ethics, Design and Planning of the Built Environment' offers a set of rigorous theoretical perspectives on urgent topics with regards to planning (risks, aesthetics, duties and rights of users, etcetera) through which both scholars and practitioners can gain valid critical instruments to approach real planning cases. It bridges these disciplinary domains without privileging any normative perspective, in doing so offering broad yet essential critical instruments to a wide audience. And it establishes new lines of inquiry for, in particular, investigating values as design factors in a domain in which this theme has found less rigorous definition in comparison to others (e.g. IT technology and industrial design).



*Claudia Basta and Stefano Moroni (eds.): Ethics, Design and Planning of the Built Environment. Springer.*

### **Evolutionary Governance Theory**

'Evolutionary Governance Theory: an introduction' offers the reader a remarkable new perspective on the way markets, institutions and societies evolve together. Based on a wide variety of case studies on three continents and a variety of conceptual sources, the authors develop a theory that clarifies the nature and functioning of dependencies that mark governance evolutions. This in turn delineates in an entirely new manner the spaces open for policy experiment. As such, it offers a new mapping of the middle ground between libertarianism and social engineering. Theoretically, the approach draws on a wide array of sources: institutional & development economics, systems theories, post-structuralism, actor-network theories, planning theory and legal studies.



*Kristof Van Assche, Raoul Beunen and Martijn Duineveld: Evolutionary Governance Theory: an introduction. Springer.*

# Take it on the road!

Sylvo Thijsen, ESG Advisory Council chair



**Staatsbosbeheer is a public organization, commissioned by the Dutch government, that manages a sizeable amount of the nature reserves in the Netherlands. Sylvo Thijsen, director of Staatsbosbeheer and the chair of the Advisory Council of the Environmental Sciences Group, sees many similarities in the tasks facing the two organisations.**

**'Government funding is declining, and a shift of responsibility and financing on to society is the logical consequence.' The ESG, he believes, should develop a vision that expresses the boldness to face that new reality.**

## **What can the ESG learn from Staatsbosbeheer?**

'To respond flexibly to societal issues. We see that at Staatsbosbeheer. First and foremost, the ESG must ensure that the knowledge base is, and will remain, excellent. You have to be able to distinguish yourself with regard to quality, speed and flexibility; otherwise there is no right to exist. For Alterra, that is part of a revenue model, but then we do have to invest in speed and flexibility.'

## **How should the ESG go about doing that?**

'There needs to be a structured approach with, besides with a vision, a ten-year plan. I know that they are working hard on that within the ESG. How should we position ourselves? How is the relation with Wageningen UR? The collaboration with other parts of Wageningen UR is now perhaps too broad on many, many topics. You could coordinate that more programmatically, and further reinforce the liaison with the top sectors.'

## **How should the ESG develop itself, on which research topics?**

'It is important is that we begin to think more internationally. You see that Africa is emerging, that the Chinese economy continues to grow. Knowledge about the design of the delta metropolises everywhere in the world is in our DNA. But we need a very strong focus for that. No longer try to serve fifty countries with twice the number of research questions. Green knowledge is gold, but it is helpful to calibrate that knowledge in collaboration with international institutes and market players. Large agri-food firms are dependent on the spatial planning, for their logistics, for instance. Forty per cent of the economy is dependent on infrastructure and logistics, and that determines how landscape and society will develop. Certainly, therein lies a market for Alterra.'

**And the university? If Alterra has to work more commercially, won't the collaboration with the Environmental Sciences department be jeopardised?**

'As I see the figures, the university is doing well. I am terribly proud of that. Within the university there is enormous pressure to publish; that is a different focus than at Alterra. The concept of the collaboration between university and Alterra is still there, but if the reality is stubborn...then I say: if it can't be done the way it should, it should be done the way it can.'

**Are the provinces new clients because of the decentralisation?**

'The provinces are the director of the regional spatial planning and also get nature as a policy area. I hope, with that administrative responsibility, that they are also going to make use of the knowledge of the ESG. Of course, Alterra does not have to sit and wait; it can get moving. Take it on the road! For that Alterra needs room to try new things with clients, the freedom to experiment with something, though it may not yet be entirely proven. That tension between science and market, between the scientific evidence and the marketing opportunity, that is the beautiful thing about the Wageningen style of working. That is a healthy tension, a necessary one. It establishes frameworks, but it is also an opportunity. Alterra should grasp those opportunities.'

## Members of the ESG Advisory Council

**Sylvo Thijsen (chair)**

*director, Staatsbosbeheer*

**Rob van Brouwershaven**

*director of Nature and Biodiversity,  
Ministry of Economic Affairs*

**Carel van der Hamsvoort**

*global head, Food & Agribusiness Research,  
Rabobank*

**Eric Luiten**

*government advisor on Landscape and Water,  
professor of Heritage and Spatial Design,  
TU Delft*

**Johan Osinga**

*director of Strategy, Province of Overijssel*

**Michael Schaepman**

*professor of Remote Sensing,  
head, Remote Sensing Laboratories,  
University of Zürich*

**Maarten Smits**

*director, Deltares*

**Chris Zevenbergen**

*professor of Flood Resilience of Urban Systems,  
UNESCO-IHE,  
professor, TU Delft*

# Our clients and partners

In the collaboration with other parties, approached from differing ecological, technological and social science disciplines: there lies our strength. This is how scientific breakthroughs can quickly be translated into practice and education. This is the Wageningen Approach.

Among our associates are:

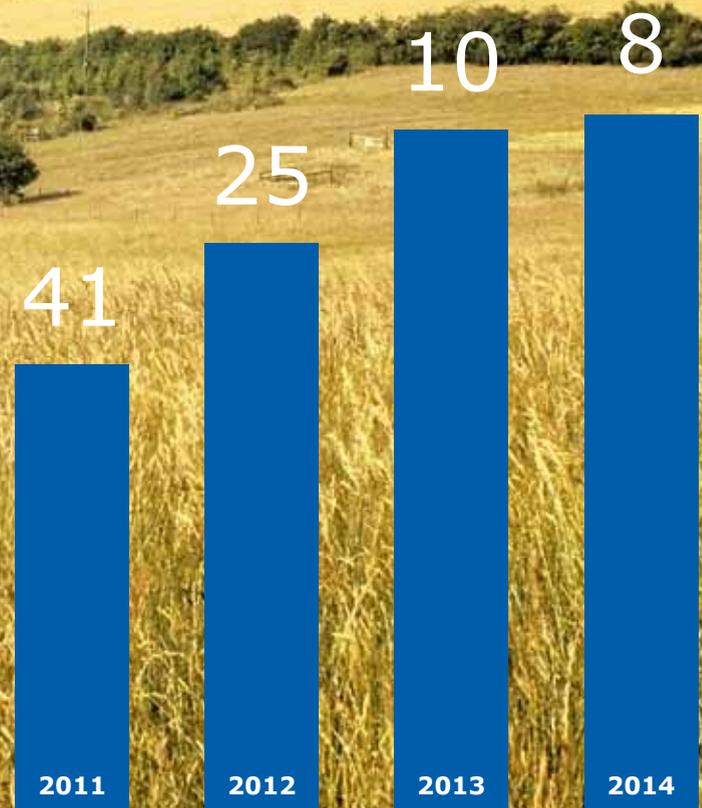


# International recognition

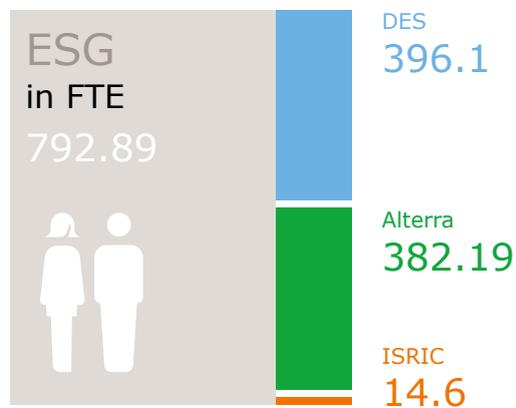
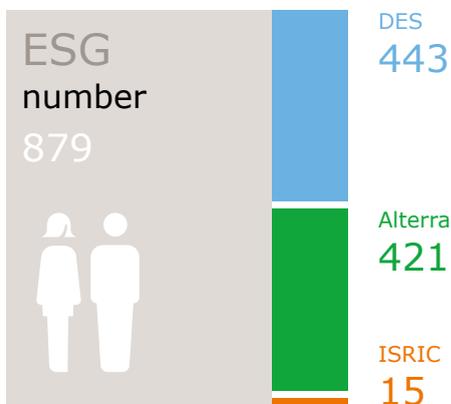
Alterra and the department of Environmental Sciences are global leaders in their fields of expertise. Wageningen University belongs to the top 10 universities in the world for Environmental Studies.

**In the QS World University rankings for Environmental Studies, between 2011 and 2014 Wageningen University climbed from 41st to 8th place.**

*(source: [www.topuniversities.com](http://www.topuniversities.com))*



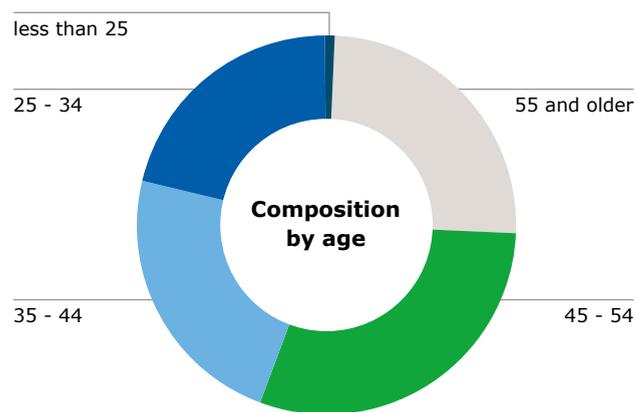
# Staff



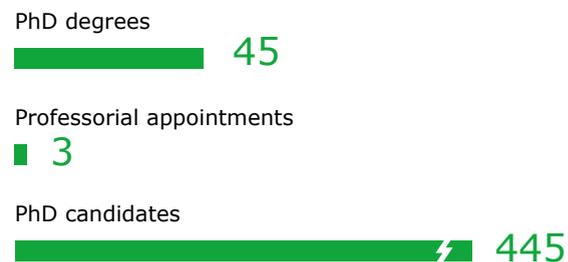
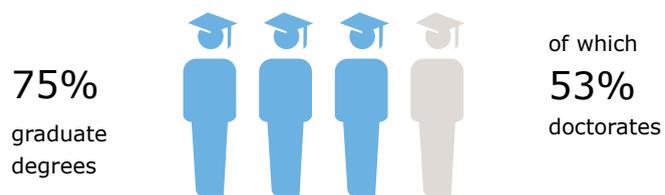
## M/F



**Average age**  
45 years old



## Level of education



## Nationalities

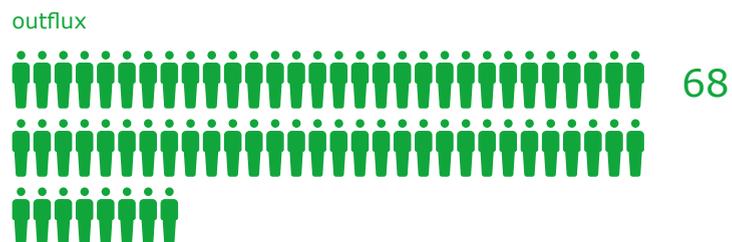
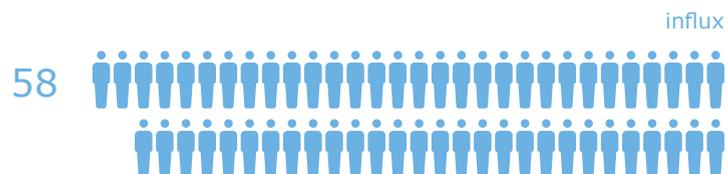


non-Netherlands  
nationalities

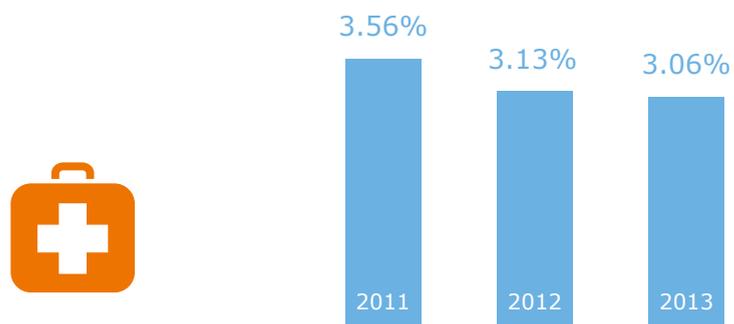
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Argentina, Australia, Bangladesh, Belgium, BNO (Hong Kong), Brazil, Bulgaria, Croatia, Chili, China, Colombia, Denmark, Ethiopia, Finland, France, Germany, Hungary, India, Indonesia, Iran, Ireland, Italy, Mongolia, Namibia, the Netherlands, Peru, Poland, Portugal, Romania, Senegal, Singapore, Spain, Sweden, United Kingdom, United States, Vietnam

## Influx and outflux



## Sick leave



# Students

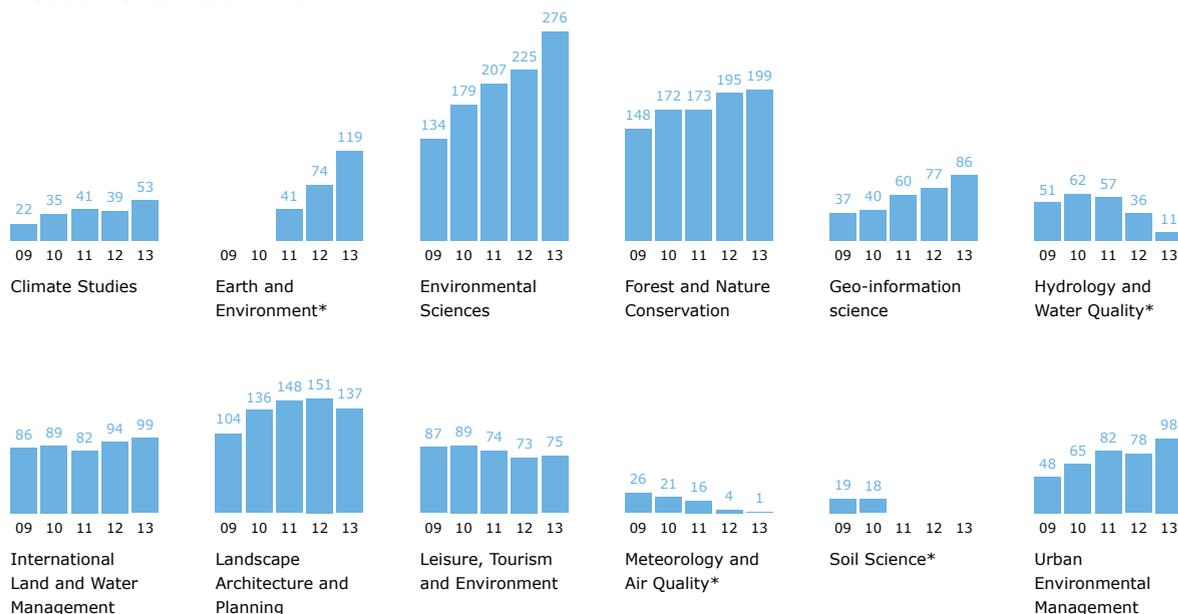
## BSc students 2009-2013



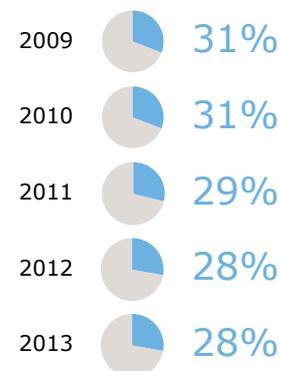
## % ESG of Wageningen University



## MSc students 2009-2013



## % ESG of Wageningen University



\* In 2011 the programmes Hydrology and Water Quality, Meteorology and Air Quality and Soil Science were combined to form the new master programme Earth and Environment.

Figures based on the 'Education Monitor 13/14', Wageningen University, dep. of Corporate Education, Research & Innovation



# Laboratories

Laboratories are, for many scientific fields, the heart of the education and research activities. For all kinds of applied research as well, laboratory research is often indispensable. By the same token, they are costly facilities that not everyone can afford – which makes it logical to share these facilities. Wageningen UR has, in the field of environmental sciences (soil, water, environment, ecology), a number of highly qualified and accredited laboratories which also provide services to clients and research groups outside of the organisation.

The following laboratories are among the facilities of the Environmental Sciences Group:

- Chemical Biological Soil Laboratory (CBLB)
- Ecology laboratory
- Laboratory for risk analyses (ERA-lab)
- Soil physics laboratory
- Laboratory for aquatic ecology
- Biogeochemistry laboratory
- Kraijenhoff van de Leur Laboratory for Water and Sediment Dynamics
- Laboratories for animal ecology
- Dendrochronology laboratory (DendroLab)
- Netherlands Centre for Luminescence dating (NCL)

*Read more about the possibilities in these laboratories on [www.wageningenUR.nl/labsesg](http://www.wageningenUR.nl/labsesg)*





# Colophon

The Environmental Sciences group is accommodated on Wageningen Campus. Wageningen UR has clustered most of his research and teaching here. It's a fascinating place where researchers, business connections, teachers, students and guests meet and exchange ideas.



Lumen, building 100  
Droevendaalsesteeg 3  
6708 PB Wageningen



Gaia, building 101  
Droevendaalsesteeg 3  
6708 PB Wageningen



Atlas, building 104  
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## More information

[www.wageningenUR.nl/alterra](http://www.wageningenUR.nl/alterra) en [www.wageningenuniversity.nl](http://www.wageningenuniversity.nl)



@AlterraWUR and @WageningenUR

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