



RESEARCH ASSESSMENT

DEPARTMENT OF ENVIRONMENT
AND HEALTH, 2014-2020

VRIJE UNIVERSITEIT AMSTERDAM

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REPORT ON THE RESEARCH REVIEW OF THE DEPARTMENT OF ENVIRONMENT AND HEALTH OF THE VRIJE UNIVERSITEIT AMSTERDAM

1. FOREWORD BY COMMITTEE CHAIR

Regular review of a research institute is an essential instrument to guarantee its scientific quality, societal relevance and viability. A panel of international experts had the challenging task to form a balanced judgement of the Department of Environment and Health of the Vrije Universiteit Amsterdam on the basis of a self-evaluation report, a site visit (which was organized virtually this year) and a variety of discussions with research leaders, senior and junior staff, and PhD students. The committee members were impressed by the high quality of the research produced in The Department of Environment and Health, which is without any doubt linked to the very research-friendly atmosphere and the good working conditions in the different research units.

Some specific issues discussed during the site visit included strengthening the scope of research and strategic partnerships, creating further opportunities for trans- and interdisciplinary research directions, and creating enabling conditions for leadership and pathways for early career researchers, as well as strategies and challenges for the future merger into A-LIFE.

Given the particular circumstances of this year's online visit, I would like to stress the keen organization and the smooth interaction before and during the assessment visit. The researchers of the Department of Environment and Health were assiduous in giving us a great deal of additional information on their work, thus providing us with the necessary means to sketch the whole picture of the ongoing research at the Department of Environment and Health. I am certain that I speak for all committee members when I acknowledge how much we profited from this very cooperative atmosphere.

Many persons were involved to make the effort as enjoyable as it turned out to be. On behalf of the review committee, I would like to acknowledge and thank them all.

Prof. Emily Boyd
Chair



2. THE REVIEW COMMITTEE AND THE PROCEDURES

2.1. Scope of the review

The Vrije Universiteit Amsterdam (VU) asked an assessment committee of external peers to perform an assessment of the research conducted at the Department of Environment & Health (E&H) over the period 2014-2020.

In accordance with the Strategy Evaluation Protocol 2021-2027 (SEP) for research reviews in the Netherlands, the committee was requested to carry out the assessment according to a number of guidelines. The evaluation was to include a backward-looking and a forward-looking component. The committee was asked to judge the performance of the unit on the main assessment criteria specified in the SEP and to offer its written conclusions as well as recommendations based on considerations and arguments. The main assessment criteria are:

- 1) Research Quality;
- 2) Societal Relevance;
- 3) Viability of the Unit.

During the evaluation of these criteria, the assessment committee was asked to incorporate four specific aspects relating to how the unit organises and actually performs its research, how it is composed in terms of leadership and personnel, and how the unit is run on a daily basis. These aspects are:

- 1) Open Science;
- 2) PhD Policy and Training;
- 3) Academic Culture;
- 4) Human Resources Policy.

This assessment was part of a cluster assessment of five institutes participating in the SENSE Research School. Institutes could choose to participate in this joint assessment on a voluntary basis. Other partner institutes opted for a stand-alone review, or a joint review at a higher or lower level of aggregation within their own university.

2.2. Composition of the committee

The composition of the committee was as follows:

- Prof. Emily Boyd (Lund University Centre for Sustainability Studies, Lund University) - chair
- Prof. Joe Alcamo (Sussex Sustainability Research Programme, University of Sussex)
- Dr. Ana Bastos (Department Biogeochemical Integration, Max Planck Institute for Biogeochemistry)
- Prof. Rik Eggen (Department of Environmental Systems Science, ETH Zürich)
- Fenna Hoefsloot MSc (ITC, Twente University) - PhD student member
- Prof. Björn-Ola Linnér (Department of Thematic Studies -Environmental Change, Linköping University)
- Prof. Lyla Mehta (Institute of Development Studies, University of Sussex)
- Prof. Lena Neij (The International Institute for Industrial Environmental Economics, Lund University)

The committee was supported by Peter Hildering MSc as project manager and drs. Mariette Huisjes as secretary on behalf of Qanu.

2.3. Independence

All members of the committee signed a statement of independence to guarantee an unbiased and independent assessment of the quality of the research performed by E&H. Personal or professional relationships between committee members and the research unit under review were reported and discussed at the start of the site visit amongst committee members. The committee concluded that no specific risk in terms of bias or undue influence existed and that all members were sufficiently independent.



2.4. Data provided to the committee

The committee received the self-evaluation report from the units under review, including all the information required by the SEP.

The committee also received the following documents:

- The Terms of Reference;
- The SEP 2021-2027.

2.5. Procedures followed by the committee

All five assessments were planned in the week of 19-23 April. The five participating institutes were Wageningen Institute for Environment and Climate Research (WIMEK) of Wageningen University and Research, the Institute for Environmental Studies (IVM) and the Department of Environment & Health (E&H) of Vrije Universiteit Amsterdam, IHE Delft Institute for Water Education (IHE Delft) and the Copernicus Institute of Sustainable Development (Copernicus) of Utrecht University.

The committee proceeded according to the SEP 2021-2027. Due to Covid 19 restrictions, all meetings took place online. Prior to the first online meeting, all committee members independently formulated a preliminary assessment of the units under review based on the written information that was provided before the site visit. In a preliminary online meeting on 16 April 2021, the committee was briefed by Qanu about research reviews according to the SEP 2021-2027. It also discussed the preliminary assessments and identified questions that they would raise during the site visit. The committee also agreed upon procedural matters and aspects of the review.

The online site to E&H took place on 21 April 2021. After the interviews the committee discussed its findings and comments in order to allow the chair to present the preliminary findings and to provide the secretary with argumentation to draft a first version of the review report. The full schedule of the assessment week is included in Appendix 2. The final review is based on both the documentation provided by E&H and the information gathered during the interviews with management and representatives of the research unit during the site visit.

The draft report by the committee and secretary was presented to E&H for factual corrections and comments. In close consultation with the chair and other committee members, the comments were reviewed to draft the final report. The final report was presented to the Board of the Vrije Universiteit Amsterdam and to the management of the research unit.

The committee used the criteria and categories of the Strategy Evaluation Protocol 2021-2027. For more information see Appendix 1.

2.6. About the SENSE Research School

SENSE is an academic network for integrated environmental and sustainability research PhD training. It is a partnership involving ten Dutch universities and research organizations. SENSE provides disciplinary and multidisciplinary PhD training, a network for high quality environmental and sustainability research, as well as a bridge for sustainable solutions at the science-practice interface. More information: www.sense.nl



3. RESEARCH ASSESSMENT OF E&H

3.1. Introduction

The department of Environment and Health (E&H) is embedded within the Faculty of Science of the Vrije Universiteit Amsterdam (VU). Its mission is to better understand the impact of environmental contaminants on human health and the environment, through top-quality academic research and education. The E&H department shares a lab building with the departments of Chemistry & Pharmaceutical sciences and of Molecular and Cellular Biology and the VU Medical Center. This lab has opened in 2017 and is equipped with high-tech, state-of-the-art research infrastructure and facilities. The department employs 35 staff members.

3.2. Organization, Management and Governance

The department E&H covers three disciplines: analytical chemistry, toxicology, and epidemiology. It is the department's ambition to integrate these disciplines into multi- and transdisciplinary research. Since 2020, the department has been organized in two sections: 'Chemistry for Environment and Health' and 'Environmental Health and Toxicology'. To stimulate interdisciplinary research, the two sections work closely together as one community. While each section has its own scope and topics, the department strives to lower the barriers, by organising weekly lunch seminars, monthly meetings of all principal investigators, cross-topic projects and project proposals and the annual E&H symposium.

E&H is governed by a management board consisting of the heads of the two sections, the institute manager and a human resources management expert. One of the section heads also functions as head of department.

At the beginning of this review period, part of E&H still belonged to the Institute for Environmental Studies at the VU (IVM). In 2017, the section Chemistry and Biology split off from this institute and merged with the section Health and Life Sciences of the university's ATHENA Department, which studies design interfaces between science and society. Together, they formed the department Environment & Health. Currently, the department prepares for yet another reorganisation. As of January 2022, the E&H department will merge with the Departments of Ecological Science and Molecular Cell Biology into the new Amsterdam Institute for Life and the Environment (A-LIFE).

Half of the institute's funding comes from research contracts with third parties from industry, government ministries, the European Commission and NGO's. In the past 6 years, this percentage has decreased from 86 per cent in 2014 to 50 per cent in 2020. More than a third (37 per cent) comes from direct funding, also called the first money stream), a lump sum budget received from the Dutch government based on the number of students. This percentage has fluctuated over the past six years; in 2014 it was 14 per cent. The remaining 13 per cent of E&H's income is acquired in the form of research grants. Up until 2017, this percentage was zero.

3.3. Strategy and aims

E&H made a clear choice during the 2017 reorganization to no longer depend almost exclusively on contract research. This seemed too risky, even though the department was very successful in this capacity. Instead, the department decided to expand its educational activities and to acquire research grants. E&H has been successful in balancing its income streams, the committee found. Nevertheless, the department is still vulnerable, the committee found, being small and largely dependent on external funding.

E&H distinguishes strategic aims with scientific, societal and institutional policy characters. Strategic aims in the field of science are:

- to perform world-leading research to develop analytical chemistry methodology for identification of environmental and health issues of emerging concern,



- to specialise in contemporary toxicological hazard assessment tools to improve toxicological understanding and risk assessment practices,
- to improve knowledge on how lifestyle, including chemical exposure, affects human health.

It is the department's ambition to contribute to society in three ways:

- contribute scientific information and knowledge of environmental pollutants and their effects to societal debates and regulatory decision-making,
- implement scientific knowledge into commercial processes to solve contemporary practical problems of industry to meet current day demands of zero pollution/chemical strategy,
- use scientific knowledge to improve regulatory chemical risk assessment in the Netherlands, Europe and beyond.

Finally, E&H identified three institutional policy aims. These are:

- to promote individual excellence and personal development,
- to maximize the integration of chemistry, toxicology and epidemiological expertise to contribute to a toxic free environment and sustainable future,
- to train next generation top scientists to operate at the cutting edge of environment and health research.

The department's research is well-embedded in the VU profile themes Science for Sustainability and Human Health & Life Sciences, as they are laid out in the 2020-2025 VU Strategic Plan. E&H is part of the interdisciplinary research school SENSE, the Amsterdam Institute for Molecular and Life Sciences and the Amsterdam Sustainability Institute.

The committee studied the documentation provided by E&H and discussed the strategy with E&H's senior staff members. It concludes that E&H has a clear research focus on the impact of environmental contaminants on pollution and human health, bringing together the perspectives of chemistry, toxicology and epidemiology. This combination is unique in the Netherlands. E&H's niche is academically, societally and economically highly relevant. More than that: is much needed, particularly due to its unique focus and combination of disciplines. The committee finds the current focus somewhat narrow, which could make the department vulnerable in the long run. In order to reduce this risk, remain relevant in the future and increase its impact, the committee recommends E&H to broaden its scope, as is elaborated in the next paragraph. In addition, the committee supports E&H's efforts in further enhancing research quality, consolidating recent developments and strengthening its educational commitment.

To clarify its position and relevance to the outer world, the committee encourages E&H to explicitly engage with the Sustainable Development Goals, set up by the United Nations General Assembly in 2015 as a 'blueprint to achieve a better and more sustainable future for all' and to be achieved in 2030. E&H's mission and aims touch upon many elements of this 2030 Agenda, such as 'good health and well-being', 'clean water and sanitation', 'responsible consumption and production', 'life below water' and 'life on land'. The same applies to the European Green Deal, a set of policy initiatives to make Europe climate neutral, while contributing to – among other things – healthier people and a healthier planet and addressing environmental pollution. In the committee's view, it should at least define how it relates to these policy initiatives.

3.4. Research Quality

The committee is impressed with E&H's excellent research and scientific leadership. The department is very successful in its rare combination of focus areas analytical chemistry, toxicological hazards and risks and human health impacts. With many publications, that are frequently cited, E&H has a high impact. Over the past six years the average number of publications in the top 10 with regards to average number of citations by all other publications in the same field has steadily risen from 27.5 in 2014 to 33.3 in 2019. It is obvious to the committee that E&H's research and products are of very high quality.



In order to maintain its position and remain relevant in a dense field of competitors, the committee recommends E&H to widen its scope in terms of collaboration with partners. While it does well in integrating chemistry, toxicology and environmental health and this in itself commendable, it could embrace a more trans- or even interdisciplinary approach. As far as research at E&H is now transdisciplinary, it predominantly encompasses natural and medical sciences. This fits E&H's overall mission and strategic focus. The committee is therefore very much in favour of strengthening the links to other medical sciences, in particular epidemiology and clinical practice. It also recommends opening up to more fields within the natural sciences, for instance to ecology, the study of hazards of pesticides and other chemicals on insect populations, on impacts of endocrine disruptors on specific species, or on transfer of toxic compounds through food chains.

In addition, the committee advises E&H to reach out to engineering sciences, social sciences (for instance science and technology studies), and the humanities (for instance environmental humanities). Connecting the work of E&H further to societal and ethical dimensions of technology could enhance the overall impact of E&H, as is showcased by E&H's success with its transdisciplinary microplastics research. By also reaching out to the engineering sciences, E&H could really make its mark on innovations. The recommended transdisciplinarity could for instance be realized by entering collaboration projects, or by developing dialogue platforms or other forms of interactions; there are always links between research and wider societal processes. There is a large component in the social sciences as well as science and technology studies that is involved with risk communication, regulatory cultures, communicating risk and uncertainty as well as local and diverse perceptions of pollution, toxicity and the wider politics and uneven benefits of the circular economy. It may be profitable for E&H to delve into some of these topics, since ultimately the uptake of E&H's methodologies and recommendations will depend on wider societal, political and cultural issues. In the committee's view, linking to these social and political aspects is a crucial aspect of sustainability studies.

The committee is aware that developing trans- or interdisciplinary working methods is notoriously difficult. It is also obvious to the committee that the department has needed (and still needs) to spend time and energy in all the mergers it went through. The committee is convinced however, that it will be worthwhile for E&H to invest in clear structures that stimulate trans- and interdisciplinary research, and not leave it up to individual supervisors whether PhD research is done in a mono-, multi- or interdisciplinary way. Once the dust has settled after the merger with A-LIFE, this may be an appropriate next ambition. A relatively easy step would be to structurally collaborate with the Institute of Environmental Sciences IVM, from which E&H has recently been separated. Collaboration with other disciplines could also be actively sought within the SENSE network. Alternatively, E&H could invite speakers from for instance social sciences to their workshops.

The upcoming merger with Ecological Sciences and Molecular Cell Biology into A-LIFE on the one hand offers an opportunity to strengthen links to ecology. On the other hand, it could also impede collaboration with other disciplines. The committee strongly recommends E&H to develop a strategy to ensure that the merger into A-LIFE does not get in the way of the institute's engagement with other disciplines such as social sciences and engineering.

That the spirit of openness is there, within E&H, and only needs to be kindled, becomes clear from its engagement with artists and designers. The committee is very pleased with E&H's microplastics research winning of ZonMW's Bio Art&Design Award in 2017. This is encouraging, exactly the kind of step that will keep E&H's research fresh, visible and relevant.

3.5. Societal Relevance

The committee is convinced that the rare combination of chemistry, toxicology and epidemiology is of great societal relevance. E&H is aware of this, the committee found. It aims to use its expertise to contribute to a toxic-free environment and a sustainable future. To realize these ambitions, the department targets regulatory bodies, industry, NGO's and the general public, via different channels and different approaches. The committee found that E&H is successful in reaching these stakeholders. Its staff members sit on many influential advisory bodies and expert committees, and are popular invited speakers to symposiums and conferences. The department also



organizes its own workshops where professional and scientific experts meet. In general, the committee found that E&H engages well with relevant partners and there is a high uptake of research by NGOs, industry, regulatory bodies

However, E&H's engagement with its partners seems to be predominantly top down: research results are shared with stakeholders and the general public, but research is not set up in dialogue with them. For instance, around themes such as regulatory decision making, zero pollution or risk assessments, the committee saw little focus on co-production with local communities and stakeholders or on citizen science. In order to be less vulnerable and more relevant in the long run, the committee recommends that the E&H department focus more on co-creation with stakeholders, as is already practiced in some of its projects. E&H could develop its own method of co-designing. In addition, ideally E&H should actively seek collaboration with partner institutes – not least its former partner at the VU IVM –, enter into a dialogue to discover their perspectives and formulate the next research question together. In this way E&H could enhance its contributions to the sustainable development goals and the health challenges associated with environmental pollution. This would respond to the pertinent needs for inter- and multidisciplinary health studies highlighted by the *Lancet* Countdown on health and climate change¹ among others.

It also struck the committee that E&H's spotlight is almost exclusively on Dutch or European contexts. The committee was impressed by the department's excellent contribution to the EU strategy, and encourages it to specifically address the European response to future needs and transformative ambitions. It misses a systematic strategy towards the Global South, however, whereas the countries belonging to this category could certainly profit from E&H's exceptional expertise, for instance in detection of key toxic compounds, method development, or hazardous chemicals resulting from a circular economy. The committee therefore recommends the department to strengthen its bonds with the Global South, for instance through the United Nations Environment Programme that it is already associated with. In order to make these bonds effective, it is important to steer clear from having a unilinear view of capacity building, the committee thinks. While it's true that many countries in the Global South may lag behind in technical expertise, measurement capacities and sophisticated equipment, there will always be way for western scientists to learn from for instance African scientists. This could for instance regard different understandings of risk, a different interface between science and society, or different understandings of the impacts of pollution. The committee suggests that E&H could think about ways to see research, teaching and learning in partnership with the Global South as equitable processes based on mutual learning.

Open science

To reach a wider audience, the department increasingly aims to publish articles in an open access format. However, the committee found that the *de facto* open access publication rate of 32.5 per cent is still very low, as is the pace at which it has grown over the past few years. In the committee's view, open access publishing can and needs to be prioritised to fulfil the ambitions of accessible research. It will be relatively easy – as the department itself states – due to the deals between large academic publishers and Dutch research institutes and budgets that have been made available for open access publishing. This is particularly worthwhile in view of the many collaborations and outputs relevant for partners and stakeholder in low- and middle-income countries.

At another aspect of open science – the reuse and storage of data so that they are Findable, Accessible, Interoperable and Reusable of FAIR – E&H is successful. The committee is especially happy that the VU has updated its policy in 2020 to better implement new current research information systems to archive datasets.

E&H has an impressive record in outreach to a wider public. For the period between 2017 and 2020, E&H staff took part in a total of 160 media broadcasts, such as informative programmes and news reports on radio, television and online. It also actively shares its expertise occasionally in the form of press releases or documentaries via social media. The committee strongly supports these activities. It recommends engaging with a wider public in a more strategic way, developing an outreach strategy that specifies goals, target groups, funding options and actions. This

¹ <https://www.thelancet.com/countdown-health-climate>



will make the department more visible and effective in the long run, and is especially relevant now that outreach is becoming more and more an integral part of academic practice and also more valued as such.

3.6. Viability

Academic culture, research integrity

The committee found that E&H is a lively community, with many international students. Naturally, the ongoing split-ups and mergers pose challenges for E&H to the development and preservation of its own culture. The management is conscious of this, the committee found. It takes the egalitarian and passionate academic culture of the Institute of Environmental Sciences (IVM) at the VU – that it formerly belonged to – as an inspiring example, which the committee fully endorses. In spite of reorganizations, there still seems to be a good vibe at E&H. This is worthy of a compliment.

To promote a safe and open working environment, E&H relies on a culture of trust and mutual accountability. Such an informal approach has advantages, but also carries important risks. This is particularly the case if conflicts of interest emerge, or if staff might not feel comfortable to share concerns with co-workers. Even if rare, such situations should be anticipated and prevented, in the committee's view. The committee recommends a more pro-active approach, with courses on how to promote a safe and open working environment at all levels of the staff.

The committee found that integrity is on the agenda at the VU in general and therefore at E&H as well. All PhD's are trained in the principles of scientific integrity, which the committee finds excellent.

Diversity

The E&H department has a relatively favourable gender balance, the committee found: of the scientific research staff, 65 per cent is female and 35 per cent is male. This may be considered as fair. As far as cultural background is concerned, the committee found that PhD and postdoctoral students at E&H form an international community, but the tenured scientific staff is overwhelmingly Dutch. This is partly due to the fact that many of the educational programmes at the university are taught in Dutch. This limits the department in hiring international staff, since it would be hard for them to teach courses in Dutch.

In spite of the good gender balance, the committee thinks it is too early to become complacent. It got the impression that diversity and inclusion are currently not top of mind at E&H. Also, diversity is currently largely defined by the male/female ratio and internationalization. Although important, this only focuses on physical representation in staff and student bodies. Focussing on these dimensions turns the question of diversity and inclusion into a 'recruitment problem' rather than aiming for the deep institutional change which is needed for guaranteeing the equal participation and well-being of minority groups (including queer, disabled, and people of colour). The committee encourages E&H to reflect on how diversity can be increased beyond gender dichotomies and nationality to include diversity in knowledge, expression, and experience in education, research, and institutional practice.

HR policy

The faculty has several policies towards professional development. For example, there is an associate professor policy and a tenure track policy. Post-doc and PhD student policies are currently being updated. In these policies, clear criteria are formulated that a staff member has to meet to progress in her or his academic career. In this way, career development is transparent to all staff members and facilitates staff and the supervisors to set out a clear development plan. Every staff member has an annual evaluation with her or his supervisor to reflect on the previous year and make a plan for the years to come. Every employee can claim two days for personal development each year. These policies seem professional to the committee.

E&H reports difficulties in finding the multi-talented PhD-candidates it needs, with both experience in the analytical chemistry domain as well as in the toxicological field. It remedies this by always viewing a PhD candidate in light of the entire team, so that a lack of experience in a certain area may be covered by a fellow PhD student or technician



working on a related project. For the future, the department aims to expand its teaching portfolio. This will not only enhance the career prospects of the department's staff, but it also enables the training of highly qualified master's students in the field of environment and health, who can later on be recruited for PhD positions at the department. The committee agrees that it would be a great idea for E&H to train its own future PhD students. It suggests that – given the societal importance of many of the themes covered by its research – E&H could perhaps even develop its own dedicated master's programme. This could also buffer some of the instability due to research funding cuts and dependence on external funding.

Mental health support for staff with problems is particularly well organised at E&H, with a series of counselling opportunities in place. This is excellent, but the committee suggests to also include prevention of these problems next to support for existing issues. This could be prioritised in E&H's management board as a point for discussion and subsequently for developing an action plan.

PhD training

The E&H department employs PhD students funded from different sources. Each of these may have its own possibilities and obligations as far as training goes. Therefore, PhD students within the E&H department develop their own tailor-made training and supervision plan. They can benefit from various graduate schools, including SENSE and the Amsterdam Institute for Molecular and Life Sciences. The PhD students are stimulated to gain a broad view through a wide variety of courses, including courses to train academic skills such as time management, communication with supervisors and colleagues and dissemination of results to the scientific community and beyond. PhD students also participate in conferences and international training networks and they have many options for personal counselling and career advice and training. The committee finds that the PhD trajectory at E&H is well-organised. It does have a few suggestions on how it could be brought further in line with E&H's strategic ambitions.

First, the self-assessment report states that young academics and PhDs are training not only to become excellent researchers but also future leaders and decision-makers. While E&H seems very successful in the former, it does not seem to have a clear strategy on the latter. The PhD candidates did not mention any concrete guidance and training in leadership skills, which seems inconsistent with the ambition of the PhD program. The committee thinks that some reflection on what modern leadership is in the field of sustainability would be in place. Since sustainability research is a problem-solving science, its future leaders need not only academic knowledge, but also skills, networks and awareness of opportunities and career pathways if they want to compete with colleagues from different universities. Subsequently, a strategy to make this concept of leadership go all the way through the department would be appropriate. One suggestion to stimulate PhDs in developing leadership skills could be to install a PhD committee for the institute. This can serve as a representative body of the PhDs in policy and decision-making and can advocate for the well-being of the PhD community. Such a PhD committee would have to have close lines with the management board. In light of the future merger into A-LIFE, a PhD committee could also serve as a meeting point for E&H's PhDs.

A second point of improvement, related to the former, could be the ethical component in PhD training. There do not seem to be clear guidelines for the PhD candidates to reflect on the ethical and societal implications of their research. This now seems an 'afterthought' rather than a core element of the PhD training. Specifically considering the fact that much of E&H research focuses on health issues, it is important in the committee's view to consider the diverging effects on marginalized communities. For example, with regard to chemical pollution, there are numerous examples of differentiated effects on people of colour or indigenous communities. If impactful research should work towards a just living environment, these reflections and considerations should be institutionalized, not only in PhD training and supervision but also in all research practices.

PhD supervision



PhD students all have a promotor, one or more co-promotors who are often daily supervisors, and an external supervisor from outside the research section. This external advisor will help to keep track of the progress and can ensure that the thesis is sufficient to comply with standards in the field. The daily supervisors have at least weekly scheduled meetings with the PhD students. In these meetings, not only scientific progress, but also workload is discussed, as this is a continuous concern among all PhD students. Daily supervisors themselves are all trained in supervision, which the committee finds excellent. The drop-out rates seem relatively low compared to other institutes, also a good thing. In general, the committee agrees with the supervision guidelines, and finds that E&H has strong control measures in place. The committee suggests that E&H should consider implementing the role of the external supervisor as an opportunity to promote interdisciplinarity. This could be done by stipulating that the external supervisor not only comes from outside the research section, but from a different but relevant discipline, or she or he could represent a stakeholder from outside the academic world.

The PhD students at E&H are highly productive, but the committee does find the publication requirement of four papers (three published, one under review) rather high. In talking to the students, the committee found that they do feel the strain. It considers it therefore a wise decision that the department has moved away from this high demand during the stressful period of lockdown. The committee suggests this decision may take on a permanent character. This would align with the general tendency to put less emphasis on the quantity of publications.

Future outlook

The committee concludes that E&H has enormous potential and high ambitions. Its expertise is extremely relevant and will become even more relevant, now that societal awareness of the importance of a healthy living environment is on the rise. The challenge for E&H will now be to live up to its ambitions and safeguard long-term success in the highly competitive academic arena.

The committee encourages E&H to broaden its focus, reach out to those who need its expertise, embrace modern, ethical leadership and be not afraid to grow.

3.7. SENSE research school

The environmental and climate research institutes in the Netherlands cooperate in the SENSE Research School, in which E&H participates together with 12 other institutes spread over 10 research institutions participate. All of the five institutes the committee reviewed during the week were part of SENSE. SENSE primarily supports PhD education in educational and climate science, and to some limited extent researchers, by providing courses and a network. The committee got the impression that SENSE does not play a major role for E&H.

During the site visits, the committee learned that SENSE is the continuation of a former national research school. Where most research schools were discontinued once universities started to increasingly use own graduate schools, the SENSE research school was maintained, as the participating institutes saw the added value of a national school in PhD education. The committee also learned that the added value attributed to SENSE differed among the institutes, and that this is the reason why the research school has a rather narrow scope, focusing on PhD education and a number of networking and outreach opportunities.

The committee thinks that a national network for cooperation between environmental institutes is a very good idea with great potential. The current limited scope however does not fully realize the opportunities such a network has. Also, the level of support is very dependent on a small number of participants. The committee encourages SENSE to develop a vision of the future.

It could be that the Research School is happy with the current situation, and does not see possibilities for cooperation beyond the current efforts. Another possibility is to discontinue SENSE. The third scenario is a revitalization of the network. In that case, the committee sees lots of possibilities. As discussed earlier in this report, the sustainable development goals that environmental and climate sciences work on are so interdisciplinary that



SENSE should consider a broader range of institutes working on environment and science from other disciplines, such as social sciences, governance, political science and law. This would mean opening up the requirements and prerequisites for the certificates, for instance by cooperation with other Research Schools such as CERES of WTM to suit PhD students' needs.

In the most ambitious scenario, SENSE could be a platform for interdisciplinary cooperation, which can be used to collectively seek collaboration with other fields, governments and international partner. It could also co-ordinate outreach and lobbying activities. Another possibility is to develop SENSE into a platform for the interests of PhD students and other researchers in the field, and develop joint policies and procedures on issues such as intersectional inclusivity, safety, equal opportunities and work-related conflicts.

The Netherlands is a relatively small country with a relatively large number of small and medium sized research institutes in environmental and climate sciences. The committee thinks that in this context, there is much to gain both nationally and internationally by joining forces.

4. EXECUTIVE SUMMARY

The department of Environment and Health (E&H) is embedded within the Faculty of Science of the Vrije Universiteit Amsterdam (VU). In the review period, E&H has undergone a significant organisational change. Currently, the department prepares another reorganisation. As of January 2022, it will merge with the Departments of Ecological Science and Molecular Cell Biology into the new Amsterdam Institute for Life and the Environment (A-LIFE).

E&H's mission is to better understand the impact of environmental contaminants on human health and the environment through top-quality academic research and education. With this, the department has a clear research focus, bringing together the perspectives of chemistry, toxicology and epidemiology. Although this focus is unique in the Netherlands and academically, societally and economically highly relevant, the committee finds it relatively narrow, which could make the department vulnerable in the long run. However, the committee also encountered a spirit of openness, that is manifested for instance in E&H's engagement with non-academic stakeholders such as artists and designers. This spirit needs to be kindled, in the committee's view, to remain successful in the long run.

The committee is impressed with E&H's excellent research and scientific leadership. The department is very successful, with many publications that are frequently cited. It is obvious to the committee that E&H's research and products are of very high quality.

E&H's expertise is of great societal relevance and the department succeeds very well in reaching stakeholders such as regulatory bodies, industry, NGO's and the general public. By focussing more on co-design, E&H could enhance its contributions to the Sustainable Development Goals and the health challenges associated with environmental pollution.

The committee found that E&H is a lively community, with many international students. Naturally, the ongoing split-ups and mergers pose challenges for E&H to the development and preservation of its own culture. The management is conscious of this, the committee found. In spite of the reorganizations, there still seems to be a good vibe at E&H. This is worthy of a compliment.

E&H struggles somewhat to find the multi-talented PhD-candidates it needs. For the future, the department aims to expand its teaching portfolio. This will not only enhance the career prospects of E&H's staff, but it will also enable the training of highly qualified master's students in the field of environment and health, who can later be recruited for PhD positions at the department.

The E&H department employs PhD students funded from different sources. Each of these may have its own possibilities and obligations as far as training goes. Therefore, PhD students within the E&H department develop their own tailor-made training and supervision plan. The committee found that the PhD trajectory at E&H is well-organised. It does have a few suggestions on how it could be brought further in line with E&H's strategic ambitions. For instance, the PhD students at E&H are highly productive, but are under a lot of strain. This is enhanced by a high publication requirement.

The committee considers the SENSE Research School to be a valuable network between universities working on environmental and climate science, that could have more potential than is currently envisioned by the participating universities. The committee encourages SENSE to develop a vision of the future. Depending on the ambitions, this could result in maintaining the current, low-profile set-up, discontinuing SENSE or revitalizing the network, for instance as a platform for interdisciplinary research. According to the committee, the Netherlands is a relatively small country with a relatively large number of small and medium sized research institutes in environmental and climate sciences. In this context, there is much to gain both nationally and internationally by joining forces.



5. RECOMMENDATIONS

- Widen the scope of research by collaborating with partners from adjacent disciplines such as medical sciences, ecology, social sciences, science & technology studies, engineering sciences and environmental humanities.
- Explicitly engage with the Sustainable Development Goals, as formulated in the 2030 Agenda of the UN. Relate your research topics to these goals, and clarify what your research contributes to them.
- Further enhance research quality, consolidate recent developments and strengthen educational commitment.
- Invest in clear structures that stimulate trans- and interdisciplinary research, and not leave it up to individual supervisors whether PhD research is done in a mono-, multi- or interdisciplinary way.
- Consider implementing the role of the external supervisor as an opportunity to promote interdisciplinarity.
- Develop a strategy to ensure that the merger into A-LIFE does not get in the way of the institute's engagement with other disciplines as recommended above.
- Reflect on what modern leadership is in the field of sustainability, do not limit this to scientific knowledges only, but expand to skills, networks and awareness of opportunities and career pathways. Incorporate these views in the training of PhD's and make them go all through the department.
- Include an ethical component in PhD training and research practice. For instance, consider the diverging effects of chemical pollution on marginalized (indigenous) communities.
- Install a PhD committee.
- Make the decision to move away from the 'four papers' requirement for PhD students during the pandemic permanent.
- Engage with a wider public in a more strategic way, developing an outreach strategy that specifies goals, target groups, funding options and actions.
- Focus more on co-creation. Develop an E&H-specific method of co-designing. For instance, enter into a dialogue with partner institutes (not least the Institute for Environmental Studies IVM at the VU) to formulate the next research question together.
- Reflect critically on the traditional view of 'capacity building' in research projects in the Global South. Think about ways to see research, teaching and learning in partnership with the Global South as equitable processes based on mutual learning.
- Even though the gender balance is fair at E&H, do not become complacent on the topic of diversity. For instance, reflect on methods to increase diversity beyond gender and nationality.
- Do not only support staff with mental health problems, but also concentrate on prevention. Prioritise this as a point of discussion and action for the management board.
- Develop a vision of the future for SENSE and organise the SENSE Research School accordingly.



APPENDICES

APPENDIX 1: THE SEP 2021-2027 CRITERIA AND CATEGORIES

The committee was requested to assess the quality of research conducted by the UHS as well as to offer recommendations in order to improve the quality of research and the strategy of the UHS. The committee was requested to carry out the assessment according to the guidelines specified in the Strategy Evaluation Protocol. The evaluation included a backward-looking and a forward-looking component. Specifically, the committee was asked to judge the performance of the unit on the main assessment criteria and offer its written conclusions as well as recommendations based on considerations and arguments. The main assessment criteria are:

- 1) **Research Quality:** the quality of the unit's research over the past six-year period is assessed in its international, national or – where appropriate – regional context. The assessment committee does so by assessing a research unit in light of its own aims and strategy. Central in this assessment are the contributions to the body of scientific knowledge. The assessment committee reflects on the quality and scientific relevance of the research. Moreover, the academic reputation and leadership within the field is assessed. The committee's assessment is grounded in a narrative argument and supported by evidence of the scientific achievements of the unit in the context of the national or international research field, as appropriate to the specific claims made in the narrative.
- 2) **Societal Relevance:** the societal relevance of the unit's research in terms of impact, public engagement and uptake of the unit's research is assessed in economic, social, cultural, educational or any other terms that may be relevant. Societal impact may often take longer to become apparent. Societal impact that became evident in the past six years may therefore well be due to research done by the unit long before. The assessment committee reflects on societal relevance by assessing a research unit's accomplishments in light of its own aims and strategy. The assessment committee also reflects, where applicable, on the teaching-research nexus. The assessment is grounded in a narrative argument that describes the key research findings and their implications, while it also includes evidence for the societal relevance in terms of impact and engagement of the research unit.
- 3) **Viability of the Unit:** the extent to which the research unit's goals for the coming six-year period remain scientifically and societally relevant is assessed. It is also assessed whether its aims and strategy as well as the foresight of its leadership and its overall management are optimal to attain these goals. Finally, it is assessed whether the plans and resources are adequate to implement this strategy. The assessment committee also reflects on the viability of the research unit in relation to the expected developments in the field and societal developments as well as on the wider institutional context of the research unit

During the evaluation of these criteria, the assessment committee was asked to incorporate four specific aspects. These aspects were included, as they are becoming increasingly important in the current scientific context and help to shape the past as well as future quality of the research unit. These four aspects relate to how the unit organizes and actually performs its research, how it is composed in terms of leadership and personnel, and how the unit is being run on a daily basis. These aspects are as follows:

- 4) **Open Science:** availability of research output, reuse of data, involvement of societal stakeholders;
- 5) **PhD Policy and Training:** supervision and instruction of PhD candidates;
- 6) **Academic Culture:** openness, (social) safety and inclusivity; and research integrity;
- 7) **Human Resources Policy:** diversity and talent management.



APPENDIX 2: PROGRAMME OF THE SITE VISIT

Friday 16 April

Time slot	Meeting
09.00 - 13.00	Panel instruction & preparation

Monday 19 April

Time slot	Meeting
14.00 - 15.00	Internal panel meeting: final preparation
15.00 - 16.00	Welcome and introduction by the rector of Wageningen University and Research and the participating SENSE institutes

Tuesday 20 April

Time slot	Meeting
11.00 - 11.30	Final preparations for Tuesday
11.45 - 12.30	Management WIMEK-WUR: organization, SWOT, future strategy and policy
13.30 - 14.15	Research at WIMEK-WUR: presentation and discussion regarding WIMEK's Grand Challenges and case studies; research facilities; future perspectives
14.30 - 15.30	Training and education of young researchers: PhD and postdoc policy WUR and WIMEK; PhD education and training programme; meeting with the WIMEK PhD Council and/or PhD and postdoc representatives.
15.45 - 16.45	Evaluation WIMEK-WUR
16.45 - 17.30	Final preparations for Wednesday

Wednesday 21 April

Time slot	Meeting
08.30 - 08.45	Welcome by Dean VU Faculty of Science
08.45 - 09.30	Organizing IVM-VU: management & strategy
09.45 - 10.30	Using research from IVM-VU: social impact & academic excellence
10.45 - 11.30	Working at IVM-VU: careers & community
11.45 - 12.45	Evaluation IVM-VU
13.45 - 14.30	Organization E&H-VU (incl. management, HR policy)
14.45 - 15.30	Research quality E&H-VU (incl. PhD policy, academic culture)
15.45 - 16.30	Societal Impact E&H-VU
16:45 - 17:45	Evaluation E&H-VU

Thursday 22 April

Time slot	Meeting
12.00 - 12.45	Final preparations for Thursday
13.00 - 14.00	IHE Delft - Research management and infrastructure
14.15 - 15.00	IHE Delft - From research to impact
15.15 - 16.00	IHE Delft - Future positioning in an international playing field



16.15 - 17.15	Evaluation WIMEK-WUR
17.15 - 17.45	Final preparations for Friday

Friday 23 April

Time slot	Meeting
09.30 - 10.30	Copernicus UU - Management/ Strategy / Talent policy
10.45 - 11.30	Copernicus UU - Young Researchers / PhDs / Postdocs
11.45 - 12.30	Copernicus UU - Research and Societal Impact
13.30 - 14.30	Evaluation Copernicus - UU
14.30 - 16.30	Preparation provisional findings all institutes
16.30 - 17.30	Presentation provisional findings & wrap-up



APPENDIX 3: QUANTITATIVE DATA

Quantitative data on the research unit's composition and funding, as described in Appendix E, Tables E2, E3 and E4:

- Research staff;
- Funding;
- PhD candidates

	2014		2015		2016		2017		2018		2019		2020	
	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#
Scientific Staff														
Full Professor ¹	1.2	3	1.2	3	1.2	3	0.80	2	0.93	3	1.60	4	1.51	4
Endowed / Emeritus	0.1	1	0.1	1	0.1	1	0.20	2	0.10	2	0.10	2	0.20	2
Associate professor ¹					0.16	1	0.40	1	0.36	2	0.36	1	0.36	1
Assistant professor ¹	0.32	1	0.59	2	0.96	3	0.87	3	0.60	2	0.70	2	1.12	3
Senior Researcher ²	3.2	4	2.4	3	0.8	1	0.88	2	0.00	0	0.00	0	0.00	0
Researcher (with PhD) ²	1.6	2	2.4	3	1.6	2	1.60	2	1.60	2	1.60	2	1.60	2
Researcher (no PhD) ²	2.24	3	0.64	1	0.64	1	0.80	1	0.80	1	0.64	1	0.64	1
Postdoc ²	3.3	5	2.23	4	0.8	1	0.40	1	0.50	1	0.80	1	0.80	1
PhD employed ³	7.13	10	5.38	9	2.41	5	0.50	2	1.00	2	2.00	6	4.61	9
Research staff	19.09	29	14.94	26	8.67	18	6.45	16	5.89	15	7.80	19	10.84	23
External PhD ⁴	4.08	5	7.88	8	7.42	9	7.43	10	4.49	9	4.33	8	3.94	6
Technical Support staff	6.14	7	5.77	8	3.6	4	4.18	5	5.02	6	7.13	9	9.32	10
Visiting fellows	3.78	8	4.25	9	2.84	6	2.06	3	2.22	7	2.52	5	1.54	4
Total staff	33.09	49	32.84	51	22.53	37	20.12	34	17.62	37	21.78	41	25.64	43

#: Total number of staff members; FTE: Research Capacity in Full Time Equivalents (not for laboratory technicians)

¹Professor, Assistant Professor and Associated Professor: Research Capacity = 40% of the appointment; emeritus professor 0.1%

²Researchers and post-docs have a research capacity of 80% of the appointment

³PhD employed: PhD students employed by the E&H department and employees that have a different position, e.g. researcher, but attribute part of their work to pursue a doctorate. They have a research capacity of 75% of the appointment

⁴External PhDs are PhD students with external funding, doing part of their research at the E&H department.

	2014		2015		2016		2017		2018		2019		2020	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Funding														
Direct funding ¹	2.63	14	2.37	16	1.70	20	3.98	56	3.69	55	3.4	42	4.08	37
Research grants ²									1.23	18	1.49	19	1.45	13
Contract research ³	16.46	86	12.57	84	6.97	80	2.47	44	1.78	27	3.09	39	5.31	50
Total funding	19.09	100	14.94	100	8.67	100	6.45	100	6.70	100	7.99	100	10.48	100
Expenditure⁴														
Personnel costs	€ 605.337	56	€ 742.727	54	€ 621.485	56	€ 557.566	55	€ 676.183	56	€ 1.112.046	59	€ 1.170.555	60
Material costs	€ 259.299	24	€ 341.994	25	€ 288.136	26	€ 269.895	27	€ 352.568	29	€ 471.486	25	€ 456.203	24
Other costs	€ 224.955	21	€ 282.145	21	€ 192.262	17	€ 185.344	18	€ 184.283	15	€ 301.851	16	€ 314.291	16
Total expenditure	€ 1.089.591	100	€ 1.366.866	100	€ 1.101.883	100	€ 1.012.805	100	€ 1.213.034	100	€ 1.885.383	100	€ 1.941.049	100

¹Direct funding by the University, ²Research grants obtained in national scientific competition (e.g. grants from NWO, KNAW), ³Research contracts for specific research projects obtained from external organisations, such as industry, governmental ministries, European Commission, charity organisations, ⁴Expenditure only concerns research grants and contract research.

Enrolment			Success rates						
Starting year	Enrolment (male / female)		Total (M+F)	Graduated in year 4 or earlier	Graduated in year 5 or earlier	Graduated in year 6 or earlier	Manuscript finished before 31-12-2020	Not yet finished	Discontinued
2010	1M	3F	4	3 / 75%	1 / 25%	0 / 0%	0 / 0%	0 / 0%	0 / 0%
2011	1M	2F	3	1 / 33%	1 / 33%	0 / 0%	0 / 0%	1 / 33%	0 / 0%
2012	3M	2F	5	3 / 50%	0 / 0%	1 / 17%	1 / 17%	0 / 0%	0 / 0%
2013	0M	1F	1	0 / 0%	0 / 0%	0 / 0%	0 / 0%	1 / 100%	0 / 0%
2014	3M	4F	7	1 / 14%	2 / 29%	2 / 29%	0 / 0%	1 / 14%	1 / 14%
2015	2M	2F	4	0 / 0%	2 / 50%	0 / 0%	0 / 0%	1 / 25%	1 / 25%
2016	0M	0F	0	0 / 0%	0 / 0%	0 / 0%	0 / 0%	0 / 0%	0 / 0%
2017	0M	2F	2	0 / 0%	0 / 0%	0 / 0%	0 / 0%	2 / 100%	0 / 0%
2018	3M	1F	4	1 / 25%	0 / 0%	0 / 0%	1 / 25%	1 / 25%	1 / 25%
2019	2M	3F	5	0 / 0%	0 / 0%	0 / 0%	0 / 0%	5 / 100%	0 / 0%
2020	1M	2F	3	0 / 0%	0 / 0%	0 / 0%	0 / 0%	3 / 100%	0 / 0%
Total	16M	22F	38	9 / 24%	6 / 16%	3 / 8%	2 / 5%	15 / 39%	3 / 8%

Note: The table includes all PhD candidates conducting research with the primary aim/obligation of graduating, based on a 0.8-1.0 FTE contract. This includes employed PhD candidates, employees in PhD track, scholarship PhD candidates, externally financed PhD candidates and external PhD candidates, who are conducting research under the authority of the Graduate School with the primary aim of graduating (guest, sandwich).

