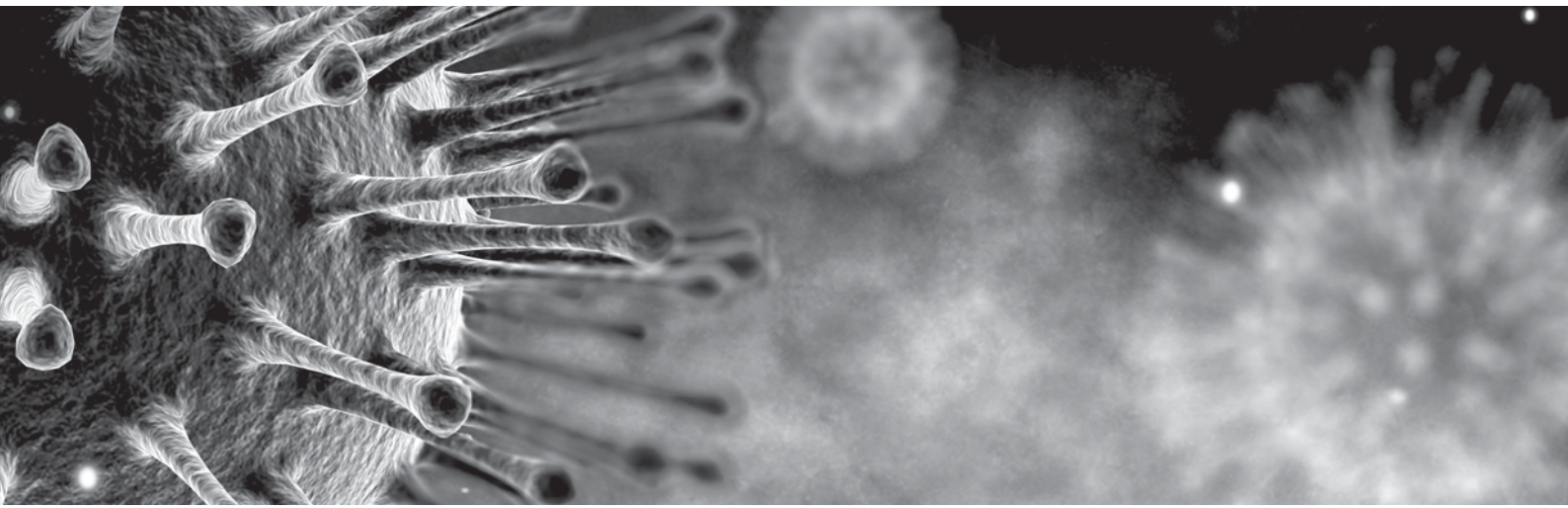


WAGENINGEN INSTITUTE FOR ENVIRONMENT AND CLIMATE RESEARCH

WIMMEK UPDATE

2011 * 2012



Our Position

The Wageningen Institute for Environment and Climate Research (WIMEK) is one of the six Graduate Schools at Wageningen University (WU). WIMEK was founded in 1993 to coordinate the research activities and PhD education of the WU chair groups involved in this research field.

WIMEK aims to develop an integrated understanding of environmental change, and its impact on the quality of life and sustainability, and offering solutions for environmental improvement by (i) conducting innovative scientific and technological research, (ii) offering PhD training and education, and (iii) disseminating emerging insights, recent research results and novel technological & policy approaches to companies, regulating authorities and society.

At present, twelve chair groups participate in WIMEK with their full research capacity or a significant part of their research capacity. Besides some other chair groups contribute to the WIMEK research programme with a few senior researchers, postdocs and PhD candidates (see annex 1).

Currently, about 300 PhD candidates have been enrolled in WIMEK, of which about 57% coming from abroad. We aim to support PhD candidates in their personal and scientific development by offering them a challenging scientific research environment, a national and international scientific network of environmental researchers and an advanced training and education programme.

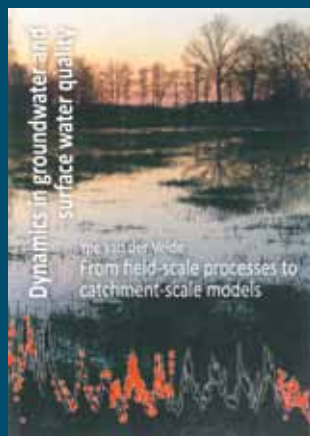
To reach these goals WIMEK has also strongly supported the development of an inter-university network of environmental research groups at national level. This has resulted in the establishment of the Netherland Research School for the Socio-Economic and Natural Sciences of the Environment (SENSE) in 1994. Now, environmental research groups from ten Dutch universities and UNESCO-IHE collaborate in SENSE and WIMEK is by far the largest participating institute.

Since its foundation in 1993, the research quality and the PhD Education & Training Programme, offered by WIMEK and its research groups, the WIMEK Graduate School and the SENSE Research School have all been evaluated very positively by international peer review committees.

Change of WIMEK's leadership

After seven years of dedicated leadership, professor Rik Leemans turned over his directorship to professor Huub Rijnaarts per 1 September 2012. We are very grateful to Rik for his inspiring work for WIMEK and SENSE. His quit the job remained not unnoticed: his leave as WIMEK director was a nice opportunity to organise a WIMEK symposium on inter- and trans-disciplinarity on 8 November 2012.

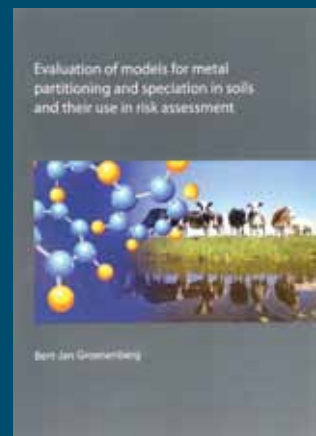
2 WIMEK PhD Graduations 2011



14-01-2011 | **Velde, Y. van der**
Dynamics in groundwater and surface water quality : from field-scale processes to catchment-scale models



28-01-2011 | **Babu, M.**
Effect of algal biofilm and operational conditions on nitrogen removal in wastewater stabilization pond



18-02-2011 | **Groenenberg, J.E.**
Evaluation of models for metal partitioning and speciation in soils and their use in risk assessment

Our research

WIMEK combines fundamental, strategic, applied and participatory research in natural and social environmental sciences and technologies. WIMEK especially promotes interdisciplinary research focusing on the interactions between ecological, chemical, physical and socio-economic processes and their interactions with society. This is considered to be essential for a solid contribution towards analysing and solving complex environmental problems.

Our research programme strongly concentrates on the components of the cause-effect-solution chain of environmental problems:

- The causes of environmental deterioration and climate change (human activities, causes and determinants of these activities);
- The behaviour of substances and other materials within an environmental compartment and their transfer between compartments;
- The consequences for ecosystems and society; and
- The prevention, abatement and/or mitigation of the effects of environmental stress and natural resource depletion, including the use of natural processes based technologies.

WIMEK's research programme is fully embedded in SENSE and follows the structure of the SENSE research programme. In this programme, SENSE concentrates on environmental problems in a multidisciplinary approach. **The four Core Themes of SENSE reflect the main research efforts with regard to environmental change:**

Core theme 1: Environmental contaminants and nutrients

Chair: Professor J. (Jacob) de Boer (IVM-VU);

Core theme 2: Environmental processes and ecosystem dynamics

Chair: Professor A.J. (Jan) Hendriks (RU Nijmegen);

Core theme 3: Global Environmental Change

Chair: Professor C. (Carolien) Kroeze (ESA-WU);

Core theme 4: Sustainable development and social change: actors, institutions and governance

Chair: Professor G. (Gert) Spaargaren (ENP-WU).

Scientific Output & Impact

The scientific output of WIMEK researchers is rather constant over the past six years (see figure 2). On average 29 PhD candidates defended their PhD thesis successfully every year. The number of articles in refereed journals fluctuated between 227 and 346 per year. Remarkable is the peak in the number of publications for the general public in 2009 and 2010, which is mainly due to the activities of the Nature Calendar.

The scientific impact of WIMEK publications is constantly at a high level. Table 1 shows that the Relative Impact of all WIMEK publications is on average 2.1, which is more than two times the world average. The same holds for the top 10% publications of WIMEK. The number of top 1% publications is even 4 times the world average.

4 WIMEK PhD Graduations 2011



29-04-2011 | **Bruin, K.C. de**
The economics of adaptation to climate change in integrated assessment models



31-05-2011 | **Hol, A**
Bio-reduction of sulfide minerals to recover invisible gold



01-06-2011 | **Dakos, V.**
Expecting the unexpected: indicators of resilience as early-warning signals for critical transitions

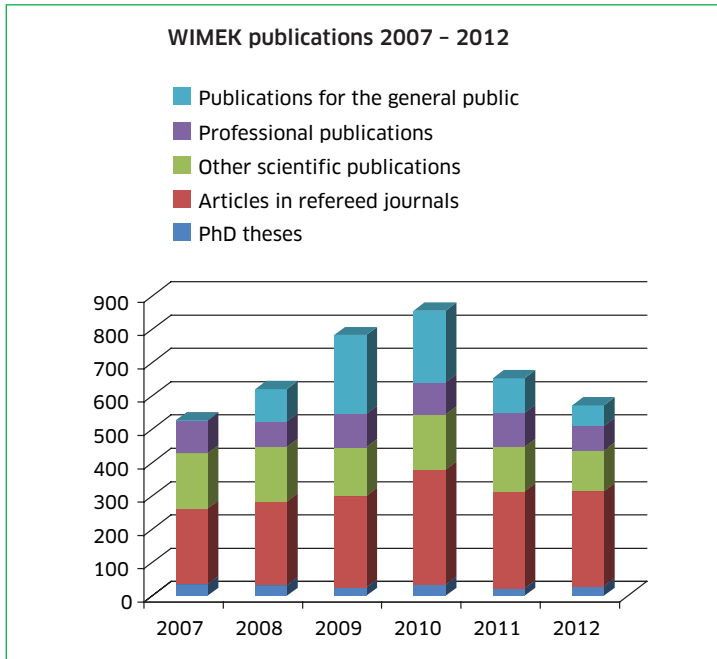


Figure 2: Number of WIMEK publications 2007 - 2012

Year of publication	N	C	RI	%T10	%T1
2007	210	4796	1.83	22% (46)	4% (9)
2008	232	4203	1.94	24% (55)	4% (10)
2009	253	4214	2.24	23% (59)	5% (12)
2010	325	2913	2.10	27% (89)	4% (14)
2011	267	1143	2.17	24% (64)	4% (12)
All years	1287	17269	2.07	24% (313)	4% (57)

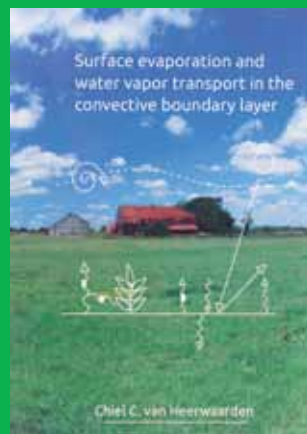
Table 1: Scientific impact of all WIMEK publications

Indicator Meaning

- N Total number of publications in a series that is analysed.
- C Total number of citations to the N publications.
- RI Relative impact or the item oriented field normalized citation score. This indicator corresponds to the number of citations to publications from a unit during the analysed time span, compared to the world average of citations to similar publications (of the same age and within the same research areas as for the group's publications). The term "item oriented" indicates that the normalization of the citation values is done on an individual article level after which the average over all articles gives the score of RI.
- %T10 Percentage of the 10% best cited papers compared to total number of publications (Total number of publications within the top 10% best cited publications in their field).
- %T1 Percentage of the 1% best cited papers compared to total number of publications (Total number of publications within the top 1% best cited publications in their field).



06-06-2011 | Netten, J.J.C.
Competition between free-floating and submerged macrophytes in a future of climate change



08-06-2011 | Heerwaarden, C.C. van
Surface evaporation and water vapor transport in the convective boundary layer



21-09-2011 | Cormont, A.
On the wings of change Species' responses in fragmented landscapes under climate change

Some highlights

AEW: Aquatic Ecology and Water Quality Management

What do ecosystems, financial markets, and the climate have in common?

Dr Vasilis Dakos (AEW) graduated in 2011 cum laude on a thesis “Expecting the unexpected: indicators of resilience as early-warning signals for critical transitions”

Abrupt shifts sometimes involve the sudden transition of a system to a contrasting regime through tipping points. These so-called “critical transitions” can have dire consequences, and, thus, being able to predict them is very important. However, predicting critical transitions is extremely difficult. This thesis explores the idea that generic early-warning signals may allow us to estimate the risk of an approaching critical transition for a wide class of systems, even if we lack mechanistic understanding of their functioning. Most of the early-warning signals are based on the observation that recovery upon disturbance becomes slow close to a tipping point, just like the long time it takes for an off-balanced canoe close to capsizing to return to its original position. This phenomenon is described as “critical slowing down” and it should, in principle, always be observed prior to a transition. In this thesis, we provided a framework for detecting critical slowing down indirectly from simple statistics (namely spatial and temporal variance and correlation) in the time series of observed ecological variables. We also put our theoretical framework into practice

for the case of past abrupt climate shifts, where we showed that past climate shifts were associated to the passing of tipping points.

As loss of resilience can pave the way for surprising transitions, the work discussed in this thesis offers a new perspective to foresee when we should expect the Unexpected.

ENP: Environmental Policy *Earth System Governance*

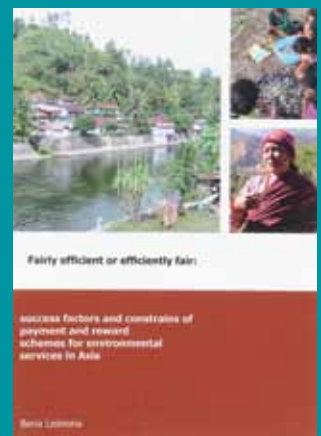
The Environmental Policy Group (ENP) crowned its successful year in 2012 with two papers published in Science. The first of these papers, entitled ‘Navigating the Anthropocene’, was co-authored by Aarti Gupta and focused on how a fundamental reorientation and restructuring of national and international institutions is needed for more effective planetary stewardship. The paper played an important role in framing the environmental governance questions in the lead up to the international London 2012 Planetary Boundaries conference. The second paper, entitled ‘Challenges to the Future Conservation of the Antarctic’ explores policy failures in that region to respond to global environmental change and growing interest in exploiting natural resources. The paper has been taken up as key policy brief for assisting decision-makers to address future challenges in the Arctic region. The year also saw the start and finish of two WUR-INREF funded interdisciplinary programmes. BESTTuna kicked-off in August under the guidance



30-09-2011 | Stein, N.E.
A microbial fuel cell-based biosensor for the detection of toxic components in water



30-09-2011 | Jeremiasse, A.W.
Cathode innovations for enhanced H2 production through microbial electrolysis



03-10-2011 | Beria, L.
Fairly efficient or efficiently fair: success factors and constraints of payment and reward schemes for environmental services in Asia

of Simon Bush and Arthur Mol with seven new PhD students and two Postdoc projects to look at the challenges of sustainable trans-boundary tuna management in the Western Pacific over the coming four years. At the same time ENP researchers Gert Spaargaren, Peter Oosterveer and Bas van Vliet together with a number of WIMEK researchers in the chair groups Environmental Technology (ETE), Environmental System Analysis (ESA) and Development Economics (DEC) and in close collaboration with three universities in East-Africa rounded off the successful PROVIDE programme with the graduation of 8 PhD candidates. PROVIDE contributed to the scientific debate on (the management of) urban environmental infrastructures in East Africa and to the development of concrete alternatives that better fit the context of rapidly expanding urban centres. The project has generated 18 articles in refereed scientific journals and two edited volumes: Van Vliet, Bas, Gert Spaargaren and Peter Oosterveer (eds.) (2010) 'Social Perspectives on the Sanitation Challenge' and one by Bas van Vliet, Joost van Buuren and Shabaan Mgana that will be published in 2013. PROVIDE also played a very active role in the INREF Conference on interdisciplinarity "Tackling the Development Challenges: the struggle for interdisciplinarity", organized on 23-24 April 2012, in Wageningen.

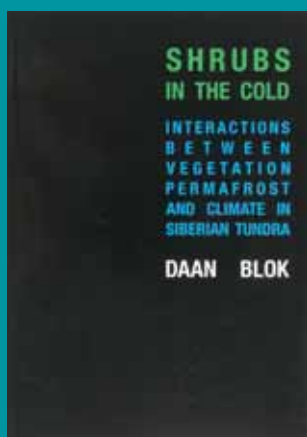
ENR: Environmental Economics and Natural Resources

An economic analysis of adaptation to climate change

Dr Karianne de Bruin (ENR) graduated in 2011 on a thesis "An economic analysis of adaptation to climate change under uncertainty". Her research focused on the exploration and further development of economic assessment methods to support decision-making in adaptation to climate change.

The changing climate increases the vulnerability of societies around the world. Besides mitigation efforts, adaptation measures are needed to counteract the impacts of climate change. However, there exist uncertainties about the impacts of climate change. Decision-makers are faced with the challenge to implement economically efficient and effective climate change policies and adaptation measures to mitigate uncertain climate change impacts.

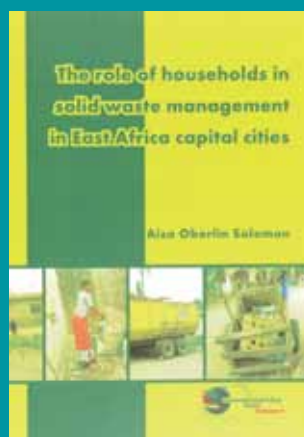
The results of this thesis show that Multi-Criteria Analysis and Cost-Benefit Analysis are appropriate decision-support tools in the context of adaptation to climate change. The priority ranking of adaptation options for the Netherlands based on Multi-Criteria Analysis, through evaluation and feasibility criteria, gives an indication of the priority options for the Dutch adaptation policy. The regional case study applies Cost-Benefit Analysis for a quantitative assessment of the costs and benefits of climate proofing spatial planning at a regional level. Furthermore, the investment decision model developed in this thesis, based on



05-10-2011 | Blok, D.
Shrubs in the cold : interactions between vegetation, permafrost and climate in Siberian tundra



07-10-2011 | Punt, M.J.
Optimal management of marine resources: spatial planning of multiple uses by multiple actors



25-10-2011 | Solomon, A.O.
The role of households in solid waste management in East African capital cities

Cost-Benefit Analysis under climate change uncertainty, takes into account the effect of future investment moments and the availability of new information on climate change impacts. The model analysis and case study application show that the optimal mix of structural and non-structural adaptation measures depends on the level of the damage costs, the cost structure of the measures, the discount rate and the timing of future investment moments, including the timing of partial resolution and full resolution of uncertainty.

ESA: Environmental Systems Analysis

Success factors and constraints of payment and reward schemes for environmental services in Asia

Dr Beria Leimona (ESA) graduated in 2011 on a thesis “Fairly efficient or efficiently fair: success factors and constraints of payment and reward schemes for environmental services in Asia”.

Payment for environmental service (PES) is strictly defined as a market-based environmental policy instrument to achieve environmental protection in the most efficient way. However, an increasing body of literature shows that the prescriptive conceptualization of PES cannot be easily generalized and implemented in practice and the commodification of ecosystem services is problematic. To investigate the underlying causes, this PhD study combines a quantitative and qualitative research approach using case studies in Indonesia, the Philippines and Nepal. The empirical observations on emerging PES-mechanisms in the Asian case studies show that interdependency of fairness and efficiency should be the main consideration in designing and implementing a PES scheme in developing countries. Neither fairness nor efficiency alone should be the primary aim but an intermediate PES that is “fairly efficient and efficiently fair” may bridge the gap between PES theory and the practical implementation of PES to increase ES provision and improve livelihoods.

Potential consequences of climate change in Europe for tourism

Dr Bas Amelung (ESA) contributed to the article “Physical and economic consequences of climate change in Europe” that was published in PNAS in 2011. The paper synthesises the results of the EU-JRC funded PESETA project, which aimed at quantifying the potential consequences of climate change in Europe in four market impact categories (agriculture, river floods, coastal areas, and tourism) and one nonmarket impact (human health). The results indicate that if the climate of the 2080s were to occur today, the annual loss in household welfare in the European Union (EU) resulting from the four market impacts would range between 0.2–1%. Bas’ main contribution was to the category of tourism.

The tourism study simulates the major outdoor international tourism flows within Europe. It integrates the climate component of tourist activity (climate suitability) with the economic analysis of tourist demand flows, considering also seasonality effects in a tourist regional demand model. For the 2080s, the distribution of climatic conditions in Europe is projected to change significantly. For the spring season, there is a clear extension toward the north of the zone under good conditions. Excellent conditions in spring, which are found mainly in Spain in the baseline period, could spread across most of the Mediterranean coastal areas by the 2080s. Changes in autumn are comparable to the ones in spring. In summer, the zone of good conditions also expands toward the north but at the expense of the south, where climatic conditions would deteriorate. Southern Europe, which currently accounts for more than half of the total EU capacity of tourist accommodation, is projected to be the only region with a decline in bed nights, estimated to range between 1% and 4% depending on the climate scenario. The rest of Europe is projected to have large increases in bed nights, in the range of 15–25% for the two

8 WIMEK PhD Graduations 2011



28-10-2011 | **Bruin, K. de**
An economic analysis of adaptation to climate change under uncertainty



01-11-2011 | **Scheinberg, A.**
Value added: modes of sustainable recycling in the modernisation of waste management systems



30-11-2011 | **Timmerman, J.G.**
Bridging the water information gap : structuring the process of specification of information needs in water management

warmest scenarios.

A key assumption is that the tourism system has full flexibility in responding to climate change. Climate change can affect overall demand, and the seasonal distribution of tourists is determined exclusively by climate factors. However, if institutional factors (e.g., school holidays) limit that seasonal flexibility, results could be quite different. In that case, for example, Southern Europe might not be able to compensate for the summer losses with gains in the shoulder seasons.

ESS: Earth System Science

Global warming affects cooling water use in the energy sector and freshwater ecosystems

Dr Michelle van Vliet (ESS) graduated in 2012 – cum laude – on a thesis “Global rivers warming up: impacts on cooling water use in the energy sector and freshwater ecosystems”

Climate change will affect flow and thermal regimes of rivers worldwide. This will have a direct impact on freshwater ecosystems and human water uses during the 21st century. Up to the present, the magnitude of both stream flow and water temperature changes under future climate, especially for large rivers worldwide, are poorly known. Recent warm and dry summers showed adverse impacts of high river temperatures and low flows on freshwater ecosystem (e.g. fish habitats) and human water uses (e.g. cooling of thermoelectric power plants). Therefore, to what extent large scale changes in river flow and water temperature under climate change could affect freshwater ecosystems and cooling water use should be better understood. This thesis addresses the impacts of climate change on river flows and water temperatures globally, along with the potential consequences for freshwater ecosystems and cooling water use in the energy sector.

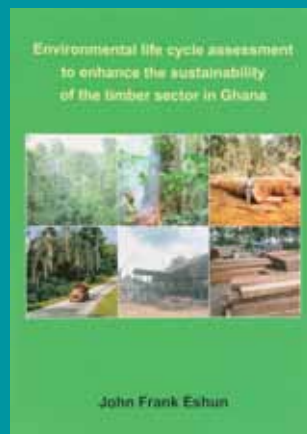
A physically-based modelling framework, consisting of the stream temperature River Basin Model (RBM) and the Variable Infiltration Capacity (VIC) macro-scale hydro-

logical model, was further developed for applications to large rivers worldwide. The resulting framework simulated observed conditions realistically. It was then forced with an ensemble of bias-corrected general circulation model output for the 21st century. Strong increases in water temperature and declines in low flows are projected in the south-eastern United States, southern and central Europe, eastern China, and parts of southern Africa and southern Australia. These regions could therefore be potentially affected by increased deterioration of water quality and freshwater habitats, and reduced potentials for human water uses under future climate.

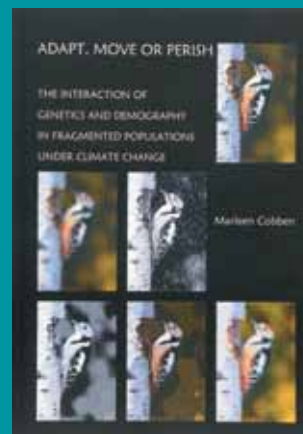
Impacts of projected changes in river flow and water temperature on cooling water use in the energy sector and freshwater ecosystems were assessed in more detail. The frequency and magnitude of exceeding maximum temperature tolerance values of several fish species significantly increased. This could, in combination with changes in flow regime, affect the distributions of freshwater species. To maintain and protect current freshwater ecosystems, environmental standards are defined with regard to the volume and temperature of water for cooling water use. In Europe and the U.S., most electricity is produced by thermoelectric power plants depending on cooling water from rivers. Projected increases in river temperatures and declines in low summer flow for both regions are expected to increase environmental restrictions on cooling water use, with substantial reductions in power plant capacities for the next 20–50 years. Conflicts between environmental objectives and economic consequences of reduced electricity production are thus expected to increase due to climate change. This study reinforces the need for improved climate adaptation strategies to ensure future water and energy security without compromising environmental objectives.



12-12-2011 | Penders, E.J.M.
Development of aquatic biomonitoring models for surface waters used for drinking water supply



20-02-2012 | Eshun, J.F.
Environmental life cycle assessment to enhance the sustainability of the timber sector in Ghana



17-04-2012 | Cobben, M.M.P.
Adapt, move or perish: the interaction of genetics and demography in fragmented populations under climate change

ETE: Environmental Technology

Use of photo-catalysis for degradation of micro pollutants in water

UV-light is applied in water treatment for disinfection of drinking water and effluents. Johannes Kuipers (PhD-ETE) et. al. investigate a new application of UV-light: the use of photo-catalysis for degradation of micro pollutants in water. As a source for UV-light low pressure mercury lamps are generally used, that have an energy efficiency of 35% and a life time of 12000 hours. Recently UV-LEDs are being developed that when fully optimized can have a much higher efficiency and life time.

In case of turbid water, or a suspended photo-catalyst, penetration of UV-light in the water is limited, which leads to a lower power efficiency. This problem can be overcome by using many small UV-LEDs that are dispersed in the water and can move freely, instead of one large fixed mercury lamp. By mixing intensively the UV-LEDs and the water, in a fluidized bed-like setup, there will be no dead zones or short cuts that are not illuminated.

UV-LEDs in a fluidized bed need wireless powering, which can be achieved by applying near field resonant inductive coupling, which is the topic of this research. The reactor is equipped with a primary coil, powered by a high frequency amplifier, that generates an electro-magnetic field. The UV-LEDs are equipped with secondary coils, that picks up the energy from the electromagnetic field, and a capacitor to control the resonance frequency of the coil.

The most important parameters determining the power transfer efficiency are: (1) the coupling between primary and secondary coils; (2) the quality factors of the coils; (3) the number of secondary coils; (4) the matching of the secondary coil and the UV-LED. Mathematical equations were derived that link these parameters to the efficiency of the energy transfer. From this model it can be shown that in an optimized system,

with matching resonance frequencies of primary and secondary coil and a large number of secondary coils, the efficiency can be over 90%. Experimentally we showed that one primary coil can wirelessly power eighteen secondary coils in water with an efficiency higher than 75%.

This technique for wirelessly energy transfer cannot only be used to power UV-LEDs, but also other electronic devices like piezo ultrasound transducers, electrodes and sensors and opens a new field of innovative reactor design for water treatment. This project is conducted within WETSUS in direct collaboration with industry that will take up the technology for further development and market application.

Natural biotechnologies reducing environmental risks of organic and inorganic pollutants.

Bioscorodite: biological crystallization of scorodite for arsenic removal

Dr. Paula Gonzalez-Contreras graduated in 2012 on a PhD thesis entitled Bioscorodite: biological crystallization of scorodite for arsenic removal. Bioscorodite is a crystalline form of an arsenic-iron salt, which is non-toxic and thermodynamically stable and which is formed naturally and in bioreactors under extreme pH conditions. Arsenic pollution of groundwater is an enormous problem all around the world, especially in India and Bangladesh where naturally occurring concentrations pollute groundwater resources that are used for drinking water, and numerous casualties occur by arsenic pollution caused skin cancer. In North and South America, groundwater and surface waters are impacted by arsenic pollution as a result of (rare-earth) metal mining. Paula showed the proof of principle of this novel biotechnology which will be put to further development for market application by the company Paques BV, thus science and business are combined in offering sustainable solutions for this world wide occurring problem.



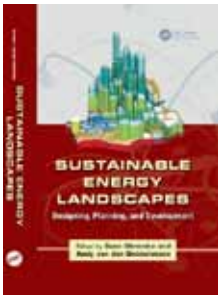
26-04-2012 | **Liang, D.**
Payment schemes for forest ecosystem services in China: policy, practices and performance



15-05-2012 | **Timmers, R.A.**
Electricity generation by living plants in a plant microbial fuel cell



25-05-2012 | **Remy, M.J.J.**
Low concentration of powdered activated carbon decreases fouling in membrane bioreactors



Transport and biodegradation of volatile organic compounds : influence on vapor intrusion into buildings

Dr. Sara Picone graduated in 2012 on Transport and Biodegradation of volatile organic compounds: influence on vapour intrusions into buildings. Sara showed by laboratory microcosm experiments and modelling that biodegradation occurring in liquid films around soil particles in the unsaturated zone of soils, removes toxic volatile compounds from the soil air with a factor 10 to 1000 faster than reported in literature. Herewith she demonstrated that current risk-models strongly overestimate the risks of volatile organic pollutants in soils, and she confirmed the low risk levels observed through field measurements reported by many consultants around the world. A more adequate risk assessment using this new knowledge is now already implemented in the current reconstruction of Utrecht Central Station by the city of Utrecht, AgentschapNL-Bodem+, Deltares, RIVM, and the company Bioclear.

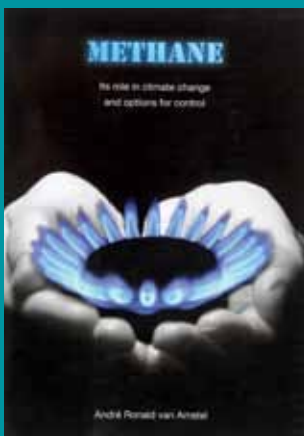
Urban Harvest: reducing resource and water footprints

Dr. Claudia Agudelo-Vera graduated in 2012 with a PhD thesis entitled Dynamic water resource management for achieving self-sufficiency of cities of tomorrow. This research developed the new Urban Harvest Approach (UHA), to improve resource management in cities and agro-industrial settings. The method was tested for urban water flows. Different strategies were evaluated by modelling the dynamics of residential water flows at different spatial scales, namely from building, to block, to district, to city scales. As an outcome, linkages to planning practices and guidelines to improve water management in cities were defined. Claudia showed that for a city of a size of Wageningen (35.000 inhabitants) the water footprint can be reduced with 40-60%. This new Urban Harvest concept is a corner stone in addressing the Water-Food-Energy Nexus that currently receives a lot of attention of

other cities and agro-industrial parties located in fresh water scarce regions all around the world, where water availability limits urban expansion, biodiversity and/or agro-industrial production.

LAR: Landscape Architecture Sustainable Energy Landscapes

Dr Sven Stremke (LAR) is one of the lead authors of the book Sustainable Energy Landscapes: Designing, Planning, and Development. The book presents state-of-the-art knowledge in the exciting new field of sustainable energy landscapes. It bridges the gap between theory and fundamental research on the one hand, and practice and education on the other. The chapters - written by experts in their fields - present a selection of interdisciplinary, cutting-edge projects from across the world, illustrating the inspiring challenge of developing sustainable energy landscapes. They include unique case studies from Germany, Taiwan, the United Kingdom, Canada, Denmark, Austria, Italy, and the United States. In the near future the appearance and spatial organization of urban and rural landscapes will be strongly influenced by the generation of renewable energy. One of the critical tasks will be the re-integration of renewable energy into the existing landscapes—which people value and want to preserve—in a socially fair, environmentally sound, and economically feasible manner. The book focuses on the municipal and regional scale, where energy-conscious interventions are effective, and stakeholders can participate actively in the transition process.



30-05-2012 | Amstel, A.R. van
Methane : its role in climate change and options for control



01-06-2012 | Galic, N.G.
Assessing recovery potential of aquatic macroinvertebrate populations using ecological models



18-06-2012 | Picone, S.
Transport and biodegradation of volatile organic compounds : influence on vapor intrusion into buildings

MAQ: Meteorology and Air Quality

The link between surface evaporation and water vapour transport

Dr Chiel van Heerwaarden (MAQ) graduated in 2011 – cum laude – on a thesis “Surface evaporation and water vapour transport in the convective boundary layer”. This thesis investigates the link between surface evaporation and the turbulent transport of water vapour in the daytime convective boundary layer over land. His findings show the relevance of the atmosphere in regulating evaporation of water from the land surface and how surface heterogeneity can modify the transport of water vapour, and the potential impact on cloud formation.

The research is split into two parts. In the first part of this thesis the feedbacks in the coupled land-atmosphere system are studied. He developed and discussed a modelling framework that defines the interactions between the exchange of moisture and heat from the land surface and the thermodynamic properties of the convective boundary layer. Second, a mathematical expression is derived that quantifies the importance of all processes and forcing that influence surface evaporation during the day. This expression is compared against measurements collected at midlatitudes (The Netherlands) and at a semi-arid region (Niger). The acquired knowledge on feedbacks in the coupled land-atmosphere system is applied to interpret climatic trends of pan and actual evaporation. The modelling framework can be also used the interpretation of results obtained by large climate models.

MIB: Microbiology

Novel anaerobes for a biobased economy

Professor Fons Stams of the Laboratory of Microbiology received an ERC Advanced Grant in 2012 to investigate anaerobic microorganisms at Wageningen University and at the University of Minho (Braga, Portugal) where he is visiting scientist since 2010 for 3 months a year.

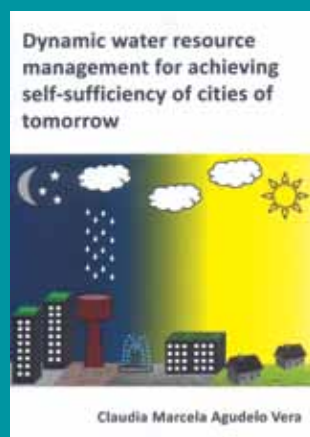
Anaerobic microorganisms (microorganisms that can grow without oxygen) are important in environmental biotechnological processes such as bioremediation of water and soil. Anaerobic microorganisms are also able to convert organic compounds in agricultural side streams to useful products such as biofuels and organic acids. The research described in the ERC proposal Novel anaerobes for a biobased economy aims to isolate and characterize novel anaerobic microorganisms and to apply these novel anaerobes for the production of valuable products such as organic acids.

Molecular ecological research of the past decennia has revealed how little is known about microbial life on Earth. Typically, more than 95% of the microbial phylogenotypes that are detected with molecular techniques have never been isolated and characterized. The role of these uncultured microorganisms in biogeochemical processes is often unknown, and it also not known if such microorganisms can be applied in biotechnology.

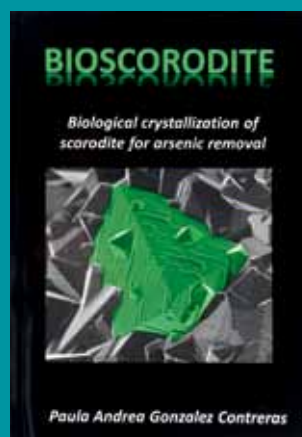
Research of Fons Stams will focus on novel anaerobes that metabolize lignocellulose (Wageningen) and fats (Braga). A main challenge is to isolate from the huge microbial diversity of anaerobic environments those anaerobes that are phylogenetically novel and biotechnologically most interesting.

Microbial perchlorate reduction in an environment resembling Early Earth conditions

In anoxic environments microorganisms rely on alternative electron acceptors for energy conservation and growth. Sulphate is an important terminal electron acceptor for anaerobic respiration. Sulphate-reducing microorganisms are abundantly present on Earth. They belong to different phylogenetic clades of the bacterial and the archaeal domains. In contrast to sulphate, perchlorate is a rather alien compound on Earth and has until recently been considered to be of human origin only. Perchlorate is manufactured for the use in rocket fuels and fireworks. Environmental pollution was considered to be the main source of perchlorate in Nature. However, microorgan-



20-06-2012 | Agudelo Vera, C.M.
Dynamic water resource management for achieving self-sufficiency of cities of tomorrow



22-06-2012 | Gonzalez-Contreras, P.A.
Bioscorodite: biological crystallization of scorodite for arsenic removal



22-06-2012 | Veraart, A.J.
Denitrification in ditches, streams and shallow lakes

isms, mainly proteobacteria, that use perchlorate as electron acceptor have been described. Nevertheless, it has remained mysterious why perchlorate-reducing microbes are also present and sometimes even abundant in pristine environments. Some light has been thrown on this by the improvement in analytics of the last decades, which made it possible to show the continuous natural formation and deposition of perchlorate on Earth, though in very low concentrations. As perchlorate reduction might have been going on for ages and even long before the man-made production of perchlorate it is tempting to speculate about an early evolution of perchlorate reduction pathways.

The Microbiology group started to investigate microorganisms indigenous to environments resembling the conditions of Early Earth, like hydrothermal vents. *Archaeoglobus fulgidus* is a sulphate-reducing archaeon that thrives in the subsurface at a temperature of up to 95 degrees Celsius. In our study we discovered that *A. fulgidus* is able to grow with perchlorate as electron acceptor. This finding extends the group of perchlorate reducers to the archaeal domain of life and to extremely high temperatures. By into-depth analyses we identified molybdo-enzymes similar to bacterial enzymes that catalyse perchlorate reduction. However, a subsequent enzyme commonly present in perchlorate-reducing bacteria, the chlorite dismutase, is absent in *A. fulgidus*. The proposed alternative pathway of perchlorate reduction relies on an interplay of abiotic and biotic redox reactions involving inorganic sulphur compounds (visualized in Figure 1), which allows *A. fulgidus* to cope with the highly oxidative chlorine intermediates formed in the reduction of perchlorate.

Based on our findings we speculate that the diversity of perchlorate-reducing microorganisms is probably much broader than estimated so far. Ancient archaea may have even prevented accumulation of perchlorate

in early terrestrial environments and consequently given rise to oxidizing conditions on Earth, before the occurrence of oxygenic photosynthesis.

SLM: Soil Physics and Land Management Novel concepts for catchment-scale interactions between groundwater and surface water

Dr Ype van der Velde graduated in 2011 – cum laude – on a thesis “Dynamics in groundwater and surface water quality : from field-scale processes to catchment-scale models” .

High nutrient loads of surface waters are a widespread environmental issue in lowland catchments with intensive agriculture. High nutrient concentrations stimulate plant and algal growth that reduce the ecological and recreational functioning of small headwaters. In turn the high nutrient loads of small headwaters cause algal blooms and hypoxia in downstream rivers and lakes, and, if the problem is widespread, even in coastal water bodies such as the Gulf of Mexico and the Baltic Sea. In order to identify effective abatement measures, we need to

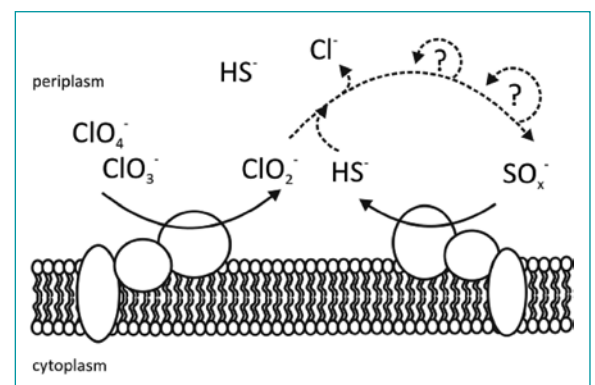
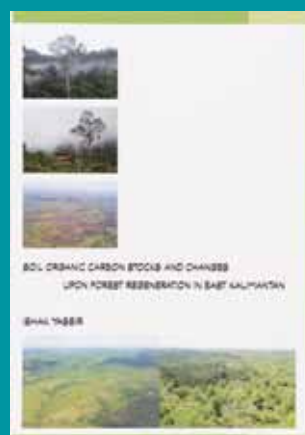


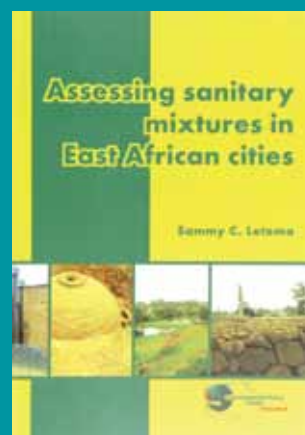
Figure 1: Proposed model for the reduction of (per)chlorate in *Archaeoglobus fulgidus*, involving biological (solid lines) and chemical processes (dashed lines); modified from Liebensteiner et al. (2013).



29-06-2012 | Sekomo Birame, C.
Development of a low-cost alternative for metal removal from textile wastewater

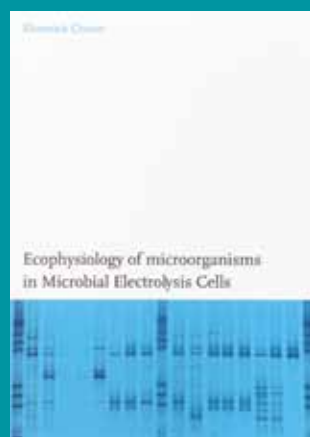


04-09-2012 | Yassir, I.
Soil organic carbon stocks and changes upon forest regeneration in East Kalimantan- Indonesia

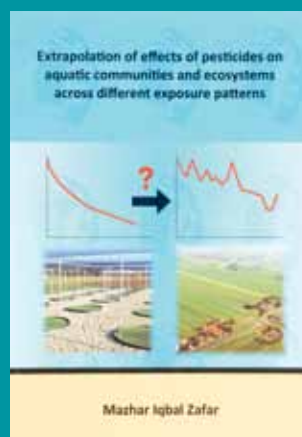


11-09-2012 | Letema, S.C.
Assessing sanitary mixtures in East African cities

better understand the processes that drive nutrient transport towards surface waters from the moment of application at the soil surface. This thesis describes the movement of water and nutrients within lowland catchments and hence contributes to the knowledge needed for sustainable management of the groundwater and surface water resources of lowland catchments. In his thesis Van der Velde describes how innovative nested-scale discharge and water quality measurements lead to the formulation of novel concepts for catchment-scale interactions between groundwater and surface water. We showed that parsimonious models that describe solute transport at the catchment scale are feasible and are currently the most effective way to relate both the observed high frequency natural dynamics and the long term changes in water quality to field-scale processes. However, these models should focus on the flow paths and travel times of water parcels inside a catchment, rather than on reproducing the correct discharge at the catchment outlet. In this thesis, we successfully developed and tested model concepts that define discharge by a composite of flow routes and concepts in which discharge is treated as a composite of travel times. To validate and improve these concepts, more datasets of flow route discharges, corresponding water quality, and subsurface storage of other catchments are needed. Important advances in these model concepts can be achieved by comparing solute transport in catchments with contrasting topographies and climates. Further developing the 'multi-methodological' approach introduced in this thesis, in particularly a stronger integration of subsurface and in-stream processes, will yield basin-scale models of surface water quality that can facilitate a more sustainable management of groundwater and surface water resources; even under the multitude of stresses imposed by intensive land use in densely populated lowland areas.



14-09-2012 | **Croese, E.**
Ecophysiology of microorganisms in microbial electrolysis cells



03-10-2012 | **Zafar, M.I.**
Extrapolation of effects of pesticides on aquatic communities and ecosystems across different exposure patterns



05-10-2012 | **Biemans, H.**
Water constraints on future food production

Societal Impact

WIMEK researchers play an important role in the scientific underpinning of national and international policy documents regarding climate change, reduction of biodiversity, the disturbance of ecosystems and a sustainable reform of production and consumption. They participate actively in advisory boards of governmental and non-governmental organisations and are frequently asked to comment on recent developments in newspapers, on radio and television. Moreover, new system concepts and technological and management solutions are being developed and disseminated to companies, governments and non-government institutions practising the science for impact mission of WIMEK and Wageningen University.

Some highlights

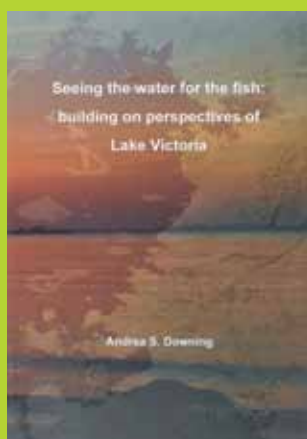
Special issue of *Current Opinion in Environmental Sustainability* contributes to global sustainability policy

On 26 March 2012, a special issue was published of the journal 'Current Opinion in Environmental Sustainability'. Editor in chief is Rik Leemans (ESA). The issue published papers on the topics of several policy briefs that were on the agenda of the annual United Nations Rio+20 Conference on Sustainable Development. The publication of the special issue tied in with the Planet under Pressure Conference in London, where each of the policy briefs were presented and discussed.

Many of the research papers published in this special issue have provided key contributions to the research programmes discussed at the Planet under Pressure Conference. All papers take a very interdisciplinary and forward thinking approach. They give a glimpse of future research results that are relevant for achieving global sustainability.

Insect Experience and Tick Radar

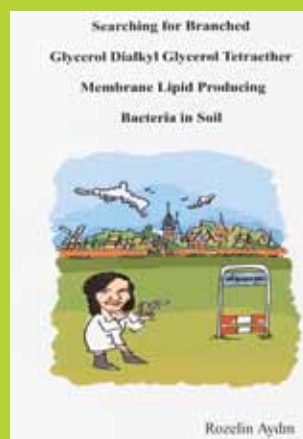
Dr Arnold van Vliet (ESA) and colleagues further expanded their citizen science networks Nature's Calendar (www.natuurkalender.nl) and Allergy Radar (www.allergieradar.nl). The Nature's Calendar network aims to monitor, analyse, forecast and communicate the timing of yearly recurring natural events. They involve over 8,000 volunteers and hundreds of school children and actively work together with the weekly national radio show 'Vroege Vogels'. The Allergy Radar project projected now involves over 3,500 hay fever patients who report their hay fever symptoms. In 2012 the Allergy Radar project launched the Allergy Radar App. In 2011 we organised the Insect Experience at the Wageningen University campus together with numerous organisation. It was a five day festival with an insect film festival, an insect symposium, a training for teachers and a large public festival that was visited by over 8,000 people. In the context of the insect experience we launched the Splashteller.nl. We asked the public to report the number of bugs on their license plate after a care drive to estimate spatial and



08-10-2012 | Downing, A.S.
Seeing the water for the fish: building on perspectives of Lake Victoria



09-10-2012 | Mutekanga, F.P.
Participatory policy development for integrated watershed management in Uganda's highlands



24-10-2012 | Aydin, R.
Searching for branched glycerol dialkyl glycerol tetraether membrane lipid producing bacteria in soil

temporal variation in insect density. It attracted an enormous amount of media-attention worldwide. In 2012 the Nature's Calendar together with the National Institute for Public Health and the Environment (RIVM) launched the Tick Radar (www.tekenradar.nl). Tick Radar provides a ten-day forecast of tick activity in The Netherlands and in the first year over 7,000 people reported a tick bite. With the information an estimation will be made of the risk of Lyme disease after a tick bite. Finally, they continued the nature news website Nature Report (www.natuurbericht.nl) with publications of two reports on topical developments in nature in The Netherlands

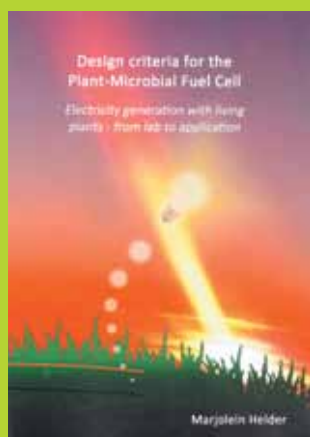
DROUGHT Dialogue Fora in Europe

Water scarcity and drought are high on the European environmental policy agenda and options to anticipate on likely more severe future water stress are keystones in the Blueprint to Safeguard Europe's Water Resources (2012). The Chair Group Hydrology and Quantitative Water Management (HWM) coordinates the EU-FP7 DROUGHT project (<http://www.eu-drought.org/>). Science-Policy-Interfacing (SPI) through Drought Dialogue Fora is an important project component. In these fora, policy-makers, stakeholders, water managers and scientists meet. We discuss the natural hazard, drought impacts, management and policy options considering different global change projections. The fora are held on different policy scales (river basin, national, pan-European) where the interplay is a focal point. The kick-off of the fora at the river basin scale was in the Jucar River basin, Valencia (Spain) in March 2012. The first pan-European Drought Dialogue Forum was organised by the HWM group with support of Alterra under the auspices Cyprus EU Presidency in Nicosia, October 2012. Mr. H.E. Sofoclis Aletraris, Cyprus Minister of Agriculture, Natural Resources and Environment opened the forum, which was attended by high level representatives

of the European Commission, the European Environmental Agency, EU stakeholder organisations and project coordinators of international drought-related projects. Here we discussed the design, implementation and review of drought and water scarcity-related EU policies (EU Water Framework Directive, Common Agriculture Policy, Regional Coherence policies). The development of the EU Drought SPI is joint learning experiment with the US National Drought Mitigation Centre and the Universities of Princeton and Washington. In the period 2013-2014 two rounds of Case Study Drought Dialogue Fora are planned in the Po River basin (Italy), Jucar River basin (Spain) and Syros (Greece), and at the national scale in the Netherlands, Portugal and Switzerland. We are preparing the 2nd pan-European Drought Dialogue Forum that will be held parallel to the EU Water Framework Conference, Lille (France), November 2013. The Drought Dialogue Fora ensure that most recent scientific knowledge on drought is integrated in environmental policy development and that it responds to policy needs at different scales.

Green Roofs - analysing the real effects

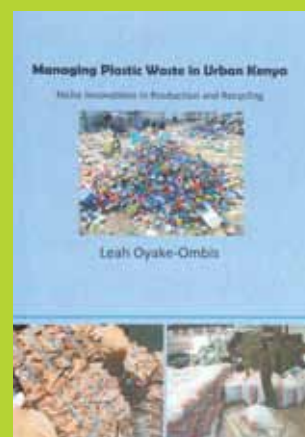
Dr Klaas Metselaar of the Soil Physics and Land Management Group (SLM) is part of a team which has designed and is currently monitoring an innovative cradle to cradle experimental green roof on the new building of the Netherlands Institute of Ecology (NIOO-KNAW) in Wageningen, the Netherlands. The experiment is set up to develop lightweight solutions for retro-fitting flat roofs in the Netherlands. It uses a classic experimental agronomic design and is monitored in terms of biodiversity, energy and water. Water and energy are considered important in the context of climate-proof cities, i.e. adapting cities to climate change. Increasing biodiversity in cities is a challenging area of research. The research themes are urgent in the context of urbanization and link to physical and



23-11-2012 | **Helder, M.**
Design criteria for the plant-microbial fuel cell : electricity generation with living plants : from lab tot application



03-12-2012 | **Le Thi, K.O.**
SURMAT : decision support tool to select municipal solid waste treatment technologies : case study in Ho Chi Minh City, Viet Nam



11-12-2012 | **Ombis, L.O.**
Managing plastic waste in urban Kenya: niche innovations in production and recycling

social wellbeing of city inhabitants, but also provide arguments for business cases, and contribute to combining ecology and the built environment in the context of People Planet Profit. The team is providing a research facility for green roof research. Dr. Marjolein Helder and Dr. David Strik of Plant-e (a spin-off company of ETE) participate in the NIOO project with green roofs producing electricity from green plants that have their roots associated with electrodes.

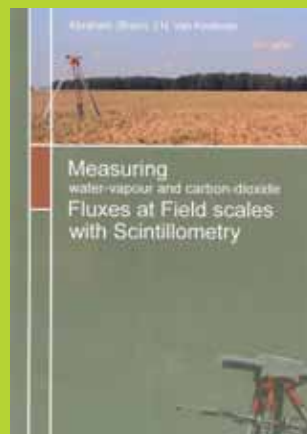
Top sector contributions of WIMEK

WETSUS, the Institute of Sustainable Water Technology in Leeuwarden, under Leadership of Prof. Cees Buisman of ETE, is a strong participant of WIMEK through the support of about 20 Wageningen PhD researchers in its programme. The institute conducts technological PhD research in direct collaboration with the water technology industry of the Netherlands.

WIMEK contributed to the scientific and societal discourses on the relation between Biodiversity and the Biobased Economy through a special symposium organised in collaboration with the ministry of environment and infrastructure (see below).



17-12-2012 | **Freitas, J. de**
Development and validation of in vitro bioassays for thyroid hormone receptor mediated endocrine disruption



17-12-2012 | **Kesteren, A.J.H. van**
Measuring water-vapour and carbon-dioxide fluxes at field scales with scintillometry



18-12-2012 | **Graaff, C.M. de**
Biological treatment of sulfidic spent caustics under haloalkaline conditions using soda lake bacteria

Our education

All WIMEK PhD students participate in the SENSE training programme. The SENSE training programme aims (i) to train PhD students to be able to conduct research in a systematic and productive way, (ii) to work effectively in an international arena, (iii) to contribute to an improved understanding of the causes and effects of environmental problems and of possible solutions, (iv) to position their own research in a multidisciplinary context and (v) to translate environmental problems into relevant sound research proposals.

In the end, we wish to help PhD students in performing their PhD study, in understanding the wider environmental and societal context of their study, and in preparing them for their future careers.

In the period 2011 - 2012, WIMEK has been involved in the coordination and organisation of several international PhD courses, for example:

- Speciation and Bioavailability (2011; Prof. Raewyn Town)
- Principles of Ecological Genomics (2011; Dr. Hauke Smidt, WU; Prof. Nico van Straalen, VU)
- Bridging the gap in atmospheric modelling (2012; Prof. Bert Holtslag)
- Integrated assessment of ecosystem services: from theory to practice (2011; Dr Dolf de Groot, WU; Dr Pieter van Beukering, VU)
- Hands-on soil and water field measurements (2011; Prof. Leo Stroosnijder)

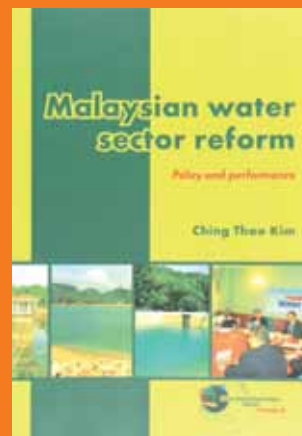
Furthermore, international PhD courses have been organised by our SENSE partner institutes and other Wageningen Graduate Schools.

In addition WIMEK staff has organised several internal PhD courses for our own PhD students. The Wageningen Graduate Schools (WGS) collaborate in the organisation of skills courses, such as PhD competence assessment; Techniques for writing and presenting a scientific paper; Voice matters - voice and presentation skills training; Project and time management; Mobilising your scientific network; Information literacy; Career orientation and other courses.

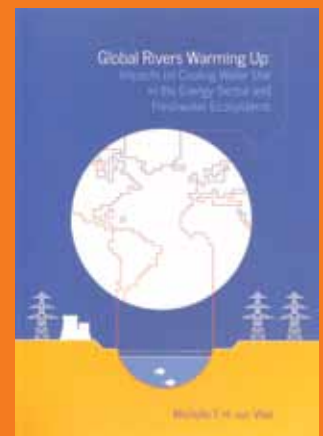
18 WIMEK PhD Graduations 2012



18-12-2012 | **Anselmo, H.M.R. Drs**
Effects of marine persistent organic pollutants on early life development and metamorphosis of echinoids



19-12-2012 | **Kim, C.T.**
Malaysian water sector reform : policy and performance



19-12-2012 | **Vliet, M.T.H. van**
Global rivers warming up: impacts on cooling water use in the energy sector and freshwater ecosystems

WIMEK-SENSE Symposia

SENSE Science Market

Towards a Biobased Economy

On 25 October 2012, 60 people gathered at the Leiden University Campus in Den Haag to discuss opportunities and pitfalls of a biobased economy, a future society that will run completely on renewable, biological resources. With a focus on SENSE PhD students, participants included SENSE scientists, employees from Dutch ministries (a.o. Karin Weustink, programme direction Biobased, Ministry of Economic Affairs, Agriculture and Innovation "ELI") and NGOs.

Huub Rijnaarts (ETE-WU) focused on shortcomings of the ELI approach, which could lead to a biobased economy causing resource depletion, new forms of pollution, and loss of biodiversity. Simply replacing fossil resources based supply's by biobased approaches are not sufficient. The ultimate goal of biobased must be a completely circular economy, based on solar energy, biobased chemicals and materials and recycling of water, nutrients and carbon, sustaining the biodiversity and eco-system services of natural resources. To accomplish this his demands an active role of governments with innovative policy support is required. In line with EU initiatives, involvement of Small and Medium sized Enterprises (SMEs) and Non-Government Organisations (NGOs) must get priority, in addition to the -generally automatically occurring- participation of the multinational industries in the areas of biotechnology, chemistry and energy. This is a typical topic to be addressed by WIMEK/SENSE since both natural science and technology, and socio-economic principles and understanding have to be combined in new approaches for sustainable biobased policies and businesses.

In parallel sessions, co-organized by SENSE Research Clusters, SENSE researchers presented papers on biotechnology, governance, transition research and ecosystem services.

In the closing plenary, chair Gert Spaargaren (Wageningen University) provoked discussions on the hottest topics of the day. It was generally agreed that a real biobased economy can only be a circular economy, based on circular technologies. This goes beyond present linear biotechnologies or the cradle-

to-cradle approach. Dutch techno-economic oriented Topsector policies have several deficits. Because of its multi-disciplinary knowledge, the SENSE Research School has much to offer to repair these deficits. Finally, governments must play an active role in the transition towards an effective, socially acceptable biobased economy.

WIMEK Symposium

Tackling the main Environmental Issues for the 21st Century - The need to improve inter- and transdisciplinary research approaches

On 8 November 2012 WIMEK organised a well-attended symposium on pathways to and experiences with inter- and transdisciplinary research. In his key note speech, Professor Alexander Zehnder, chair of WIMEK's International Advisory Board, stressed that modern day environmental problems are increasingly complex and single disciplines alone cannot solve them anymore. More and more there is an urgent need for a close collaboration between disciplines (interdisciplinary) and the inclusion of societal actors (transdisciplinary). Universities have generally a hard time to develop truly inter- and transdisciplinary projects. One of the reasons is that the hiring of faculty staff is mainly based on disciplinary excellence. Leaving the comfort zone of a discipline is a too high price for many scientist and engineers. The arguments heard for staying within a distinct discipline go from: too difficult to get funding, no way to make a publication in a high impact journal, to nobody reads or cites the work. Citations and publications in high impact journals are essential for a career in today's university environments. In his presentation Zehnder showed that on the contrary inter- and transdisciplinary projects have a high potential to make considerable impact, and get extensively cited. With a slight shift of its approach and philosophy WIMEK could make a considerable impact by (i) focussing more on interdisciplinary PhD training, (ii) extending the research network to relevant actors and stakeholders and (iii) focussing on the implementation of sustainable solutions.

Proofs of Esteem

SPINOZA award

The NWO/Spinoza Prize, the highest Dutch award in science sometimes also referred to as the 'Dutch Nobel Prize', is awarded to Dutch researchers who rank among the world's top scientists. The laureates are internationally renowned, and know how to inspire young researchers.

The Netherlands Organisation for Scientific Research (NWO) has awarded Professor Willem de Vos, microbiologist at WIMEK & VLAG graduate schools at Wageningen University, one of four NWO/Spinoza prizes for 2008. He received this prestigious prize (2,5 M€) for his ground-breaking research into the contribution of microorganisms to human food and health. For more information see: <http://www.wageningenur.nl/nl/Personen/prof.dr.-WM-Willem-de-Vos.htm>.

One year later, NWO has awarded WIMEK Professor Marten Scheffer (Aquatic Ecology and Water Quality Management Group) one of three NWO/Spinoza Prizes for 2009. Professor Scheffer received the prize (2,5 M€) for his pioneering contributions to our understanding of critical transitions in complex systems, varying from shifts in shallow lakes to climate change and the collapse of ancient cultures. For more information see: <http://www.wageningenur.nl/en/Persons/prof.dr.-M-Marten-Scheffer.htm>.

European Research Council (ERC) Grants

In 2010, Professor Marten Scheffer has been selected as one of the top research leaders by the European Research Council (ERC) in its competition for "Advanced Grants". Scheffer will spend the grant (2,5 M€) to do more research on early signals that announce a sudden change in a system, be it a migraine attack or a change in climate.

In 2012, Fons Stams of the Laboratory of Microbiology received an ERC Advanced Grant to investigate anaerobic microorganisms at Wageningen University and at the University of Minho (Braga, Portugal) where he is visiting scientist since 2010 for 3 months a year.

PhD awards

2011 and 2012 were very successful years for our WIMEK PhD graduates resulting in 4 cum laude PhD theses. Moreover, in both years WIMEK PhD graduates won the SENSE PhD award.

In 2011, the SENSE PhD Award competition had a particularly special outcome: two ex aequo Laureates of the SENSE PhD Award 2011.

The jury has decided to award it to both Dr. Annemiek ter Heijne (Environmental Technology, Wageningen University) and Dr. Sarian Kosten (Aquatic Ecology and Water Quality, Wageningen University).

Annemiek ter Heijne her thesis "Improving the cathode of a microbial fuel cell for efficient electricity production" is a collection of high quality articles on the potential of electricity from biomass with the help of a Microbial Fuel Cell. The introduction puts the technical processes in a broader perspective of renewable energy provision at the global scale in the future, while the conclusion provides a discussion on some of the barriers for the future development. The publication in high quality journals, as well as the patents, is proof of the scientific relevance and the quality of the work that has been delivered by the candidate.

The (cum laude) thesis of **Sarian Kosten** "Aquatic ecosystems in hot water, Effects of climate on the functioning of shallow lakes" studies shallow lakes and the role of climate change and the 'ecosystem services' delivered by the lake-systems. An impressive amount of empirical work over a wide geographical area is combined in the thesis, which resulted in six publications in high-impact journals. Together they make a substantive contribution to the scientific debate on climate impacts on shallow lakes.

During the SENSE Summer Academy 2012 **Vasilis Dakos** was presented the SENSE PhD Award 2012 for his (cum laude) thesis: "Expecting the Unexpected: Indicators of Resilience as Early-Warning Signals for Critical Transitions". The dissertation brings together the existing knowledge on system-changes happening

in the phase just preceding a tipping point. Its application on (both present and historical) climate changes makes this dissertation also very relevant for the environmental sciences. A very high quality product with impressive impact in the field.

At the 9th annual Wetsus Congress, October 2, 2012 (Leeuwarden), Environmental Technology PhD candidates **Fei Liu** and **Ran Zhao** won the Prof. Marcel Mulder Publication Prize for their papers published last year in Energy & Environmental Science (impact factor 9.6). In his research, Liu investigates the extraction of energy from the increase in entropy that results from the mixing of fresh water and seawater, while Zhao works on making improvements on the novel water desalination technology called membrane capacitive deionization (MCDI).

Other proofs of esteem

Marten Scheffer elected to Dutch Royal Academy of Sciences (KNAW)

WIMEK researcher Marten Scheffer has been appointed member of the Dutch Royal Academy of Sciences (KNAW). He is one of the 14 admitted to the academy this year. Scheffer has been officially installed on 10 September 2012.

The WIMEK-SENSE PhD Council

In the course of 2011 the WIMEK PhD council merged with the SENSE PhD council. The SENSE PhD Council (SPC) represents all PhD students involved in any of the partners of the SENSE Research School for Socio-Economic and Natural Sciences of the Environment. The main aims of the council are to provide students with all the information relevant to their work at the SENSE Network and to strongly work together on solving problems regarding education, supervision and planning that students might face during their research project.

A representative of the Council is normally present at the meetings of the SENSE Education Committee and at the meetings of the SENSE Board. In the opportunities, the council focus attention on all work-related issues brought to the SPC by students.

In the past years, some of the issues that were dealt with were:

- the overall rules regarding the teaching responsibilities of PhD students

- the modification and improvement of the introductory A1 course to all SENSE students
- the development of a new internet-based TSP and PhD research progress monitoring form, which will be implemented in 2013
- strengthening our contacts with SENSE alumni

Other activities of the SPC also include: organization of events that encourage students to participate in SENSE activities, promote the SENSE Research School as a Center of Excellence in research and create a link between students from different departments.

The SPC consists of a group of motivated and cooperative PhD students from different institutes within SENSE. If you want to know more about the current members, check out the SPC website. If you have any complaints, suggestions or doubts regarding the SPC, feel free to contact us. And off course we always warmly welcome new members interested in taking part in our activities!

For more information see: www.sense.nl/docs/2532.

Participants SENSE Introductory Course - March 2011



How to contact us

WIMEK

WIMEK Board (01-01-2013)

Prof. A.A.M. (Bert) Holtslag (chair)

Prof. R. (Rik) Leemans

Prof. H. (Henk) Siepel

Prof. G. (Gert) Spaargaren

Prof. A.J.M. (Fons) Stams

Prof. S.E.A.T.M. (Sjoerd) van der Zee

PhD candidate (vacancy)

Scientific Director

Professor H.H.M. (Huub) Rijnaarts

e Huub.Rijnaarts@wur.nl

Executive Secretary

Mr. J. (Johan) Feenstra

e Johan.Feenstra@wur.nl

SENSE PhD co-ordinator & WIMEK PhD counsellor

Ir. S.I.P. (Serge) Stalpers

e Serge.Stalpers@wur.nl

WIMEK Secretariat & SENSE website

Ir. M. (Marjolijn) Dannenburg

e Marjolijn.Dannenburg@wur.nl

WIMEK PhD mentor

Dr H.J. (Marieke) de Lange

e Marieke.deLange@wur.nl

Address

WIMEK, PO Box 47, 6700 AA, Wageningen

Office

Room A229, LUMEN Building (WUR building 100);

Droevendaalsesteeg 3a, 6708PD, Wageningen.

Phone

+31 317 484836 (Mr. Johan Feenstra)

Wimek website

www.wimek.wur.nl

SENSE

Director of Education

Dr. Ad van Dommelen

e Ad.van.Dommelen@ivm.vu.nl

Coordinator SENSE Research School

Mr. Johan Feenstra

e Johan.Feenstra@wur.nl

Website manager / communication officer

Ir. Marjolijn Dannenburg

e Marjolijn.Dannenburg@wur.nl

SENSE website

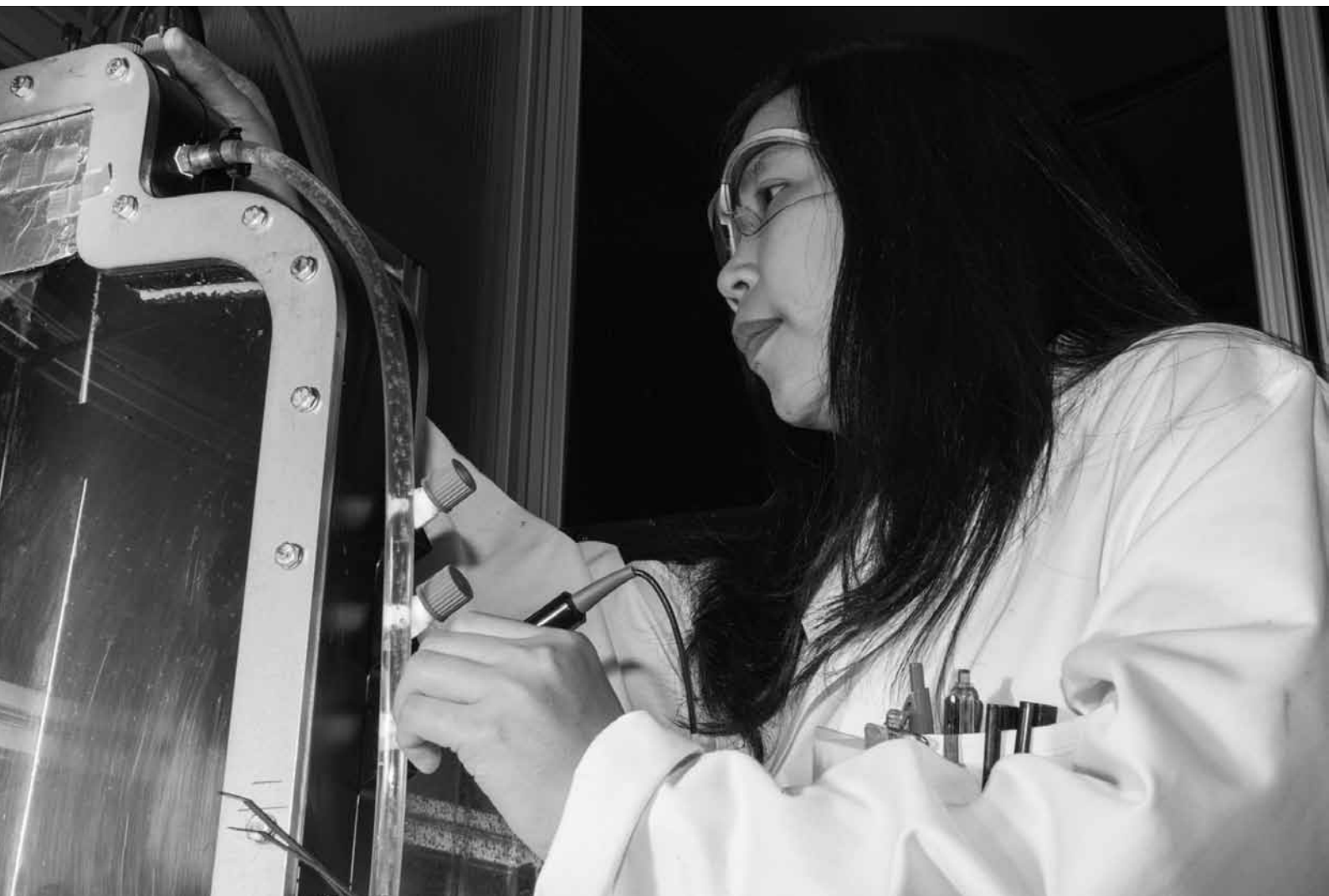
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International Advisory Board (IAB) WIMEK

- Prof. Alex Zehnder (Emeritus Professor of Environmental Biotechnology at ETH Zurich);
- Prof. Wolfgang Cramer (Professor of Global Ecology, Institute of Geo-ecology, Potsdam University, Germany);
- Prof. Guy Brasseur (Associate Director for Research and Director of the "Earth-Sun Systems Laboratory" ESSL at NCAR);
- Prof. Philip Lowe (Professor of Rural Economy, University of Newcastle upon Tyne)



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ANNEX 1: WIMEK Research Groups

Code	Chair Group	WIMEK Research Group Leader(s)	%
AEW	Aquatic Ecology and Water Quality Management Group	Prof. M. (Marten) Scheffer & Prof. A.A. (Bart) Koelmans	100 %
ENP	Environmental Policy Group	Prof. A.P.J. (Arthur) Mol & Prof. G. (Gert) Spaargaren	50%
ENR	Environmental Economics and Natural Resources Group	Prof. E.C. (Ekko) van Ierland	35%
ESA	Environmental Systems Analysis Group	Prof. R. (Rik) Leemans	100%
ESS	Earth System Science Group	Prof. P. (Pavel) Kabat & Prof. R. (Rik) Leemans	100%
ETE	Environmental Technology Group	Prof. H.H.M. (Huub) Rijnaarts & Prof. C.J.N. (Cees) Buisman	100%
HWM	Hydrology and Quantitative Water Management Group	Prof. R. (Remko) Uijlenhoet	100%
LAR	Landscape Architecture Group	Prof. A. (Adri) van den Brink	100%
LUP	Land Use Planning Group	Prof. P.F.M. (Paul) Opdam	20%
MAQ	Meteorology and Air Quality Group	Prof. A.A.M. (Bert) Holtslag & Prof. M. (Maarten) Krol	100%
MIB	Microbiology Group (only Environmental Microbiology part)	Prof. W.M. (Willem) de Vos & Prof. A.J.M. (Fons) Stams	30%
NCP	Nature Conservation and Plant Ecology Group (3)	Prof. F. (Frank) Berendse	20%
SCO	Systems and Control Group	Dr. K. (Karel) Keesman	10%
SLM	Soil Physics en land Management Group	Prof. C.J. (Coen) Ritsema & Prof. S.E.A.T.M. (Sjoerd) van der Zee	70%
SOQ	Soil Chemistry and Chemical Soil Quality Group	Prof. R.N.J. (Rob) Comans	100%
TOX	Toxicology Group	Prof. I.M.C.M. (Ivonne) Rietjens & Prof. A.J. (Tinka) Murk	20%

Left page, top: The innovative building of the Netherlands Institute of Ecology (NIOO-KNAW) is home to several green-roof experiments of a team from scientific, governmental and business organisations. Source: NIOO-KNAW

Left page, bottom: PhD student Kanjana Tuantet discovered that algae efficiently take up nutrients from urine, turning an abundant waste product into a new resource. Photographer: Hans Wolkers

ANNEX 2: Notes

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