Forty years of Leiden environmental science: the history of the Leiden Institute of Environmental Sciences (CML) 1978-2018

Tukker, A.; Udo De Haes, H.A.; Groot, W.T. de; Barendse, G.; Huppes, G.; Voet, E. van der; ... ; Bodegom, P.M. van

Forty years of Leiden environmental science

The history of the Leiden Institute of Environmental Sciences (CML) 1978 – 2018

Ed Olivier

Forty years of
Leiden environmental science

Forty years of Leiden environmental science

The history of the Leiden Institute of Environmental Sciences (CML) 1978 – 2018

Ed Olivier

Cover photo **Hurricane Isabel on 15 September, 2015, just before the severe weather reaches the east coast of the United States.**
The photo was taken by the crew of the International Space Station (ISS).
Image courtesy of Mike Trenchard, Earth Sciences & Image Analysis Laboratory, NASA Johnson Space Center.

Contents

Forty years of Leiden environmental science

Forty years of Leiden environmental science relates the story of CML, today one of the Faculty of Science's eight institutes but with its roots in a more or less independent group of ex-activists within the university.

Back in the day, many of those at the top of the university would probably have had trouble accepting that 'those upstarts' would still be around forty years on – not locked away in some cubbyhole with their stencil duplicator, but as a professor, assistant professor or even a dean. Today they are professors emeritus or have retired: Helias Udo de Haes, Wouter de Groot, Gerard Barendse, Gjalt Huppes, Gerard Persoon, Hans de Iongh and Jan Boersema – which doesn't stop most of them just carrying on working. And a new generation of environmental scientists is now leading CML's research and teaching: Geert de Snoo, Arnold Tukker, Martina Vijver, Peter van Bodegom, Jeroen Guinée, Ester van der Voet and René Kleijn.

During the first ten-year **period, 1978 – 1987**, the Environmental Science Centre – as it was then known – wrests itself free of the activist past of Udo de Haes, then with the Department of Environmental Biology and fighting construction of the Leidse Baan road, the Witte Singel Doelen complex and the siting of the new academic hospital out in the polder, and sets up shop at Rapenburg 127, embarking on a programme geared mainly to teaching. The new Centre takes over the existing interfaculty Environmental Science course from the Environmental Biology department. Two interuniversity study groups – led by Udo de Haes and De Groot – do research on drinking water extraction versus conservation and recreation in the dunes between Scheveningen and IJmuiden. The first projects take shape: on intensive livestock farming, the Integrated Study on Dune Drinking Water Extraction, coastal protection of the North Sea island Texel and the toxicity of flower-bulb pesticides. In 1983 CML moves to the former girls' high school on Leiden's Garenmarkt. In 1984 the *Basisboek Milieukunde* ('Textbook of Environmental Science') is published.

During the **period 1988 – 1997** a wave of environmental awareness sweeps across the Netherlands. There's huge interest in the courses on offer at CML, with hundreds of requests for an information pack; at the time the Centre – first a working group, then an interfaculty department, now an institute – has no dedicated programme of its own. For its 61 staff,

excluding students, in 1988 CML disposes over nineteen offices in the Garenmarkt premises and three elsewhere in town. There's further research on pesticides, in surface waters and in field margins. On a commission from Zuid-Holland Provincial Executive and the Ministry of Public Housing, Spatial Planning and the Environment, Gjalt Huppes works on material balances for cadmium and polycyclic aromatic hydrocarbons (PAH) and a 'deposit' system for nitrogen and phosphorus, nutrients that are causing environmental eutrophication. Studies on the cradle-to-grave environmental footprint of products are given the now familiar name Life Cycle Assessment (LCA). CML leads the field in this area and augments the analytical toolkit first with Substance Flow Analysis (SFA) and later Environmentally-Extended Input-Output Analysis. The Environment and Development section opens field stations in Cameroon and the Philippines. In 1995 the Centre moves to its present location, the Van Steenis Building on Leiden's Einsteinweg. While the first CML staff member obtains his doctorate in Frankfurt, Germany in 1988 (Kees Canter), 1991 sees the first home-grown PhD at CML, when Dik Melman is conferred his doctorate under Udo de Haes.

In the **period 1998 – 2007** storm clouds are brewing over CML. While the university's Executive Board would like to see it join one of the faculties, the interdisciplinary nature of the Centre's work is becoming problematical. Too much hard science for the Faculty of Social and Behavioural Sciences, too much social science for the Faculty of Science. Reviews by accreditation panels are consistently 'good to excellent', but director of education Gerard Barendse sees day-to-day life at the university becoming ever tougher and more business-like.

CML's scientific work on LCA is gaining ever more international traction and in 2002 the groundbreaking 'Handbook on LCA: operational guide to ISO standards' is published. In 2003 CML goes 'plural', when the Leiden Environmental Science Centre is renamed the Institute of Environmental Sciences, Leiden University. The Dutch abbreviation CML is retained. Once it becomes clear there's no future for CML if it doesn't have an educational programme of its own, Van der Voet and Kleijn get together to draw up an Industrial Ecology curriculum. They succeed and in 2004 CML can for the first time offer students its very own Master's in Industrial Ecology. An important step for the institute is the launch of the online Pesticide Atlas in 2004. In 2006 founding father Udo de Haes takes his leave from the Institute of Environmental Sciences.

In the **period 2008 – 2017** the institute embarks on a painful reorganization that will resonate for years in the 'happy family' that CML once was. Leaving the Environment and Development section (and their field stations) behind, two sections, Conservation Biology and Industrial Ecology, carry on under the flag of the Faculty of Science. In 2009 Geert de Snoo is appointed Professor of Conservation Biology as well as Director of CML. Together with several colleagues, Gerard Persoon moves to the Faculty of Social and Behavioural Sciences, where he's appointed Professor of Anthropology.

Leave is taken of the field stations in the Philippines and Cameroon – in style, with a 'farewell conference' and two handsome books reviewing their work. CML reformulates its mission: 'Multidisciplinary research and education in relation to the sustainable management of natural resources, environmental quality and biodiversity at the highest level, with a good balance between theoretical and applied science'.

In 2012 Geert de Snoo is appointed Dean of the Faculty of Science. Eddy van der Meijden moves in as interim-director until the post is taken over in October 2013 by Arnold Tukker, CML's current director.

It's not shouted from the pages, but in the book *Bestrijdingsmiddelen en waterkwaliteit* ('Pesticides and Water Quality') Geert De Snoo and Martina Vijver settle scores with the official Review of the government's report on 'Sustainable crop protection' (spring 2012) published by the National Environmental Assessment Agency, which using models paints a far rosier picture of Dutch surface-water quality than is borne out by measurements. Under the leadership of Arnold Tukker, the universities of Leiden, Delft and Rotterdam collaborate on the Centre for Sustainability. In 2016 Martina Vijver takes the initiative to crowdfund a 'Living Lab': 36 experimental ditches on a patch of wasteland at the Bio Science Park in Oegstgeest. The ditches are connected via a pool to the Old Rhine and are used to monitor the real-world impact of pesticides and herbicides on surface-water quality.

Fieldwork assistant Erik Gertenaar collects material for PhD student Milena Blomqvist's study on ditch-bank plant diversity. Photo Milena Blomqvist, 2003

Can't you get those upstarts to stop their antics?

Prehistory: activism from the Department of Environmental Biology

When Helias Udo de Haes – founder of the Leiden Environmental Science Centre, now the Institute of Environmental Sciences – graduates from Leiden as a biologist in 1968 there's plenty afoot at universities in the Netherlands. In Amsterdam students are preparing for the legendary five-day occupation of the Maagdenhuis, the University of Amsterdam's main administrative building. The occupation is triggered by a similar action at Tilburg Catholic University, which for the occasion is renamed Karl Marx University. In Groningen physical geography students are up in arms against their lecturer Dr. W.F. Hermans, who subsequently refuses to continue lecturing and ends up resigning. In his book *Onder professoren* ('Amongst Professors') the renowned author metes out his revenge on students and ex-colleagues.[1]

The actions mark the birth of a move towards greater student participation in university curricula.

Notes on page 18

The fledgling student union is setting demands, which include lower canteen prices and more student accommodation. Actions generally conclude with a pledge of solidarity with the struggles of other sections of society around the world. Above all, the actions are seen as a protest against an academic world that has grown stuffy and introvert.

'Turbulent times,' in the words of national daily *Trouw*. 'People had a predominantly left-wing mindset.'[2] The TV documentary *Een monument van ongeduld* ('A monument of impatience'), a retrospective on the '70s, opens with student protests at the University of Amsterdam's Social Sciences faculty. The students are demanding 'socially relevant' lectures and want the university to declare itself an anti-capitalist institution. According to the *Trouw* article, the Netherlands is now a divided nation that has fallen prey to polarized thinking bereft of any nuance. A scandal at Dennendal, an anti-authoritarian institute for the mentally handicapped, has split the country. In Amsterdam, squatters defending occupied houses in Vondelstraat are engaged in pitched battles with the police.

'Things were all pretty crazy back then', the newspaper concludes twenty years later, 'but at times we miss the idealism and enthusiasm of those days'. The protests of the '70s are now often referred to as 'first-generation citizen participation': a newfound ability to respond to policy, wrested from the powers that be by a newly emancipated citizenry. Over the years this has become a right laid down in law, meticulously spelled out in participation policies at the national, regional and local level.[3]

In the 1970s public participation starts being introduced under the influence of student protests.

Club of Rome

The year CML's founding father Helias Udo de Haes graduates as a biologist from Leiden, 1968, the Club of Rome is meeting for the first time: a group of 36 scientists, economists and industrialists with grave concerns about population growth, food production, industrialization and depletion of natural resources. Despite blanket scepticism from politicians and captains of industry, they succeed in putting environmental issues on the international agenda. When the Club of Rome's report *Limits to Growth* is published in 1972, Dutch scientists have already been coming together for a year in an association calling itself the Environmental Defence Council.

In 1968 the Club of Rome meets for the first time.

For academics to come into action against the pollution of the Rhine and opening of a nuclear power plant at Borssele is pretty much unheard of. At the University of Utrecht there's resistance to the planned construction of a motorway – today's A27 – straight through the country estate Oud Amelisweerd, and at Leiden University there are protests against construction of the new Leidse Baan road connecting The Hague and Leiden, east of then-National Route 44.

'The future is inundating us, rather than us shaping it,' is how Labour Party leader Joop den Uyl describes it in his notes from that era. 'Urbanization is not being managed like the Delta Works,' he writes, a reference to the immense sea barrier project being planned on the Dutch west coast.[4]

From 1950 through to the oil crisis of 1973 the Netherlands has seen unprecedented economic growth. 'We took over the helm too late,' Den Uyl himself writes, looking back on his first and only cabinet ten years later. 'When we took over, the will to reform had already peaked. History goes in waves, you know: from 1945 to 1965 there was a surge of confidence in some kind of social engineering, but now that wave's reversed.'

In 1971 Dutch scientists set up the Environmental Defence Council.

Oil boycott

Speaking on the post-war 'golden quarter-century' in a television speech on 1 December, 1973, Den Uyl concludes: 'Those days are gone forever'. In response to the oil boycott against the United States and the Netherlands announced by the Arab OPEC nations the prime minister announces a series of policies, including the first of ten traffic-free Sundays. At the end of his governing period in 1977 Den Uyl tells the coun-

Traffic-free Sunday 4 November, 1973. Picnic and music on the motorway.
Photo R. Mieremet/Anefo

In the mid-1970s politicians also begin to recognize environment damage as an issue.

try the new era will be characterized by fuel shortages, higher energy prices, lower population growth and a shift of jobs from production to services.

Eastern Scheldt, a spectacular environmental decision

The Den Uyl government (1973-1977) fails to achieve what everyone had expected or feared, but at the end of 1974 it takes a spectacular environmental decision. The cabinet is plunged into crisis when it emerges that junior parties PPR and D66 want to leave the Eastern Scheldt section of the Delta Works undammed, as do Labour ministers Jan Pronk, Irene Vorrink and Wim Meijer. Their motive: while damming the Eastern Scheldt will afford Zeeland province flood protection, it will irreversibly damage the unique brackish-water environment. Ministers Westerterp (KVP, Transport & Public Works) and Duisenberg (Labour, Finance) double down, though. A study committee comprising among others Professor Kuenen, head of the Microbiology Department, comes up with an idea as expensive as it is brilliant: a half-open dam that lets in the sea-water in normal weather conditions but holds it back during storms. Den Uyl gratefully throws his weight behind this solution, but Westerterp and Duisenberg are not going down without a fight. The almost two billion guilders extra the storm-surge caisson dam would cost is deemed far too high a price by the finance minister. Leaned on by his colleagues, though, he eventually agrees to the plan. Westerterp comes round when he realizes he can write history as minister of the day, persuaded by the words of his own director of the Department of Public Works and Water Management: 'If you say money's not an issue, the world will be amazed by what they see'.[5]

On 13 September, 1971 an estimated 5,000 opponents of the Leidse Baan hold a protest march to the viaduct being built on Papelaan in Voorschoten. The assembled crowd is addressed by Wim ter Keurs, Geert Jan de Bruyn and Helias Udo de Haes, according to the *Leidse Courant* 'very well-known biologists'.
© De Omroeper

Leiden environmental action

After graduating, in 1969 Helias Udo de Haes takes up a position at the Measurement and Control Technology department of Delft Polytechnic (now Delft University of Technology) on a government grant. There he's approached by an old Leiden classmate who asks him to join in with actions against construction of 'Provincial Road 1' from Katwijk to Scheveningen through the dunes at Meijendel – known by everyone as the Dune Road. The young scientist steps in to coordinate a motley band of teachers, journalists, artists and feminists that succeeds in halting construction of the new arterial road. After the Council of State nips the original Dune Road route in the bud in 1970, the Zuid-Holland Provincial Executive proposes an eastern variant: the Leidse Baan, planned from The Hague to Leiden through the De Horsten royal estates. The environmental group's objections to this route are, if anything, even greater than with the Dune Road.

Not particularly excited with his job in Delft, Udo de Haes devotes all his energy to environmental activism. His pursuits are rather time-consuming, though, and aren't applauded by the Polytechnic. He's given a choice. "Listen here, they said. We couldn't agree more with what you're doing, but if you want to stay here you really have to start working – or otherwise find yourself a new job."

A new job it is. In 1970 Udo de Haes joins the staff of the Environmental Biology department, led by Prof. Dr. D.J. Kuenen, later to become Rector Magnificus of Leiden University. "I made it a precondition that I'd be allowed to continue with the actions. 'That freedom you must give me,' is what I told Professor Kuenen, and that's exactly what he did."

In his acceptance speech on taking up the position of Extraordinary Professor of Environmental Science ten years later, Udo de Haes will tell 'the eminently learned Kuenen': "Seventeen years ago I joined your staff at Environmental Biology. From that day on, over and again you helped me make important choices and supported me by giving me clear advice. Above all for that reason I'm happy to call you my guru."

There's no time to lose, as the Zuid-Holland Provincial Executive has put its full weight behind the alternative to the Dune Road: the Leidse Baan, a motorway connection between Leiden and The Hague via Voorschoten and Leidschendam. In 1970 work has already started on a viaduct over Papelaan and a tunnel at De Horsten.

In January 1972 the 'Environmental Taskforce of Leiden University' publishes a brochure entitled 'Is the Leidse Baan really necessary?'. It's been put together by Drs. W.J. ter Keurs, Prof. Dr. P. Sevenster and Dr. H.A. Udo de Haes. Being on the university payroll, they feel obliged above all to adopt a business-like tone and restrict themselves to matters of substance. Udo de Haes: "In Utrecht they were also challenging construction of a new road: the Amelisweerd project. There were people up in trees there, and complete fights down below. Here in Leiden it was really all very well-behaved. We weren't just against the plans, we also actively sought contact with the provincial offices, Dutch Rail and various urban development agencies. What are the alternatives? How can public transport be improved? What can you do to induce people to live closer to their job? We did everything conceivable to find a way to stop that road going ahead."

Blurring of disciplinary boundaries

Activist professors and university staff: just how permissible is that? In his preface to the brochure 'Is the Leidse Baan really necessary?' Kuenen is more

A cabinet crisis about whether or not to dam the Eastern Scheldt ends with a decision to build a half-open dam that can be closed when needed.

In 1969 Udo de Haes successfully coordinates a protest against construction of an arterial road between Katwijk and The Hague: the Dune Road.

After the Dune Road plans are cancelled, the Zuid-Holland Provincial Executive proposes a new route: the Leidse Baan, from Leiden to The Hague via De Horsten.

Poster 'Leidse baan? Neen!' ('No to the Leidse Baan!') and brochure 'Is de Leidse Baan werkelijk nodig?' ('Is the Leidse Baan really necessary?')
Dutch Posters, International Institute of Social History (Netherlands Archive of Graphic Designers)

concerned about what's in store for the country if biologists get involved in spatial planning than about whether professors and lecturers should be manning the barricades. 'Disciplinary boundaries are becoming increasingly blurred, though,' he writes. 'And this is exactly what the future demands, as the interdisciplinary connections become ever clearer and decisions in any given sector of social life resonate ever louder in others.' What the attentive reader is witness to here – in 1972 – is the founding moment of the Environmental Science Centre six years later.

'This study can help us broaden our perspectives and gain a better understanding of developments in our country,' Kuenen continues. 'The rate at which certain processes are changing our world is making decision-making ever harder. We can no longer keep on embellishing on the same well-worn patterns. New solutions must be sought.'

In their brochure the Leiden biologists sum up the deleterious impacts of landscape fragmentation, noise nuisance and traffic fumes. They forecast that the number of people killed annually on Dutch roads will rise from 3,181 (!) in 1970 to 7,000 in the year 2000. Thankfully, this projection failed to materialize. Until 1973 the number of traffic deaths in the Netherlands indeed rises to 3,264. Subsequently, though, measures like compulsory motorcycle helmets and car seat-belts lead to a structural decline, to 1,166 in 2000 and 621 in 2015. The projected threefold increase in car traffic does prove correct, though, even without the Leidse Baan.

The document ends by concluding that the Leidse Baan will reduce traffic on the outskirts of Leiden and The Hague 'only partially and for a very short time' and that traffic chaos will soon ensue in The Hague's city centre. It's not just the Utrechtse and Leidse Baan that are planned there but the Rotterdamse Baan, too, and hundreds of homes are scheduled for demolition. The Leiden biologists point to the threats to nature between Voorschoten and Leidschendam: 'Forty-five hectares of a type of marshy woodland found nowhere else in the Netherlands will become fragmented. Nationally important meadow-bird sites will be torn apart. The entire landscape, slated for inclusion in the future National Landscape Park, will be tarnished because it will no longer meet the criteria for a designated sanctuary for those seeking peace and quiet, as intended.'

The environmentalists' position during this period is that fewer roads and better public transport is the way to prevent further damage to nature. A later interview with the *Leidsch Dagblad* in 1986 shows that while Helias Udo de Haes is still of the same opinion he no longer deems such measures sufficient. "My feeling today – contrary to what I thought ten, fifteen years ago – is that these problems can't be resolved through spatial-planning measures alone. Adding an extra bus route won't help curb traffic. The only way to reduce road traffic is monetarily – by doing away with extravagant travel-cost reimbursements and introducing tolls on road networks."

However that may be, the brochure certainly has an impact. Its main strength is perhaps the considerable attention paid by Ter Keurs, Sevenster and Udo de Haes to alternatives to the Leidse Baan, including fast public-transport links and dedicated bus lanes, which were indeed later implemented.

Duivenvoordse and Veenzijde Polder: forty-five hectares of a type of marshy woodland found nowhere else in the Netherlands. Photo Takeaway (Wikimedia)

On 4 October, 1971 Leiden city council adopts a unanimous motion to provisionally halt road construction and look into alternative options. On 21 October the Provincial Council likewise approves a motion – carried by 42 to 39 votes – in which a decision is postponed until January 1972. On 28 January of the new year it's announced that road construction will be put on hold for the time being.[6]

'With the decision to provisionally postpone the Leidse Baan – the six-lane motorway between The Hague and Leiden desired by Zuid-Holland Provincial Executive – the nerve-racking tug-of-war of the last few months between proponents and opponents of this notorious road has reached a climax, with the conservationists victorious,' writes Hugh P. Gallacher in nature magazine *De Levende Natuur*.[7]

In January 1972 the Environmental Taskforce puts out the brochure 'Is the Leidse Baan really necessary?'.

On 28 January, 1972 Zuid-Holland Provincial Council takes a provisional decision not to build the Leidse Baan.

'According to the Committee for European Conservation Year 1970, part of the area (the Duivenvoordse Polder) is among the richest meadow-bird sites in the Netherlands, with a density of species rarely seen outside this country (particularly Shovelers, Oystercatchers, Lapwings, Black-tailed godwits, Common redshanks, Ruffs, Skylarks and Western yellow wagtails). In another part (the marsh woodland along the railway between The Hague and Amsterdam) there are an estimated 400-500 breeding pairs of 40 different bird species; the meadows are adorned with orchids and Snakeshead fritillaries; the Raaphorst and Ter Horst woods boast Yellow figwort, Bluebells, Lords and Ladies, Moschatel, breeding Stock doves, Kingfishers, Wood warblers and no fewer than two Blue heron colonies. The entire area has its own hydrological system and is consequently still particularly rich in fish (of which 14 species have already been counted) and amphibians; the occurrence of Weasels, Stoats, European polecats and a vast number of Hares goes some way to completing the picture of this extraordinary natural jewel, on which the high-rise developments of The Hague, Leiden, Voorschoten and Leidschendam are today so harshly encroaching.'

Environmental Science course

The Environmental Science course launched in 1972 by the Environmental Biology department of the Biology subfaculty of Leiden University's Faculty of Science was not the first of its kind in the country. "Amsterdam beat us to it," reminisces Udo de Haes.

"Kuenen was professor and I was his sole assistant. As president of the IUCN, the International Union for Conservation of Nature, he was often out of the country. We were well-behaved, didn't row with anyone. It was four years before the decision was made to set up the institute. There was considerable suspicion, another reason being that we were also against the site scheduled for the new University Hospital. We were of the opinion that the newbuild shouldn't be out in the middle of the polder but at the current location behind the station. We started out as fighters – respectable fighters, though, otherwise we'd never have been accepted at the university."

By 'we' Udo de Haes is referring, among others, to his old comrade-in-arms Wim ter Keurs, now a biologist at the department of Environmental Biology, and Evert Meelis, now at the department of Mathematical Biology. The action against the original newbuild plans for the University Hospital was preceded by protests against the so-called Witte Singel plan. And, lest they be forgotten, minor skirmishes to save the Hortus Botanicus, situated in Leiden's centuries-old city centre. All the actions are eventually successful and have a tangible effect on traffic and spatial planning policy in Leiden.

Udo de Haes: "While Kuenen appreciated it all, on the one hand, he also felt it was problematical. He wanted to maintain clear distinctions between it all. We were allowed to use the stencil duplicator and could send out our reports by university mail. But one day a reprimand from the Education Ministry arrived. The secretary-general didn't want us distributing our activist materials via university mail. That had to stop. So from then on we paid for it all

The Environmental Taskforce of Leiden University opposes plans to build the new University Hospital outside the city centre.

Helias Udo de Haas in Voorschoten, in front of the bike tunnel at the site the Leidse Baan was planned

Helias Udo de Haes

1941 Born in Zeist
1968 MSc Biology, Leiden
1970 Leiden, Environmental Biology staff
1971 PhD Biology, Leiden
1978 Founder and Director of Leiden Environmental Science Centre, CML
1986 Extraordinary Professor of Environmental Science (on behalf of the Worldwide Fund for Nature)
1992 Professor of Environmental Science, Faculty of Science
2000 Scientific Director, CML
2006 Professor emeritus

Helias Udo de Haes grew up in the world of anthroposophy and Free Schools. He attended the school run by Kees Boeke in Bilthoven, which gained fame when Princesses Beatrix, Irene and Margriet attended for a short while. From anthroposophy Udo de Haes retained an interest in the premises of biodynamic agriculture. In Leiden he also helped set up a health-food store, which to this day still bears the name 'Helianth'.
He successfully supervised a total of 23 PhD students in CML's three departments: Industrial Ecology, Environmental Biology and Environment and Development. Since his retirement Udo de Haes has returned to his roots: birds and plants. As a visiting professor he still contributes to studies, organizes excursions and gives lectures.

out of our own pocket and changed the name. The Environmental Taskforce *of* Leiden University was renamed the Environmental Taskforce *at* Leiden University, a neat solution. Later, simply Leiden Environmental Taskforce."

Resistance from within the university

In academic circles there's growing opposition to the young biologists' activities. "It was certainly no longer just biological, but completely interdisciplinary and in fact only partly scientific," says Udo de Haes wryly in retrospect. "It was very indulgent of Kuenen that he didn't just put an end to it once and for all. 'Can't you get those upstarts to stop their antics,' he'd been asked by one of his fellow university governors. And so we came up with the idea of creating an interdisciplinary centre. It turned into a working group, later an interfaculty department, and eventually an institute of the Faculty of Science. By the end of the 1970s the environmental movement had also appeared on the scene, in the shape of Greenpeace and *Milieudefensie* – Friends of the Earth-Netherlands."

According to Evert Meelis, 'activism is a passing phase in one's life' Helias Udo de Haes once remarked during this period.[8] "At the Centre I eventually chose to restrict myself to just teaching and research," says Udo de Haes, "a choice that wasn't appreciated by Wim ter Keurs. Once the Environmental Science Centre had been founded, we said: this is where our activism stops; our task is now research and teaching. Wim carried on, though, but no longer from within the university."

Notes

1 Veenstra, Mark (2010), '*Dr. W.F. Hermans*', *Girugten* 41 (4), pp.6-7

2 *'Zo suffig waren de jaren '70 niet'* ('The '70s weren't that dull at all'), Rutger Vahl, *Trouw*, 10 November, 1995

3 *'Derde generatie burgerparticipatie, hoe doe je dat?'* ('Third-generation citizen participation, how do you do it?'), Meryem Kilic and Twijnstra Gudde, 22 October, 2008

4 *'Joop den Uyl, 1919-1987, dromer en doordouwer'* ('Joop den Uyl, 1919-1987, dreamer and perseverer'), Anet Bleich, Uitgeverij Balans, Amsterdam 2008, p.172

5 Ibid, p.300

6 https://www.wegenwiki.nl/N206_(Nederland)

7 *De Levende Natuur* 75 (4):78-81 (1972). This Dutch-Belgian magazine for field biology was established in 1896 by Jac. P. Thijsse, Eli Heimans and Jasper Jaspers jr. and was then subtitled 'Magazine for Nature Sport'

8 Evert Meelis in the *liber amicorum 'Sporen van een gedreven pionier, verhalen bij het afscheid van Helias Udo de Haes'* ('Traces of a passionate pioneer, stories on the departure of Helias Udo de Haes'), edited by Gerard A. Persoon, Gerard Barendse and Henk Bezemer, Institute of Environmental Sciences, 2006

One of the things to emerge from the Taskforce's actions is a plan to set up an interdisciplinary environmental science centre.

We didn't want to get too involved in theory, just wanted to get to work

The period 1978 – 1987: first premises at Rapenburg 127, Leiden

On 19 December, 1977 the University Council takes the decision to establish the Leiden Environmental Science Centre (CML), as part of the medium-tern planning for 1978-1981. Helias Udo de Haes is in the public gallery. At the same meeting a decision is also made on the new University Hospital. "I was there half as an activist against hospital construction in the polder, half as intended director of CML," he reminisces. "Luckily, both decisions played out all right for me."

The new hospital is to be built behind Central Station, and Udo de Haes is indeed appointed director. The new Environmental Science Centre is to be funded from contributions from the participating faculties and, temporarily, out of the discretionary budget. For the time being, for the first four years, the plan is for the centre to operate as an interfaculty partnership. An interim review after two years and a final review after four will indicate whether the centre has a future.

The first premises occupied by CML are Rapenburg 127, rather more modest than Udo de Haes had hoped for, but favourably located in terms of liaison with faculties and departments. The problems start immediately, though, because the premises are too cramped to house all the activities. An attempt to rent space from the neighbouring literary faculty fails. Instead a room is rented on Molensteeg and shortly afterwards at Rapenburg 48, a municipal building.

Minister Ginjaar of Public Health and Environmental Protection performs the opening ceremony on 21 June, 1978. 'One of the issues touched on in the minister's speech was the role academic environmental centres can play in the scientific underpinning of government environmental policy,' in the

On 19 December, 1977 the University Council takes the decision to establish the Leiden Environmental Science Centre (CML).

Minister Ginjaar opens CML's first premises – Rapenburg 127 Leiden – on 21 June, 1978.

words of the Annual Report.[9] What an attentive reporter from the *Leidsch Dagblad* also hears the minister say, it may be added, is that research at the university must be conducted as objectively and responsibly as possible. "What it is be avoided is that too close a relationship between the university and the action group creates the impression that requirements of objectivity are not being met."[10]

One of those invited is Jan Boersema, lecturer in environmental science at the University of Groningen: "I knew Helias by name, above all because like me he had studied behavioural science.[11] Later on I always kept in touch with people at Leiden via the national consultations between the environmental institutes. There were an arrogant lot, though," he adds with a smile. Boersema has fond memories of the meetings of the Academic Environmental Science Committee in Utrecht, which was chaired by Udo de Haes. "Stimulating, tough meetings. The discipline was just taking off, the atmosphere was always enthusiastic, pioneering. We discussed 'how everyone was tackling it'. Besides a legally defined framework, each university also had its own local peculiarities and a newbie like environmental science had to secure itself a place in established structures – both organizationally and in terms of content. There were suspicions about this newbie's academic calibre. Was there a shared scientific approach? Were people respecting disciplinary standards? Weren't they just activists dressed up as academics? We ourselves obviously held that we were on the right path – because it was interdisciplinary – and we felt we had something new to contribute in terms of substance that the era demanded. Something that was sorely needed, given the gravity of the (environmental) problems we intended to tackle."[12]

Notes on page 43


Minister opent Centrum voor Milieukunde

Ginjaar wil sectorraad voor milieu-onderzoek

LEIDEN – Minister dr. L. Ginjaar (volksgezondheid en milieuhygiëne) wil dat [...] sectorraad voor milieu-onderzoek komt. Deze raad zou wetenschappelijk onderz[...] het gebied van milieuvervuiling en aantasting van natuur en landschap moeten [...]neren. Beleidsbepalers, onderzoekers en belangengroepen zouden in de sectorra[...] tegenwoordigd moeten zijn.

★ Minister Ginjaar: eis van objectiviteit

De minister verklaarde dit gisteren bij de officiële opening van het Centrum voor Milieukunde van de Leidse universiteit. Volgens Ginjaar is het wetenschappelijk onderzoek op het ogenblik nog teveel versnipperd. Er zijn wel commissies en raden die het onderzoek op bepaalde deelgebieden coördineren, maar volgens de bewindsman is er nog geen sprake van een relatie tussen gecoördineerd onderzoek en een nationaal milieubeleid.

Verheugd toonde de minister zich over de oprichting van het Centrum voor Milieukunde, omdat dit – net als het milieubeleid – een integrale benadering van milieuproblemen voorstaat. Dat wil zeggen: rekening houdt met zowel sociale als economische en culturele kanten van het milieu.

Ginjaar zei dat van het universitaire onderzoek ongeveer 5 procent dienstjaar is aan het milieu. Dat komt – bij een totaal aan uitgaven voor onderzoek in 1978 van 1.266 miljoen gulden – neer op ongeveer 63 miljoen gulden. "Door de overheid wordt onderkend dat onderzoek aan universiteiten een belangrijke bijdrage kan leveren aan het beleid en dit inderdaad ook doet. Dit resulteert dan in subsidies voor beleidsrelevant onderzoek", aldus de bewindsman.

Hij noemde in dit verband als voorbeeld het onderzoek naar de vrije ruimte in het stadsgewest Den Haag-Leiden, dat tot gevolg had dat de Leidse baan ter discussie werd gesteld.

[...]ven voor de waterwinning in de duinen, in het bijzonder in Zuid-Holland West, door één van de twee studiegroepen van het Centrum voor Milieukunde. 'Het onderzoek dat in deze werkgroep wordt uitgevoerd is nu één van die voorbeelden van onderzoek dat een belangrijke rol kan vervullen bij de beleidsbepalingen; in dit geval bij het opstellen van het structuurschema voor drink- en industriewatervoorzieningen door mijn departement", aldus de bewindsman.

Overigens zei hij dat het onderzoek aan de universiteit zo objectief en verantwoord mogelijk moet worden uitgevoerd. "Voorkomen moet worden dat door een te nauwe relatie tussen universiteit en actiegroep de schijn wordt gewekt dat aan de eis van objectiviteit niet zou zijn voldaan"

Prof. dr. D.J. Kuenen, rector magnificus en zelf milieubioloog, noemde de opening van het nieuwe centrum "een gebeurtenis van betekenis'. Drs. C.J. van Kuijen, kroonlid van de universiteitsraad, onderstreepte dat nog eens door erop te wijzen dat ondanks "deze barre tijden" het centrum toch nog drie personeelsplaatsen had gekregen. Hij constateerde dat er in deze situatie, waarin een nationaal milieubeleid ontbreekt, dringend behoefte is aan een wetenschap als milieukunde.

Het centrum voor Milieukunde is een interfacultair samenwerkingsverband dat wetenschappelijk onderwijs en onderzoek op het gebied [...]

tuur- en landschapsbehou[...] centrum zijn vertegenwoo[...] faculteiten godgele[...] rechtsgeleerdheid, gene[...] wiskunde en natuurwete[...] pen, sociale wetenschapp[...] centrale interfaculteit.

Het in september van star[...] onderwijsprogramma vo[...] een interfacultaire cursus[...] kunde, studiegroepen mili[...] en studentenstages. Beh[...] concrete onderzoek dat e[...] wordt door studenten v[...] schillende faculteiten, wo[...] het centrum ook onderz[...] richt door de deelnemen[...] groepen en door de mede[...] van het centrum, van wie [...] Udo de Haas het centrum [...]

Minister Ginjaar opens the first CML premises. *Leidsch Dagblad*, 22 June, 1978

Old activist atmosphere

At the outset, in 1978, staffing comprises two full-timers plus a secretary and student assistants for 360 hours a year. Those first two are Dr. Helias Udo de Haes (biologist) and Ir. Wouter de Groot (civil engineer/hydrologist). De Groot: "I'd come back from Kenya and when I was at Delft University of Technology lecturing on my work there – road and bridge construction – someone drew my attention to the vacancy at CML. Five years earlier I'd already written about the environment, but that was something every healthy lad did in the sixties. There was nothing unusual about that. Just like me, Helias and the others were very practically oriented. We didn't want to get involved in theory, just wanted to get to work. It's more fun to design how things can be improved," he says. "The study groups were all design-oriented, drawing up plans for waste recycling, say, or for sustainability in Zambia. It didn't matter what, as long as you were working on creating something tangible."

At the outset, staffing comprises two full-timers plus a secretary and student assistants.

On 1 January, 1979 Drs. Gjalt Huppes (economist/political scientist) joins the group for half-days. "The programme was very educationally oriented – all quite new. It was still very much the old activist atmosphere, we were continually producing new study material. It was mimeographed on the stencil machine and bundled by hand. We did it all ourselves. The somewhat activist-oriented teaching was appreciated by the students – as it still is, in fact. For young people from all the faculties, the environment is still a great motivator for following a course at CML. With time, the teaching was combined more and more with research. Our first study we did with the help of the students, which required a considerable amount of effort. Long projects lasting six months. In groups of seven or eight, thorny issues were tackled that all had a bearing on the environment, development and policy. One of the early projects was a study on farmland amalgamation in North Bodegraven which involved agronomists, hydrologists, economists and social scientists. All kinds of interesting stuff came out of it, creating the foundations for a new kind of land consolidation policy. Many people in the world of land consolidation had their doubts, I think, and the same held for the farming community. Is this how it now has to be done? The research had a certain amount of influence; I see that the paper is still being downloaded today.[13] It was important to bring a far broader way of thinking to the surface. It was pure academic, independent research."

Environmental Science course and interdisciplinary study groups

The new Environmental Science Centre takes over the existing interfaculty Minor in Environmental Science from the Environmental Biology department. "In the first few years it was extremely popular," reminisces Udo de Haes, "with perhaps 160 students per course. The *Leidsch Dagblad* reported on it every week. That was unheard of. We covered a broad range of issues, for which there was also a lot of outside interest. But gradually it also became increasingly professional; over the years, interest began to stabilize at around 60 students. Besides the general Environmental Science course we organized interdisciplinary study groups in which students collaborated full time for six months. Participation in these groups has remained fairly constant, I may add."

Udo de Haes and De Groot each take on one of the two interuniversity study groups. The themes

CML takes over the existing interfaculty Minor in Environmental Science from the Environmental Biology department.

chosen are: 'Dune water extraction and alternatives' and 'Recreation and conservation in the dunes between Scheveningen and IJmuiden'. There is close collaboration with Delft University of Technology and Rijnland Water Board. During the first few years Udo de Haes also gives an Environmental Biology caput lecture series for biology undergraduates. In 1978, 18 of the 30 students do their exams.

To allow Udo de Haes and De Groot to devote more time to the Integrated Study on the Zuid-Holland Drinking Water Supply, in 1980 their teaching responsibilities are taken over by sociologist Gerard Barendse. Staffing now stands at 3.3 FTEs. The drinking water research is published by CML itself, as CML report No.1: *Waterwinning in de duinen* ('Water extraction in the dunes').

As the only non-biologist, in the first year Huppes feels a little out of place and is glad with the appearance of Barendse. "Luckily we were soon joined by a sociologist," he laughs. "We also had a small room of our own. But it was understood by one and all that one's perspective fell short if economic, political and social aspects were ignored. That insight was broadly shared right from the start."

Environmental education

Gerard Barendse had himself followed the Environmental Science course he would for years give in Leiden in his student years in Amsterdam. For him the environment course meant a welcome break from the tedious, rather uninspiring sociology lectures. "Between '75 and '80 all the universities wanted to get involved in environmental teaching. It was enormously on the rise. Teaching was also the first thing CML did. When I applied for my job, Helias and Wouter thought it was great that I waxed so lyrical about the environmental science course. Looking back, it might seem strange that people on the university payroll were also involved in social action from their position there. But in those days that was fine. The course was very activist in nature. People from government and industry were invited to give lectures. Young scientists like Helias Udo de Haes and Wouter de Groot would then sit at the back of the lecture hall and fire off tough questions for them to grapple with. The students in those days loved it."

In later years the flow of outside speakers began to dry up. "Before too long we'd abandoned the idea that the knowledge we were looking for was already out there in society and started creating science ourselves," de Groot says. "It was our thing, an independent discipline of its own. Developments in society came second."

"When it comes to the environment, Helias' motivation is really deep-seated," says Gerard Barendse. "He can get rebellious and mobilize people. Take action himself, write letters to the press. Gjalt Huppes and Wouter de Groot had that far less. They were above all scientifically interested in all kinds of issues, as well as wed to their research topics. As a lecturer I had the breadth of scope to discuss all facets of the environment, but at the same time I had no hobbyhorses."

The foundation course still attracts between 45 and 75 students a year. The advanced courses

In 1980 Gerard Barendse takes over the teaching responsibilities of Helias Udo de Haes and Wouter de Groot.

The Environmental Science foundation course attracts between 45 and 75 students a year.

Wouter de Groot on the bank of the Binnen Liede near Haarlemmermeer

Wouter de Groot

1949 Born in Rotterdam
1974 MSc Civil engineering, Delft University of Technology
1975 Staff, Stichting Nederlandse Vrijwilligers (Dutch Volunteers Foundation), Kenia
1977 Researcher/assistant professor, CML
1992 PhD Environmental science theory, Leiden
1993 Professor of Environmental Science, Brussels
1998 Professor of Social Environmental Sciences, Radboud University, Nijmegen
2014 Departure from CML

'To achieve something in collaboration with others' was what motivated Wouter de Groot's to study civil engineering. He built bridges in Kenya and later, figuratively, in the Netherlands too. "You don't always need social science to get things moving," he realized. "If you identify a certain landscape as threatened, society will spring into action. But with gigantic issues like climate that's not the case." In today's climate politics De Groot sees that technical solutions like carbon capture and storage aren't being accepted. "As soon as you come up with a technical solution, it's vetoed by Friends of the Earth. It's a strange phenomenon in society that straightforward technical solutions to what are essentially technical problems meet with such resistance."

are designed for 15 to 20 people. Barendse: "In those early days you didn't have to work out whether or not that made sense – we simply had a fixed number of tenured staff. If we thought it would be interesting to set up a separate course on something, we just did it. In other departments and disciplines they held that teaching went at the expense of research. We were simply passionate about our work and wanted to get things done. That's the way it stayed for quite some time. You started out as a small group of two or three people and grew year by year. Besides the courses, we had our own style of teaching with which we distinguished ourselves: interdisciplinary study groups. In those days, certainly, the interuniversity study group was a revolutionary form of teaching, with its roots in more technical disciplines. Putting students from very diverse disciplines together for six months to work on a topical issue was in stark contrast to the traditional academic *modus operandi* of lectures and working groups. As time progressed, the research questions came to us from the wider world of government and industry. That's also what we did in the post-graduate studies. In the library there was shelf upon shelf of study-group reports."

CML staff pose together with several project staff outside the door of Rapenburg 127, probably in 1981 or 1982. On the left: Helias Udo de Haes, Wouter de Groot, Albert Salman and Carel Drijver. Squatting at the front: Gjalt Huppes, Fieneke Speksnijder and Dick Melman. Standing on the right: Gerard Barendse. Photo CML

First scientific research project

The Environmental Science Centre has not been set up to operate as a research institute. In the first few years the emphasis is well and truly on teaching. But from both provincial and national government there's a growing swell of requests for big research projects. Several years later, three-quarters of those at CML are involved in research. "Not funded by the university," says Barendse, "but from outside. I myself always stayed on the teaching side, simply being appointed to lecture and organize courses." The first CML scientific research project is a study on 'open space' in The Hague municipal district, more specifically on the loss of such space and fragmentation of what remains due to urban development and on the factors driving that process. The research is subsidized by the then-ministry of Public Health and Environmental Protection.

CML is also directly involved in various integrated policy studies coordinated by government institutes. The first of these is a study by the National Institute of Public Health and the Environment (RIVM) on water extraction in South Kennemerland, part of an Environmental Impact Assessment. The second is a major project by the National Institute for Drinking Water Supply (RID) on the drinking water supply of Zuid-Holland province. Udo de Haes: "We were involved because of the ecology, the impacts on flora and fauna. That stemmed from the Dutch Society for Dune Conservation, which I was also part of. The society was opposed to surface infiltration because of the excavations that involved and the seepage of polluted water into the dunes. The crux was to develop alternatives to dune surface water infiltration for the drinking water supply, a process that was causing increasing damage to the dune environment. In the framework of that project CML could also hire a few new staff. In the end, the Provincial Council opted not to expand surface infiltration. There were plenty of alternatives. Infiltration could be intensified at existing locations. The water could be treated, which meant the wells clogging up less frequently – solutions like that. Water conservation also played a part, but on its own that wasn't enough. At the time, the plans for major expansion were cancelled. It was a very serious study with a satisfactory result. And for the first time drinking-water utilities took conservation on board as an operational objective. A third major project was concerned with coastal erosion on Texel due to the rising sea level."

In the first few years the emphasis is on teaching, but there's a growing swell of research commissions from both provincial and national government.

Environmental Science Council

At faculty level the consultative structure comprises the Environmental Science Council, presided over by Prof. Mr. A.R. Bloembergen (Faculty of Law). Other Council members represent the faculties of Religious Studies, Medicine, Science, Social Sciences and the Central Interfaculty. The Council's executive board is made up of the chairman, Dr. J.P. Scherft (Medicine), Prof. Dr. P. Sevenster (Science) and secretary – with no voting rights – Helias Udo de Haes.

When Bloembergen leaves in 1979 to take a seat on the Supreme Court, he's succeeded as chairman of the Council by Prof. Dr. R. Louw of the faculty of Science. Interuniversity contacts are maintained by the Scientific Education Committee, Environmental Science, of the Academic Council. At the national level the aim is to distinguish three independent fields of study: environmental science, environmental studies and environmental engineering.

Review

As scheduled, the first review comes out in February 1981.[14] The Council is satisfied with how the inter-faculty Environmental Science course has been upgraded to a more comprehensive Minor. The course attracts a steady 44 to 60 students. It was not the intention, though, that 90% of those attending are from the faculty of Science, though most are from the Biology subfaculty. It can't be down to the modules: transport, water pollution, energy and agriculture and – organized by the Institute for International Studies – development of the Amazon region. Perhaps it's because of the emphasis on the natural environment during the years the course is organized by the Environmental Biology department.

The interuniversity Environmental Science study groups consist of four to ten students researching a

CML attracts mainly students from the Faculty of Science.

specific environmental topic in an interdisciplinary setting. It's a six-month study, five full days a week. The main educational aims are to learn how to analyse a topical environmental problem and design a research programme.

Research at CML develops faster than expected. In a division of substantive duties with the country's other academic environmental centres, Leiden has opted for degradation and pollution of the natural environment: above all environmental problems in the fields of water extraction, water management and agriculture. Internal consultations with the departments is not always easy, but a good relationship develops with the National Institute for Drinking Water Supply, the Zuid-Holland Provincial Land Use Planning Agency and the National Institute for Public Health and the Environment (RIVM). "Our original inspiration had been all the actions, but little by little we began to approximate the university's formal description of our duties," Udo de Haes reminisces.

In these early years the Environmental Science Centre has difficulty finding its place in the Leiden scene. Delegation of powers to the Environmental Science Council meets with objections from the faculties, which are not keen on losing their say on this part of their teaching and research. It's the outside research that is driving growth.

The second review[15] shows that by 1983 staffing is up to 10.4 FTEs, with personnel now ten-strong. Udo de Haes: "When we got the Environment and Development section, too – with perhaps three FTEs – nationally speaking we had a pretty solid contingent. Gradually, first-stream funding by the university itself was supplemented by second-stream (Netherlands Organization for Scientific Research (NWO) and European funds) and third-stream funding (government and industry).

Gerard Barendse: "Between 1978 and 1990 we always seemed to be floating in thin air, unembedded in the university's faculty structure, but the centre's raison d'être was never seriously questioned at the time. Each year we were doing more research and teaching and each year the Executive Board reapproved our funding."

Not every research project was welcomed with open arms, though. "One time we were eligible for a grant from NATO, but we weren't up for that," says Udo de Haes. "We were pretty left-wing in those days. CML was also approached by Shell for some counter-expertise on a study by IVM, the environmental institute of the Free University in Amsterdam, on pollution of the Volgermeer Polder. We declined. We're not going to review the work of our sister institutes, we said. Some other organization will have to do that. The projects we participated in were commissioned by reliable organizations, usually government agencies rather than hardcore industry."

Leiden School of environmental science

In 1981 Helias Udo de Haes and Wouter de Groot publish the article *Milieukunde, contouren van een nieuwe wetenschap* ('Environmental Science, contours of a new science') in the magazine *Intermediair*. The article is intended as a kick-off for the Leiden School of environmental science. "The article's message was: 'We in Leiden, we in the Netherlands, are the ones that must create environmental science. And that's precisely what we intend to do'," De Groot reminisces. The same year the Ecology and Development Cooperation study group forms the seed for CML's Environment and Development department.[16]

Leiden has put itself on the environmental map. By 1983 CML is working on so many projects that the third-stream-funded 11.4 FTE scientific staff far exceed the centre's core first-stream personnel. One of the outside researchers is the young biologist Ester van der Voet, now university lecturer Industrial Ecology at CML. "After graduating I went to work at the environmental consultancy CE Delft, where I stayed for two years. From there I was seconded here for a while and after that I joined CML's project staff in 1984. The permanent position I got in 1989 was my 21st job; in those days that was par for the course: three months here, seven months there – which meant I had worked on a host of different topics. And that was in fact great." Van der Voet is the Centre's first female scientific staff member. "It was very much a man's world," she notes.

Acidification

"My first projects at the time were on intensive livestock farming and ammonia emissions," says Ester van der Voet. "Just how much ammonia is coming out of those sheds? In those days acidification was the number-one environmental issue. How ammonia factored into the equation had only recently come to light. A number of farmers with huge livestock sheds adjacent to nature reserves had been taken to court. Using all kinds of atmospheric models we calculated how much ammonia was ending up in those reserves. That was a whole lot more than the standards of the day. Based on those findings the Intensive Livestock Farming directive was developed, which is still in force today, if I'm not mistaken. That's one of the great things about this discipline: that your work can sometimes be implemented so directly in society. But it took quite a while before acidification got onto the agenda, as indeed was the case for climate change some years later. In the eighties, acidification was the number-one issue: sulphur dioxide, mainly from coal-fired power plants, and nitrogen oxides, mainly from traffic."

Moving house to Garenmarkt

After a second set of premises (Rapenburg 106-108) need to be added in 1982, one year later CML gets an opportunity to transfer in its entirety to Garenmarkt 1b (the so-called Venus Wing).

"That old girls' high school was rather in line with CML's activist roots," says Barendse. "Because we weren't part of a faculty, we weren't automatically entitled to all kinds of lecture halls either. For a course coordinator that's pretty annoying. We had to wait until all the biologists had filed their lecture programmes, which meant we sometimes had to make do with five or six different buildings. There was a funny side, too, though. One day you might be sitting under the vaulted ceiling of the old acade-

In a division of substantive duties with the country's other academic environmental centres, Leiden has opted for degradation and pollution of the natural environment.

By 1983 staffing is up to 10.4 FTEs.

The article 'Environmental Science, contours of a new science' is intended as a kick-off for the Leiden School of environmental science.

In 1983 CML moves to the building Garenmarkt 1b.

Ester van der Voet

1956 Born in Amsterdam
1982 MSc Biology, Leiden
1984 Project staff, CML
1996 PhD Industrial Ecology, Leiden
2001 Lecturer, CML
2005 Visiting professor, ETH Zurich
2005 Assistent professor, CML
2010 Visiting scientist, Yale University
2011 Departmental head, Industrial Ecology (until 2013)
2012 Member of International Resource Panel, UN Environmental Program (UNEP)

Ester van der Voet is a biologist, but is the first to admit it's been a long time since she worked in that field. At the moment she's working mainly on resources, with a focus on concrete and steel. The enormous global output of these materials begs questions as to their environmental footprint. She's also devoting an increasing amount of time to digital education for a wider audience: the Message Open Online Course (MOOC). "What that teaches you is to clarify your message. How can I explain things so my mother understands?"

Ester van der Voet at the former Wernink Beton concrete works in Leiden

my building, the next day in the lecture hall of the Anatomic Museum, stag's antlers up on the walls. We often ended up in the Biology lecture halls in Nonnensteeg, behind the academy building, or in Zoology on Kaiserstraat."

Now the faculties involved have approved the continued existence of the Environmental Science Centre under the scheduled review, the time has come – in 1984 – to sort out the administrative structure once and for all. The most obvious option is for CML to become an interfaculty department aligned with the faculty of Science.[17] This is effectuated in 1987.

Innovation budget

CML applies successfully for three additional staff under the Executive Board's innovation budget: a Third World Studies coordinator, a structural PhD post and an additional part-time secretary. At the Centre the three sections are gradually getting fleshed out. Topics like coastal protection of the North Sea island Texel, grassland vegetations and the role of phosphates in ecosystems are the remit of the Ecology and Policy section. The toxicity of flower-bulb pesticides and separate collection of household waste are organized under Environmental Protection. And Environment and the Third World covers projects in developing nations, including environmental assessment of civil engineering projects in African regions prone to flooding.

In 1985 the requested posts are filled by agricultural engineer Ir. C.A. Drijver (Environment and Development), Drs. Th. C. P. Melman (doctoral research post) and Ms. H. Steevels-Groenevelt (secretary).[18]

In 1983 CML moves to the building Garenmarkt 1b.
Photo CML, 1983

Publication status

From now on all publications are assigned a status: A for accepted in international scientific journals down to D for publications in non-scientific media. In 1984 two publications are given an A status and 15 a D. In the same year there are also 18 publications with a B status, which means they include a research report and have been accepted by one of the country's learned societies. CML staffing is now up to 18 FTEs, of which 9.8 are externally funded and 3.4 unpaid.

One study that attracts attention in 1984 is on the 'Kustex' scheme to protect the coast of Texel. The aim of this study, commissioned by the Directorate-General of Public Works and Water Management and under the final responsibility of Delft Hydraulic Laboratory, is to design a strategy for protecting the coast from ongoing erosion. CML's task is to analyse

In 1985 three additional staff can be taken on under the Executive Board's innovation budget.

and evaluate the impacts of that erosion on nature – through habitat loss, foredune displacement, sand deposition and lowering of the water table – and set out options for restoration.

Pesticides in flower-bulb growing

Udo de Haes: "We never short-changed anyone. Certainly not, nor did we exaggerate or play things down. Our studies were always purely scientific – which is why we were always a good partner for RIVM. It always annoys me enormously when I see the environmental movement not getting its facts straight."

One piece of research of relevance in this connection is Wouter de Groot's study on pesticide use by flower-bulb growers. "We simply wanted to know exactly how dangerous that stuff was," he says. Everyone is very surprised at the study's results, which show the pesticides pose absolutely no risk to public health, but are a danger to those using them: the bulb-growers. And for their children, if they play in the bulb-shed: very hazardous indeed. Thus, for specific groups and specific places; perhaps for the frogs in the ditches, too, but not for public health in general. The study was not particularly well received – not by the bulb-growers, but not by the environmental movement either. "It was a very modest study anyway," assures De Groot. "It forced us to reflect systematically on the impacts of pesticides. Before long we had come up with a kind of mini impact-assessment system. Who uses the stuff? Where does it end up? Already it was becoming a fledgling LCA (Life Cycle Assessment). It also helped us set up the Environmental Protection department, the beginning of Industrial Ecology. For me it was the first time I got involved in environmental protection issues."

CML research shows the pesticides used in flower-bulb cultivation pose mainly a danger to the growers themselves.

In 1986 the young ecotoxicologist Geert de Snoo, freshly graduated from the Free University of Amsterdam, also joins CML. "There was really no room at the inn," he says, "so I was put up in an attic in the building next to the Garenmarkt premises together with Cees Kanters. That probably wouldn't be done these days. Prior to getting a permanent position I perhaps had ten temporary contracts. At the time there was still not much knowledge on the impacts of pollutants on nature and the environment. That field was then new at the Free University and I was one of the first students."

Pesticides in flower-bulb growing are found to pose the greatest risk to bulb-growers themselves.

Postgraduate training

Together with IVM, the Free University of Amsterdam's environmental institute, and the Interfaculty Department of Environmental Science of the University of Amsterdam , CML makes efforts to get a postgraduate Environmental Studies programme established. After the proposal is first rejected by education minister Wim Deetman, the plan's initiators find a listening ear at the then-ministry of Public Housing, Spatial Planning and the Environment (VROM). The ministry is willing to provide the funding needed to set up such a programme.

"We thought it strange that after the Masters phase there was no more environmental education whatsoever," says Gerard Barendse. "Graduate lawyers, public administrators, chemists and biologists who wanted to work in the environmental field could receive post-graduate training. With the various institutes, among which there was a certain amount of envy at the time, we put together a one-year environmental course. And we did so with a fair amount of success for about ten years, I might add. The post-grad Environmental Management course was aimed chiefly at students from Eastern Europe. After the fall of the Berlin Wall they had a lot of catching up to do there. In those days the Netherlands was a trailblazer when it came to the environment, so funds were also forthcoming. The Dutch and English-language courses ran in parallel for a while, but after about ten years they were amalgamated. When the money from the Matra fund[19] dried up, the course was terminated. Perhaps we were lax in not anticipating that. But the course was very successful. Of the 36 students who followed the course in '87/'88 over 80% ended up finding a job in their chosen field."

Textbook of Environmental Science

In collaboration with colleagues from the other environmental science centres, CML staff members contribute to the *Basisboek Milieukunde* ('Textbook of Environmental Science') published in 1984. The editorial board consists of Jan Boersema (University of Groningen), Jan Willem Copius Peereboom (Free University, Amsterdam) and Wouter de Groot (Leiden). The textbook is designed to provide the essential theoretical background for all branches of higher education.[20]

Jan Boersema, environmental science lecturer, was one of those working through the Association of Universities in the Netherlands (VSNU) to get the environmental institutes of Amsterdam, Leiden, Groningen and Wageningen to collaborate more closely: "What we had was essentially just a ragtag collection of syllabuses. So I thought to myself: we should put the best of it all together in a single volume – a proposal applauded by all concerned. But before too long there was discussion about the very nature of the discipline. The Wageningen school said: what should be studied is the earth system, no more, no less. But others said: won't that include volcanic activity too, while our main focus is on solving environmental problems? Personally, I generally take the middle road. We ended up phrasing it such that our contribution is to study the environment scientifically, looking mainly at

1984 sees publication of the 'Textbook of Environmental Science', providing essential theoretical background for all branches of higher education.

anthropogenic changes to the system – which excludes volcanic activity."

The introduction is written by Udo de Haes. "What *milieukunde*[21] actually comprises," he says in retrospect, "has been debated for thirty years. I myself have changed my mind on a number of issues. To my mind, *milieukunde* is not a scientific, academic discipline but something to be taught at institutes of higher vocational education. *Milieukunde* is an umbrella framework, and as such is too broad to be a science. It covers all kinds of different fields: nature and landscape, water management… you can probably cite at least ten. You obviously have fields in which it can specialise and then it does become a scientific discipline. Wouter de Groot didn't agree. He defended *milieukunde* as a scientific discipline for far longer. That breadth is more in line with the practical orientation of higher vocational training. Industrial ecology – the science of the circular economy – I do see as a true discipline: the relationship between commercial industries, raw materials and closed cycles. With plenty of contacts in industry."

"The textbook was written in clear language and was an enormous success," says Boersema. "We even presented it to minister Winsemius in 1984; he'd just become minister of Public Housing, Spatial Planning and the Environment. The three of us – Copius Peereboom, De Groot and myself – took off to Leidschendam. Winsemius didn't know there was such a thing as academic environmental science. He was interested, though. In a memorandum a ministry official later noted: 'These are all small groups at the universities. I don't see any immediate

relationship with the ministry. 'I do,' the minister had jotted down in the margin. He thought: we need to establish a link between academic environmental science and policymakers. What we shall do is set up three part-time professorships. That won't cost us much, but will mean we have a finger in the pie. They wanted a technical man, who ended up in Delft, an administrative science man, in Nijmegen I think, and a rotating professorship, which acted as a stimulus. Each university could put in a request to appoint someone for a while. In Groningen we had an energy man for a time."

The Textbook ran into several reprints, with over 35,000 copies sold. Gerard Barendse: "The Textbook was important: it was the only compulsory purchase for the foundation course. We backed it up with articles from all over the place, which we put in separate syllabuses. No more than 25 pages per lecture, because if you have two lectures on a given day that's still quite a lot of preparation. We always had outside lecturers, from other departments or from government and industry."

Minister Winsemius, keen to establish a link between academic environmental science and policymakers, sets up three part-time professorships.

Activists and radicals

"You could say the Textbook put *milieukunde* on the academic map," says Boersema. The tug-of-war between the various universities wasn't yet much of an issue in those days. At the same time, though, "in Groningen you had social geographers who said: *milieukunde* is in fact just what we've been doing. They saw those involved in it as activists and radicals. Perhaps that was due to Helias' activist past. But in Groningen we had Lucas Reijnders, who as a scientists was also a real firebrand. In our neck of the woods social geography students weren't allowed to follow that minor in the days the professor in question was still with us. That was one of the professors W.F. Hermans had described in his book as a complete oaf."

Boersema still considers the Textbook an excellent piece of work. "In terms of substance it's obviously antiquated. But in structure and breadth it's not hopelessly outdated. The question then was whether an amalgamated field of study could evolve into a new discipline in its own right, like biochemistry, for example."

Environment and Development programme

In 1985 the Environment and Development section teams up with the subfaculty of Cultural Anthropology and Sociology of Non-Western Societies to put in an application to the Executive Board for an Environment and Development programme.

"There were innovation funds available and if you could jump in fast with a good idea, you had a chance," De Groot remembers. "That gave those with passion a certain edge over more cautious folk. Within a month we'd drawn up a proposal. We worked on it day and night; everyone was completely overworked. It was the middle of the night when we drove to the printers in Rijswijk – we were exhausted. Reading it today, it doesn't amount to much. But despite the slightly hare-brained start, it can't be denied we were people with active minds and a healthy dose of enthusiasm."

The aim of the new programme is teaching and research, in equal measure, in the field of human ecology – the interdisciplinary science of human-environment systems – geared to Third World development issues. The principal teaching elements are (three) courses, study groups and educationally grounded field study. There are to be two support bases in developing countries: in Africa and South-East Asia.

The research is aimed at theory-forming and methodological elaboration, with knowledge from the social and natural sciences being synthesized. The theory must be as practicable as possible and at the same time have maximum relevance for designing solutions to environmental and devel-

In 1985 CML teams up with the subfaculty of Cultural Anthropology to seek approval for an Environment and Development programme.

opment problems. The University Council gives the go-ahead. Staffing is set at 2.8 FTEs, with possible expansion to 7.2 for scientific staff and PhD candidates, pursuant to a review (in 1988).

Field stations

For the Environment and Development programme four new posts are created at CML. One of the newcomers is Gerard Persoon. He applies for the vacancy of anthropologist/non-western sociologist with an interest in environmental issues. "The ideas for the programme came from Wouter de Groot, I think," he says. "The first few years were really fantastic. The locations of the field stations still had to be found, as it were. In 1987 I went out to the Philippines and Indonesia with my colleague Timo van Tilburg to find an interesting spot. It ended up being the province of Isabela in the Philippines, where the university still collaborates very closely to the present day. We'd drawn up a list of criteria. It had to be safe for students as well as sufficiently varied in terms of ecosystems and landscapes. It had to be interesting from a social perspective, too, with a degree of ethnic diversity. We also didn't want to be in too exotic a place – not on some small, remote island lacking any real dynamic. This meant the choice for the Philippines was soon made. There was also the language issue. The students had to be able to make their way language-wise, which makes Indonesia difficult, as you simply have to be able to speak Indonesian there. For me it was handy, because I already speak it, but for students it's still an enormous handicap, as there was little mastery of English over there, certainly in those days. In the Philippines, English is many people's first language. The official language is that of the Tagalog, an indigenous language. Many other population groups prefer to speak English rather than the language of a neighbouring people."

Gerard Persoon (l.) and Timo van Tilburg on a working visit to the Philippines, 1987.
Photo private collection Van Tilburg

The Philippines post-Marcos

The Philippines prove to be interesting for the young discipline of environmental science. Dictator Marcos has just been deposed; there have been democratic elections. Persoon: "The whole world thought: that's where we must go, beautiful things are set to happen. We entered into a partnership with a minor university in a region that's still very interesting. We obviously had only a small programme and very limited funds. We couldn't really invest much, but

Jan Boersema in the Hooglandse Church in Leiden

Jan Boersema

1947 Born in Groningen
1971 MSc, Behavioural Science, Groningen
1972 Researcher and lecturer, Environmental Science Centre, Groningen
1994 General Secretary, Advisory Council for the Environment
1994 University lecturer, CML
1997 PhD Theology, University of Groningen
2002 Institute, and professor, Institute for Environmental Studies, Free University of Amsterdam
2012 Professor emeritus
2012 Professor, Fundamentals of Environmental Sciences, CML

What's an environmental scientist doing getting involved in theology? In the '70s and '80s Boersema lectured on theories that endeavoured to explain the environmental crisis. In a widely discussed *Science* article the historian Lynn White pointed his finger at the religious anthropology of our Christian-humanist culture, which puts humankind on the top of the 'ladder of creation'. This was the motive for Boersema to embark on a study that took him to the creation myths and the Greek philosophers. He obtained his doctorate with a thesis on the subject at the Faculty of Theology. For Jan Boersema science is the most powerful instrument we have for interrogating and understanding reality. "Science, free of ideology, must endeavour to untangle what we see, bring it into better focus and expose it for what it is."

fleshed out the cooperation in terms of teaching and research – a partnership of benefit to both sides. That collaboration has now lasted 30 years. Of course there are tiffs now and again, but on all the main issues we've always managed to work things out. The arrogance of the Americans who always think they know better: that we didn't want. We had no knowledge of the country or the culture whatsoever. Even for the best-educated Leiden anthropologists the tropical rainforest was entirely new. We have certain skills they lack and vice versa; that's always been our premise in shaping the partnership."

CML pairs up as many Dutch and Philippine students as possible and ensures that besides places for Dutch students there are also always scholarships for Philippine contenders. That it's a small, local university has the advantage that you don't keep on bumping into American, Japanese or German

Dutch students in search of game in Cameroon. Photo CML/Van Santen, 2002

universities trying to curry the favours of the local organization with huge sums of money.

Cameroon

Persoon: "Cameroon had a different prior history. Before I came to CML, Carel Drijver was already active over there. The overseas office already had a variety of activities in the north of Cameroon. For Leiden we also wanted an interesting spot in Africa, together with Anthropology. That faculty had always had a regional interest in sub-Saharan Africa and South-East Asia, as a kind of carving-up of the world among all the various Dutch anthropological institutes. That was one of the factors playing into the choice made by CML. That's why we didn't go out to India or South America. In '89 a conference was held where the contracts with both Cameroon and the Philippines were officially signed."

Based on their respective experience in South-East Asia and Africa, it is decided that Gerard Persoon is to coordinate work in the Philippines and Hans de Iongh in Cameroen. "We selected students who wanted to get involved in fieldwork there," says Persoon. "That was the kick-off for all kinds of projects that were funded by the Netherlands' Foreign Office. For years everything went extremely well. Professionally, those were the best years we had there, in a kind of pioneering setting. Our network was yet to be built. For me, too, the Philippines was a new country. There was a major element of adventure. The first year in the Philippines we had a really good man on the team: Gerhard van den Top, now head of Amstelland Water Board. In that kind of pioneering context one develops qualities that allow one to rise above oneself. Intellectually it's very demanding, but you also need social skills. All the more so in a country that's still very hierarchically organized. You're meeting with governors, landowners, embassy people; you have to learn to get along with all kinds of folk. We had someone like that in Cameroon, too: Frank Toornstra. Each year we sent students there to do research. In the Netherlands they were prepared for the trip by Hans de Iongh and myself and other colleagues. For six or seven months they were pampered. That was still in the days before the Bachelor and Master structure was introduced; later it came down to a maximum of three months for anthropology students."

Projects

"Sometimes projects were suggested by partners in the Philippines or Cameroon. In the Philippines we had a forestry group, for example. We tried to get groups of students working on one central theme there. One time we had a group working on the firewood issue. Where does the wood come from? Who's earning on it? What are the alternatives? If you tackle that kind of topic with a whole group you can create added value."

"For biologists in Leiden every square kilometre of forest felled is a major loss. For Philippine governors, though, the train of thought is: my people must eat; you can't eat trees, so they have to go; then you can grow rice or corn. They see forest clearance simply in terms of development. So there's a conflict. We had major discussions. The

Timber from the Cagayan Valley on its way to Manila. Photo Van den Top, 1989

Reforestation in Nueva Vizcaya. Photo Gerard Persoon, 1998

CML opens field stations in the Philippines and Cameroon. They're coordinated by Gerard Persoon and Hans de Iongh.

value of the forest goes beyond just the plants and animals that live there. It's not only the biodiversity you lose: the hydrological system is also disrupted. You're faced with erosion, flooding and landslides. Your infrastructure gets damaged. And following on from deforestation you often get what they call 'idle grasslands': enormous tracts of grassland where nothing much else grew and there was no longer any agriculture. What was left was an essentially useless stretch of land. In the early '90s the Philippine government announced that the Sierra Madre was to be given formal protection. That wasn't down to us, but to the government. Those grasslands either need to be reforested or otherwise made suitable for farming again. In the Philippines you've got a limited number of families with an extraordinary amount of land. Once the democratization process had got underway, land reform also needed to be tackled. That was an era in which huge feudal systems were overturned."

Dr. Constance (Stans) Eikelenboom – in 2016 – flanked by Jan Boersema (l.) en Helias Udo de Haes. Photo Maarten van 't Zelfde

Second Environmental Science course

In 1985, the year in which the first Dutch environmental science journal is launched, the Environment and Policy course is given for the first time, as a follow-up to the Environmental Science foundation course. Besides lectures on policy planning and implementation, the students also prepare an environmental impact statement on the 'Waterman Plan' for extending the Zuid-Holland coast. The new course immediately attracts 41 participants. In the ensuing years the course syllabus is extended with a Use of Models in Environmental Science module and a Writing Proficiency course. In 1987 the Environment and Policy course is expanded into Environmental Science II. With its Environment and Development course CML achieves the objective it had set itself in 1978: an interfaculty mix of natural-science and social-science students. The course is followed by 43 students, including 17 biology students and 12 studying non-western sociology.

'Stans Award'

At the initiative of one of the Environmental Science students, Dr. Constance Eikelenboom , an ecotoxicologist then nearing her retirement, in 1986 the CML Students Award is created as a motivational prize for exceptional publications. As Ms. Eikelenboom is known informally as 'Stans', it's soon termed the Stans Award. It's awarded annually – on the recommendations of a selection committee made up of staff members – in the form of a book token.

"Stans worked at the Institute of Trading Standards," Gerard Barendse relates. "On taking leave on her retirement, instead of gifts she asked people for money for that motivational prize."

"Yes, everyone knew Stans Eikelenboom," says Udo de Haes with a laugh. "Really charming and likeable. She just suddenly came up with that motivational award. At first I was involved with it, later Jan Boersema, too. An exceptional woman. She passed away recently, 94 she was, but she was still involved until shortly before her death. Even then she was still getting very worked up about that issue with rubber granulate in artificial grass on sports fields. She did far more than we realized."

New Roads in Environmental Policy

1987 is an important year for the Environmental Science Centre. Across the board, its research is fast gaining in importance. In June that year CML organizes a national congress: '*Nieuwe Wegen in het Milieubeleid*' ('New Roads in Environmental Policy'). On Friday 26 June, 1987 Udo de Haes is appointed Extraordinary Professor of Environmental Science, a position instated through an endowment from the World Wildlife Fund (now Worldwide Fund for Nature). Udo de Haes' inaugural address is entitled *Persoonlijk voordeel; van vijand tot bondgenoot in het milieubeheer* ('Personal advantage; from foe to partner in environmental management').[22]

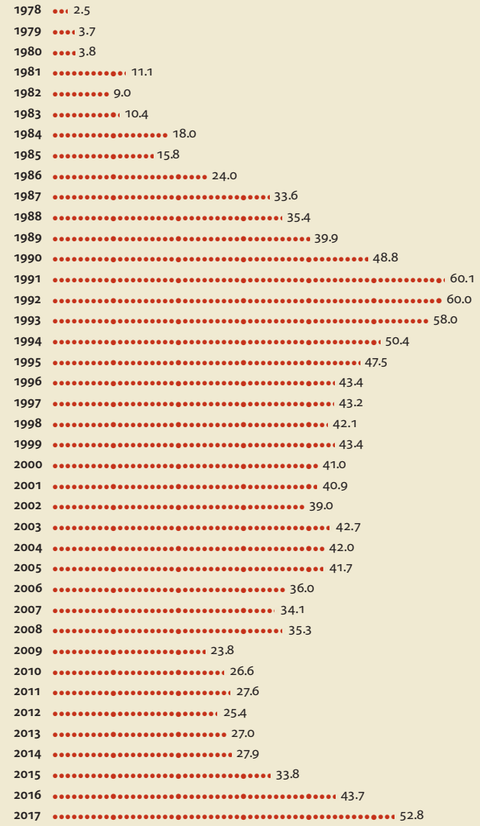
In 1985 the first Dutch environmental science journal is launched: Milieukunde.

The 'Stans Award', an initiative of Constance Eikelenboom, is awarded annually to the authors of exceptional publications.

CML organizes a national congress: 'New Roads in Environmental Policy' – June 1987

Udo de Haes is appointed Extraordinary Professor, 26 June, 1987

Total staffing (FTE)



Stans prize

Student incentive award for best thesis; Dutch titles translated

1986 • **Ted Schrader**
Use and management of natural resources in the Logone floodplain (Cameroon)

1987 • **Jeroen Guinée | Luc Velhorst**
Market-based environmental policy

1988 • **Gerard Steehouwer**
Relationships between elephants, vegetation and people in and around Waza Park (North Cameroon)

1989 • **Willy Douma | Wim Kloezen | Paul Wolvekamp**
The relationship between changes in natural resource management and local environmental degradation in India

1990 • **René Kleijn**
Organochlorine compound flows in the Dutch economy

1991 • **Erik Wakker**
The economic value and sustainability of the rattan trade in the Philippines

1992 • **Joeri Bertels**
Impacts of artificial lighting on flora and fauna in the Netherlands

1993 • No prize awarded

1994 • **Ariënne Henkemans**
Farming methods for the Sierra Madre highlands (Philippines)

1995 • **Natascha Zwaal**
- The migration behaviour of elephants in and around Waza National Park (Cameroon)
- Human-elephant conflicts around Waza National Park (Cameroon)

1996 • **Marnix de Groot**
Migration motives and migration behaviour of the Ifugao on Luzon (Philippines)

1997 • **Marco Huigen**
Standard operation procedures with special operation payments: a study on forest policy distortion in a local furniture industry in the Philippines

1998 • **Mariska de Jong | Tessa Minter**
Natural elements on arable farmland around the villages of Borger and Gasselternijveen, Drenthe

1999 • **Jinke van Dam**
The role of land quality in the process of migration to the Sierra Madre (Philippines)

2000 • **Steven Kragten**
Exploring the role of farmland-plot shape and surroundings in natural pest control

2001 • **Igor Nikolic**
Modelling gene flows from genetically modified crops

2002 • **Joy Segers**
The Sandwich tern on Griend: an analysis of the natural and social system

2003 • **Barbara Slee**
Avoiding the loss of valuable knowledge: an evaluation of the impact of the international debate (concerning the protection of indigenous knowledge relevant to the conservation and sustainable use of biodiversity) on the local level in Ecuador

2004 • **Franz Krause**
Communal management of a common pool resource: Zanjera irrigation in the Philippines

2005 • **Sander Pieterse | Ben Wielstra**
The effects of small-scale forest disturbance by indigenous people on species diversity and community structure of birds in the Gunung Lumut protection forests (East Kalimantan, Indonesia)

2006 • **James Sumner**
Life Cycle Assessment of hydrogen fuel production and its use as a vehicle fuel compared with other fuel and vehicle types

2007 • **Chris Davis**
Integration of Life Cycle Analysis within agent-based modeling using a case study on bio-electricity

2008 • **Emma van der Zanden**
Impact of floods and coping strategies by households in Cagayan Valley, the Philippines

2009 • **Jim van Ruijven**
Algae-based biodiesel production in Hawaii: options and environmental impact

2010 • **Leontien Cenin**
The impact of land use on a macro scale in northern Cameroon on the abundance and diet of three migrant harriers

• **Lisanne Daniëlle Korpelshoek**
The relation between small-scale cover characteristics and foraging of three migrant harriers in the Lake Chad region

2011 • **Ingrid Odegard**
The future of food: scenarios and the effects on resource use in agriculture

2012 • **Pietro Galgani**
Compost, biogas and biochar in Northern Ghana: climate impact and economic feasibility in the context of voluntary carbon markets

• **Kirstine Schiebel**
Yellow nutsedge (Cyperus esculentus) in the Netherlands: the effects of changing policies on distribution and abundance

2013 • **Anika Regett**
Towards a practical application of Life Cycle Sustainability Analysis (LCSA). A case study on stand-alone water-splitting devices for direct solar-to-fuel conversion

2014 • **Myrthe Fonck**
Human-lion conflicts in the Nairobi National Park. Lion diet and factors influencing lion prey choice

2015 • **Kevin Groen**
The importance of spatially-varying landscape factors on the abundance and species richness of bees (Apidae) in agricultural fields and field edges in the Netherlands

2016 • **Carlos Felipe Blanco Rocha**
Evaluating impacts on ecosystem services in LCA. A model and application to the use of water by the mining industry in northern Chile

2017 • **Davide de Mauro**
Quantitative scenario analysis of the Dutch dairy chain. Assessment of the effectiveness of circular strategies to solve environmental problems associated to nitrogen and phosphorus flows

In his address Udo de Haes discusses Garrett Hardin's concept of 'The tragedy of the commons', the title of his seminal paper on overgrazing of pastures in bygone times. Farmers gain from expanding their herd even if that leads to overgrazing of the commons, the benefits of the additional livestock accruing to the individual farmer while the ensuing problems are shouldered by all. For Udo de Haes it's emblematic of the environmental problematique. For personal gain, the individual saddles the community with the burden. The newly appointed professor argues that environmentally friendly behaviour should beget personal reward. As a successful example he cites the environmental levy paid by industries for wastewater discharge. Soon after introduction this measure already proves to work far better than anticipated. For industry, water treatment is cheaper than effluent discharge. This charge acts as a regulatory mechanism, as intended by the policy officials, but it couldn't be termed 'regulatory', merely 'financial'. What's to stop the government adopting similar measures when it comes to road traffic and use of environmental pollutants like cadmium and nutrients like nitrates and phosphates that are leading to eutrophication?

Material balances

With the projects 'Material balances' and 'Material deposits' (mirroring the deposits on certain types of packaging), Gjalt Huppes, Helias Udo de Haes and Ester van der Voet in collaboration with IVM – the Free University of Amsterdam's environmental centre – in 1987 lay the groundwork for the toolkit that will become known as Substance Flow Analysis (SFA) and later also as Materials Flow Accounting. Material balances and material flowcharts describing inputs, outputs and accumulations in the Dutch economy and environment prove to have been never drawn up before and can serve as useful guides for data-gathering and synthetic interpretation thereof. This same period also sees development of the main contours of the second analytical tool: product Life Cycle Assessment (LCA). What emissions and environmental impacts can be attributed to a particular product, and how can you systematically improve that footprint as a producer, and indeed as a consumer, too?

September 1987 sees the launch of the UBM postgraduate Environmental Studies programme, on which the Netherlands' four environmental institutes and later also Wageningen cooperate. In Leiden most of the work is done by Gerard Barendse. In the preparatory phase ten self-study packages are put together, with CML responsible for Environmental Biology and Environmental Law, among other things. When it comes to overseas teaching, the initial step is a course on Wetlands Management in Cameroon. In the new national development plan for academic environmental science teaching Leiden is cited as research centre in the fields of 'Nature and Landscape' and 'Environment and Third World'.[23] By this time staffing at CML is already up from 24.5 to 32.1 FTEs and the centre has 32 scientific and 18 other publications to its name. Among the Master's dissertation topics that year: the nutrient balance of ditch banks, noise nuisance and recreation near Zestien-

The UBM postgraduate Environmental Studies programme is launched in September 1987.

Gerard Barendse

1950 Born in Poeldijk
1975 MSc Sociology of non-Western societies, Leiden
1976 Scientific staff, M&T, Sociology, Leiden
1977 Scientific staff, Foundations and Methods, Sociology, University of Amsterdam
1980 Lecturer, later Education coordinator and Institute Manager, CML
2010 Retirement

After his retirement Gerard Barendse moved to Dreischor in the province of Zeeland. He's not often in Leiden any more. "There was a good working atmosphere at CML in which I never felt hampered. We had good working relationships. I was there for over 30 years, which speaks for itself." Having been unexpectedly catapulted into a management position, the years of reorganization were not easy for Barendse. He's still thankful to Hans van Helden, Director of the Faculty of Science's Administration Directorate, for saying on his departure that he, Gerard Barendse, fought like a lion to save CML. "It meant my colleagues heard the other side of the story."

Gerard Barendse in a ditch with a natural bank at his home in Dreischor

hoven Airport, the vegetation of the floodplain of the River Logone (Cameroon), village irrigation systems in India, and the health risks associated with the production process (adhesives processing) at Fasson Hazerswoude.

Practice versus science

The question weighing heavy on the Environmental Science Centre all the way through to the major, and painful, reorganization in 2008 is still whether it's all scientific enough. In this context De Groot cites the waste recycling plan drawn up by CML for Leiden municipal council. "It was great, but we still shouldn't have done it. You can make a plan like that for any number of local councils, but in scientific terms you're not one step further. It's a job for engineers. It should really have been a case study for far broader theory development on recycling in the Netherlands. I'm a bit averse to non-scientific courses with an academic status, like dentists' training, for example. Obviously crucial for society, but it's concerned far more with practical skills than with science. Scientific education should really be kept separate from practically oriented training. And they should be at the same level. It's unfortunate that science is held in higher esteem than practical work. The smartest practitioners in the Netherlands – dentists and surgeons – have to be academically schooled if they're to join the ranks."

Notes

9 Annual Report 1978, Environmental Science Centre, Leiden University

10 *Leidsch Dagblad*, 22 June, 1978, p.21

11 According to the Dutch-American primatologist and behavioural scientist Frans de Waal, behavioural science has ceased to exist in the Netherlands thanks to the compartmentalized thinking at the country's universities. He himself emigrated to the United States in 1981. (TV programme *Zomergasten*, 20 August, 2017)

12 Farewell anthology for Wouter de Groot, November 2014

13 https://openaccess.leidenuniv.nl/bitstream/handle/1887/8045/11_513_037.pdf?...1

14 Interim Review 1978, 1979, 1980, Environmental Science Centre, Leiden University, February 1981

15 Review of the Environmental Science Centre, supplement to the Interim Review, February 1983

16 *Sporen van een gedreven pionier, verhalen bij het afscheid van Helias Udo de Haes* ('Traces of a passionate pioneer, stories on the departure of Helias Udo de Haes'), edited by Gerard A. Persoon, Gerard Barendse and Henk Bezemer, 2006

17 Annual Report 1984, Environmental Science Centre, Leiden University

18 Annual Report 1985, Environmental Science Centre, Leiden University

19 EU fund for East European candidate member states created to help countries on the fringes of the European Union to strengthen democracy and the rule of law

20 Boersema J.J., Copius Peereboom J.W. and W.T. de Groot (1984), *Basisboek Milieukunde* ('Textbook of Environmental Science'), Boom, Meppel

21 The Dutch term *milieukunde* refers to a practically oriented discipline concerned with both 'hard-science' ecological processes and 'social-science' environmental issues. In English the former aspect is generally subsumed under 'environmental science(s)', the latter under 'environmental studies'. As characterization of the discipline is precisely what is at stake here, the Dutch term has been retained in this passage. Subsequently, we return to using the term 'environmental science(s)', in a broad sense.

22 *Persoonlijk voordeel, van vijand tot bondgenoot in het milieubeheer* ('Personal advantage; from foe to partner in environmental management'), Dr. H.A. Udo de Haes, Leiden University, 26 juni, 1987

23 Annual Report 1987, Environmental Science Centre, Leiden University

So where's your budget?

The period 1988–1997: a wave of environmental awareness

To mark its tenth anniversary, in June 1988 CML organizes a symposium on the theme 'Participation and Partnership in Environmental Management'. The congress is concerned mainly with properly distinguishing the various kinds of participation, ranging from purely autocratic based on a few isolated studies, on the one hand, to some form of autonomy, on the other.[24]

A wave of environmental awareness is sweeping across the Netherlands.[25] The report *Zorgen voor Morgen* ('Concern for Tomorrow') and Queen Beatrix' Christmas message have made quite an impression on the country. The vision shared by the Queen with listeners and viewers is a sombre one: "What we are now witnessing is not the destruction of the Earth at a single blow but in a slowly unfolding drama. Our world is suffering from deforestation, desertification and poisoning of the air, soil and water, extinction of animal and plant species, depletion of the ozone layer shielding us from hazardous radiation, and global warming with dangerous consequences like rising sea levels. Slowly the Earth is dying and the inconceivable – the end of life itself – is now nonetheless conceivable."[26]

There is major interest in CML's postgraduate programme, with eight-hundred requests for an information pack received. Although after selection of the 200 candidates no more than 38 remain, the message is clear: the environment is a hot topic. In 1988 CML has 44 staff (21.1 FTEs) engaged in externally funded research. Themes include: 'Haarlemmermeer and Haarlemmermeer Polder, 140 years of consequences of two types of policy', Reed bunting plan, Environmental Impact Statement on Lake Veere, Environmental Impact Statement on Ramspol, Meadow bird study, and Ditch bank vegetation.

1988 Is also the year in which the first CML staff member obtains his PhD, though it's not at Leiden where Kees Canters is awarded his doctorate, but at Frankfurt am Main. The subject: 'Ecological studies in a finely structured forest area in Taunus' (*Okologische Untersuchungen in einem kleinflächig gegliederten Waldgebiet im Taunus*).

Not the ideal accommodation

For a total of 61 staff, excluding students, in 1988 CML disposes over nineteen offices in the Garenmarkt premises and three elsewhere in town. Not the ideal accommodation, in Udo de Haes' view. While the contract research (with its associated funds) is obviously very welcome, at the same time it's putting a brake on scientific studies, leaving staff no time to submit their work to top journals. Udo de Haes therefore argues for rotating PhD posts – to be funded by the University. This would allow the accumulated results of the contract research to be transformed into doctoral theses. Lacking its own accredited programme, CML would have to apply to one of the faculties for such studies.

Field margins

Geert de Snoo joins CML in 1986 and for his first three years researches the side-effects of pesticides on birds, mammals, invertebrates and aquatic organisms in the Volgermeer Polder and at other sites. For his thesis he goes on to study field margins in the Haarlemmermeer Polder: "I was working with conscientious objectors and other project staff. I had the time of my life. On arable farmland we staked out three or six metre wide strips along field edges where no insecticides or herbicides were to be used. How does biodiversity benefit, how does the environment benefit, and what does it cost the farmer? Very much an interdisciplinary study. The interviews with people in their own homes, around the kitchen table, taught us a lot. We found out pretty soon that unsprayed field margins along cereal fields were certainly feasible but out of the question for sugarbeet, where crop losses were just too great. We started out with a small group of six farmers, but a growing number joined in with the project. The farmers were also motivated to protect nature on their land. Although potato losses were modest, farmers considered the risk too high there, given their dependence on the potato harvest. In that respect there was also a social-science aspect to our studies. I learned a lot from that work and it ultimately led to the Pesticide

Ten years of CML. All the employees on and below the stairs behind the Garenmarkt premises. Photo Timo van Tilburg, 1988

Notes on page 66

CML organizes the symposium 'Participation and Partnership in Environmental Management'.

In 1988 CML has 44 staff engaged in externally funded research.

CML's premises on Leiden's Garenmarkt are cramped: 19 offices for 61 staff, excluding students.

Unsprayed field margins in the Haarlemmermeer Polder. Photos Geert de Snoo, 1991

Atlas. It certainly influenced government policy, because regulations conerning farmland buffer zones were introduced."

Pesticides and the environment

For CML staff and students it's convenient that fieldwork can be done in the Haarlemmermeer area so close to Leiden. De Snoo: "As an institute we built up something of a tradition in this area. Dick Melman did ditch banks, I was working on field margins and Kees Canters and others were doing roadside verges. We had those linear, small-scale landscape elements pretty much covered. What started out as empirical research gradually evolved into a very extensive study of pesticide use, using all kinds of datasets from Netherlands Statistics (CBS). There's massive variation in the way farmers use crop protection agents. Some are used more sparingly than prescribed, some in far higher quantities. Herbicides are generally used a little less because of the risk of crop damage. Insecticides, on the other hand, are often overapplied. In those days there were chemicals on the market that you only needed to add in a minute amount to a huge spraying tank. With those agents there was massive overapplication."

Material balances

On a commission from Zuid-Holland Provincial Executive and the then-ministry of Public Housing, Spatial Planning and the Environment Gjalt Huppes is working on material balances for cadmium and polycyclic aromatic hydrocarbons (PAH) and a 'deposit system' for nitrogen and phosphorus, nutrients that were causing environmental eutrophication.

Huppes: "Environmental policy was being shaped, though strictly speaking not particularly well yet. That was happening during the period I myself was also changing course, from socially broad-based science and economics to environmental analysis for underpinning decision-making. Towards the end of the '80s the first studies on product life cycles began to emerge. It was only several years later they were given a name: LCA." Product Life Cycle Assessment (LCA) is a method for determining a product's aggregate environmental footprint over its entire life cycle, all the way from extraction of primary raw materials and production and transport through to product use and final waste disposal.

"Not a student activity," says Huppes, "but serious, heavy-duty research. There were soon commissions coming in from the European Union, too. Substance flow analysis was also emerging as a variety of systems analysis, looking at cadmium, for example. There, you discover the problem arises not so much from large-scale uses, but from all the diffuse applications in the background, where recycling is out of the question. When all is said and done, the only serious solution for cadmium is to store it somewhere in concentrated form after use and prevent diffuse flows from occurring at all. It's unexpected results like this that appeal to people."

Udo de Haes adds: "If you want to retrieve something from the flow, you have to introduce some kind of monetary deposit system," says Udo de Haes. "You pay at the outset and only if you store it properly do you get your deposit back. This may also be relevant for climate policy."

Pivotal in LCA development

On the world stage CML has played a pivotal role in developing LCA. The foundations were laid by Gjalt Huppes; its substance was fleshed out by CML scientists Jeroen Guinée and Reinout Heijungs; and with his work at SETAC and ISO Helias Udo de Haes brought it to market, as it were, around the globe. Udo de Haes wouldn't go as far as to call LCA a Leiden invention, though. "In the United States they were working on this kind of study earlier than here – in '74 already perhaps, an industry initiative. There was a desire to demonstrate in a court of law that one's product was more environmentally friendly than a competitor's. Nappies and beverage packaging, those were the first products. Procter & Gamble versus Unilever. In Europe it was in the '80s we started. There were several other institutes working on the issue, but in the early days CML was leading the pack and serving as a key source of information. We came up with two analytical tools here: Life Cycle Assessment (LCA), encompassing the entire product chain, and Substance Flow Analysis (SFA), on a weight basis. Single substances, particularly metals, but also individual nutrients like carbon, phosphorus, nitrogen and potassium as well as pesticides. What both these tools embody is cradle-to-grave systems analysis."

Jeroen Guinée has an international reputation as one of the methods' founding fathers. "I was lucky enough to be in the right place at the right time during their development," he says. "At the time the Netherlands was very forward-thinking when it came to environmental policy-making. People like Minister Nijpels were extremely keen to establish product policy and so that project was started at the end of '89. At CML, LCA was really Gjalt Huppes' baby. Reinout Heijungs and I collaborated on it. That led to publication of the first manual, which found its way around the world, above all because there was absolutely nothing available in that area."

For the ministry of Public Housing, Spatial Planning and the Environment CML is working on material balances for cadmium and polycyclic aromatic hydrocarbons (PAH).

The first studies on product life cycles begin to emerge. Later they become known as Product Life Cycle Assessments (LCA).

Gjalt Huppes

1946 Born in Amsterdam
1975 MSc Political science, University of Amsterdam.
1975 Scientific staff, Socio-economic history, Free University of Amsterdam
1979 Assistant professor, CML
1993 PhD Macro-environmental policy, Leiden
2003 Head, Industrial Ecology, CML
2011 ISIE Award and departure from CML

Gjalt Huppes has his roots in hard science, studying mathematics briefly before graduating in political science. Working part-time, he brought up his four children together with his wife. "If you ask me, nobody should work more than four days a week," he says. "I don't think it has any effect on your overall work output. You use the other three days, too, to mull over key issues you're working on. If all goes well, it means your life's somewhat more relaxed. Your career gets slowed down, though."
Huppes finds it hard not to grow cynical. In the world of international environmental conferences he hears too much ideologically motivated smooth talk. "Some people go out of their way to prove progress is being made." Since his retire-ment Huppes has being focusing more on the political side of the environment and on climate policy, first in an EU FP7 project, now on a soon-to-be-completed book on climate policy instruments.

Gjalt Huppes on his rooftop terrace in Amsterdam

During this period research is focused mainly on energy, waste and selected emissions. "It all started with packaging," Guinée recounts. "Household litter bags were at bursting point, there were no collection points for cans or paper. Municipal councils didn't know what do to do with their refuse tips or the growing amount of packaging waste. At the time these issues were also being inventoried by RIVM and we wanted to look at it all from the product angle."

Leiden invention

Gjalt Huppes: "This form of substance flow analysis was a Leiden invention, but the overall idea of a kind of macro-metabolism in society was emerging elsewhere, too. That has a long history, tied up with the idea of depletion. The systems thinking underpinning it all – from process inception via usage through to end phase – had already been developed soon after the Second World War. What one sees is a shift from micro to macro use. At the micro level the analysis is well-developed; it's working like a charm internationally. Around the world there are thousands of studies on the subject. At the individual product level you can soon pinpoint areas for improvement. But when you start asking what needs to be done politically, things get more complicated. It's no big deal to make a more fuel-efficient car, but unfortunately that's not how the world works. In America, those fuel savings mean they now no longer buy an ordinary car but a small pick-up truck – the efficiency improvements translate into larger vehicles. As consumption declines, petrol prices drop and the oil's used differently. These are all indirect mechanisms you can't capture in that simple analysis of a coffee cup or a glass. A field of study has now emerged that tries to achieve better coverage of these kinds of indirect mechanisms within an LCA framework. An analysis method focused on indirect effects and at the same time systemic: that's what's lacking. This is a sensitive issue for policy analysis as a whole."

Wouter de Groot agrees: "Gjalt was quick to realize that while LCA is a clever box of tricks, it has its limits. There comes a point you can't take it any further. The ideas don't then vanish because they've proven invalid, but because they've been resolved. LCA is in essence such a straightforward system that after ten years it's been resolved, academically speaking. It's then in the hands of the consultants. The next step was input-output analysis. Other ways of thinking could start blossoming alongside LCA."

Integration of teaching and research

Over 1989 teaching and research are further integrated at CML. At the same time western environmental science is organized in a separate section and the Environment and Development section is amalgamated with the programme of the same name.[27]

That same year Leiden University makes its mark with the international congress 'The People's Role in Wetland Management'.[28] It's attended by over 250 scientists and policymakers from 38 countries, including many researchers from the developing world. Minister Gerrit Braks of Agriculture, Nature Management and Fisheries opens the congress by

In 1989 CML organizes the international congress 'The People's Role in Wetland Management'.

announcing that two Dutch nature areas have been added to the list of internationally important wetlands: Engbertsdijksvenen (Twente) and Oostvaardersplassen (Flevoland).

Presentations and workshops are held on the use of wetlands, the relationship between local populations and National Parks, public education and awareness, legislation and the role of development agencies, NGOs and the scientific community in promoting participation in wetlands management. Included in the programme is an excursion to the Eastern Scheldt storm surge barrier organized by the Directorate-General for Public Works and Water Management and CML. For those interested, after the congress there are guided tours of sites managed by the National Forestry Commission and the Dutch Society for Nature Conservation.

The congress is presided over by Udo de Haes, with key organizational responsibilities for Marcel Marchand and Carel Drijver. All the presentations are subsequently collected into an 872-page volume.[29] A selection is published in a special edition of the journal *Urban and Landscape Planning*.

Dr. R. Nayga, president of Isabela State University, and Mr. C. Oomen, Rector Magnificus of Leiden University, sign the partnership agreement, flanked by Helias Udo de Haes, minister Gerrit Braks, Prof. P. Nkwi, Cameroon minister of Higher Education, and Gerard Persoon. Photo CML

Third World studies

In 1990 Leiden University signs a partnership agreement with the Education ministry of Cameroon.[30] During the initial period considerable energy is put into creating facilities for environmental research, though 19 Dutch students are already engaged in joint studies with Cameroonian and Philippine students on issues including deforestation of the Cagayan valley in the Philippines and soil and water management by the farming population of North Cameroon.

Environmental biologist Hans de Iongh, who has worked in developing countries and has just been appointed an advisor to minister Jan Pronk, leaves the ministry of Foreign Affairs to join CML: "I applied for the job of coordinator of Environment and Development's Africa programme. Carel Drijver was the first coordinator, but he was moving on to PhD research. As I already had a good deal of experience with Africa while working at a consultancy, I got the job. Among my activities were management of the Cameroon field station programme and fund-raising, but I also had to do doctoral research, with field work in Indonesia – that was one of the conditions. Perhaps I'd been too optimistic about that when I started out, but in 1996 I managed to get my doctorate. Ultimately, I'm extremely glad I made that choice. Working at Leiden University is a real privilege anyway, because of the academic freedom one enjoys. And then there's the special atmosphere you always have at CML. People are really engaged with one another and with what they're doing."

Dutch students team up with Cameroonian and Philippine students for field studies.

Flat organization

After graduating in environmental chemistry in 1990, René Kleijn, now portfolio-holder of education and assistant professor, 'hung around' at CML, as he himself terms it. He still remembers the tumultuous staff lunches from that early period: "It was a very flat organization. Every fortnight we all sat around discussing whatever there was to be discussed. We had the 'green' and 'grey' departments, and later Environment and Development, too. Everyone was welcome, including the students, and there were often heated discussions. Helias, Gjalt, Wouter, Kees Canters and Frans Klijn, all of them real characters, which sometimes led to clashes. As a newbie in the second row, I enjoyed the fireworks – which were always interesting. There were always at least thirty people. No wonder it sometimes got a bit out of hand. Policy, funds, field stations: everything was up for discussion, in terms of substance, too. Helias always tried to keep it all on the rails, but he obviously wasn't entirely unbiased…"

Green and grey: ecology and environmental management, competing for attention with the developing world. René Kleijn: "There were sizeable

Flowers for Helias (r.) from Wouter de Groot.
Photo Timo van Tilburg

university funds flowing to the new Environment and Development department. At times that caused frowns, though most people felt it was fine, because when it came down to it we all felt that was where the real problems were. I think at the time I was one of the few people from 'grey' who was cooperating with Environment and Development. Seatrans, the South East Asia in Transition project, was working on material flows in developing economies like Laos, Vietnam, the Philippines and Thailand. It wasn't just at the national level that research was being done, but in small villages, too. Wouter de Groot and Marieke Hobbes were involved. I thought it would be fun to do something with another department."

Safety regulations

Coordination of the fieldwork and the dispatching of students to Cameroon is done by Hans de Iongh: "The first thing we did was tighten up safety

regulations. During my time in Africa I'd witnessed several fatal accidents first-hand. To allow students to drive around in cars and on motorbikes in those African conditions was dicing with death in my opinion. Looking back, I'm very grateful we put an end to that, as we got through those twenty years with the field station pretty much without any of the students suffering serious injury. One weekend when I was out with my wife in Waza National Park in June 1998 we were shot at by elephant poachers, killing our driver and with my wife seriously injured by flying shrapnel. Thankfully, she made a good recovery, but our driver we couldn't save – the bullet had pierced his lung. There was also an incident when a student got catapulted out of her car during a holiday trip, going head over heels and breaking her back. But that eventually worked out okay. She fully recovered and in fact went on to marry another student she'd met out in Cameroon. We had our own fleet of vehicles with experienced drivers on the payroll of our partner university there. You really need them; the roads out there are pretty dreadful. Both in the Philippines and in Cameroon we helped strengthen the capacity of our local partner. It was then still multidisciplinary. There were not only social scientists involved in the research, but biologists and other natural scientists, too."

Environmental Science and Environmental Policy

In 1991 CML organizes its first English-language course: Environmental Science and Environmental Policy. Most of those signing on are administrative science students from the United States. The shortage of English-language course material in line with the problem-oriented flavour of environmental science then current in the Netherlands is all too apparent. Priority is given to producing good translations.

CML organizes its first English-language course: Environmental Science and Environmental Policy.

CML's first PhD

While annual reports up to 1990 show a neat but somewhat embarrassing dash under the heading 'PhD theses', in 1991 the first fully-fledged CML thesis under Udo de Haes sees the light of day: Dick Melman is conferred his doctorate with a dissertation on 'Ditch banks in the peat meadow district: scope for conservation and nature development in agricultural grassland'.

"This was in line with our vision of boosting biodiversity not only in nature reserves, but precisely in farming areas too," explains Udo de Haes. "He did trials on a series of farms where there'd been reallotment and where hundreds of metres of ditch banks were being managed differently. Against all expectations, the results were surprisingly good."

In 1991 CML has a total staff of 118 (60.1 FTEs). The housing situation is again precarious. Some of the staff find room to work in the Kamerlingh Onnes Laboratory. In the Organization and Development Plan for 1991-1995 steps are set out to bring an end to the organizational muddiness resulting from the expansion of CML in the '80s.

The first fully-fledged CML thesis: in 1991 Dick Melman is conferred his doctorate under Udo de Haes.

Some of the staff find room to work in the Kamerlingh Onnes Laboratory.

Chlorine risk analysis

With Arnold Tukker, the current scientific director, CML has already been collaborating since 1991. He's working at TNO, the National Institute of Applied Scientific Research in Delft, when CML gets involved in a study on the chlorine chain at the request of RIVM and VNCI, the Netherlands Association of Chemical Industries. René Kleijn: "There was a lot of discussion on that issue at the time. For the environmental movement, chlorine was pretty much the devil incarnate. The industry held there was no problem at all, as long as the risks were kept within certain bounds. Against that background we contacted the ministry ourselves and asked them if we should do a cradle-to-grave study, a substance flow analysis of chlorine in the Netherlands. By chance we found out that TNO had also been asked for a tender. We then decided to draw up a joint tender and got the job together. That was the first time we met. After that chlorine study we did another one on PVC in Europe and so gradually we came to collaborate more. Arnold's very good in hauling in all kinds of projects and establishing contacts. He's been a key partner of CML's for a very long time. In fact he was already a major procurer for CML even before he worked here."

The first collaboration with Arnold Tukker, who's working at TNO in Delft when the institutes are together commissioned to carry out a study on the Dutch chlorine supply chain.

Problem-oriented environmental science

In 1992 Wouter de Groot obtains his doctorate with a thesis entitled 'Environmental Science Theory: concepts and methods in a one-world, problem-oriented paradigm'.[31] He is appointed part-time professor at the Free University of Brussels.[32] The extended version of the thesis, put out by an international publishing house, is the result of many years of study and theory development in the realm of problem-oriented environmental science.

"Looking back, the direction I took with that work was not ideal. My focus was almost entirely on academic methodologies: concrete plans drawn up in collaboration among various environmental specialisms. Helias and his people went on to develop methods that were analytically rather than synthetically grounded. My PhD thesis was rooted in problem-oriented thinking. The edifice that Helias and Gjalt built was systems-oriented – which proved far more successful, in a nutshell. Understand me right: I still take pride in that study. There are all kinds of elements that have stood the test of time: the environmental-philosophy side, for example. There are plenty of details in that thesis that are certainly laudable. But the main thrust of working synthetically in the planning stage – that never really

CML camping weekend at Voorne-Putten. Photo Geert de Snoo

got off the ground, while systems thinking provided the foundations for the entire field of Industrial Ecology."

Together with its UBM partners, CML starts an English-language version of the UBM: the European Postgraduate Course in Environmental Management (EPCEM). Those successfully completing the course obtain the title Master in Environmental Management (MEM).

Udo de Haes' professorship

On 1 October, 1992 Helias Udo de Haes' extraordinary professorship is converted to a full professorship in environmental science, with the emphasis on natural-science aspects. In everyday language, loss of the epithet 'extraordinary' may not seem to warrant celebration, but in the academic world it most certainly does. On the same date this endowed professorship from the World Wildlife Fund: the WWF Professorship, is abolished.

LCA Manual

In 1992 the LCA Manual 'Environmental Life Cycle Assessment of Products' is presented to minister Hans Alders of Public Housing, Spatial Planning and the Environment. Jeroen Guinée: "It was really two reports. How do you conduct an LCA? – that was the first report – with the more scientific background behind the choices we'd made being set out in the second report. In 2002 we repeated the entire exercise. That led to a pretty hefty volume, as we obviously also had to discuss everything that had happened since 1992. Since our first publication similar LCA manuals had appeared in Denmark and Sweden. But they weren't like ours, which was virtually a recipe book, distinguishing all the steps and explaining how they were to be done. Justifiably, it's still regarded as a milestone in the development of LCA. We ourselves were pleasantly surprised, too."

Gjalt Huppes recalls how at the same time it was also a kind of farewell to the Dutch policy scene: "With our Substance Flow Analysis and Life Cycle Assessment we soon realized that the Netherlands was becoming too small for that kind of work, that you were too dependent on the political wind of the day and on bureaucrats who tended to come and go each time the ministry was reorganized. We first went to the EU and then also to other international organizations like the United Nations. The EU funds studies, simply as contract research. Things they consider relevant to policy may by all means have a methodological background. So for 25 years we were able to do broad research supported by EU funding from the so-called Framework programmes. There are few sources that work that well. Industry-funded research is a different matter altogether. For the chemical industry we'd already done a comparison of milk packiging early on. Without empirical research, certain things tend to be missed. One should remember that in those days there was no software at all: one had to write all the programs from scratch. The aim being to compare flax and cotton, for example, or wooden board material and hemp. I don't always take pride in the details of empirical research, but if you don't do studies like that you can't ask the right questions. It's published and you're cited. My

1 October 1992 Helias Udo de Haes is appointed Professor of Environmental Science.

In 1992 the LCA Manual 'Environmental Life Cycle Assessment of Products' is presented to minister Hans Alders of Public Housing, Spatial Planning and the Environment.

René Kleijn flanked by wind turbines along the Nn at Alphen aan den Rijn

René Kleijn

1964 Born in Naaldwijk
1990 MSc Chemistry, Leiden
1990 Researcher and lecturer, CML
2012 PhD Industrial Ecology, Leiden
2012 Director of Education, Industrial Ecology, CML
2014 Management team, CML
2015 Assistant professor, CML

When he was working in Professor Rob Louw's chemistry lab and found out how much PCBs there were in porpoise blubber René Kleijn already knew it was going to have to be 'something environmental'. "The blubber I had in my hands contained more PCBs than the standard PCB solution I was preparing in the fume cupboard with safety goggles and gloves," he says. With his broad interests, Kleijn certainly found his niche at CML: "If you come across an interesting topic – fitting into the broad framework of Industrial Ecology – you can simply set to work on it."
As a resource specialist, Kleijn is often to be heard in the media, 'whenever another resource price skyrockets'. "Sometimes you have to simplify matters to make them understandable, but without compromising your scientific integrity. During one recording I once heard the final editor say to the interviewer: 'He's got the gift of the gab', which is apparently a major compliment for a scientist."

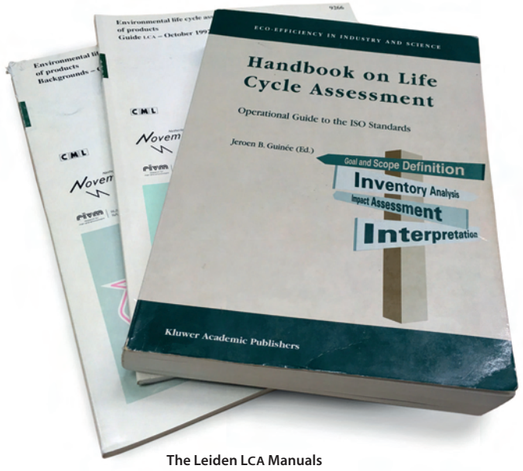
citation score is pretty high as a result, but I sometimes have my doubts when I delve into those reports today. My department hasn't done that many applied practical studies, not even for industry. Sometimes it was just a case of checking research results, those of Unilever, say, because they themselves also had their doubts. So we corrected the errors."

Lack of administrative support

The Environmental Studies and Environmental Science courses, for which CML carries out feasibility studies in 1992, fail to materialize for lack of support at the administrative level. The main reason is that the Amsterdam universities have already decided to establish two research schools: one for environmental sciences (at the University of Amsterdam) and one for the more socially oriented environmental studies (at the Free University). Leiden and Wageningen have been asked to join up with the Free University for their western-oriented studies. One way to do so would be to organize CML's non-western studies under Leiden's Centre of the same name. At Leiden there's too little support for this set-up, though. Instead, a free doctoral programme 'Development and Environment' is set up in collaboration with the department of Cultural Anthropology and Sociology of Non-Western Societies.

New Textbook

The fourth, fully revised edition of the Textbook is published in 1992. Although a fifth edition is to follow in 1994, the huge success of the early years is now a thing of the past. Times have changed, university education has become more specialized and at the same time increasingly international.[33] Boersema: "Again, it was the three of us that prepared the revision: Wouter de Groot, Jan Willem Copius Peereboom and myself. Jan Willem had meanwhile been 'exiled to Nijmegen', as he himself called it."



The Leiden LCA Manuals

Creating the revised edition proves to be rather more complex than the original Textbook itself. It is no easy matter to get the forty co-authors all facing in the same direction. The environment has meanwhile become booming business. "In '89 we'd had the National Environmental Policy Plan under Nijpels," says Boersema. "In the academic world the discipline was gaining in significance. At which point all the vested interests started showing up. Everyone was keen to put their mark on that publication and finding the right balance was a laborious process."

'Scientific pleasure'

In 1993 for the first time CML finds itself in the position of having to substantially cut its costs. It no longer manages to recoup its shortfalls from previous years, while in terms of its contract research and teaching it's among the country's priciest academic environmental centres. The division of labour with the administrative unit needs to be improved, it is decided, and decentralization within the department is required.

'Despite all this, there was also still scientific pleasure to be had in our work,' Udo de Haes nonetheless writes in his preface to the annual report. In those initial years finances played no major role at CML.

Looking back, Udo de Haes says: "We were organized directly under the Executive Board, with whom we enjoyed a good relationship until in the Environmental Science Council Gerard Mulder[34] suddenly asked: 'So where's your budget?' At which point it transpired we'd been operating without a budget for all those years. It was all going well, but it wasn't exactly professional. We simply didn't know how to draw up a proper budget – in retrospect pretty remarkable. It wasn't as if we were making huge losses or anything. Biology handled our everyday affairs, making sure nothing untoward occurred. We just kept the books balanced through some kind of intuition. Our director-administrator, Aad Vijverberg, was also the Biology administrator. When it came to bookkeeping issues, he simply had the last word. We had a kind of informal management team, with me as overall director, Gerard Barendse as director of education and Aad Vijverberg as director-administrator. Each year it ended up with infighting to get the budget sorted out, which always felt like another nail in your coffin."

And the scientific pleasure? For Udo de Haes, one of the sources of that pleasure is the go-ahead for CML to organize an international workshop on Life Cycle Assessment under the auspices of the United Nations Environment Programme (UNEP), with a second one later in San Francisco. In collaboration with several other organizations, in February 1993 the Environmental Science Centre organizes a congress on 'Local resource management in Africa', again in Leiden.

The first major CVPED[35] conference is held in the Philippines, entitled 'Forestry for people and nature: field research and theory on environment and development in the Cagayan Valley'.

In 1993 for the first time CML has to cut its costs. It transpires the institute has never operated with a budget.

CML organizes an international workshop on Life Cycle Assessment under the auspices of the United Nations Environment Programme (UNEP), 1993.

Happy days

"For us the mid-'90s were happy days," is how Gjalt Huppes remembers it too. "At the EU and the UN you had people who really wanted to get things moving and who also had a certain amount of scope to do so. In that same period we went along to the EU with the Substances and Products department. It was sometimes hard to meet all the conditions. You had to set up project accounts, for instance, which was hard in the academic world, because the university works with an overall budget. For years it was one of my main responsibilities to get that sorted out. Administrative staff who open interim accounts should be court-martialled on the spot as my accountant uncle used to say," he adds with a laugh. "From a scientific perspective those may all be interesting side-tracks, but it's something that needs to be done if you want to get your research funded."

Huppes himself obtains his doctorate in 1993 with a thesis entitled 'Macro-environmental policy: principles and design, with case studies on milk packaging, cadmium, phosphorus and nitrogen, and energy and global warming'.[36]

Can all chains be closed?

On 11 February, 1994 Udo de Haes gives his second address to mark his appointment as a full professor: 'Can all chains be closed?: the role of environmental analysis tools in supporting environmental policy' (in Dutch).[37]

Udo de Haes: "The best example of where Life Cycle Assessment is precisely the right tool is in the climate debate, where it is now authoritative. You can calculate the climate impact of products and processes all the way from cradle to grave. Biofuels may sound climate-neutral, but that's obviously not the case, because to produce those fuels you need energy at all kinds of stages. Some types of biomass even cause higher greenhouse emissions than fossil fuels because of artificial fertilizer requirements and post-harvest oxidation of soils. Waste, 'second-generation biomass', is an improvement. Across this field, LCA is a powerful tool. It's accepted around the world. To my mind this is where my most important contribution lies. There was also a division of labour with the department. They worked on developing a methodology and applying it in key case studies," says Udo de Haes, referring to the work done by Jeroen Guinée and Reinout Heijungs. "I myself became engaged more in issues of standardization. I guess I also had insufficient grasp of the underlying maths. Thankfully, others got their teeth into it and CML proved itself authoritative in the field."

SETAC and ISO

In the late '80s Udo de Haes was appointed a member of the international scientific body SETAC (Society of Environmental Toxicology and Chemistry), founded in 1979 – and that was a story in itself. "SETAC was having a working meeting at Procter & Gamble's in Brussels," relates Udo de Haes. "We'd heard about it and Jeroen Guinée (then a co-worker on the project, now assistant professor - Ed.) and I jumped in the car and just drove there. At the front desk they didn't let us in, but we knew the names of some of the people there and after a bit of to-ing and fro-ing we were allowed in. So there we were, the two of us. We soon established a rapport with the other forum members, though, and I was then appointed to the group and took that work upon me. Organization of congresses, the International Journal of LCA, for which I was a reviewer. I was well and truly at the heart of the European branch. Once every four years we held a World Congress."

"Around 1995 the International Organization for Standardization (ISO) came into the picture, led from the United States. What had to be done was develop a series of international standards for LCA. At that stage I joined in as a representative of SETAC – first as an observer and later, with voting powers, as the Dutch representative. I was involved for six or seven years. It was very intense and I learned a lot. What struck me most was the difference between the US and the majority of European countries: the latter regard LCA as an instrument for supporting policymaking, while in the States they see it as a tool for beating business competitors in court – where everything needs to be nailed down scientifically. My main role there was impact assessment. Carbon dioxide and methane are both greenhouse gases, but methane has a 20 times more powerful warming effect, so it's assigned a factor twenty compared with one for carbon dioxide. This allows you to add it all up. You can then take a horizon of 10 years, 100 years or 1000 years. We opted for 100 years. They're all choices that need to be made, but it can all be standardized. The aim was to draw up such equivalency factors for all the relevant impact categories."

Environmental Management Council

When Jan Boersema moves from Groningen to the coastal conurbation in 1994 to take up a position as general secretary of the Environmental Management Council in The Hague, he makes a conscious decision to take up residence in Leiden. What he's after is a way to keep one foot in the world of academic environmental science: "I phoned Helias to ask whether I could work for one day a week in Leiden. He thought it was a good idea and gave me a zerohours contract, as it was called. Ed Nijpels, then chairman of the Environmental Management Council, also thought it was a good thing for me to stay in Leiden one day a week. 'Will we be able to benefit in The Hague, too?' he asked. That was obviously the case; it became a kind of exchange, with Ester van der Voet later working at the Council for six months or so, for example."

"It was fun; you're at the epicentre of political debates," Van der Voet confirms from her own experience. "Today it's known as the Council for the Environment and Infrastructure. At the time I worked with others on recommendations on the human ecological footprint and on the functions of biodiversity."

After eight years Boersema takes up an appointment at the Free University of Amsterdam, but in 2009 he jumps in again in Leiden to administer exams and after his retirement in 2012 he's appointed Extraordinary Professor, Principles of Environmental Sciences. "Funnily enough I've never enjoyed a salary at CML, but always contributed free of charge."

As a representative of SETAC, Udo de Haes works on a series of ISO standards for LCA, in the mid-1990s.

In 1994 Jan Boersema is appointed general secretary of the Environmental Management Council in The Hague. To keep in touch with the academic world he also works one day a week at CML.

The fourth, fully revised edition of the 'Textbook of Environmental Science' is published in 1992.

Jeroen Guinée

1962 Born in Utrecht
1987 MSc Environmental hygiene, Wageningen
1987 Researcher, CML (as community service as a conscientious objector)
1989 PhD student, CML
1994 Senior researcher, CML
1995 PhD, Leiden
2015 University lecturer, CML
2016 Assistant professor, CML

After graduating in Environmental Hygiene from Wageningen, to his own surprise Jeroen Guinée was granted permission to work at CML by way of 'community service' when he filed as a conscientious objector to military service. On completing this period Guinée started his career at CML with a study on packaging for the Environment ministry, but previously as a student he's already designed the initial Substance Flow Analysis flowchart with his then-supervisors Huppes and Udo de Haes. At overseas congresses today he sometimes finds himself being asked by users of his LCA Manual if they can be photographed with him. It was only late in his career that Guinée starting teaching – in 2010 and since 2014 an LCA course, too. "It was really only then that I thought I had something of interest to tell them," he says.

Jeroen Guinée on Katwijk beach

Landscape-Ecological Map of the Netherlands

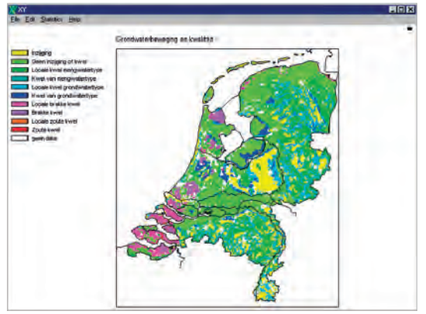
After running for 11 years, in 1994 the Landscape-Ecological Mapping of the Netherlands (LKN) project is concluded. Countless pilot areas have been studied. To bring together all the data available in the Netherlands, liaison has been established and maintained with numerous source-data owners. In 1997 Frans Klijn will obtain his doctorate with a thesis on the topic. LKN is a database with ecologically relevant landscape data for use in land-use planning and scientific studies at the national and regional scale. It comprises information on geomorphology, soil, ground and surface water, landscape, vegetation/flora and fauna.

'Metals project'

A major programme on Sustainability and Environmental Quality gets off the ground, funded by NWO, the Netherlands Organization for Scientific Research. CML participates in the programme with its 'metals project'. "It was essentially a move back from LCA to Substance Flow Analysis again," says project leader Jeroen Guinée. "Cadmium, lead, zinc and copper flows in the Netherlands and Europe. We collaborated with Wageningen University, the Free University and the University of Amsterdam. We'd come up with the plan to write one article together and to get that organized we booked into Rotterdam's New York Hotel for a couple of days with all those involved. That was also a kind of landmark moment."

During the same period the SENSE Research School is established around the core of the four old UBM partners (CML, IVAM, IVM and Wageningen).

After running for eleven years, in 1994 the Landscape-Ecological Mapping of the Netherlands (LKN) project is concluded.



Map from the Landscape Ecological Mapping of the Netherlands (KPN) project.

In 2000 Helias Udo de Haes is appointed Chair of this Research School.

Van Steenis Building

Thanks to the transfer to the Van Steenis Building on Leiden's Einsteinweg in 1995, all the sections of the Environmental Science Centre are reunited – with a sigh of relief on many sides.

Acquisition of the former 'Infotheek' building is in line with the university's policy to develop the Leiden Bio Science Park around the Gorlaeus-Huygens-Oort Complex. This project is a brainchild of biochemistry professor Rob Schilperoort, then-chairman of the ministry of Economic Affairs' Biotechnology Programme Committee.[38] He manages to convince Leiden city council of the desirability of a science park devoted exclusively to biomedical science, with opportunities for start-ups as well as established companies. When Queen Beatrix officially inaugurates the Bio Science Park in 1984

In 1995 CML moves to the Van Steenis Building on Leiden's Einsteinweg.

it's already home to several major American biotech companies and Leiden spin-offs.

A little over ten years later CML gets the opportunity to move into the Van Steenis Building, sharing the premises with the National Herbarium/Hortus Botanicus and the Biological Sciences and Environmental Science Administrative Unit (BBWM). With the latter CML is already in frequent contact, because BBWM oversees CML's finances and human-resource policy. The new proximity improves efficiency and communications enormously.[39] Almost a year later the Van Steenis Building is officially opened on 11 June, 1996, with Queen Beatrix attending. Also present are Education minister Dr. Ir. J.M.M. Ritzen, Rector Magnificus Prof. Dr. L. Leertouwer and Chairman of the Executive Board, Drs. L.E.H. Vredevoogd.

The only thing everyone misses in the modern Van Steenis Building are the old lunches together in the Garenmarkt premises. Gerard Persoon: "There, everybody sat around the table and shared what they were working on. With a group of thirty or more that no longer works. At the new location we didn't have a space like that and there were a growing number of English-speaking staff. So it all fell apart a bit. In Environment and Development we were working in faraway places, while Industrial Ecology and Conservation Biology were here, close to home. So there was a huge geographical distance. Socially, though, it was all still fine. We were all part of the same club."

Gjalt Huppes, too, misses lunching together: "That was very good for contacts with the foreign staff. The tables were long and everyone just came in and pulled up a seat, which allows people to get to know one another. In principle I'm still in Leiden one day a week, but I now do a lot of work in Amsterdam, too."

During the period 1989-1994 CML's research is evaluated by the accreditation panel of the Association of Research Universities in the Netherlands (VSNU). It's given high ratings in terms of both quality and productivity. Nationally, too, environmental science scores very well.

Simavera

In 1995 Jeroen Guinée obtains his doctorate with a thesis on 'Development of a methodology for the environmental life-cycle assessment of products, with a case study on margarines'. Reinout Heijungs transforms his work on the LCA Manual into a dissertation on LCA methodology: 'Environmental Drama and the Environmental Stage'. This thesis, from 1997, is also the first to be honoured *cum laude* at CML. In 1995 Geert de Snoo receives his PhD for his studies on agricultural field margins: 'Unsprayed field margins: implications for environment, biodiversity and agricultural practice'.

When Guinée obtains his doctorate for his methodological work on LCA, he's already been working with colleagues Ruben Huele and Paul Mulder for a while on data systems for product analyses. In the early stages that boils down in practice to 'tinkering with a Commodore', but thankfully the first PCs soon arrive on the market. Guinée calls the software Simavera (*Systeem voor de integrale milieuanalyse van verpakkingen*). CML develops the data system on a commission from the Environment ministry and the researchers also manage to get a commercial partner interested. "Today it's a very well-known system," says Guinée, "sold under the tradename Simapro, which I came up with. On the one hand it obviously doesn't sound very smart that millions are now being earned by someone else rather than us, but there again: we're a research institute. We have no desire to develop commercial software and certainly not to handle its maintenance."

In 1995 CML moves to the Van Steenis Building on Leiden's Einsteinweg.

Her Majesty Queen Beatrix visits CML at its new location. Udo de Haes explains things. Photo CML, 1996

Substance Flow Analysis

The next year Ester van der Voet is conferred her PhD with a thesis on Substance Flow Analysis (SFA).[40] "One of the first studies in the SFA framework focussed on cadmium," she explains, "a toxic metal you don't want in the food chain. You can ban cadmium, but that doesn't solve the problem, because it's a by-product of zinc production. You can't use zinc without freeing up cadmium, as they're both contained in the same ore. You can use it in products or leave it in the waste – which is what was happening, and that was no good at all. We said: it's much better for it to be in those yellow Heineken beer crates, because that at least means it can't go anywhere. And those crates have a very long lifetime. So why not? In the end, though, they stopped making the crates. That's what everyone remembers most about cadmium: that bright colour yellow."

Pressured by the environmental movement, beer-brewers Heineken stop using the familiar yellow crates, even though CML's SFA study has demonstrated that it's in fact rather a good solution. Equally well demonstrated is that communications are not one of CML's strengths. Ester van der Voet:

During the period 1989-1994 CML's research gets a positive review from the accreditation panel of the Association of Research Universities in the Netherlands (VSNU).

CML scientists develop software for cradle-to-grave environmental analysis of packaging.

"Publicity wasn't something that interested people here. In the beginning we fed entirely on the market and just wanted to discover things. Our results got to the people that needed them, with no societal pressure from the environmental movement. And eventually they ended up in European policy. We contributed to a report on cadmium and mercury. Mercury's a similar kind of metal. It's stored nicely in large vessels, which is fine. All you've got to do is make sure those vessels don't leak."

Communications

Wouter de Groot also wrestles with communications issues: "The problem with the problem-oriented approach is that it's so deeply entrenched in people. People are constantly making plans. And we're very good at it, too, but if someone comes along with something better, we're not really prepared to listen. It's awfully hard to convince engineering consultants and practical scientists that there are universal ways of solving problems. Personally, I'm a terrible salesman. If I feel someone's not interested, I just get on with something else. At the Free University they were much better at it. I always thought they were less smart than us, but they took their time setting up some issue or other at the university and then 'marketed' it, making it widely available. CML was always pretty lame in that regard and I myself was atrocious."

Organizational position

After almost twenty years the organizational position of the Environmental Science Centre is still being debated. Having started out as a working group reporting to the University Executive Board, in 1987 CML is granted the status of interfaculty working group attached to the Faculty of Science. In 1994 the Executive Board proposes splitting CML up between Science and Social and Behavioural Sciences. This doesn't appeal to CML at all, nor are the respective faculties very enthusiastic. Only the Science Faculty was interested in the hard-science research. "Apart from that, not a single faculty was interested," says Udo de Haes. A committee chaired by Prof. Dr. G. Mulder is set up to find a solution. "We were plunged back into reality. I liked him very much and the feeling was mutual, but that didn't detract from the fact that he was very independent. And he thought it was all a bit of a mess at CML, which indeed it was to some extent. 'If you go on like this, we'll have to disband you,' he said. The Science Faculty was the only place we could really go, while Social and Behavioural Sciences only wanted Environment and Development – which would mean us having to split in two. At the very last moment we didn't do so, but that was ultimately the end of Environment and Development. So they got their way, but what remained was magnificent: an independent institute within the faculty."

"We were the odd man out, not only because of our interfaculty status, but also because we got such a lot of funding from contract research. Within the university they felt we weren't really playing by the rules, that we were a little tainted by an image of playing up to industry. That wasn't the way we ourselves saw it at all. To my mind we operate entirely independently of industry. If some result or other isn't favourable to them, so be it. The problem is more that you're working with a small range of products. It's often very small innovations that are involved. It's then outside the LCA framework that the really big innovations occur. So unintentionally your work is still very much industry-friendly."

"At first we were more focused on reports than on scientific publications. And reports don't lead to doctoral theses. In the old days your university income came solely from research, with teaching something that had to be done in your spare time. The research is what you were judged on. Over the years our teaching income has become better specified as well as more substantial."

Fantastic university

In 1996 Hans de Iongh is conferred his PhD with a thesis on 'Plant-herbivore interactions between seagrasses and Dugongs in a tropical small island ecosystem'. Of all those in Leiden he's the one who's taken the concept of 'interuniversity' to its extreme, studying environmental science in Wageningen, working in Leiden, obtaining his doctorate in Nijmegen and being appointed visiting professor in Antwerp: "I think Leiden's truly a fantastic university. Perhaps not the best in the Netherlands – Wageningen ranks higher – but certainly the most interesting. Such a rich history: the Cleveringa Lecture, the university's stance during the German occupation, the diversity of the faculties. To my mind CML still occupies a unique position among the environmental institutes, though I find it hard to compare them. What I do see is the enthusiasm of those working there, the passion they have for their discipline. There's always a really good atmosphere, among the departments, too."

In October 1996 CML biologist Kees Canters receives the Dr. A. Scheygrond Prize, awarded by the Dutch Mammal Society to those making a major contribution to mammal research and protection in the Netherlands.[41]

Supply-chain analysis

In 1997 Jean-Paul Hettelingh is appointed Extraordinary Professor of Enviromet rics, a post created by the National Institute for Public Health and the Environment (RIVM).[42] The appointment means an important strengthening of the CML research programme 'Supply-chain analysis in the economy and the environment'. At RIVM Hettelingh is researching transboundary air pollution for the EU and UN. A key challenge within this new discipline of enviromet rics is to extend models in two directions, back to root causes as well as forward, to real-world risks to public health and ecosystems. The work being done at CML on Life Cycle Assessment and Substance Flow Analysis and the associated models can provide solid support for that research. The professorship is also an incentive for teaching on the post-graduate Nature and Environment programme.

Besides the Stans Prize, the student incentive award, in this period two scientific awards are created for CML staff: one for the article generating greatest publicity, the other for the best scientific publication.

The Executive Board of Leiden University proposes splitting CML up between the Faculties of Science and Social and Behavioural Sciences.

In October 1996 CML biologist Kees Canters receives the Dr. A. Scheygrond Prize.

In 1997 Jean-Paul Hettelingh is appointed Extraordinary Professor of Enviromet rics.

English-language textbook

In the '90s English makes inroads as the working language at Dutch universities, and this is reflected in new course materials. One result is that in 1997 the English-language 'Classics in Environmental Studies'[43] by Nico Nelissen (Nijmegen), Jan van der Straaten (Tilburg) and Leon Klinkers (Nijmegen) ousts the Dutch-language Groningen-Leiden-Amsterdam Textbook from its position in environmental science education.

"Logical," says De Groot, "because the Textbook was obviously entirely outdated. It mirrored environmental science as it was in the '80s. Those first fifteen chapters with environmental specialisms you would now replace by a handful of chapters on big themes like climate change. Those synthetizing chapters of mine are also no longer really acceptable. There are obviously no scientists in Utrecht saying: it was all dreamt up in Leiden, that's how we're going to do it. It certainly served its purpose, though. If you have a textbook to your name, you're part of the club." The new textbook 'Principles of Environmental Sciences' is ultimately published in 2009.

Notes

24 Bezemer H. and H.A. Udo de Haes. *Participatie in milieubeheer* (1989): anthology based on the symposium 'Participation and partnership in environmental management', held in Leiden on 17 June, 1988 to mark the 10th anniversary of the Environmental Science Centre, Leiden University

25 Annual Report 1988, Environmental Science Centre, Leiden University

26 *Koningin Beatrix aan het woord, 25 jaar troonredes, officiële redevoeringen en kersttoespraken* ('Queen Beatrix in her own words. 25 years of Queen's Speeches, Christmas speeches and other official addresses'), Sdu Publishers, 2005

27 Annual Report 1989, Environmental Science Centre, Leiden University

28 *Leidsch Dagblad*, 3 June, 1989

29 Marchand, M. and H.A. Udo de Haes (eds.), The People's Role in Wetland Management (1990), Proceedings of the International Conference, Leiden, June 5-8, 1989, Environmental Science Centre, Leiden University

30 Annual Report 1990, Environmental Science Centre, Leiden University

31 De Groot, W.T. (1992), Environmental Science Theory: Concepts and Methods in a One-World, Problem-Oriented Paradigm, Elsevier Science Publishers BV, Amsterdam

32 Annual Report 1992, Environmental Science Centre, Leiden University

33 Jan Boersema's contribution to the farewell anthology for Wouter de Groot, November 2014

34 Prof. Dr. G.J. Mulder joined the Environmental Science Council in 1991 on behalf of the Faculty of Science

35 Cagayan Valley Programme on Environment and Development

36 Annual Report 1993, Environmental Science Centre, Leiden University

37 Annual Report 1994, Environmental Science Centre, Leiden University

38 *Van kabinet naar science park, 200 jaar faculteit der Wiskunde en Natuurwetenschappen*, Universiteit Leiden ('From cabinet to science park; 200 years of Leiden University's Faculty of Science'), Dirk van Delft, Frans van Lunteren, Willem Otterspeer, Cor Oudes, Marjolein van Schoonhoven, Geert de Snoo, Ron van Veen, Leiden University Press 2015

39 Annual Report 1995, Environmental Science Centre, Leiden University

40 Substances from cradle to grave: development of a methodology for the analysis of substance flows through the economy and the environment of a region, with case studies on cadmium and nitrogen compounds, Ester van der Voet (1996)

41 Annual Report 1996, Environmental Science Centre, Leiden University

42 Annual Report 1997, Environmental Science Centre, Leiden University

43 Classics in Environmental Studies, An Overview of Classical Texts in Environmental Studies, Nico Nelissen, Jan van der Straaten and Leon Klinkers, 1997, International Books, Utrecht

Hans de longh in the 'Dutch-African' grassland along the A4 near Leiden

Hans de longh

1951 Born in The Hague
1976 MSc Environmental sciences, Wageningen
1976 Staff, Eindhoven College of Technology, Indonesia
1979 FAO staff, Rwanda
1981 Staff, Haskoning consultancy, Nijmegen
1989 Staff, Ministry of Foreign Affairs, The Hague
1990 Assistant professor, CML
1996 PhD, Radboud University Nijmegen
2009 Visiting professor, University of Antwerp
2009 Regional consultant, IUCN (until 2013)
2016 Professor emeritus

Hans de longh has his roots in development cooperation. As a student at Wageningen he was already passionate about third-world aid. After graduating he worked for Eindhoven College of Technology in Indonesia, for the FAO in Rwanda and at Haskoning consultancy and the Ministry of Foreign Affairs. Asked about the fact that many professors carry on working after their formal retirement he says: "That's not unusual, of course, if you're engaged in your work with any degree of passion, but the policy is really to step aside for the next generation."
Pushed on the matter, De longh professes to being rather proud of getting a contract with the university after his official retirement, albeit for half a day a week. "That now allows me to deliver two PhDs a year."

You need friends on issues of substance

The period 1998 – 2007: storm clouds brewing

In 1998 the Environmental Science Centre celebrates its 20th anniversary with a symposium on the environmental impact of the Multilateral Agreement on Investment. It is also the tenth year of the partnership with the College of Forestry and Environmental Management in the Philippines. In September 1998 an international conference organized by CML in that country on the theme of 'Co-managing the environment' attracts considerable attention, with over 250 attending. Also involved in the conference is the organization Plan International, which is implementing two major projects in the region.

Co-management – collaboration between a government agency and a local partner like a village community – requires a carefully structured approach as well as clarity as to the anticipated results. Conflicts arising from illegal and over-intensive use of natural resources have become a defining factor. If such conflicts are to be resolved, government must step in.[44]

Notes on page 80

CML organizes a symposium on the environmental impact of the Multilateral Agreement on Investment.

Professorship

In 1998 Wouter de Groot is appointed part-time Professor of Social Environmental Sciences at the Catholic University of Nijmegen. "At the time I was already Extraordinary Professor in Brussels for something like 0.05 hours a week," he relates. "I was giving courses in Industrial Ecology and Environmental Management, both for ten days a year. But when I was appointed professor in Nijmegen I let the Brussels professorship go."

The professorship means you can have PhD students. Every professor has *ius promovendi*, the right to award a student a doctor's title. According to De Groot, in Leiden it's always been very hard to become a professor on one's own turf. "We were very bad at that. With Gjalt it never worked out, even though he's as professorial as you can get. But it's 50% ability and 50% luck, and without the latter it often comes to nothing."

During this period Leiden University operates according to the so-called 'principle of staffing establishment', which means a professor can only be appointed to succeed a retiring colleague. Later the faculty of Science will introduce a 'tenure track' under which a relatively young scientist is appointed for a six-year period, during which they can prove themselves professionally. After five or six years there follows a review, which, if positive, leads to appointment as a professor. If not, the candidate must leave, with a little more than a year to seek an alternative post. "We're a bit like the youth section of Ajax football club," explains Geert de Snoo. "You strive to compete internationally, but your means are limited."

That Udo de Haes is CML's sole professor for many years is primarily down to the Centre not being part of any faculty. Even among professors, the maxim is apparently: 'own faculty first'.

Professorships don't grow on trees. Leiden follows the 'principle of staffing establishment': only retiring professors are replaced.

'Theological tic'

Having graduated in biology, Jan Boersema becomes a doctor of theology in Groningen with a thesis on 'The Torah and the Stoics on Humankind and Nature'. In a series of publications he explores the relationship between environmental issues and people's worldview. That relationship is absolutely key to serious analysis, he argues, in publications including *Het milieu kan niet zonder Bijbel* ('No environment without the Bible').[45] During this period he's also editor-in-chief of *Milieu*, the national environmental science journal. In the TV programme Nova he's referred to as an 'eco-theologist', while the national daily *De Volkskrant* calls him 'a biologist with a theological tic'. Boersema shrugs it all off with a smile: "I've always had ludicrously broad interests and I like writing for a wider audience. Writing understandably is not the same as writing in a 'popular' fashion. Some people hold that complex subject matter has to be written up in a complex way, but that idea was debunked years ago by [renowned Dutch author] Karel van het Reve. Even in my more specialist studies I tried to relate things in an understandable manner. My topics also lent themselves to that. That was the case with my food studies with PhD students, my analysis of Jewish dietary laws and my reconstruction of the ecological history of Easter Island, studies that also caught the attention of scientists around the world as well as plenty of citations."

The 'Nature and Environment' Master's track is launched as part of the Biology Master's in collaboration with the National Herbarium. From 2002 onwards it will be on offer as the Master's programme Sustainability and Biodiversity.

A Green History of the World

"Sometimes a book comes out that makes one think: I should have written that myself," says Boersema. "Clive Ponting's 'A Green History of the World' from 1991 was one such book. He views history through green-tinted spectacles. Not the spectacles of the powerful or the common man or the oppressed, but from the perspective of the interaction between humanity and nature. I've always retained an interest in the philosophical side of the environmental problematique; that's also the essence of my professorship at the Free University. And it's what brought me to the subject of Easter Island, too. That island provided an environmental paradigm of how things can go wrong: a culture that went too far in overexploiting the natural environment – by building

and transporting those huge statues. They're confronted with erosion and an ever-shrinking area of farmland and in the end they eat one another. Roggeveen, the first European to set foot there, in 1722, finds a society that's falling apart. That's the collapse described by Ponting and Jared Diamond. My question was: Why do we call a culture that does things like that 'advanced'? That was what I wanted to study: the tensions between 'progress' and quality on the one hand and sustainability on the other. Over the years that became an entire book, first in Dutch and later in a revised English edition published by CUP. What my analyses showed was that the entire 'collapse' interpretation was wrong. Perhaps there was overexploitation and loss of environmental quality, but the population showed resilience and managed to adapt. Sustainability was never threatened."

"We all saw the decline in farmland biodiversity."
Photo CML

Pesticides and the environment

In 1999 Geert de Snoo collaborates with Frank de Jong on the book *Bestrijdingsmiddelen en Milieu* ('Pesticides and the Environment'),[46] reporting their results on variation in Dutch usage of crop protection agents. "It's still one of the few studies on farmers' behaviour," says De Snoo. "Farmers fill out the forms in all honesty, but nobody had really looked at them. Once you dissect it all, a whole new reality emerges. Pesticide producers only have sales figures and those data are often confidential, moreover. They're hard to get your hands on."

During this period De Snoo is very much a pioneer. "It was only in England they were doing anything about field margins and that was mainly with an eye to protecting partridges as game fowl. Around the same time there was a project in Germany to protect the rarest weeds of arable fields and we set up something similar in the Netherlands, too. We all saw the decline in biodiversity in the countryside, on farmland. So why was it occurring? Today we're seeing the decline in insects. Under European policy farmers are now obliged to maintain a percentage of their land as 'ecological focus areas', which should have a positive impact on biodiversity there. At Leiden, and at CML in particular, we were then trying mainly to establish whether or not biodiversity and agriculture can go hand in hand."

LCA goes global

Work on LCA is becoming ever more international.[47] Gjalt Huppes remembers a conference in Japan – 'the Japanese are always good in big, longer-term issues' – where the question was raised whether aluminium or iron was to be preferred. "Funnily enough, the iron industry stood up and said that within ten years they'd be carbon-neutral in terms of emissions, as they'd be replacing aluminium. The same afternoon the aluminium industry gave a presentation reporting that they, too, would be climate-neutral within a decade, as they'd be replacing iron. My simple question as to how both positions could be true, neither of them was willing to answer. Which goes to show that if you're too quick to shift the dynamic in this kind of analysis, you can get any result that supports your plan. Without clear methods that are to the point, that risk will always remain."

In 2000 CML is involved in the Life Cycle Initiative set up by the UN Environmental Programme (UNEP) and the professional society SETAC. In 2002 Udo de Haes will be appointed scientific director of the project, which aims to get the LCA know-how truly implemented around the world. The initiative stems from the so-called Malmö Declaration on the circular economy.

Strategic plan

July 2000 sees the presentation of 'CML 2005, a strategic plan for teaching and research at the Environmental Science Centre'.[48] The plan sets out activities that CML hopes will allow it to reduce its dependence on the Executive Board from 2006 onwards.

The Centre's programme on Supply Chain Analysis in the Economy and the Environment has three main elements: continued contribution to the Biology course in the framework of the Nature and Environment Master's programme; contribution to the scientific-management variant of the Faculty of Science's fifth-year programme; and establishment of a Centre for Environmental Supply Chain Analysis (CKM) in collaboration with three TNO institutes.

The highlight of the Environment and Development programme is transformation of the current Master's programme into a English-language course at the Faculty of Social and Behavioural Sciences. Besides the unexpected influx of students from Cultural Anthropology/Sociology of Non-Western Societies, Administrative Science and Political Science, participation from Education and Psychology is what CML is after. To that end new contracts with foreign partners are also signed. Finally, the plan includes a proposal to instate an extraordinary professorship of 'Environment and Sustainability Issues', possibly to be positioned at the Faculty of Philosophy.

The strategic plan – which thus keeps all the strands of CML together – is approved by the University's Executive Board and the Deans of the Faculty of Social and Behavioural Sciences and the Faculty of Science. The Centre is granted the status of university institute, to be headed by a three-man team comprising Helias Udo de Haes as scientific director, Aad Vijverberg as management director and Gerard Barendse as educational director. There is also a (scientific) Institute Council and a (human-resources) Personnel Council. The Environmental Science Council is to be superseded by an Advisory Council.

In 1999 Geert de Snoo collaborates with Frank de Jong on the book 'Pesticides and the Environment'.

In 2000 CML is involved in the Life Cycle Initiative set up by the UN Environmental Programme (UNEP) and the professional society SETAC.

CML is granted the status of university institute.

Geert de Snoo

1961 Born in Zeist
1986 MSc Biology, Free University of Amsterdam
1986 Researcher, CML
1995 PhD Environmental science
1996 Head of Conservation Biology, CML (previously Environmental Biology, formerly Ecosystems and Environmental Quality)
2003 Extraordinary Professor of Management of Biodiversity and Agricultural Landscapes, Wageningen UR
2009 Professor of Conservation Biology, CML
2009 Director, CML
2012 Dean, Leiden Faculty of Science

Geert de Snoo has no trouble staying cheerful. "Environmental scientists can sometimes be gloomy, but that certainly doesn't hold for me. Conservation works; environmental management works! We now know it's crucial for biodiversity to increase the extent of small landscape elements like hedges and pools from three to seven percent. More 'green spaces' indeed leads to greater biodiversity. But you also need to be a bit relaxed about it. I'm not particularly bothered if it's a black-tailed godwit or a hare out there in the field. The world changes."

Geert de Snoo on a green ditch bank, Haarlemmermeer

'Tougher and more business-like'

"That was when things started getting tougher and more business-like," relates Gerard Barendse. "The first 20 years it only stood to reason that CML had no faculty affiliation. We got paid for a certain number of FTEs and the budget simply grew in step with that. Nor was any accountability required from us. After 2000 you were paid for the number of students that came in, got their Bachelor's and gained their Master's – for which there were simply fixed sums laid down. The faculties allocated that across the various programmes. The Environmental Science foundation course was part of Biology, for example, and was followed by a fair number of biology students. They were then with us for four months. We then had to apply for funds to the faculty concerned. At that stage we didn't yet have our own Industrial Ecology programme. That meant you didn't have any graduates of your own. In that numbers game we had to prove our worth on the basis of input and output figures. So we had to negotiate with Biology, which was also going through a reorganization at the time."

ISO standardization

The authoritative 'Handbook on LCA: operational guide to ISO standards' is published in 2002.[49] "That first handbook really broke new ground," reminisces Udo de Haes. "Later on, though, we developed better methods for quantifying impacts."

It's a question of how environmental footprints can best be expressed. Udo de Haes gives an example: "A cow gives us milk, meat and leather. How is the waste product manure then to be allocated across those three products – on a weight basis, an energy basis, or perhaps simply a financial basis? CML favoured a monetary basis, this being the purest method. But in the hard-science LCA community that proved totally unfeasible. During the meeting I had a flash of inspiration: why not adopt a 'ladder of preferences'. First, see whether you can avoid the allocation issue altogether. If not, then do it on a suitable material basis: energy, for example. If that's unfeasible, do it monetarily. And that's what happened. Gjalt wasn't happy with it, but if I hadn't made that move the whole standard would've simply failed to materialize. We'd have been right, but would've lost in the process."

Huppes responds: "Helias and I may differ in our style, but we understand each other extremely well. Helias can keep track of agendas, has a good feel for publicity, doesn't get floored in meetings. Don't forget, those ISO meetings are attended by all kinds of people, all doing their own thing. Those Americans, in particular, are highly unpleasant characters. I could never have handled those negotiations like Helias. There are too many levels for me. Scientifically I'm more precise, but at a certain point I just run aground. That often led to bickering, I must admit, but from another angle he kept everything on the rails. That I was unable to do that, I knew full well."

And there are always new barricades to be manned. Udo de Haes has high expectations of a recent development, a 'golden find' by the World Health Organization : Disability Adjusted Life Years (DALY). "That was a real breakthrough. How many

In the period 1995-1999 CML's Environment and Development and Supply Chain Analysis research programmes are reviewed by an accreditation panel from the Association of Universities. They are qualified as 'good to excellent'.

Yale is home to the Society for Industrial Ecology, in the founding of which CML plays a key role: the inaugural conference takes place in Leiden in 2002.

The Bachelor/Master structure is introduced at Leiden University, creating new opportunities for organizing teaching at CML.

years of healthy life are lost? Not entirely scientific perhaps, but at any rate scientifically grounded." The way Udo de Haes' phrases it echoes the tease he once got from then-Rector Magnificus Lammert Leertouwer (1991-1997): 'So oder so, aber sowieso'.

In 2003 CML goes 'plural', when the Leiden Environmental Science Centre is renamed the Institute of Environmental Sciences, Leiden University. The Dutch abbreviation CML is retained.

The Environmental Biology research group (MiBi) transfers from the subfaculty of Biology to CML and amalgamates with the Ecosystems and Environmental Quality section to form a new CML department of Environmental Biology, later Conservation Biology. Along with Wim ter Keurs, Kees Musters and Paul Vos join CML. "In the Ter Keurs-Udo de Haes era Environmental Biology and CML had grown apart a little," says the departmental head of the day, De Snoo, diplomatically. "But afterwards the various positions were stitched back together again."

During this period another section is also rechristened: 'Substances and Products' becomes 'Industrial Ecology', headed by Gjalt Huppes. 'Environment and Development', responsible for the field stations in Cameroon and the Philippines and headed by Gerard Persoon, is now referred to by its English name in Leiden, too.

Master's in Industrial Ecology

Once it becomes clear there's no future for CML if it doesn't have an educational programme of its own, Van der Voet and Kleijn get together to draw up an Industrial Ecology curriculum. Kleijn: "Ester and I have shared a study for years and the two of us pretty much concocted that programme on our own. It was a wild plan, which we went on to discuss with a small group of people from Delft and Rotterdam."

The upshot is that in 2004 CML can for the first time offer students its very own course. In September of that year the Master's in Industrial Ecology (with 12 students) is launched, a collaboration between Leiden University, Delft University of Technology (TUD) and Erasmus University Rotterdam (EUR). The same year 20 students enrol for the Master's in Sustainability and Biodiversity.

Ester van der Voet is proud of the Master's programme: "When it started out, CML was some kind of activist group. We just did our thing. Plenty of common sense is what you then need, and that's precisely what we had, but the theoretical grounding was still lacking at that point. That was something we built up over the years. I've been following industrial ecology from the very start – I was there when it was all taking shape. It's now a serious discipline with a learned society and a couple of journals. We've developed a great deal of theory and methodology and these have now been universally accepted. We were fairly naive when it came to academic relations, but Rotterdam Erasmus had a friendly dean, Wim Hafkamp, with a background in sustainability. It boiled down essentially to a kind of chess game with the deans of the three universities. If one party dug in their heels, the other two would manage to drag them on board."

In the end, it's thanks to the generosity of Leiden's Chemistry Faculty and Professor of Chemistry Jan Reedijk that the new course gets off the ground as a chemistry track. "That's how we started out in 2004," Kleijn relates, "gradually growing to the 80 Master's students we now have each year. Van der Voet: "In 2011 we got our own accreditation. It was a lot of work and was great fun. I learned a lot. In academic circles people sometimes look down on teaching. Research is the thing to be doing. And publishing in *Nature* or *Science*. Teaching is just really for jaded researchers. That's a shame, I feel. I don't see it that way at all. It's one of the university's core tasks, after all, as an institute of higher learning. I do agree, though, with the faculty's maxim that teaching needs to be rooted in research. You must have something to report in the discipline you're working in. But that doesn't make teaching any less respectable."

Emancipation of Industrial Ecology

Ester van der Voet is glad she had the privilege of witnessing the emancipation of her discipline first hand from the very start. "It's the missing link between the economy and the environment. Industrial Ecology is also about the economy. Not in terms of money, but in physical terms, in terms of products and materials. If you can express it in kilograms it's Industrial Ecology. How can you reduce the environmental burden without having to go back to a pre-industrial society?"

For years Van der Voet has worked closely with the two founding fathers of the Leiden school, Helias Udo de Haes and Gjalt Huppes: "Helias is a man of consensus. At meetings he always managed to come out with a decision with which everyone was happy. He also always put in a tremendous amount of preparation. Gjalt is the man of vision. He was unbelievably important for the whole field of Industrial Ecology. He was there at the cradle of the three main methods in use today: Life Cycle Assessment, Substance Flow Analysis and Environmentally Extended Input-Output Analysis. And Gjalt was not the best of communicators. One of our jobs was always to translate what he was saying, but he's a true genius. He has the complete picture and is at the same time *au fait* with all the details."

Annual Environmental Biology field day on De Horsten Estate Photo Geert de Snoo, 2005

Environmental processes

Shortly before Udo de Haes' departure as scientific director his Environmental Processes course is taken over by ecotoxicologist Martina Vijver, who has just obtained her doctorate at the Free University: "It's an

Helias kicks off a discussion at CML on the importance of looking smart at meetings and congresses.

CML celebrates its 25th anniversary – in 2003 – with a symposium on the theme 'Globalization and the Environment – diverging strategies for policy and management'.

The Master's in Industrial Ecology is launched.

Martina Vijver takes over the Environmental Processes course from Helias Udo de Haes.

introduction to all the basic environmental processes," she explains. For her it's a huge adventure joining the CML staff. "It's like being thrown to the lions, but you're really engaging with all those key processes: acidification, eutrophication, pollution, climate change. It's not long before you're thoroughly familiar with the institute and the students."

The Environmental Processes course has been introduced in 1999 together with two other subjects for third-year biology students. In the first few years the course sputters along with just a handful of participants,[50] but by 2006 the number has grown to several dozen. Vijver: "I still think it's a great course: all the key processes and their impacts on biodiversity."

The fifth CVPED conference is held on 10 April, 2005 in the Callao caves in the Philippines.

The online Pesticide Atlas is launched in 2004.

Online Pesticide Atlas

An important step for CML is the launch, in 2004, of the online Pesticide Atlas (www.bestrijdingsmiddelenatlas.nl), with a dataset starting in 1997. The digital atlas shows where pesticide use in the Netherlands is leading to surface water pollution.

Geert de Snoo is convinced of the tool's effectiveness, not in the last place because the atlas is still in use today: "Map the problems! That's an important part of it, making it transparent and accessible. Together with Martina Vijver we later wrote a second book on the subject: *Bestrijdingsmiddelen en Waterkwaliteit* ('Pesticides and water Quality')."[51] Having the atlas also put us in a position of being able to advise on nature and environment policies. All those activities had their knock-on effects in that regard. When they were drawing up the Nature Policy Plan they also looked our way. What's Leiden doing? What's the status of those small landscape elements? With all our robust know-how we were clearly an important player. I've indeed propagated that know-how my entire career as a researcher. We've informed the public, organized meetings to describe now nature was doing from a scientific perspective. We've done so in masterclasses for Members of Parliament and their staff, but also held dozens of talks in barns, restaurants or out in the sticks. Those are settings where people start talking and the questions asked often set you thinking anew. Can some kind of follow-up be organized? Preferably in such a way that you actually achieve something. That really motivates me."

CML is involved in an initiative to stimulate Leiden's teaching and research in the realm of biodiversity via a green partnership between Naturalis, the National Herbarium, the Institute of Biology Leiden (IBL) and CML.

Nature-inclusive agriculture

In 2003 Geert de Snoo is appointed Extraordinary Professor of Management of Biodiversity and Agricultural Landscapes at Wageningen University for one day a week. He doesn't see competitors Wageningen as the lion's den: "No, I saw it more in terms of optimizing the collaboration. I was also able to do a lot of work on field margins there. One should always remember the Netherlands is 60% farmland. To halt the decline in biodiversity you're going to have to reorganize farming. More nature-inclusive, less intensive, healthier soils, more space for nature."

CML organizes a number of major international conferences, including a series of partly Japanese-funded congresses on 'Eco-efficiency' in 2002 with 200 participants in the Gorleaus Laboratory and later, in 2006 and 2010, an international conference attended by over 400 in the Philippines. The Society for Industrial Ecology's first conference is held in the Dutch coastal town of Noordwijkerhout in November 2001 and draws over 300 participants. In 2004 CML is also involved in a symposium organized by the UNEP/SETAC Life Cycle Initiative in Portland (USA) with 120 participants on 'The sustainable management of natural resources in a life cycle perspective'.

A very fruitful year

'The year 2005 was a very fruitful year,' writes scientific director Udo de Haes, optimistic as ever, in his preface to the Annual Report.[52] CML awards a record seven PhDs, six of them in Leiden. Wil Tamis attracts a lot of attention with his thesis on 'Changes in the flora of the Netherlands in the 20th century'. Udo de Haes: "He identified the key factors behind changes in the Dutch flora over the twentieth century. At first it was largely agricultural fertilizer use that was to blame, while at the end of the century climate change emerged as the predominant factor."

CML awards a record seven PhDs, six of them in Leiden.

Besides the new Master's programmes, the Environmental Science foundation course is still also doing well, attracting 69 students that year. The other (15) courses continue to draw between 15 and 32 participants.

CML is preparing for change, writes Udo de Haes. The budgetary agreements with the Executive Board are due to expire at the end of 2005 and the Board is determined to make CML part of the Faculty of Science. Geert de Snoo is one of those who realizes it's time for CML to abandon its independent course: "In the end it's obviously the pursuit of a sustainable world that inspires us," he says, "but we're a university and that means we must teach and do research. You need friends on issues of substance and be well connected with the other disciplines. You can have a very strong institute, but without those connections you'll always be vulnerable."

One year later, in 2006, Udo de Haes, the man who's witnessed it all from the very start, takes his leave of the Institute of Environmental Sciences. He does so with a heavily attended farewell congress and not before he has congratulated his 23rd and 24th students to have achieved their doctor's title the same year. The professional society SETAC honours him with the LCA Award for his work in the field of Life Cycle Assessment and he is appointed Officer in the Order of Orange-Nassau. At a meeting

Helias Udo de Haes and Aad Vijverberg take their leave from CML.

Udo de Haes is decorated as Officer in the Order of Orange-Nassau by Leiden's deputy mayor Gerda van den Berg. Photo Leiden University, 2006

in The Hague a special edition of *The Journal of Industrial Ecology* dedicated to Helias is presented. Udo de Haes' farewell lecture on 8 September, 2006 in the Gorlaeus Laboratory is entitled (in translation): 'Nature and the environment in numbers; beyond quantification of environmental quality'.

For Udo de Haes a new era dawns in which he can work at a more leisurely pace and now leave teaching and meetings entirely to others. He takes a seat on a government advisory committee on the procurement of sustainable timber, from which he later resigns when he finds the committee is not entirely at liberty to give the advice it sees fit. He still organizes excursions and gives lectures and carries on as a garden consultant for *Stichting Vogelbescherming*, the Dutch section of Birdlife International. "I've come full circle, back to my roots," he says, "the green side, the plants and animals."

Earlier, on 9 June, 2006, management director Aad Vijverberg has already taken official leave of CML and the university. For forty years he's been responsible for overseeing work at Environmental Biology and CML. He's succeeded in his duties by Gerard Barendse. Prof. Dr. J.A. van Veen is appointed interim-director, tasked with establishing a strategic roadmap for CML's definitive amalgamation with the Faculty of Science.[53] But the plan he draws up would see CML virtually decimated, which leads to major unrest at the institute. Having received a vote of no-confidence from the Personnel Council and departmental heads, Van Veen is succeeded on 1 July 2007 by interim-director M.D. van Dijk. "The University Executive Board was put into quite a predicament by the situation that had arisen and they formulated a new mission for the new interim-director Maarten van Dijk," recalls Barendse. Van Dijk immediately gets to work preparing for the reorganization in 2008.

Louwes Fund

After agronomist and FAO staff member Hendrik Jan Louwes (1921-1999) bequeathed one-and-a-half million euros to the universities of Oxford and Leiden, Louwes Lectures become a regular feature. The legacy is intended for young talent doing research on food and water at the two universities and can be deemed a compliment for CML's Environment and Development programme. After a while the Louwes Fund is established, which is used to pay for post-graduate research by PhD students from Africa and the Philippines.

In 2007 the Oxford and Leiden universities' programme kicks off, with the first Louwes Lecture held in the Naturalis lecture hall in Leiden. Addresses are given by Ms. Tineke Huizinga, the Dutch secretary of Transport and Water Management, and Ms. Grace Padaca, governor of Isabela Province in the Philippines.

The first Louwes lecture. Left to right: Paul van der Heijden (Rector, Leiden University), Tineke Huizinga (Transport secretary), Romeo Arguelles (Philippine ambassador to the Netherlands) and Grace Padaca (governor of Isabela Province in the Philippines. Photo CML/Van der Ploeg, 2007

Financial tug-of-war

Leiden's Rector Magnificus professor Paul van der Heijden (2007-2013) gives the green light for a financial restructuring programme designed to end the financial tug-of-war within the university. Gjalt Huppes is still very enthusiastic about it: "Van der Heijden laid down the ground rules, with fixed payments for teaching. Those successfully completing their doctoral research get an additional PhD bonus and there was also a bonus for getting contract research funding. The battle for funding was something you always threatened to lose and that made it a thing of the past. We were continually in an underdog position, battling with people defending their own interests. And doctorates are now something you get paid for, according to a fixed rate. Van der Heijden was a true innovator in that respect. If there was something you wanted, it had to be based on performance. For us that now meant total freedom. That we pulled in a lot of outside research funding was something nobody cared tuppence about. They just wanted to retract our university budget. I'm still very grateful to Van der Heijden for his efforts – and I'm not the only one."

Barendse understands Huppes' enthusiasm about the new budgetary set-up. "Gjalt always wanted everything backed up by solid data. In my experience those data weren't convincing enough, though, because we lacked the power to actually claim those funds."

Right to exist

Meanwhile close on 500 students are enrolled in one or other CML course; 24 students successfully complete an individual research project and no fewer than 35 foreign students are now following a post-graduate programme at the institute.

Gerard Barendse: "The Executive Board felt that CML should be part of one of the faculties. A quick

Gerard Barendse takes over the responsibilities of management director Aad Vijverberg.

Agronomist and FAO staff member Hendrik Jan Louwes bequeaths a legacy, giving his name to a lecture on water use and water management.

A financial restructuring programme brings an end to the financial tug-of-war within the university

look-around pointed to it having to be the Faculty of Science. But in the upper echelons of that faculty there was a hard-science culture. Having had CML thrust upon it, the Faculty Board then insisted on all kinds of conditions being met. First the accreditation of the teaching had to be successfully concluded, which thankfully all went well. Then there were objections to the contract research, which they felt wasn't scientific. In the eyes of the faculty CML had a very low status. They also demanded that CML reorganize itself. After Helias' departure we were keen to have a new director, but only an interim-director was appointed. He came from outside and I was instated alongside him to guide that process. For me that was all very tricky, as I was soon treated as something of a scapegoat by colleagues. On the other hand it was hard being up against such a powerful institute as the Faculty of Science. It was impossible to simply shave off bits and pieces here and there, so one of the three sections had to go: Environment and Development. That section was completely disbanded and staffing was cut in the other sections, too. During this period Hans de Iongh is chairing the Personnel Council, which takes an active stance in fighting for the continued existence of a strong CML. "Those were exhausting years," he says. "At one point most of the Personnel Council were even threatened with dismissal." Following the reorganization, only an interim-director is appointed for the time being.

Barbara Croes teaching at Garoua Wildlife College. Photo CML/Buij, 2006

Notes

44 Annual Report 1998, Environmental Science Centre, Leiden University

45 See also Dekker, C. (ed.), *Geleerd en gelovig* ('Learned and religious') (2015), p.259 et seq., Ten Have

46 De Snoo, G.R. and F.M.W de Jong, *Bestrijdingsmiddelen en Milieu* ('Pesticides and the Environment') (1999), Jan van Arkel Publishers

47 Annual Report 1999, Centre of Environmental Science, Leiden University

48 CML 2005, *Strategisch plan voor het onderwijs en onderzoek van het Centrum voor Milieukunde* ('Strategic plan for teaching and research at the Environmental Science Centre'), July 2000

49 Guinée, J.B., Handbook on Life Cycle Assessment: Operational Guide to the ISO Standards (2002), Springer Netherlands

50 Annual Report 1999, Centre of Environmental Science, Leiden University

51 De Snoo, G.R. and M.G. Vijver, *Bestrijdingsmiddelen en waterkwaliteit* ('Pesticides and Water Quality') (2012), Institute of Environmental Sciences, Leiden University

52 Annual Report 2005, Institute of Environmental Sciences, Leiden University

53 Annual Report 2006, Institute of Environmental Sciences, Leiden University

If you're not at the table, you don't exist

The period 2008 – 2017: after a painful reorganization, resurgence

The years 2007 and 2008 are dominated by the reorganization, with the Environment and Development section being disbanded and the Institute of Environmental Sciences becoming part of the Faculty of Science in 2009. 'A new start following completion of the reorganization process,' as the 2009 Annual Report puts it.[54]

In 2009 Geert de Snoo is appointed Professor of Conservation Biology as well as Director of CML. The rest of the management team comprises Gerard Barendse (Institute manager), Gjalt Huppes (head, Industrial Ecology) and Wouter de Groot (deputy, Conservation Biology).

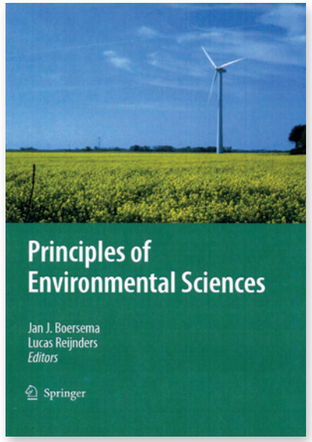
The Conservation Biology section is new and consists of the former Environmental Biology section and part of the Environment and Development section. De Snoo, who takes over as director from interim administrator Maarten van Dijk, notes that the institute has become 'very isolated' within the university over the past few years. "The university's built up around faculties and if you're not in one you're extremely vulnerable," he says. He sees it as one of his tasks to establish solid ties between CML's two sections and the faculty's other institutes: "We've managed to position CML within the faculty far more as a regular institute." In 2011 De Snoo takes the initiative of establishing the LDE Centre for Sustainability in collaboration with Delft University of Technology and Erasmus University Rotterdam – an interuniversity partnership in which CML's scientific research is aligned with Delft's technological know-how and Rotterdam's in the field of management and business administration.

Before amalgamation with the Faculty of Science becomes a fact, the CML management team has also had a good look-around in The Hague. On the campus there the Faculty of Governance and Global Affairs is taking shape. In the administrative heart of the Netherlands there's still room for CML. An appealing prospect for those environmental scientists keen to be right on top of policymaking. In the end, though, a decision is favour of hard science

Notes on page 99

The Environment and Development section is disbanded.

In 2009 CML becomes an institute of the Faculty of Science.



The English-language successor to the Textbook.

is made. A decision with which De Snoo – now Dean of the Faculty of Science – is still very happy today. "When it comes to the natural sciences we've got everything here, from astronomy through to environmental sciences. That gives us a very stable basis. What we're doing today is only possible in a natural-science setting. It was a good decision not to move the whole institute to The Hague."

Principles of Environmental Sciences

In 2009 the English-language successor to the Textbook is published: 'Principles of Environmental Sciences', edited by Jan Boersema and Lucas Reijnders.[55] Boersema: "The synthesis – seeing the connections – is extremely valuable, all the more so if you take that to a certain level. That's disappearing in the environmental sciences incredibly fast. Those environmental-science pioneers were still fairly broad in their interests. They were still aware of what other people were doing and sometimes made use of it. The environmental world has succumbed to the new academic mores of striving above all for top-notch publications. You're no longer encouraged to spread your wings that little bit more."

In partnership with the National Institute for Public Health and the Environment (RIVM) CML establishes the research project EnBioLife (Environment, Biodiversity and Life Support). In this framework Willie Peijnenburg is appointed Extraordinary Professor of Environmental Toxicology and Biodiversity. CML reformulates the institute's mission: 'Multidisciplinary research and education in relation to the sustainable management of natural resources, environmental quality and biodiversity at the highest level, with a good balance between theoretical and applied science'.

Gerard Barendse: "The higher aim was obviously to develop methodologies that policymakers could get to grips with. Helias was always passionate about each and every environmental issue and could get terribly worked up about what was happening to the environment. Gjalt had that far less. His department was involved mainly with developing methods. There, it was all about models and how the calculations should be done, never about a concrete environmental problem. It was always up in the air a bit, at the theoretical level. At times that was frustrating, because it didn't get you into the papers. At the same time it was valued enormously internationally, precisely because of the methods."

Willie Peijnenburg is appointed Extraordinary Professor of Environmental Toxicology and Biodiversity.

'One happy family'

"It was a very harmonious group of people," says Barendse. "Critical towards one another, but constructive. Everyone wanted CML to flourish. All kinds of things were always organized when someone produced something or announced some plan or other. Always constructive, one happy family. Then suddenly it transpires that something's being created around it that involves envy and 'being realistic'. That led to tensions within CML. But I did what I could."

Many of those at CML experience the first few years of the post-Udo de Haes era as an uneasy time. Gerard Persoon: "After Helias retired we were entirely in the dark as to how exactly we were to continue. For the Faculty of Science we had too many social scientists and weren't doing enough hard science. The Faculty of Social and Behavioural Sciences, for their part, had no affiliation with topics like industrial ecology. It was soon pretty clear the Environment and Development department, in particular, couldn't be shoehorned into either faculty. We tried to get it funded via NWO, the Netherlands Organization for Scientific Research. Not only for the Leiden students, but also for those we had from Wageningen and Amsterdam. There weren't many such facilities, where students could do interesting research in developing countries in a reasonably sheltered setting. As a stable location in their own right, the field stations also had a cumulative effect on the research, perhaps one of their key features. It wasn't just some study that had to be written up – you really built up something together. Sometimes students were tied to PhD projects. But it didn't go well, for all kinds of understandable as well as trite reasons like jealousy. Wageningen had itself already had to shut down field stations, so they weren't really prepared to help us keep ours."

Farewell in style

CML says farewell to the field stations in the Philippines and Cameroon in style, with a 'farewell conference' for each of these research and training programmes and books reviewing their work.

Gerard Persoon: "In June 2009 we organized the concluding conference in the Philippines and a year later did the same for Cameroon. The Dutch

The Conservation Biology department holds an informal dinner. Photo CML, 2008

With 'farewell conferences' and books reviewing their work CML says farewell to the field stations in the Philippines and Cameroon.

Gerard Persoon

1951 Born in The Hague
1979 MSc Cultural anthropology, Leiden
1979 Project staff, Ministry of Foreign Affairs, Indonesia
1986 Assistant professor Environment and Development, CML
1994 PhD Cultural anthropology and development sociology, Leiden
1996 Head, Environment and Development, CML
2009 Professor of Environment and Development, Institute of Cultural Anthropology and Development Sociology, Leiden
2017 Professor emeritus

After graduating in anthropology at Leiden, Gerard Persoon lived for several years in Indonesia working on a conservation project. When he came back to the Netherlands and started work at CML in 1986 his thesis was 'almost finished' – a incantation he would often hear from the PhD students he came to supervise – but he was eventually awarded his PhD in 1994. "To complete your thesis requires time, concentration and peace and quiet. But we all started out with a temporary contract and you were always doing your best to ensure you weren't kicked out next year."
Persoon is still regularly to be seen at the subfaculty of Anthropology, where he still has an office along with 15 PhD students whose theses are almost finished.

Gerard Persoon on derelict land in Alphen aan den Rijn

coordinators took their leave and everything was handed over to the local organizations. I myself moved to the Faculty of Social and Behavioural Sciences with two colleagues – Jan van der Ploeg and Tessa Minter – and we still had good personal contacts in the Philippines. But they couldn't understand it at all and kept on asking why we weren't just carrying on."

The decision to disband the Cameroon field station has become unavoidable, regardless of developments in Leiden. "The Boko Haram rebels were causing growing problems," Persoon relates. "It had become totally unsafe there. It had always been dangerous, with raids and violence. The strange situation arose that the university, via the Asia Institute, wanted to appoint me professor, with the Faculty of Science wanting to fire me at the same time. An absurd state of affairs. With a notice of departure in one hand I was appointed professor. Seldom in my life have I been so angry."

Through to his retirement in 2017 Persoon has enjoyable years as Professor of Anthropology, though. When it comes to collaboration with the Philippines university he can carry on doing what he's always done. Persoon misses the Centre's interdisciplinary context. He's kept in touch with Hans de Iongh on projects in Kenia and Indonesia, among other things.

Crossing Boundaries and Savannah Landscapes

To mark the 20th year of the Cagayan Valley Programme on Environment and Development (CVPED) in the Philippines the book 'Crossing Boundaries' is published.[56] It's presented at the sixth CVPED conference, 'Changing Landscapes'.

In the introduction Persoon writes that the Cagayan Valley, with its vast natural resources, high biodiversity, the ethnic backgrounds of its inhabitants and the emerging environmental problems, seemed ideal for CML at the time. Over 250 students from the two universities have done Bachelor's or Master's research there. Vastly more have followed courses and field training programmes. Many of the large-scale research projects were about resource management, reforestation, biodiversity and network management. The rediscovery of the Philippine crocodile in 1999 spawned a wealth of studies and practical conservation work for this endangered species.

In the Philippines the international, interfaculty collaboration resulted in five PhDs conferred and nine still in progress, 224 Master's dissertations and 148 scientific publications.

A year later, in 2010, the Cameroon counterpart of the farewell book is published, entitled 'Savannah

Gerard Persoon is appointed Professor of Anthropology at the Faculty of Social and Behavioural Sciences.

At the symposium to mark his retirement Gerard Persoon receives the royal honour of Officer in the Order of Orange-Nassau from Leiden's mayor Henri Lenferink.

Collaboration with the Isabela State University in the Philippines yielded 14 doctorates, 224 Master's dissertations and 148 scientific publications.

landscapes for the future'.[57] Hans de Iongh is proud of what's been achieved in the twenty years of cooperation with Cameroon. The Centre for Environment and Development Studies in Cameroon (CEDC) partnership has led to sixteen PhDs conferred, with another six in progress. All in all 96 Cameroonian and 78 Dutch students have successfully completed their traineeship at the Centre and 263 scientific publications have been clocked up. The field station's location, in the very north of Cameroon, has proven a challenging environment for CML's research and teaching activities in the realm of conservation. What is lacking in Cameroon from a Dutch perspective is political stability, here in this region bordering on the Sahel.

Udo de Haes and De Iongh both have vivid memories of the perilous journey they made from Chad to Cameroon in 2008. "It started the moment we left the airport at N'Djamena and made our way across the bridge over the border river, the Logone," Udo de Haes writes in De Iongh's farewell anthology.[58] "It was packed there, *jam-packed*. Traipsing across the bridge were an interminable flow of people and animals fleeing from Darfur rebels. And suddenly it dawns on you that you're not that far from an internationally recognized conflict zone."

On their return trip the two take an alternative route. De Iongh: "The French were supplying the Chad government army with arms and ammunition. I'd accidentally pocketed a key from the hotel, which I wanted to return on our way back, but we decided against it. We didn't travel back via N'Djamena; that hotel was meanwhile in the firing line, too. I still have that key on my desk, it was room number 9."

The next day in Maroua the conference is held for which the Leiden contingent has come. Udo de Haes in the *liber amicorum*: "That began with a long wait, if I remember rightly, because the sultans who'd been invited as dignitaries had to underline their status by arriving later than their colleagues. Which means it can all take a long time."

De Snoo on the Ctgb board

The pesticide atlas and the field margin study that Geert de Snoo, Martina Vijver, Wil Tamis and Maarten van 't Zelfde have been working on have not gone unnoticed. In 2008 De Snoo is asked to join the board of Ctgb, the Dutch Board for the Authorization of Plant Protection Products and Biocides, a position he will hold until 2013. De Snoo tells the story: "I was there in an administrative capacity. You operate within the ministry's set framework, but it obviously helps if you know how it all works in practice. My specialist knowledge was on biodiversity and the environment. Others knew more about pesticide action. Together you interpret the reports, which often come from producers. You have to keep one another on your toes, but based on arguments of substance – usually from the risk-avoidance perspective, but sometimes from the precautionary angle, too. If there are new scientific insights, you have to adapt accordingly. That's the job of both scientists and the authorization board."

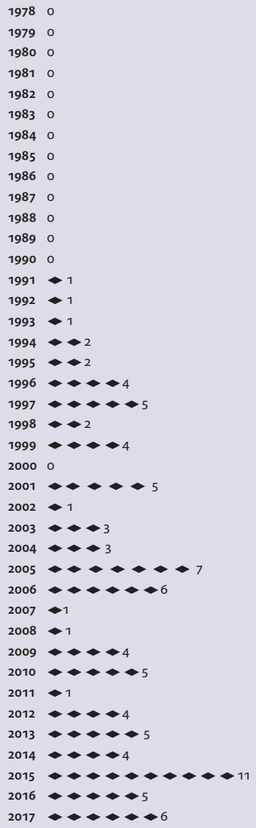
"There are an enormous number of studies," the current dean adds. "If something's very clearly going wrong, compounds are taken off the market. But sometimes it's not black and white and the board can only act within the confines of the law. It's always single substances for which approval is requested. Looking further, though, you should really also study what all those substances do in concert with one another, as all those small quantities add up. These are issues we tackle rather more seriously at CML, in Martina Vijver's Living Lab, for example. There, it's precisely the combinations that are being studied. But approval's something you do case by case.'

Old-fashioned pesticide studies

De Snoo: "In the near future, pesticide studies may well be suddenly regarded as old-fashioned, but they remain essential as ever. If one chemical's taken off the market, others come in to take its place. You have to keep your finger on the pulse at all times. That's right up the street of a knowledge institute, which can identify compounds that accumulate or pop up somewhere else in the food chain. Scientific studies yield the models used in the approval process, where there's a need for new insights. It's some way to being applied science, but it's extremely necessary. But is it 'sexy' research? I don't think so."

In 2005 Ester van der Voet goes to Zurich to work as a visiting professor for one teaching semester and in 2009 for the same four-month period as a visiting scientist at Yale University's Center for Industrial Ecology. "In itself it was quite an experience to live in the States for a while, but one of the things that really amazed me was the amount of time

PhD theses (1978 onwards)



The Cameroon field station yielded 22 doctorates, 174 Master's dissertations and 263 scientific publications.

In the 2009/2010 semester twenty students follow the new minor in Sustainable Development for third-year Bachelor students. On the Hague campus, preparations are underway for a Sustainability major in the Bachelor's programme.

In 2010 CML manager Gerard Barendse leaves on early retirement.

Ester van der Voet succeeds Gjalt Huppes as head of the Industrial Ecology department and member of the management team.

people can spend on a course there. If you compare that with how things go here… They have ten times the funds – they're so well-endowed! Which makes it all possible. The standard of work must be high, but you can really take your time on it."

Master's programme accredited

Industrial Ecology is approved as a Master's programme by the Dutch-Flemish review board and in 2010 by the education minister, too, allowing 23 new students to embark on their Master's at CML. For the university's Biology programme, CML joins forces with Naturalis and the National Herbarium to develop a new Master's programme: Evolution Biodiversity and Conservation.

Although it's not unusual for people at CML to obtain their doctorate fairly late, the time has only now arrived for lecturer René Kleijn to get his PhD. "There comes a time when you're nearing the limits of what a university still finds acceptable if you haven't got your doctorate," he says. "Around 2000 I'd already been involved in founding the International Society for Industrial Ecology[59], the ISIE, when I was asked whether I would perhaps like to become its president. That was really very strange: I didn't even have my PhD. In that position you can hardly put in a candidacy for president of a scientific society. There are other obstacles, too: you also can't be on a doctoral committee, unless an exception is made for you. It started to chafe – and then an issue came along that piqued my interest: depletion of the raw materials required for renewable energy systems. If we're serious about making a transition over the coming three decades using wind turbines and photovoltaic cells, will there then be enough resources to manufacture all that equipment? The question is not so much whether there's enough of those materials in the earth's crust, but whether they can be extracted in that relatively short space of time."

The answer comes as no surprise. Those resources are there, but there's a lead time of fifteen years before the raw materials – copper, for example – become available in sufficient quantities.

Climate conference

On behalf of the International Resource Panel of the UN Environment Programme (UNEP), on 3 November, 2010 CML researcher Ester van der Voet speaks at the climate conference about tackling non-CO_2 greenhouse gases. The conference is scheduled as a preliminary kick-off for the Mexico climate summit at the end of November. "As I'm on the International Resource Panel, I do that kind of thing fairly regularly," she says matter-of-factly. "I do those conferences twice a year. The panel has a work stream on metals that I've been contributing to right from the start."

Van der Voet calls her work for the Resource Panel 'one of the greatest things I'm involved with right now'. "It's also remarkable I got there, not being a professor. That has to do with the fact it's a new, fledgling discipline. We're still on a relatively unbeaten track. I'm now in my second term; I anticipate getting a third, but that would be the last." Out in the international community, fledgling disciplines, too, find themselves facing hard political realities. "Our proposal to write a report on the food supply was trimmed back to reporting on food wastage. You're not supposed to come anywhere near conclusions impinging on vested agricultural interests."

First Master's diplomas

In September, 2011 Prof. Dr. Ir. H.E. van de Akker, chairman of the exam committee, confers the first fifteen Master's diplomas for Industrial Ecology. One of the students, Sarah Herms, graduates *cum laude*. From now on Industrial Ecology is no longer on offer as a Chemistry specialization, but as a full Master's programme with a diploma to match.

In celebration of his 65th birthday, in December 2011 CML holds a mini-symposium for Gjalt Huppes entitled 'Making climate policy a global reality: Instruments, mechanisms, consequences and policy process'. Earlier that year at the University of Berkeley California he's received the International Society for Industrial Ecology's prestigious ISIE Society Prize. This prize is awarded every two years and is the world's highest recognition of professional achievement in this field. He receives it for his contributions to industrial ecology, and in particular for his pioneering work in the field of Life Cycle Assessment (LCA), Substance Flow Analysis (SFA) and Environmentally Extended Input-Output Analysis.

Erasmus Mundus Industrial Ecology (MIND)

Now the Industrial Ecology course is going well, CML contributes to an international variant too. Besides Leiden and Delft the universities of Graz and Gotenburg also participate in the MIND programme, made possible by the European Commission's Erasmus Mundus project. The MIND programme is followed each year by ten EU students and fifteen from elsewhere. During the third and fourth semesters students can opt for a study period at an international university, in Japan or Thailand, for example. "It took five years," says Ester van der Voet. "We've just delivered the last crop of students. We're now looking at a follow-up on the circular economy.

Geert de Snoo as Dean

In 2012 CML director Geert de Snoo is appointed Dean of the Faculty of Science. For the time being Prof. Dr. Eddy van der Meijden becomes CML's interim-director. For many, De Snoo's appointment is seen as a turning point for CML, which itself only recently became part of that faculty. "It was Geert who managed to get the institute integrated," says Gerard Persoon. "So

Party on the occasion of Geert de Snoo stepping down as CML's director.
Photo CML, 2012

In 2010 Industrial Ecology is approved as a Master's programme by the minister of Education.

Ester van der Voet is appointed a member of UNEP's International Resource Panel.

The first Master's diplomas for Industrial Ecology are conferred.

Geert de Snoo is appointed Dean of the Faculty of Science.

perhaps it was a good thing the social-science side had been dropped. I can see now it was ultimately a wise move for CML."

De Snoo feels completely at home in his new job. "But teaching's out of the question for the time being, and research is very much a side-line. I used to have fifteen PhD students; now that's just five. Of course I'm a professor here and my real passion lies in research and teaching." In 2012 the Dean was appointed for a five-year period. "In consultation with the directors of our faculty's eight institutes and the University Executive Board I recently signed up for another three years. One needs to circulate a bit. Pass on the Faculty to those succeeding you, preferably that little bit better."

Kramer Professor of Renewable Energy

At the department of Industrial Ecology, Gert Jan Kramer is appointed Professor of Renewable Energy. It's a part-time appointment, as he also works at Shell as manager, Energy Futures. Up to his appointment at Leiden, Kramer is a professor at Eindhoven University of Technology. In Leiden he focuses his attention on developing new, realistic renewable energy scenarios, using CML's expertise in the fields of Life Cycle Assessment and Substance Flow Analysis.[60]

Pesticides and water quality, scope for improvement

It's not shouted from the pages, but in the book *Bestrijdingsmiddelen en waterkwaliteit* ('Pesticides and Water Quality')[61] De Snoo and Vijver settle scores with the official Review of the government's report on 'Sustainable crop protection' (spring 2012) published by the National Environmental Assessment Agency.[62] Although CML has contributed a sub-report, the final review is not based on water quality measurements, as argued for by De Snoo and Vijver, but on predictive modelling using sales figures, crop data and new spraying methods. CML's monitoring results differ from the modelling data, showing a 70% reduction in surface-water pollution rather than the 85% calculated. At the same time, though, modelling and monitoring both point to increased emissions from flower-bulb growing, fruit-growing and livestock farming.

Pesticide concentrations in Dutch surface waters are certainly substantially lower than several decades back, but the most recent positive results date from 2001 or earlier, with virtually no improvements having been seen over the past decade. According to De Snoo and Vijver, though, there's still scope for improvement. The greatest problems can traced back to just one or two percent of farmland.[63]

"The Review had fifteen chapters with modelling projections from Wageningen," says Vijver. "We were allowed to write a single chapter on the monitoring data, on which we wanted more emphasis, but the idea was rejected. In our 'Pesticides and Water Quality' book, which we intentionally published around the same time, we made no secret of the fact. We've been asked to contribute to the current review up to 2025 at any rate. The first interim review is nearing completion. You can answer questions using models and using data. For the models, greenhouse tests are

Gert Jan Kramer is appointed Professor of Renewable Energy.

In 2012 the book 'Pesticides and Water Quality' is published.

Martina Vijver in her Living Lab near Oegstgeest

Martina Vijver

1975 Born in IJlst
1999 BSc Environmental science, IJsselland College
2004 PhD Philosophy, Free University of Amsterdam (Biology, Ecotoxicology)
2005 Researcher, CML
2014 Assistant professor, CML
2015 Co-founder of RISE (Women's Network, Leiden Science Faculty)
2017 Professor of Ecotoxicology, Leiden University

On 1 December, 2017 Martina Vijver was appointed Professor of Ecotoxicology by the Executive Board and is to give her address on 16 November, 2018. "I did my professional training at a college in Deventer. Which means it's not entirely automatic for you to go on to get a PhD and make a career of science. But it also shows there are many routes to where I find myself today. In all modesty I can say I managed it on my merits – which is as it should be. The field of nanotechnology is innovation-driven, multidisciplinary and developing rapidly. I'm a great believer in all the innovations in technology and materials, but I want to keep tabs on what's happening and scientifically assess the risks to society and the environment. "
Dean Geert de Snoo may predict that pesticide research will no longer be 'sexy' in the years to come; with her Living Lab the new professor has put it right back on the map.

done. We measure concentrations in the ditch behind the greenhouse. There are a lot of uncertainties in the data."

The publicity the book receives shows it's keenly read by the various sectors and organizations. On 21 July, 2012 the flower growers' magazine *Vakblad voor de Bloemisterij* has the headline: 'Flower-growers not doing well enough'. On 3 July, 2012 the Dutch Federation of Agriculture and Horticulture (LTO) posts its conclusion on its website: 'Water quality generally good, but needs to improve in several regions', while the bulb-growers' magazine *Bloembollenvisie* writes: 'Water quality fairly good but could be even better'. The magazines *Milieu* and *Vrij Nederland* are relentless. 'Appeal for further restrictions on pesticides,' the former writes, while *Vrij Nederland* boils it down to the very basics: 'Poison on the flowers. Dead bees, silent spring'.

In the papers, LTO's response is harsher: 'The measures the researchers propose are meaningless, according to LTO. They would sound the death-knoll for various crops. To simply ban pesticide use in those areas would be to put the cart before the horse.'[64]

Three CML directors in a in a row. From left to right: Helias Udo de Haes (the first), Arnold Tukker (present) and Geert de Snoo (from 2009 to 2012, now Dean) Photo CML, 2016

Scientific director appointed

On 1 October, 2013 Arnold Tukker is appointed Professor of Industrial Ecology and scientific director of CML. One year later he also becomes director of the Centre for Sustainability set up by the three universities of Leiden, Delft and Rotterdam. Besides his work at CML, Tukker retains his part-time research post at TNO. One of his projects is development of Exiobase.[65] This database provides insight into the global footprint of countries in relation to their natural resource use and emissions, in particular in terms of the amounts of carbon, water, land and materials embodied in trade flows and final consumption.[66]

"When Geert de Snoo was appointed Dean he said: Industrial Ecology must have a professor, too," says Tukker. "He would have to be scientific director and also be allowed to recruit a new professor for the Department of Conservation Biology. Eddy van der Meijden's main task was to keep an eye on the shop and ensure a new director was found. I was told about the vacancy by friends here at CML. I applied and was eventually accepted for the position."

On 1 October, 2013 Arnold Tukker is appointed Professor of Industrial Ecology and scientific director of CML.

The new dean and CML's new scientific director are pretty well matched, says Tukker: "But we always get along very well. During the reorganization Geert did everything in his power to prevent this institute from collapsing. He's the chess grandmaster-type. CML's extremely lucky to have had Geert during that difficult time. If things are going that badly, you also have to think everything through three times. I'm also a good chess-player and was once even junior champion in Schoonhoven. But generally speaking I perhaps tend to spring into action a little faster – come on, let's just do it! And in my term at CML's rudder that happens to be feasible. We're small; we need to grow faster. That means pulling in funds, pulling in people. And in doing so, making choices."

Tukker gives the example of an intervention reminiscent of the action taken by his predecessor Helias Udo de Haes when he was accepted as member of the LCA steering party at SETAC, at the time likewise in Belgium, as chance would have it: "Since 2014 Europe's had a massive resource programme. And it was clear to me that if we didn't take action now we'd miss the boat. So I went to Belgium and jammed my foot in the door. In the final two or three weeks it was still possible, I talked CML and Delft University of Technology in. We should obviously have thought about it all two years earlier and started lobbying, but anyway that hadn't happened and yet we still succeeded. Geert and I both understand how the other operates. He sees the benefits of my approach and I try and keep up the appearance of everything running smoothly, so Geert is also happy with it all."

In connection with the reorganization, there is no CML Annual Report in 2008.

'If you're not at the table, you don't exist'

"Helias always ensured CML was the first to leave its mark everywhere," says Tukker, "which is an art in its own right." The scientific director wouldn't want that to be interpreted as a plea for more emotional, intuitive actions at CM, though. "No, that's not what I mean. I'm not the wild and emotional type, either. In your institute you want clarity. There were all kinds of things that weren't organized that well. Your decisions have to be made transparently and you must be able to explain them. You should make as little use as you can of your position of power and do whatever you can in collaboration with the people involved. Together with the others I try and identify a point on the horizon where we want to be heading, but at the same time remaining flexible about the route to get there."

Tukker has found out that Leiden University has its own unique culture. "At the time they said of that failed merger between KLM and Alitalia: 'The KLM folk thought they did their deal-making during the meetings, while the Italians thought they did it over lunch. The same holds for us. At TNO, where I also still have a post, business is indeed done during meetings, but in Leiden it's over drinks. The Leiden happy hour – not to be missed."

Unapologetically, Tukker flies all over the world to represent CML. "I indeed travel a lot," he says, "but that's simply because I get so many invitations, now from China, too. It's good to have those contacts. Gjalt Huppes and Ester van der Voet underscore the importance of those trips: "The international conferences are very important," says Huppes. "If you're

Tukker: "In Leiden deal-making's not done at meetings, but over drinks."

not at the table, you don't exist." Van der Voet adds: "Our voice – that of industrial ecology – needs to be heard and I myself want to keep up to speed on all the latest developments. The discussion on resources and critical materials is dominated by geologists who are very good at finding new stocks of metals in the earth's crust, but the whole idea of a circular economy where there's far more reuse and recycling, that's not where that's coming from. That's what we must bring to the table. We can broaden the perspective a little by looking at the scope for urban mining. What kind of stuff is kicking around in our infrastructure? You can also view that as a mine."

Leiden-Delft-Erasmus Centre for Sustainability

Tukker is director of the Centre for Sustainability (CfS), a strategic alliance between Leiden University, Delft University of Technology and Erasmus University Rotterdam in the field of sustainability. The Centre aims to contribute to the sustainable production, management and consumption of natural resources in an urbanizing world.[67]

"Circular economy," says Tukker. "There you suddenly have a topic that everyone can get involved in. Leiden is good in material flows and biodiversity, Delft does technology and design, and Rotterdam has its expertise in the realm of transitions. There's no overlap. We're all strong in our field and are happy to see each other flourishing. And it's working a charm. Regional parties are suddenly investing in our innovation hubs. The provincial government's putting millions into a circular-economy transition programme that we're establishing together with CfS and Wageningen University and Research."

Dutch sustainability research ranked very high internationally

According to a 2014 international evaluation by a group of 39 professors, CML enjoys a solid reputation and is a robust springboard for further development of Dutch research in the field of environment and sustainability. '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 agricultural chemicals (Conservation Biology).'[68]

A year earlier, in 2013, Industrial Ecology and Mathematics are ranked as the best Master's programmes in Leiden by the Dutch National Student Survey. The survey was completed by nearly 265,000 university students.

Pesticide Atlas given a make-over

In 2014 the online Pesticide Atlas (www.bestrijdingsmiddelenatlas.nl) is given a make-over, making it easier for users to select a particular compound. In the menus only the relevant choices are shown and land use and pesticides are linked. "From there we can see where monitoring shows standards have been exceeded," explains Vijver, "what compounds and crops are most problematical and whether things are getting better or worse over time. I myself also wanted to have chemical concentrations linked to biological impacts."

In the meantime Dr. Martina Vijver has also managed to obtain a prestigious Vidi grant for nano-ecotoxicological research. She's been studying the environmental impact of microplastics. She explains: "There are a lot of things I do in parallel, there's plenty of scope for that here. I organize my own research funding. I've never been involved in anyone else's project – I'm just too stubborn for that. The issues are challenging. I do teaching, I do research and I work at the ministry. Until recently I worked part-time, which nobody felt was a problem. We're a very young department, which means it's fun to be here. From the university's perspective it would be good for me to move on, but the way things are looking I'll be here for another thirty years. I'm already almost halfway…".

The Vidi grant scheme (indeed named after *veni, vidi, vici*) established by the Netherlands Organization for Scientific Research (NWO) is designed to allow experienced scientists to develop their own innovative line of research and set up their own research

One of the maps in the revamped online Pesticide Atlas, www.bestrijdingsmiddelenatlas.nl.

In 2015 CML publishes more than 70 papers, contributes to the UN climate summit and advises the Dutch government on safe use of pesticides. Eleven PhDs are conferred.

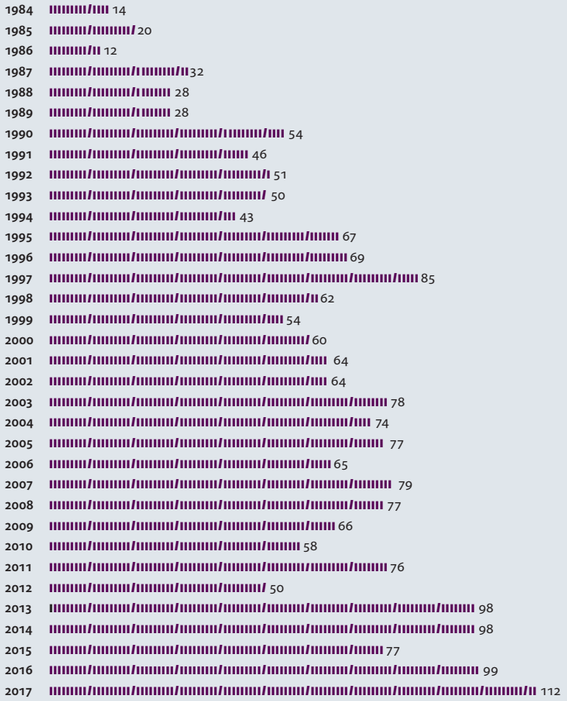
Nadia Soudzilovskaia receives an NWO Vidi grant for her research on mycorrhiza.

In 2016 CML publishes over 90 papers, celebrates the royal honour conferred on assistant professor Hans de Iongh, contributes to the Global Soil Biodiversity Atlas and confers five PhDs.

The symposium 'Human-Wildlife conflicts in Africa' is organized to mark Hans de Iongh's retirement. He receives the royal honour of Officer in the Order of Orange-Nassau.

Scientific publications

(1984 onwards)



Arnold Tukker

1960 Born in Brandwijk
1987 MSc Chemistry, Utrecht
1988 Ministry of Public Housing, Spatial Planning and the Environment
1990 Senior consultant, TNO
1998 PhD, Tilburg
2010 Professor of Industrial Ecology, Trondheim
2013 Professor of Industrial Ecology, Leiden
2013 Scientific Director, CML
2014 Director, Leiden-Delft-Erasmus Sustainability Centre

Ever since he first made contact in 1993, there hasn't been a moment Arnold Tukker hasn't been cooperating with CML in some way or other. "That's how it went up to my appointment as scientific director twenty years later." In the field of Life Cycle Assessment CML is one of the leading institutes. For Tukker, intensive collaboration between CML's two departments is what he'll be pursuing in the future: "Conservation Biology's concerned with natural capital, biodiversity at various scale levels. That's a story you can link to Industrial Ecology, where you're concerned with the smartest economic use of resources extracted from nature. How do you do that as efficiently as possible? Taken together, that gives a coherent picture of CML."

Arnold Tukker in the courtyard of the Van Steenis Building in Leiden, the housing of CML

group. Vijver: "With the shift towards nanomaterials and plastics a new direction has emerged requiring collaboration with Physics – for knowledge about colloids – and the Cell Observatory – for hands-on know-how on microscope techniques. Which all helps consolidate the integration within the Faculty."

American award for Merlijn van Weerd

On 27 September, 2015 CML researcher Merlijn van Weerd receives the prestigious Parker/Gentry Award, the first Dutch recipient ever. The biologist is given the international prize for natural history research and conservation for his contribution to rediscovering the Philippine crocodile, *Crocodylus mindorensis*. "The animal was assumed to be extinct," says Philippines coordinator Gerard Persoon, "But during one of his surveys in 1999 Merlijn had trapped a small crocodile. That became the seed for a project protecting the Philippine crocodile, right in the area where we had our field station."

In 2003 Van Weerd teamed up with anthropologist and CML colleague Jan van der Ploeg to set up the Mabuwaya Foundation, which is assessing the potential for humans and crocodiles to live side by side in this part of the Philippines. "I went to the Faculty of Social and Behavioural Sciences to lobby to renew the partnership with the same university there, which we eventually did in 2012."

Van Weerd also co-discovered a spectacular new Philippine monitor lizard species, *Varanus bitatawa*. This giant fruit-eating forest monitor lizard lives in the remaining forests of northern Luzon in the Philippines. Together with an international team of scientists, in *Biology Letters* Van Weerd co-authors an article on this secretive, two-metre long reptile.

Merlijn van Weerd holds an adult Philippine crocodile. Photo CML

Living Lab

In 2016 Martina Vijver, Maarten Schrama and Henrik Barmentlo manage to raise 15,000 Euro in a crowdfunding campaign for their Living Lab: 36 experimental ditches on a patch of wasteland at the Bio Science Park in Oegstgeest. The ditches are connected via a pool to the Old Rhine and are used to monitor the real-world impact of pesticides and nutrients on surface water quality. "All the compounds coming onto the market are normally tested in the laboratory, under lab conditions," Vijver explains. "There's no daylight, no natural fauna. You stir it all now and again – or not, depending on the test protocol. On top of that, the compound is then tested on something that's easy for us to cultivate in the lab: a water

CML's Living Lab, where the real impacts of pesticides and nutrients are measured, is established after a crowdfunding campaign.

The opening of the Living Lab is celebrated on 9 June, 2017. Photo CML

flea, *Daphnia*. But water fleas are crustaceans, not insects. You can't seriously tell me they're just as sensitive as insects. They don't even have the same nervous system. Yet every single compound that comes onto the market we test on water fleas. But the fact of the matter is that *Daphnia*'s ten thousand times less sensitive to Imidacloprid, for example, than a random insect. You can't screen compounds using insects, because for screening you need to consider the entire reproductive cycle – for which there's just not enough time. Every two seconds a new biocide comes onto the market somewhere in the world. You can never keep up with that. In the Living Lab we've been working for a full year testing just two compounds. We'll always be lagging massively behind. Only ten percent of the compounds on the market have been tested for their toxicity. The toxicity of the rest has been derived or estimated."

In actual fact, the Living Lab is not made up of 36 ditches, but 38. The contractor's mistake, but it's been put to good use, with the extra ditches now being used for educational purposes when school classes come to visit the project.

Living Lab, next level

The next step is to excavate 48 small 65-litre ponds, which is being done in 2018. Vijver anticipates spectacular results: "We seeing fantastic things emerge. In the ponds we can keep the micro-communities very stable. It's proving possible to make a very good estimate of a stressor's impact, even the impact of two. We deliberately went for the agro-chemicals: one crop-protection agent and one nutrient. I don't pretend the Living Lab's a natural system. It's a pioneer community of readily colonizing organisms. You only see that outdoors, in nature. The Living Lab can help tie up field knowledge to the results obtained in the lab."

Two extra Living Lab ditches are used for school classes visiting the project.

Beyond doubts

Tours of the Living Lab are organized. Conservation Biology has a blog and a Facebook page. Which elicits the familiar question: is it all scientific enough? Vijver: "I think we've moved beyond those kinds of doubts now. Everything we're doing is fundamental. You can also see that from the kind of grants we're getting and the publications we have. I think we're putting up a top-class scientific performance. Science has changed a bit, too. Nowadays the EU sets the requirement that research funds must spawn socially relevant results. You can no longer say: we'll just publish in scientific journals. Results have to be disseminated more widely than just that one journal article read by 3,000 people and then never again. What's relevant is whether you're also giving policy-related advice or teaching something to a wider audience."

"I have the added luck that the dean thinks it's great," Vijver adds. That's an understatement. "I'm enormously proud of it," says De Snoo. "CML also has a reputation for researching these kinds of things in the real world, as we did with the field margin studies. That's something we have over thirty years' experience with. There was now a conscious effort to establish links. That's a great way of making progress."

Martina Vijver: "You can no longer say: we'll just publish in scientific journals."

Notes

54 Annual Report 2009, Institute of Environmental Sciences, Leiden University

55 Boersema, J.J. and L. Reijnders (eds.) (2009), Principles of Environmental Sciences, Springer

56 Crossing Boundaries, celebrating 20 years of environmental research in Cagayan valley and Sierra Madre, 2009

57 Savannah landscapes for the future, celebrating 20 years of environmental research and education in northern Cameroon, 2010

58 The Mermaid and the Lion King, essays in honour of Hans H. de longh, Institute of Environmental Sciences, 2016

59 https://is4ie.org/

60 Annual Report 2010, Institute of Environmental Sciences

61 Snoo, G.R. de and M.G. Vijver, *Bestrijdingsmiddelen en waterkwaliteit* ('Pesticides and Water Quality') (2012), Institute of Environmental Sciences, Leiden University, download: http://hdl.handle.net/1887/19252

62 Eerdt, M. van et al., *Evaluatie van de nota Duurzame gewasbescherming* ('Review of the report 'Sustainable crop protection'') (2012), National Environmental Assessment Agency

63 Annual Report 2012, Institute of Environmental Sciences, Leiden University

64 *Leidsch Dagblad* 7 July, 2012

65 www.exiobase.eu

66 Annual Report 2013-2014, Institute of Environmental Sciences, Leiden University

67 Annual Report 2013-2014, Institute of Environmental Sciences, Leiden University

68 Annual Report 2013-2014, Institute of Environmental Sciences, Leiden University

A fresh young crowd, with a mix of experienced people

2018: current status and plans

Walking into the Leiden Institute of Environmental Sciences today, in 2018, nothing remains of the wild prehistory and CML's unsteady first thirty years, when international recognition regularly alternated with the threat of dissolution.

The Institute offers a Master's in Industrial Ecology, a Minor in Sustainable Development, a Master's specialization in Biodiversity and Sustainability, a popular open online course (MOOC) on the Circular Economy and a PhD programme. During their time at CML, students work together in multidisciplinary groups using interactive learning methods. CML links science to societal issues and prepares students for a role in managing the world's natural resources and biodiversity.[69]

Asked what CML has bequeathed to the world, Helias Udo de Haes answers: "With Life Cycle Assessment, CML has laid down the entire international discussion framework and even provided guidelines at the European level. In this respect the world's now a better place – or at any rate less worse off. No, let's just say: CML has made a real contribution."

"A lot of energy," says Wouter de Groot in answer to the same question: "We've always managed to motivate people. We were a great club, something I often hear from people who've worked at CML. It gave you a kick. Industrial Ecology's now an immensely successful field, thanks particularly to Gjalt and to a slightly lesser extent to Helias and even less to myself. That whole club there managed to create something of real significance."

"CML's spawned numerous first-class researchers," says Gerard Persoon, "with countless people ending up in all kinds of different sectors – including administrative posts. They've all learned to be very interdisciplinary in their thinking, with an open mind towards other disciplines. CML should really reward itself with an Alumni network for its 40th anniversary. It would be interesting to see what's become of former staff and students. I reckon there'd be enormous diversity."

Ester van der Voet: "CML was one of the first institutes to start work on Industrial Ecology and we still play an important role in the field. CML has truly managed to help create a new scientific discipline. That's really something to be proud of."

Hans de Iongh's first thoughts go back to CML's work in the Philippines and Cameroon: "We made a major contribution to strengthening local capacity. I'm extremely proud of that. The PhD students, with whom I'm still in touch, do really make a difference there. It's an enormous career leap for someone from a developing country to get a PhD. It opens all kinds of doors. We also introduced new ideas and innovations there, developed courses and set up a field station that's still up and running today."

Gjalt Huppes likes to focus on the facts: "Discussions are often unnecessarily political, with people tending to go off on ego trips. The university's role is to provide some sort of guidance in this respect. I know for a fact that private research consultancies have an inescapable tendency – if they're to survive – to come up with the simple answers their clients want to hear. Our role, then, is to provide the methodological underpinning. At CML we also have people working on 'backcasting'. Suppose the future's this or that. What does one then need to get there?"

'A fresh, young crowd'

"It's a fresh, young crowd," says Scientific Director Arnold Tukker, "with a great mix of experienced people. We're growing; you can see there's a good atmosphere. CML simply no longer features on the list of institutes the Dean or the Board's concerned about. In conversations it's obvious everyone's happy with us, which was far less clear four years ago."

The Faculty of Science – 'Leiden Science' – is over 200 years old, with a sum total of 2,190 staff in eight institutes and 3,380 students.[70] Together, the seven faculties in Leiden (and The Hague) have 6,500 staff and 26,900 students. Tukker: "CML has almost doubled in size and at the same time with a staff of over 100 we're still one of the faculty's smaller institutes."

Among the things Tukker takes pride in is environmental scientist Paul Behrens' recent publication in the leading journal *PNAS*[71] on the environmental footprint of national dietary recommendations. In 2017 several other scientific publications attract attention, including an article by Jeroen Guinée in *Nature Nanotech* about how LCA can be combined with risk assessment for new nanotechnologies. It's the first high-ranking publication with co-authors from each of CML's departments.

"When I came here I had set myself a number of objectives," says the Scientific Director. "The first of two major ambitions was to get papers published in top-notch journals like *PNAS*, *Science* and *Nature*; the second was several nice personal scholarships. That's all been achieved and that helps enormously to gain proper recognition as an environmental outfit from the long-established scientific disciplines at the university. Thanks to achievements like this we're now up with the leading global players. Of the world's twenty or thirty institutes working in our field we must now be in the top five."

With all the changes going on, it's a challenge for the Scientific Director not to tread on some toes.

Notes on page 105

Helias Udo de Haes: "With Life Cycle Assessment, CML has laid down the entire international discussion framework".

Gerard Persoon: "CML should really reward itself with an Alumni network for its 40th anniversary".

Arnold Tukker: "With a staff of one hundred we're still one of the faculty's smaller institutes".

"We needed a new professor for the Conservation Biology group and we wanted him or her to tighten that department up, get it more focused. The appointment went to Peter van Bodegom, someone you immediately saw in the job interviews would do all he could in pursuit of quality. And the great thing is he was the candidate the group themselves wanted. At CML we're great believers in doing science together, with PhD candidates working alongside professors. That's always how it's been here. We're a team; the honour is shared. That's also far more fun for everyone concerned."

Peter van Bodegom: "In the research all kinds of great cross-connections have been created. In the Living Lab we're linking ecotoxicology to impacts on entire ecosystems and the spread of pathogens. We're showing how new molecular techniques can improve our understanding of biodiversity on land, in the water and in the air, and we're developing remote-sensing techniques that can be used to derive ecosystem services and can feed into tools for Industrial Ecology.''

Collaboration with Naturalis

Tukker is enthusiastic about the collaboration with the Naturalis Biodiversity Center: "A fantastic museum with a huge collection when it comes to biodiversity and a good research department. Their research director Koos Biesmeijer is now also a professor with us. He was originally a professor at another university, but now he's a three-minute bike ride away. Naturalis was behind the Nature for Life agenda, in which we're enthusiastic partners. You need to have a good network, shared interests and people who are willing to give each other credit. That way you can get things done."

Van Bodegom:''With the Naturalis Biodiversity Center we're working on new ways to redefine the status of nature – our natural capital – in the landscape and the circular economy. That's something the world urgently needs."

Cooperation with Naturalis is one of the two tracks Dean Geert de Snoo also sees for CML in the future. "There's even more potential there. We get together with Naturalis every four weeks to discuss the future. Today there are also a host of top researchers working there."

Data Science

The other track is data science. De Snoo: "In numerous disciplines that's leading to a great deal of innovation. You can create self-learning systems. In that way CML can also join the top players internationally. As Dean I've made a great effort to get a data science programme established for the entire university. We've put fourteen PhD students together in the biology building. They're also physically in there two days a week to work on projects. All very exciting!"

Van Bodegom: ''Thanks to information science, in the near future we'll be able to follow the large herbivores in nature areas live as moving dots and analyse their patterns of movement.''

New teaching programme

It was recently announced that CML has received the go-ahead from the Ministry of Education for a com-

Tukker: "Naturalis Biodiversity Center is a fantastic museum with a huge collection when it comes to biodiversity and a good research department".

De Snoo: "In numerous disciplines data science is leading to a great deal of innovation."

Peter van Bodegom by the sea, South Katwijk

Peter van Bodegom

1972 Born in Vlaardingen
1995 MSc, Wageningen UR
2000 PhD Microbiology, Wageningen UR (cum laude)
2000 Researcher, Free University of Amsterdam
2004 University lecturer, Free University of Amsterdam
2011 Assistant professor, Free University of Amsterdam
2015 Professor of Environmental Biology, CML

Peter van Bodegom's field of research extends across microbiology, ecology and biogeography. He uses a combination of models, experiments and big-data analysis to understand and predict the interactions between organisms and their environment, with particular focus on those between human beings and nature. He develops tools for a systems approach to the interdependencies between man and nature, for water boards, for example, and for the 'Sand motor' project off the Ter Heijde coast, and is in discussion with government agencies to encourage a new perspective on biodiversity and nature.

pletely new teaching programme: Governance of Sustainability. Tukker: "We're doing it in partnership with the Institute of Public Administration in The Hague. All that remains now is to draw up a curriculum and get it accredited." CML is also contributing to the new interfaculty Bachelor's Urban Studies, to be launched in September 2018.

Transition Campus

Tukker has high expectations of the ACCEZ initiative: 'Accelerating the Circular Economy in Zuid-Holland', an initiative of Zuid-Holland Provincial Executive in which the Leiden-Delft-Erasmus Centre for Sustainability is exploring the transition to an innovative, circular and sustainable future. Tukker: "Zuid-Holland province has a number of economic sectors that need to change their ways, like Rotterdam Port and Westland greenhouse horticulture. They can't carry on like this for another twenty years. Economic growth in the province has been flagging compared with the rest of the country, it's been found – there's something going on and action needs to be taken. We must bring in new industries and technologies. In my line of business, the web of relationships between science and application is simply part and parcel of the package. That's different in physics or astronomy. That link with practical implementation is something you must have. What also appeals to me very much is that we reconsolidate our roots both regionally and nationally. Gjalt, Ester, René and myself have an international reputation, but here in the Netherlands we were no longer that visible."

The collaboration between CML and the other parties in the Centre for Sustainability on the issue of the circular economy 'could well be the most powerful partnership in Europe,' so said Tukker in his address on 26 February, 2016.[72] "If we're to continue to live in prosperity we need to transform today's economy into a circular economy in which resources are recycled and far less primary raw materials are required. To get that economy up and running, CfS and CML are currently inventorying the world's material flows. A global economy based on eighty percent recycling can be around five times the size of today's economy, using the same amount of primary resources."

New forms of education. Leiden University has twenty Massive Online Open Courses (MOOCs) on offer, including the course 'A Circular Economy of Metals: Towards a Sustainable Societal Metabolism', given by Ester van der Voet. Photo Leiden University

In partnership with the Institute of Public Administration in The Hague, CML sets up a new Governance of Sustainability programme.

Participants in the Sustainable Development minor. Photo Els Kroon, 2017

Notes

69 Annual Report 2016, Institute of Environmental Sciences, Leiden University

70 Leiden Science, Our Talents & Discoveries in 2016, Faculty of Science

71 Behrens P.A., Kiefte-de Jong J.C., Bosker T., Rodrigues J.F.D., Koning A. de and A. Tukker (2017), Evaluating the environmental impacts of dietary recommendations, *PNAS* 114(51): 13412-13417

72 *Leidsch Dagblad,* 24 February, 2016

Acknowledgements

For CML's first thirty years, this publication is based partly on the historical review by Edith de Roos and Gerard Barendse in the *liber amicorum 'Sporen van een gedreven pionier, verhalen bij het afscheid van Helias Udo de Haes'* ('Traces of a passionate pioneer, stories on the departure of Helias Udo de Haes'), 2006.

I thank Esther Philips and Institute Manager Paul de Hoog for their support; Maarten van 't Zelfde for his help with the photos; the interviewees for their time and patience; my brother Dr. A.J. Olivier for his advice on the text; translator Nigel Harle, also for dotting some i's in the Dutch text; Gerrie van Adrichem for the excellent graphic design; and Taco van der Eb for the stunning photo portraits.

Ed Olivier

A cherished tradition that CML has kept up over the years: the annual staff outing, in 2017 to Volendam. Seated front centre: Institute Manager Paul de Hoog.

PUBLISHER Institute of Environmental Sciences (CML),
Leiden University, Faculty of Science
www.universiteitleiden.nl/wiskunde-en-natuurwetenschappen/milieuwetenschappen

Leiden, June 2018

TEXT Ed Olivier ©

ENGLISH TRANSLATION Nigel Harle, Gronsveld

DESIGN Gerrie van Adrichem www.gerrievanadrichem.nl

PHOTO PORTRAITS Taco van der Eb www.tacovandereb.com

PRINTER Verloop Drukkerij, Alblasserdam www.verloop.nl

ISBN 978-90-71287-89-3

CML
Institute of Environmental Sciences

Universiteit
Leiden