CML: Institute of Environmental Sciences

Universiteit Leiden
The Netherlands

CML
Institute of Environmental Sciences

Discover the world at Leiden University.

WELCOME

Our Institute of Environmental Sciences (CML) is one of the world's leading institutes in research and education in environmental sustainability. We are proud to present the highlights of our work of the past two years.

In 2013-2014, we published over 100 papers, contributed to various international sustainability debates, renovated our building and educated thousands of students from all over the world through our MOOC. These accomplishments and many more are highlighted in this booklet, we wish you a pleasant read.

CML staff, researchers and students

Our mission is to provide strategic multidisciplinary research and teaching in the sustainable management of natural resources, environmental quality and biodiversity.

Research

We have two distinct research programmes: Conservation Biology and Industrial Ecology.

Our Conservation Biology programme focuses on subjects related to understanding the impact humans are having on biodiversity and natural resources and contributes to their optimal management, while the Industrial Ecology programme is involved in research into the development of decision-making tools for sustainable production and consumption.

Our research is a balanced mix of fundamental and applied science for national and European science foundations, and contract research for clients such as the Dutch government and the private sector.

Education

CML is the centre for sustainability expertise at Leiden University.

Our courses prepare students for a future role in managing the world's natural resources, environmental quality and biodiversity.

We offer a Masters in Industrial Ecology, a Minor in Sustainable Development, a specialization track in Conservation Biology, a popular open online course (MOOC) on Metal Scarcity and a PhD programme.

1978
CML was founded as part of Leiden University

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Research programmes: Conservation Biology and Industrial Ecology

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Teaching programmes

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PhDs awarded in 2013-2014

196
Publications in 2013-2014


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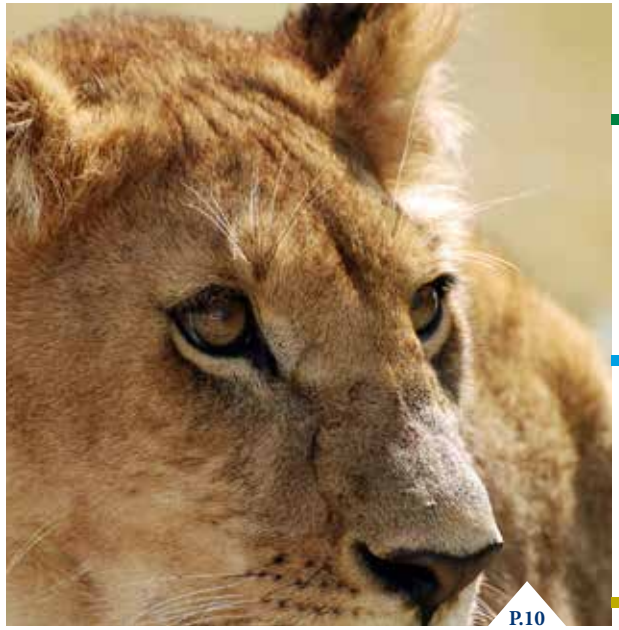
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SOCIETY 2013

CML contributes to debate in Nature about saving lions with dollars and fences

CML research on pesticides and water quality on Dutch television programme Zembla

CML PhD student featured in article on circular economy in popular science magazine KIJK

UN panel raises alarm on energy use in metal production. CML researcher is on the panel

Minister of Environment submits CML report "Omstreden Bestrijding" (Controversial Weed Control) to Dutch Parliament

Prize for societal impact: Ester van der Voet

Radio interview with Prof. Geert de Snoo on the future of nature conservation on farmland

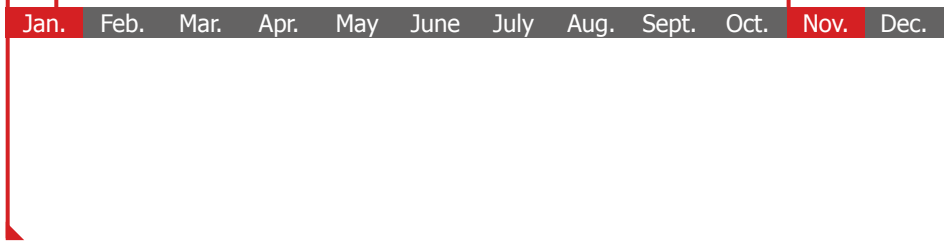
Radio interview with Dr René Kleijn on the environmental impact of throwaway Dutch public-transport cards containing RFID chips

2014

Prof. Arnold Tukker part of steering committee European Rare Earth Competence Network

CML parakeet research on VARA's Vroege Vogels programme

Lions collared in Nairobi National Park by team from Leiden University



Prize for societal impact: Martina Vijver & Paul van den Brink

UN panel raises the alarm on energy use in metal production

Dr Ester van der Voet is a member of the International Resource Panel

The amount of energy used in metal production is very high. Primary metals production is responsible for 7 to 8% of total global energy use. "This shocked us," said Dr Ester van der Voet. Production from scrap recycling is much less energy intensive and can therefore reduce energy requirements significantly. But, "the demand for metals keeps on growing. As long as this is the case, recycling will never be able to supply a substantial part of the metal demand," according to van der Voet.

For a circular economy, demand has to level off. This is, however, unlikely to occur as long as the global population is still growing and infrastructure is being developed, but it can be a goal for the future. Another aim is to increase recycling rates, which are presently too low. Metal systems, therefore, have to be designed so they can be recycled and this involves not only recycling technologies but also the material and product design.

The International Resource Panel

The International Resource Panel is made up of renowned scientists from all over the world. Their task is to develop scientific assessments of the environmental impact of human resource use throughout the full lifecycle, and to advise on ways of reducing the impact. Van der Voet contributed to the report entitled *Priority Products and Materials* and was the principal author of *The Environmental Challenges of Anthropogenic Metals Flows and Cycles*.

See the full report:
http://tinyurl.com/Metals-Report

Saving lions by following their every move

Lions collared in Nairobi National Park by a team from Leiden University

A female and male lion were collared with satellite collars on 25 January 2014 by a joint team from the Kenya Wildlife Service, scientists from Leiden University and the Leo Foundation. Prof. Hans de Iongh, who is also a member of the IUCN Species Survival Commission, and PhD student Francis Lesilau from CML have been assisting in collarings since 2007. The project has resulted in a significantly lower mortality rate among lions.

"Without the collaring programme, the retaliatory killing of livestock-raiding lions by Maasai would have continued. And with a population of only 35 lions in Nairobi National Park, this could have led to the extinction of the entire population."
Prof. Hans de Iongh

A population of some 35 adult lions are now living in Nairobi National Park. Since it covers an area of only 117 km^2, the animals regularly leave the park and go to the nearby urban areas in Nairobi to the north or to the rural livestock areas in the south. This has resulted in growing conflicts between people and lions, with increasing numbers of lions being killed or translocated as a result of conflicts.

The joint research programme between Kenya Wildlife Service and Leiden University intends to map the conflict areas and develop an early warning system for conflict prevention and conflict management. The satellite collars send an SMS warning to scientists if lions come within 500 meters of livestock corrals. A rapid response team of local rangers can then intervene by going to the area to assist the Maasai livestock owners.

Stans Prize for research on human-lion conflicts in the Nairobi National Park
Myrthe Fonck won the 2014 Stans Prize for her Masters thesis entitled *Human-Lion Conflicts in the Nairobi National Park: Lion Diets and Factors Influencing Lion Prey Choice*. This prize is an annual student incentive award for the best thesis, article or report produced by a CML student.

YouTube video on lion collaring:
http://tinyurl.com/Video-Lions

Marthe Fonck wins the Stans Prize:
http://tinyurl.com/Prize-Marthe

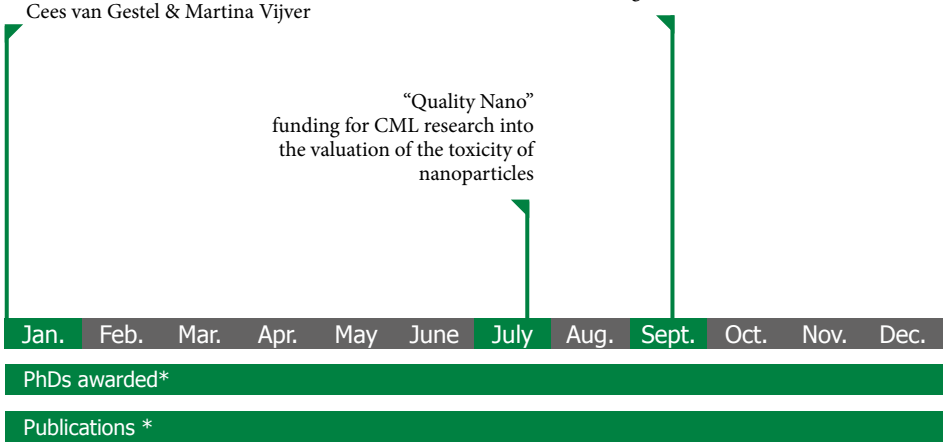
Paper by Prof. Hans de Iongh:
http://tinyurl.com/Paper-Iongh

RESEARCH 2013

Prizes:
- Best MSc thesis (Stans): Anika Regett
- Best scientic publication: Hao Qiu, Willie Peijnenburg, Cees van Gestel & Martina Vijver

Dr Martina Vijver receives NWO ASPASIA grant

"Quality Nano" funding for CML research into the valuation of the toxicity of nanoparticles



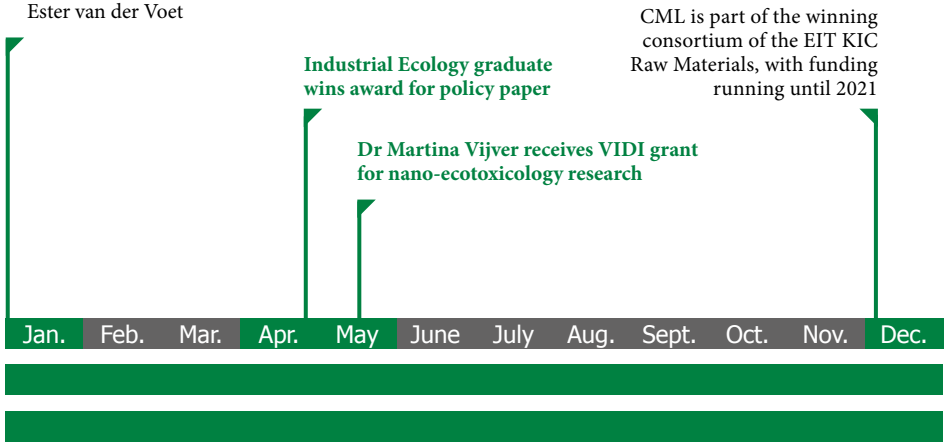
2014

Prizes:
- Best MSc thesis (Stans): Myrthe Fonck
- Best scientic publication: David Font Vivanco & Ester van der Voet

Industrial Ecology graduate wins award for policy paper

CML is part of the winning consortium of the EIT KIC Raw Materials, with funding running until 2021

Dr Martina Vijver receives VIDI grant for nano-ecotoxicology research



**For a complete list of all publications and PhD defences: http://www.cml.leiden.edu/publications/*

Assessing the environmental risks of nanomaterials

Dr Martina Vijver receives VIDI grant for nano-ecotoxicology research

Scratchproof glasses, crack-resistant paints, anti-graffiti wall coatings and many other products contain nanoparticles. But despite their widespread use, we do not yet know the risks of these particles. CML researcher Martina Vijver received a VIDI grant in 2014 to research the environmental risks of nanomaterials.

"I believe that nanotechnology products offer new solutions in many different branches, such as biomedical and technical fields, and I am very positive about this. Nevertheless, I am aware of the unwarranted side-effects and my aim is to find a scientific understanding for the potential risks that can occur."
Dr Martina Vijver

Vijver and her fellow researchers will combine ecotoxicological knowledge with advanced microscopy to determine how particles are taken up, where they end up in the body and, specifically, in which cells, and whether they cause any damage. This information will have great scientific value and also offers practical knowledge that can be used in the design and synthesis of new nanoparticles.

In addition to her academic career at Leiden University, Vijver is also advising policy makers and communicating relevant scientific results to a wider general audience. For more information, see: www.epa.gov/ecotox, www.pnec-pro.com and www.bestrijdingsmiddelenatlas.nl

VIDI grants

VIDI grants are awarded to scientists who are in the top 10% in their field and have excelled in research in the first few years after receiving their PhDs. They are awarded by the Netherlands Organisation for Scientific Research (NWO) and provide research funding for a period of five years.

Industrial Ecology alumnus wins award for policy paper

Assessing the potential of recycling strategy against rare earth element criticality

An article by one of our former Industrial Ecology Masters students, Jelle Rademaker, was the second runner-up for the best policy paper in the prestigious journal *Environmental Science and Technology* in 2013. His article, which was written jointly with his supervisors René Kleijn (Leiden University) and Yongxiang Yang (Delft University of Technology), was based on his MSc thesis.

"My Masters in Industrial Ecology and writing this award-winning paper have taught me how to analyze, understand and tackle complex, multidisciplinary issues. As an entrepreneur now, I still benefit daily from these skills."
Jelle Rademaker, Industrial Ecology graduate

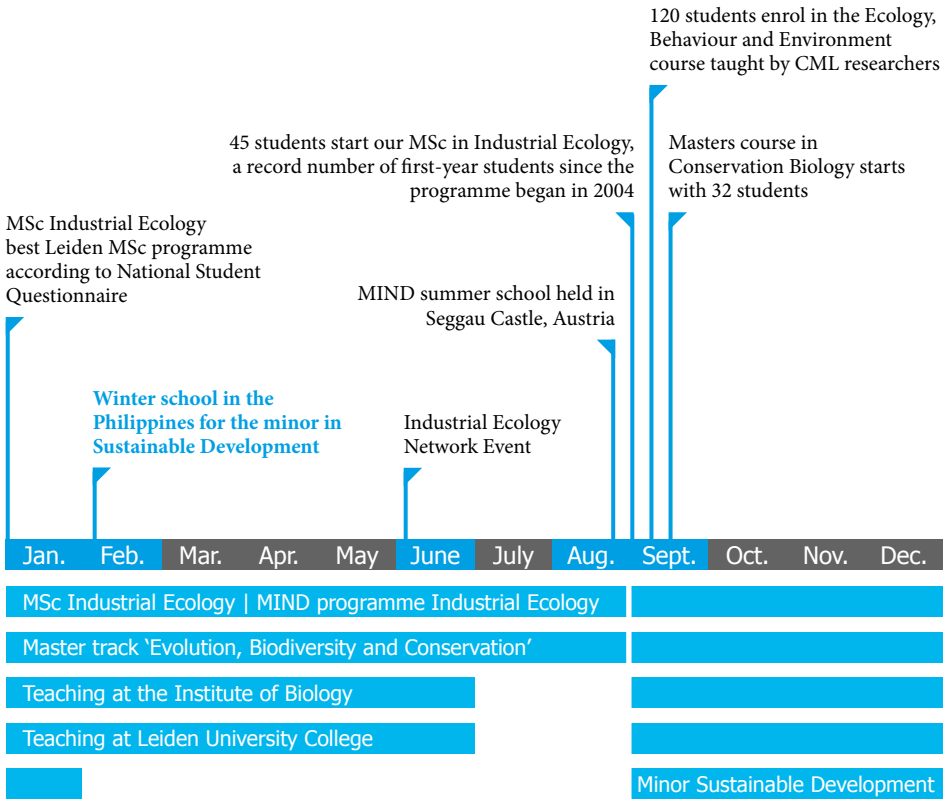
Rare earth elements are key to many clean technologies, such as electric vehicles and wind turbines, but they are in short supply and are predominantly produced in one country, namely China. For many OECD countries, this has been a cause of concern and has led to the introduction of strategies that would decrease dependence on the primary production of rare earth elements. One of the often quoted 'solutions' is recycling, even though there was little research done on its potential. Rademaker's paper changed this and offered insight into its potential value.

Results

Rademaker's paper assessed the potential of a recycling strategy against rare earth element criticality for a diverse set of high-tech and cleantech applications of rare earth elements for the period 2011-2030. Results show that for some time to come, waste flows will remain small relative to the rapidly growing global rare earth element demand. Policymakers therefore need to be aware that during the next decade recycling is unlikely to substantially contribute to global rare earth element supply security. Future rare earth element recycling efforts should focus on the development of recycling technology and infrastructure.

Read the full paper:
http://tinyurl.com/Paper-Rademaker

EDUCATION 2013



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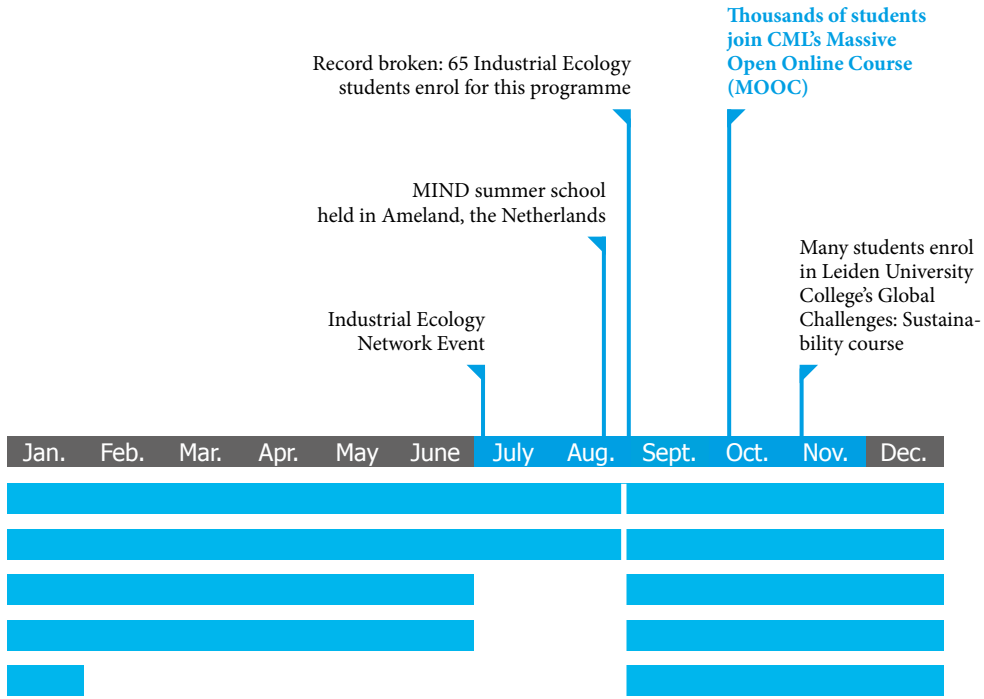


20 Photo by Merlijn van Weerd

Minor in Sustainable Development: waste and crocodiles

Learning how the world's major environmental problems can be made manageable

In 2013, students on CML's Sustainable Development course researched the City of Leiden's waste policy and presented their results to a panel of waste and recycling experts. Their message was "don't let our research results disappear into the trash!"

"The nice thing about the Minor in Sustainable Development for me was working in a small group with students from different backgrounds who all shared an interest in sustainability. No matter what your education or prior knowledge is, everyone is welcome to enrol and learn more about sustainability. The enthusiasm of the teachers made it even more fun."
Jeanine Floris, third-year psychology student

Although there are national and European guidelines on the disposal of waste, each municipality handles its waste differently. The 19 students on this course concluded that the municipality of Leiden is working efficiently but that there is still room for improvement, for example in recycling glass and paper waste. One of the problems is that a lot of nonglass waste is thrown into the glass recycling bins. The students advised the municipality to place a waste container near the glass containers and although this might seem logical, it is rarely done.

Crocodiles

As part of the international water management course, five students had the opportunity to visit the Philippines for an interdisciplinary Winter School. They all researched issues relating to water use, including tropical rainforests, agriculture, the situation of the indigenous people in the northeastern Luzon area and even crocodiles.

For more information on the Minor in Sustainable Development:
http://tinyurl.com/Minor-CML

Thousands of students join CML's Massive Open Online Course

Can we meet the metals challenge?

CML hosted its first Massive Open Online Course (MOOC) entitled *Wheels of Metals: Urban Mining for a Circular Economy* in 2014. It was based on reports by the Global Metals Flows Working Group for the UNEP's International Resource Panel (IRP) and was developed in cooperation with UNEP. Dr Ester van der Voet was the lead instructor and designed the course with Drs Ruben Huele.

"Metals are indispensable in today's society and are found in buildings, cars, planes, electronic products and so on. The world's population and affluence is growing and the demand for metals is increasing at the same time. Supply is also growing to match this demand, but at the expense of increased energy use. The challenge is how to produce sufficient metals, not just now but also in the future, and in an low impact manner."
Dr van der Voet, Lecture in week 5

The highlights of the course were:

- a Google Hangout with members of the International Resource Panel
- an Elevator Pitch on the Circular Economy for Metals, with the ten best pitches being presented to the International Resource Panel
- more than 5000 participants from 148 different countries

Experiences of students and staff

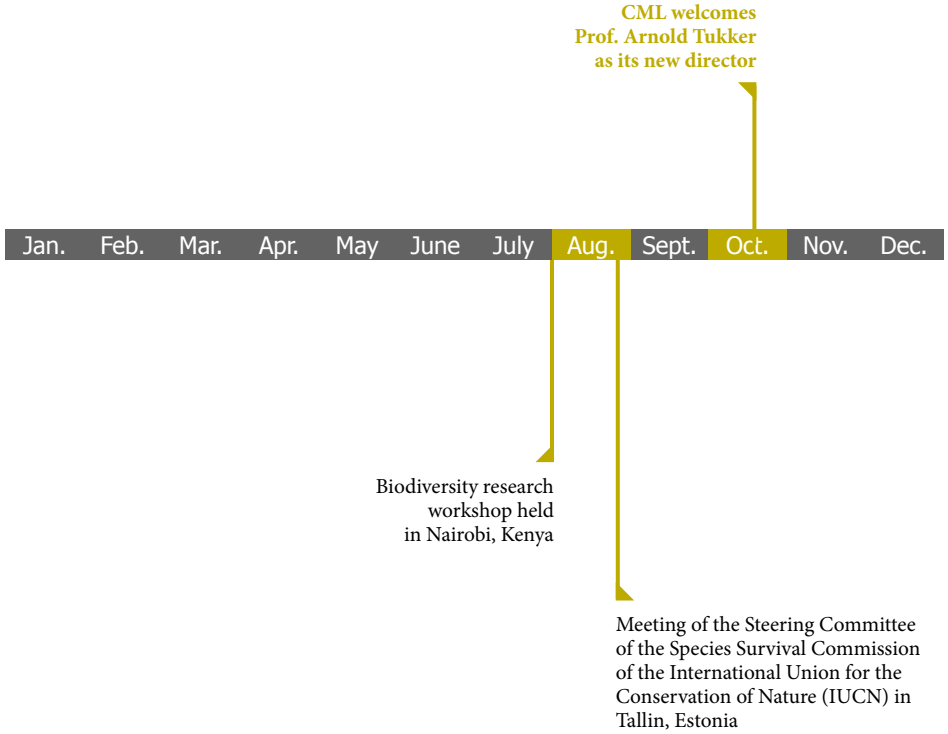
"Thank you for this MOOC and let's do the job! Special thanks go to Prof. van der Voet, the staff, Coursera, the Internet and all my classmates from around the Earth."
Wilfredo Angeles Sarmiento, Qatar

"As a result of this course, I learned that there is such a thing called backcasting. I'd never heard the term before. Thanks for the new knowledge!"
Ljubomir Gatdula, Philippines

"I'm so very glad to have done this MOOC with a global class, participants from all over the world who have to address this global challenge together. Thank you very much for being there with me."
Dr van der Voet, The Netherlands

Curious about the MOOC?
https://www.coursera.org/course/metals

ORGANIZATION 2013



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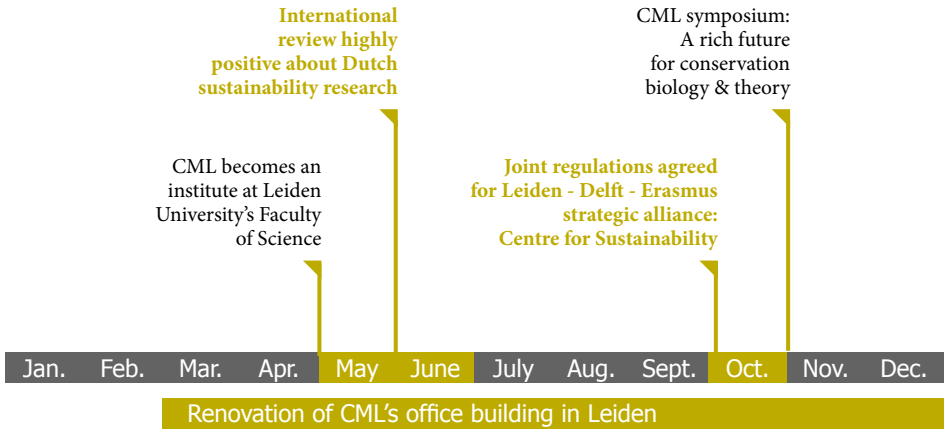

A new director

CML welcomes its new director Prof. Arnold Tukker

Prof. Arnold Tukker became the scientific director of CML on 1 October 2013. He also has the Chair of Industrial Ecology and is Head of CML's Department of Industrial Ecology. He will support and expand CML's international research and educational programmes in Industrial Ecology and Conservation Biology and will play an important role in developing the Leiden-Delft-Erasmus Centre for Sustainability.

"I want us to have an even greater impact on policy and science than we already do."

"It is fun working with PhD and MSc students and coming up with new research ideas together."
Prof. Arnold Tukker

In addition to his work at CML, Tukker plans to keep his part-time research position at TNO, a well-respected not-for-profit research organization in the Netherlands. One of his projects involves the development of Exiobase (www.exiobase.eu), a global, detailed Multi-regional Environmentally Extended Supply and Use / Input Output (MR EE SUT/IOT) database. This database provides insight into the global resource footprint of nations, quantifying carbon, water, land and materials embodied in trade and final consumption.

The Leiden-Delft-Erasmus Centre for Sustainability

Prof. Tukker is the Chair of the executive board of the Centre for Sustainability. Leiden University, Delft University of Technology and Erasmus University Rotterdam are working together on the subject of sustainability in a strategic alliance. The Centre aims to contribute to the sustainable production, management and use of resources in an urbanizing world.

The website of the Centre for Sustainability: http://centre-for-sustainability.nl

Download the booklet "The Global Resource Footprint of Nations". Footprints are calculated using EXIOBASE 2.1: http://tinyurl.com/Booklet-Footprint

International review highly positive about Dutch sustainability research

Review: CML has a good reputation and a strong base from which to develop

Environmental and sustainability research in the Netherlands is considered to be of a very high standard, according to an international evaluation by a group of 39 professors. CML was one of the research groups reviewed in 2014.

"CML works on important questions, relevant to some of the most critical problems facing humanity. Some of its work has been taken up in policy and practice, for example by the UN Environment Programme (Industrial Ecology) and in regulation of pesticides and agrochemicals (Conservation Biology)."
Assessment Report, 2014

The Dutch institutes were all very positively assessed by the international reviewers and praised for their interdisciplinary cooperation and the societal relevance of their scientific research. The scientific excellence and the communication and leadership skills of young professionals who have followed courses in environmental and sustainability research in the Netherlands make them attractive to future employers both nationally and internationally.

Industrial Ecology and Mathematics are the best Leiden Masters Programmes

The Masters in Industrial Ecology and Mathematics have been ranked as the top Master programmes in Leiden, according to the Dutch National Student Survey 2013. The survey was completed by nearly 265,000 university students.

See you next year?

We hope our annual report has given you an idea of our institute's activities and achievements in 2013-2014.

We look forward to hearing from you
For additional information, please visit our website: http://www.cml.leiden.edu, contact us on +31 (0)71 527 7461 or email us at secretariaat@cml.leidenuniv.nl.

We are proud of what we have achieved in the last two years and are excited about what the future will bring!

CML staff, researchers and students

Colophon

Compiled by Communicatie voor Duurzaamheid

Editorial team
Concept design and content: Merel Segers
Graphic design: Tiron Graphics
Language editing: Ann Reeves

Thanks to all CML staff, researchers and students that have contributed to the report
Paul de Hoog, Dr Ester van der Voet, Prof. Hans de Iongh, Dr Martina Vijver, Jelle Rademaker, Prof. Arnold Tukker, Marlijn van Weerd, Dr Peter van Bodegom, Susan van den Oever, Maarten van 't Zelfde, Esther Philips-Volriet, Dr René Kleijn

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