

Sustainability in research

Position Paper

Today's research for people, planet, and future generations



Content

Colofon

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Preface

This position paper is both a call to action and a signal of support. At Amsterdam UMC, we are committed to improving health today while preserving opportunities for healthy living of generations to come, as demonstrated by our strategy 'A healthy future for all'. This commitment includes recognizing and addressing the impact of climate change and environmental degradation on public health, the ways in which population behaviors affect both human and planetary health, and the contribution of the healthcare and research sectors – including the practices of their employees and researchers – to these challenges. As a university medical center, we acknowledge that the inevitable transition to a sustainable healthcare system and society is a shared responsibility; and that scientific research plays a pivotal role in this transition. We aim to become an international forerunner in developing the necessary knowledge that enables the sustainability transition in healthcare. With expertise ranging from cells to patients and prevention, we can be on the forefront of developing and applying sustainable choices across a wide range of academic fields. Sustainable research precedes sustainable healthcare; therefore, we should aim to improve sustainability in our research alongside the sustainability of the care we provide or are involved in. Through case studies we demonstrate the diversity of research that has already integrated sustainability in one or more ways.

Amsterdam UMC aims to integrate sustainability into all four of its core tasks. In care delivery, this means striving for high quality and accessible care; that is also effective and environmentally responsible. In research, we aim to generate knowledge that helps to create a healthy future for all. Our educational programs increasingly equip future professionals with the skills and awareness to incorporate sustainability into their daily practice. And through valorization, we ensure that the outcomes of research make an impact on healthcare and prevention practices and policies.

This position paper describes the aim of Amsterdam UMC in undertaking sustainable research to enable a sustainable healthcare system. It outlines why this transition matters, what position Amsterdam UMC takes, and how researchers can contribute. Following this position paper, a knowledge agenda will be co-created with Amsterdam UMC researchers and partners, to define the knowledge gaps that we will prioritize in our sustainable research and research on sustainability. We will also continue to provide more guidance in the practical implementation of sustainability in research.



Hans van Goudoever





01

Why sustainable research matters

Environmental degradation, biodiversity loss, and climate change are among the greatest threats to global health in the 21st century. Children and future generations will bear the heaviest burden despite contributing least to the problem. Extreme weather events, exploited natural resources, and pollution are already impacting both physical and mental health, with disproportionate effects on people living with chronic disease and in vulnerable communities. This contributes to growing health inequalities in cities like Amsterdam, across the Netherlands, in Europe and between global north and south.

At the same time, healthcare itself has a major environmental impact. In the Netherlands, the sector is responsible for **7.3% of national carbon footprint, 13% of raw material extraction, and 4.2% of national waste production**. Amsterdam UMC directly emits around **60 kilotons of CO₂e each year (scope 1)** and is the fourth largest polluter in the Amsterdam Metropolitan area. These figures sit against the backdrop of other structural challenges, such as increasing pressure on healthcare workers and rising costs. Our system is not sustainable in its current form. In research, laboratories are extremely energy intensive. A fume hood consumes **3.5 times the amount of energy of an average household**, while an ultra-low

temperature freezer consumes **2.7 times the amount of energy of an average household**. Travelling to a research conference on another continent causes emissions of **300 to 1000 kg CO₂**. Clinical trial carbon emissions vary broadly, but this example calculates **123.9 kg CO₂eq/participant in a double-blind randomized controlled trial with 179 participants**. These figures illustrate the order of magnitude of research-related emissions.

Yet, our sector is also one of constant innovation. Every day, researchers at Amsterdam UMC and other research institutions expand our understanding of the human body, disease mechanisms, preventive measures, and health interventions. Their knowledge is urgently needed to guide the sustainability transition in healthcare and society; a transition that is not optional, but inevitable.

To safeguard a future of high-quality, accessible, effective and affordable care, we need research that offers insight into reducing the environmental footprint of healthcare, research, and preventive approaches, provides evidence-based strategies for adaptation, and strengthens health system resilience. We will need to take a critical look at our own research practices, as well as create opportunities for new research questions and transdisciplinary collaborations.

The following icons are used to categorize the research types involved in the case studies:



Fundamental



Translational



Clinical



Public health



Case study

Pediatric Asthma: Tracing Health in socioeconomic and environmental Struggles (PATHS)



Drs. Sarah van den Berg, Dr. Susanne Vijverberg, Dr. Berber Kapitein
Emma Children's Hospital

About one in five new childhood asthma cases in the country are linked to air pollution, which disproportionately affects socioeconomically disadvantaged communities, who are more likely to live in areas with high air pollution and urbanization. Additionally, climate change worsens indoor conditions, increasing mold exposure in poorly insulated and ventilated homes, often rented by vulnerable families.

By studying both indoor and outdoor environmental exposures, the research aims to understand how these factors influence asthma severity and contribute to hospital admissions. It highlights that environmental issues like climate change and pollution have immediate, tangible health impacts, especially on children's respiratory health. The goal is to develop interventions with input from children, parents, and stakeholders to reduce asthma risks in vulnerable populations. ■



Case study



Case study

Reduction of anesthetic gases

Drs. Egid van Bree, Dr. Jasper Kampman, Dr. Niek Sperna Weiland
Anesthesiology and Center for Sustainable Healthcare



Anesthetic gases (e.g. sevoflurane and desflurane) are used to facilitate general anesthesia during surgery. These gases are hardly metabolised by patients and are exhaled unchanged. They end up in the atmosphere, where they act as strong greenhouse gases. After some time, they enter the aquatic environment where they remain as PFAS. These substances are highly polluting to natural air and water systems.

By demonstrating that total intravenous anesthesia (TIVA) is equally safe, increases quality of recovery after surgery and drastically reduces the carbon footprint of anesthesia, a possible solution was found. This transition from inhaled to intravenous anesthesia was implemented throughout the Netherlands, showing a 75% decrease in carbon footprint of these pharmaceuticals in Dutch hospitals. Plans are being made to export this approach to other countries. ■

FCS-Free Cell Culture

Drs. Aram de Haas
Division 9 and Centre for Sustainable Healthcare



This project explores animal-free alternatives to fetal calf serum (FCS) for cell culture. Across Amsterdam UMC, we use many hundreds of liters of FCS annually. For every liter of FCS, an estimated 2 to 6 unborn calves are needed. Researchers are supported by offering tailored FCS-free options for their specific cell lines and experiments. The project is a collaborative effort across departments, enabling testing of various cell types. Participation is voluntary, driven by researchers' intrinsic motivation. Results are gathered in one place to help others learn and build on previous findings.

Switching to well-defined, animal-free alternatives reduces reliance on animal agriculture, which is responsible for greenhouse gas emissions, land degradation, and water consumption. It also leads to more consistent and physiologically relevant cell models, improving reproducibility and research quality. Hence, fewer experiments are needed, reducing lab waste and the overall reliance on animals, supporting more sustainable and ethical research practices. ■



02

Defining sustainability in research and research on sustainability

Sustainable research should not be a separate specialty within our research portfolio. On the contrary, it should be a way of thinking that can be embedded in all research activities. Whether you work on fundamental, translational, clinical, public health or any other type of research, there are opportunities to contribute to a healthier planet through your work.

At Amsterdam UMC, we understand **environmental sustainability in (bio)medical, healthcare and public health research as the effort to reduce the ecological footprint of both healthcare and the research that supports it, while safeguarding or improving health outcomes.** This reflects the **Brundtland definition of sustainability**: “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” Working towards a healthy future for all means implementing sustainability in our ways of researching disease, health, and prevention. Contributing to reducing the environmental footprint of healthcare and research means positive changes are made in at least one of the following domains within environmental sustainability:

- Climate (change)
- Energy use
- Biodiversity and ecosystems
- Water and land use
- Depletion of natural resources

This is not an exhaustive list of domains within environmental sustainability, but an example to show the diversity of ways to be involved with sustainability. Depending on the type of research and the research topic, different aspects of sustainability can be of importance. Applied examples include conducting health(care) research in

ways that minimize harm to the environment, developing solutions that contribute to a more sustainable health-care system, and studying how environmental change impacts health.

Environmental sustainability is one of three core dimensions of sustainability, alongside financial and social sustainability: people, planet, and profit. Social sustainability refers to the long-term well-being of people and communities. Research on this topic aims to foster a safe, inclusive, and healthy working or living environment, supporting resilience, and ensuring that care delivery and research promote equity and social cohesion. Financial sustainability refers to the capacity of a system to remain effective and accessible over time within available financial resources. It is often the driving force behind healthcare efficiency research. It means that healthcare spending is aligned with the value of services provided – avoiding cost growth outpacing health benefits – and that public and private investments are planned and allocated efficiently to maintain affordability, ensure intergenerational fairness, and support long-term system stability.

At Amsterdam UMC, we view all three dimensions of sustainability as essential to a future-proof healthcare system and society. The environmental dimension of sustainability is our focus because of the increasing necessity to step up before the climate crisis becomes an even bigger health crisis.

We distinguish three focus areas in which research can implement environmental sustainability:

1. Sustainable research conduct
2. Sustainability as a co-benefit
3. Sustainability as the primary focus



Case study

Transition to a healthy and sustainable food environment for staff and visitors at Amsterdam UMC

Drs. Maxime van den Heuvel, Dr. Coosje Dijkstra, Dr. Wilma Waterlander
Public and Occupational Health
Dr. Ir. Hinke Kruizenga Nutrition and Dietetics
Prof. Dr. Ir. Joline Beulens Epidemiology and Data Science

This project examines how Amsterdam UMC can transform the hospital food environment to be at least 80% healthy and 60% plant-based by 2030. Baseline data shows only 24% of products meet healthy criteria, underscoring the need for significant changes. To guide this transition, a comprehensive food system mapping was conducted, resulting in a dynamic roadmap co-created with stakeholders including cooks, dietitians, food outlets, facilities staff, and hospital leadership. The roadmap is implemented

with reflexive monitoring to support continuous learning and adaptation, generating actionable insights to guide similar transitions.

By promoting healthier and more plant-based diets, the project addresses both public health and environmental sustainability, since food production—especially animal-based and processed foods—significantly contributes to greenhouse gas emissions, biodiversity loss, and resource use. ■





1 Sustainable research conduct

Sustainable research begins with the way we plan to acquire our answers. During the research, we should make conscious choices about materials, energy use, and resources. For example, Green Teams in laboratories are reducing single-use plastics, replacing harmful chemicals with safer alternatives, and using less energy-intensive equipment. In data science and epidemiology, researchers are rethinking how large datasets are stored, processed, and shared to limit digital emissions. Choosing to reuse existing data or to organize low-emission conferences are also examples. **Sustainable research practices are relevant to all researchers in Amsterdam UMC, not only to those who study sustainability or related topics.** Whether your research focuses on specific disease mechanisms, patient populations, diagnostic methods, or treatments, everyone can contribute to making (bio)medical, healthcare and public health research more sustainable.



Case study

ULTRASAFE

Drs. Hannah van der Stok Molecular Cell Biology and Immunology
Drs. Aram de Haas division 9 and Centre for Sustainable Healthcare
Dr. Tom Caniels Medical Microbiology and Infection prevention
Dr. Evelien Boekhout-Berends Endocrinology Laboratory



This project assesses the stability of various biological samples stored at different ultralow temperatures to evaluate the necessity of using ultra-low temperature (ULT) freezers at -80°C . While -80°C storage is common, its biological relevance is uncertain, and these freezers consume significant energy. Raising the temperature to -70°C could reduce energy use by 30%. Samples including patient materials (blood, cerebrospinal fluid), cells, RNA, viruses, and bacteria are stored at -60°C , -70°C , and -80°C , with

stability monitored over time to provide scientific guidance on safe storage conditions.

ULT freezers are major energy consumers in hospitals, with one unit using as much energy annually as one to three households. By generating evidence on sample stability at higher temperatures, the project aims to encourage sustainable freezer use, cutting energy consumption and climate impact. ■



2 Sustainability as a co-benefit

Research can also positively contribute to environmental sustainability through its (health) outcomes. Studying early detection or treatment of a disease may reduce the need for more intensive treatments when the disease has developed further. In reviewing or developing clinical guidelines, it is possible to include environmental considerations as part of high-quality care. Recommending development of green spaces (parks, forests, etc.) to improve mental health also has positive effects on biodiversity. Stimulating active transportation increases physical activity and reduces the carbon footprint associated with transport. Reducing the intake of ultra-processed foods leads to a healthier diet preventing disease, while also typically being more environmentally sustainable. These kinds of research outcomes affect how care is delivered or disease is prevented and how resources are used, even if sustainability is not the primary objective. **By including environmental considerations alongside other intended outcomes, more studies can contribute to the body of knowledge on healthcare and research sustainability.**



Case study

Reconstructing accelerated low-field MRI using deep learning

Drs. Daisy van den Berg, Dr. Matthan Caan, Prof. Dr. Gustav Strijkers
Biomedical Engineering and Physics



During this project, a deep learning-based reconstruction method was developed to accelerate imaging on a 0.4T Esaote low-field MRI system. In collaboration with Esaote, the method is now being integrated into their software. Low-field MRI scanners use less energy and have a smaller environmental footprint than high-field systems because they do not require helium, complex cooling, or extensive RF shielding. A key challenge in low-field

MRI is the typically long scan time, which can compromise image quality. This approach reduces scan times by up to 60%, making low-field MRI more practical in clinical settings as patients need to remain still for only about 2 minutes instead of 5. This project demonstrates that a lower environmental footprint can go hand in hand with improved patient experience and reduced costs. ■



3 Sustainability as the primary focus

Research can aim to reduce the environmental impact of healthcare through 'mitigation' research, e.g. analyzing the carbon footprint of surgical instruments by using a Life Cycle Assessment or reducing the carbon footprint of anesthetic gases. Investigating ways for the healthcare system to respond to climate-related risks is commonly called 'adaptation' research, e.g. studying how heatwaves affect vulnerable populations or what additional health risks follow from an increase in the frequency of flooding. Planetary health research is research on the interrelation of human and planetary health, e.g. researching the effects of pharmaceuticals on the environment or the effects of pollution on human health. **Research that focuses on sustainability generates essential knowledge that supports the development of more climate-resilient and environmentally responsible healthcare and research systems.**



Case study

Environmental impact of care pathways

Drs. Lisanne Kouwenberg Public and Occupational Health
Prof. Dr. Wouter Hehenkamp Gynaecology and obstetrics



This research calculates the environmental impact of two care pathways for uterine fibroids: uterine artery embolization (a minimally invasive procedure) and laparoscopy-based hysterectomy. The analysis includes all stages of care—patient visits, the procedure, hospital stay, and follow-up visits—factoring in materials production and waste treatment, energy, and travel. Using Life Cycle Assessment (LCA), a detailed method to measure carbon footprint and other environmental impacts (e.g., land and water use), the study highlights where the most significant environmental hotspots occur within the care pathway.

The main goals of this research are to identify environmental hotspots within healthcare processes for mitigation and to provide data that can help patients and professionals make more sustainable treatment decisions. Many patients are open to integrating sustainability into their care choices, so providing information on environmental impact can support informed decision-making.

The study also lays the groundwork for quantifying other care pathways in the hospital. The Center for Sustainable Healthcare offers support in quantifying the environmental impact of specific care activities or pathways, helping integrate sustainability into medical research and practice. ■



Case study

Making old drugs new: the green case for thioguanine in inflammatory bowel disease



Prof. dr. Nanne de Boer
Gastroenterology and Hepatology

Current treatment strategies for inflammatory bowel disease (IBD) only seem to have the desired effects in 40% of patients, causing a need for better medication. Thioguanine, which is registered to only treat leukemia outside the Netherlands, was formally registered as a treatment for IBD thanks to drug repurposing research. Clear benefits of drug rediscovery trajectories include reduced development time, lower research-development costs, known safety profiles, improved affordability and quicker translation to the clinic.

Drug rediscovery studies bypass the need for large scale trials, as the general safety of the drug was shown previously. Drug development takes years of research, accompanied by a relatively high environmental impact, although that remains unclear due to limited publication by e.g. pharmaceutical companies on this topic. Drug rediscovery is a feasible strategy for accessing new treatment strategies while limiting environmental impact. In the future this research line will aim to measure differences in environmental impact of drug rediscovery vs. drug development. ■



Case study

Pesticides as an unforeseen trigger for atrial fibrillation



Drs. Preetam Kishore, Prof. Dr. Bianca Brundel
Physiology

This research explores whether environmental pesticide exposure could trigger or contribute to the development of atrial fibrillation (AF), a common heart arrhythmia. Traditionally linked to aging, hypertension, and lifestyle, emerging evidence suggests environmental toxins, like pesticides, might play a role in AF's onset and progression. This suggestion was brought to the attention of the researchers by citizens involved in the NWA-ORC CIRCULAR project.

The study aims to identify relations between chronic pesticide exposure and human health, through more ethical models (fruit flies) with a lower environmental impact than research mammals, and answers research questions that were generated in collaboration with citizens. The knowledge it generates can be implemented in policy (e.g. agriculture and chemical industry) to prevent further environmentally caused heart disease. ■



03

Our ambition: training and supporting researchers, reducing emissions and increasing sustainability-related research output

Amsterdam UMC strives to be a frontrunner in building a sustainable healthcare system and healthier society, through our contribution to science. We aim to embed environmental sustainability into the fabric of our research culture by encouraging sustainable innovation, enabling collaboration, and leading by example.

Our ambition is twofold:

- to ensure that our own research practices align with sustainability principles, and
- to generate high-quality research that contributes to environmentally sustainable healthcare and a healthier society.

We want sustainability to become a natural lens through which research questions are framed, projects are designed, and findings are translated into policy and practice. In this position paper, we have included many examples of researchers that are working on sustainability, from mapping the environmental impact of care pathways to researching the impact of pollution on children's asthma development. Aligning our research practices with sustainability principles includes critically examining the use of materials, energy, and data; striving for circularity and

low-impact methods; and avoiding research waste by ensuring that research outputs are relevant, applicable, and accessible. We want to implement sustainability into training programs offered for researchers, so everyone can learn about this topic and how to apply it to their own work. We will continue to offer support to researchers through existing and new structures. These actions will contribute to our researchers being ready to work more sustainably and spread their knowledge on sustainable research and healthcare.

We also recognize that researchers cannot do this alone. Institutional leadership, infrastructure, and culture change are essential. That is why Amsterdam UMC should invest in creating a supportive environment for sustainable research; one that connects existing initiatives, builds capacity, and rewards those who lead the way. We invite researchers across all disciplines to help shape the future of health and medicine by making sustainability a guiding principle in their work. Together, we can lead the transition to healthcare and a healthier society that benefits both people and the planet. Sustainability offers an opportunity to work together across disciplines and allows researchers to approach their work from different perspectives.

By the end of 2028, Amsterdam UMC aims to:

1. Have **training available for all researchers** on sustainable research conduct and to **support researchers in implementing sustainability** as a topic in their research.
2. Support sustainable research through **focusing our internal research grant programs on sustainable research and implementing sustainability principles in supporting services** for researchers.
3. Increase the proportion of Amsterdam UMC **publications that explicitly address environmental sustainability** in their methodology or results to **50%** of all publications.
4. Reduce **carbon emissions from research-related activities by a minimum of 30%**, including at least laboratory consumables, data storage, energy use, and academic travel, using 2018 as a reference. This will be part of a broader institutional transition aligned with national climate targets and the Green Deal Duurzame Zorg 3.0.





Case study

Patient engagement with decision-making for sustainable healthcare

Drs. Eva Cohen, Dr. Annemijn Aarts
Gynaecology and obstetrics



This research explores patients' and healthcare professionals' attitudes toward integrating environmental sustainability into healthcare decision-making. The research investigates whether and when patients want to be informed about the environmental effects of treatments and healthcare services, and how such conversations can be facilitated in clinical practice. Findings reveal that patients are generally supportive of sustainable healthcare and are interested in environmental impact information, especially when treatment options have comparable clinical effectiveness.

However, patients consider such discussions inappropriate in emergencies or when communication barriers exist. This knowledge can guide conversations about environmentally impactful treatments, enabling patients and clinicians to make decisions benefiting both individual- and planetary health. The project highlights growing patient engagement with sustainability and the importance of including patient perspectives in research and projects on the environmental impact of healthcare. ■



Case study

Environmentally CONscious use of PSYCHOTropics (ECO-PSYCH) study

Drs. Anna Stohr, Drs. Dayna van Heel, Dr. Jurjen Luykx
Psychiatry



This study focuses on sustainable prescribing, dispensing, and use of psychotropic drugs by addressing knowledge gaps among patients, prescribers, and pharmacists regarding environmental sustainability. It evaluates the environmental impact of specific psychotropic medications—such as their carbon footprint and ecotoxicological effects on aquatic life—and tests the effectiveness of small educational interventions to raise awareness.

Psychotropic drugs, used widely and often long-term, contribute to environmental harm. This creates a vicious

cycle: worsening mental health increases healthcare use, which further impacts the environment and exacerbates mental health issues.

The project builds a network of motivated stakeholders and experts across medicine, pharmacy, and ecotoxicology, fostering interdisciplinary collaboration. The goal is to understand stakeholders' needs and preferences for sustainable psychotropic drug use, in order to provide evidence that supports sustainable prescribing guidelines. ■

04

Sustainability in research:
Today's research for people, planet, and future generations



The Sustainable Research Cycle as a tool for implementing sustainability in research

The Sustainable Research Cycle is a practical instrument that we developed to be used by all researchers to advance their understanding of the sustainable choices they can make during their research. It is designed to provide recommendations to researchers, highlight priorities, help navigate options, and align decisions with principles of sustainability at each stage of the research process. The Cycle presents 3 focus areas for implementing sustainability in research. The focus areas correspond

to the definition of sustainability in research from Chapter 2: sustainable research conduct, sustainability as a co-benefit, and sustainability as the primary focus. These focus areas are not as separate as they may appear, and depending on the research, researchers could decide to implement different elements of each focus area into their research at each stage. We invite all researchers to read through the Cycle and reflect on how they can apply these insights to their own research.



Case study

Evidence Based Research

Drs. Mitra Nekouei Shahraki, Prof. Dr. Mariska Leeflang
Epidemiology and Data Science



This project emphasizes the connection between Evidence-Based Research (EBR) and reducing research waste, focusing on the need for systematic use of prior evidence before starting new clinical research, which is not part of standard research practices currently. EBR aims to reduce research waste by ensuring new studies are grounded in existing evidence, preventing unnecessary, poorly justified, or trivial research. This approach helps optimize the use of resources such as time, funds, participants, and natural resources, and use them for the research that is most needed, aligning with environmental sustainability principles.

By integrating systematic reviews, EBR helps to identify where research is truly needed, what kind of research design can address these needs, and how the results of new studies can be optimally interpreted within the context of existing knowledge. This optimizes the balance between the environmental footprint of research and the potential benefits the newly generated knowledge can bring. ■



THREE WAYS TO INTEGRATE SUSTAINABILITY INTO YOUR RESEARCH

SUSTAINABILITY AS THE PRIMARY FOCUS

SUSTAINABILITY AS A CO-BENEFIT

SUSTAINABLE RESEARCH CONDUCT

- Share learnings, process limitations, and future directions to inform sustainability-focused research;
- Assess how your research findings have (had) downstream environmental sustainability impacts;
- Evaluate the environmental footprint of the research process;
- Share lessons learned across departments and institutions;

- Frame research questions around mitigation, adaptation, or planetary health;
- Choose to address a pressing issue (high-impact diseases, procedures, and healthcare activities;)
- Consider scalability and real-world implementation.

- Translate and share insights in actionable guidance for sustainable transformation;
- Disseminate findings beyond your academic field;
- Share results and supporting materials in open-access venues;
- Avoid unnecessary storage;

- Add environmental sustainability impacts as an outcome;
- Perform a sustainability check: weighing potential impact on health and environmental costs of the study.

- Start with a systematic review to ensure relevance and prevent duplication;
- Devise a research question that is related to a knowledge gap;
- Involve stakeholders to improve relevance and impact.

- Ensure methodological transparency;
- Highlight actionable findings;
- Reflect on equity implications;
- Clearly report the measured environmental outcomes alongside your primary research findings;
- Document code, data, and methods to support reproducibility;
- Ensure outputs are reusable for future systematic reviews and meta-analyses;

- Choose the most efficient methods for evaluating the environmental impact (e.g., LCA);
- Consult experts on each aspect of your study.

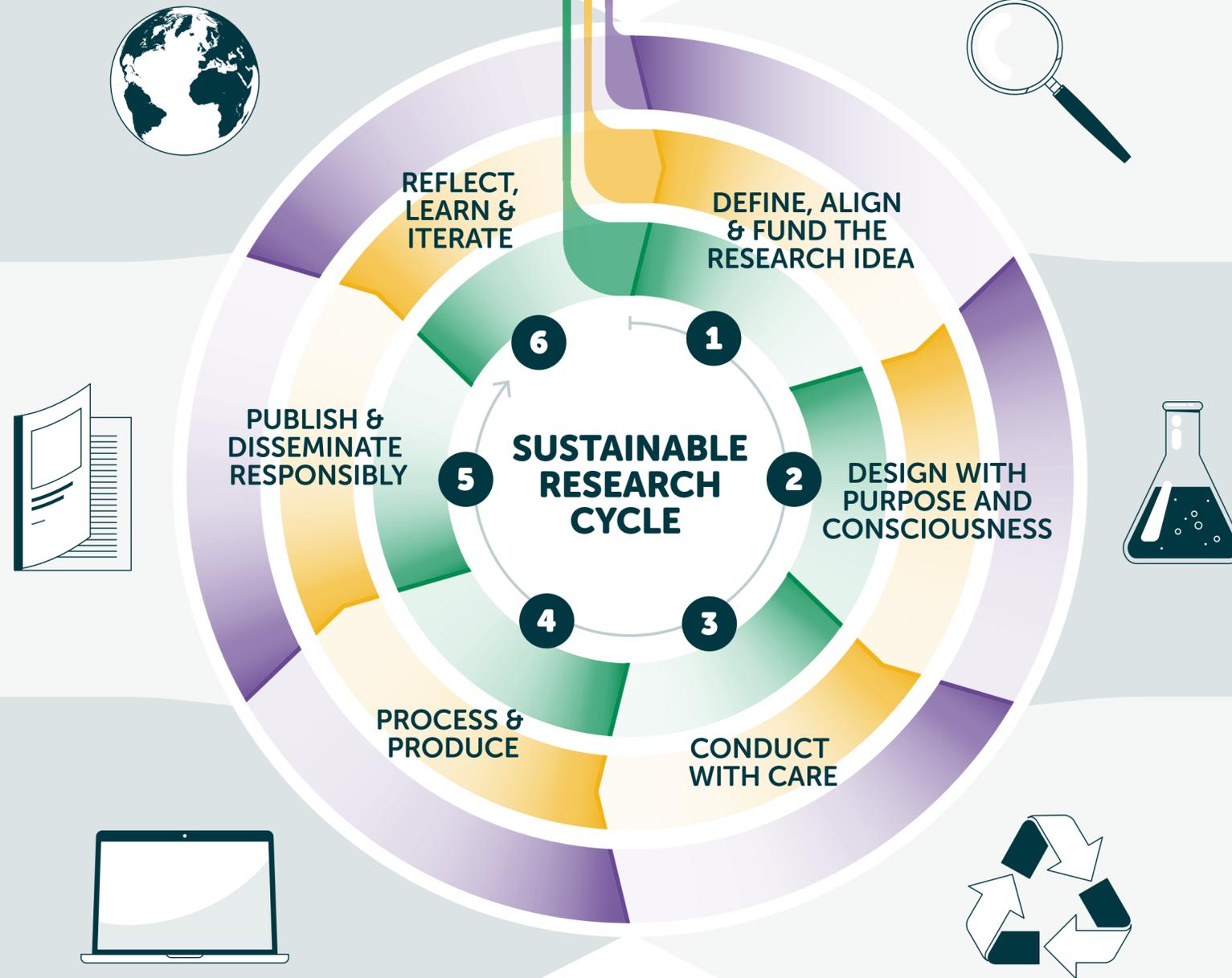
- Design for measurable environmental outcomes;
- Aim to generate actionable recommendations with systemic impact.

- Choose lean methods;
- Design data collection and material use to minimise waste;
- Reuse existing data and resources where possible.

- Consult methodology and sustainability experts;
- Apply standardised environmental impact categories and reporting formats.

- Track sustainability goals during conduct and adapt to needs;
- Engage experts and stakeholders.

- Apply Reduce–Reuse–Recycle principles;
- Minimise travel and site visits;
- Use shared infrastructure.





Case study

Circular changes for airway care interventions in the ICU

Andrea Esmeijer, Romy Berkhout, Dr. Willemke Stilma, Prof. Dr. Frederique Paulus
Intensive Care (adult)



This research project examines the environmental impact of airway care interventions used in the treatment of critically ill, invasively ventilated patients. Common interventions, such as nebulization therapy or endotracheal suctioning, generate costs in terms of materials, staff time, and waste. One session of nebulization therapy has an equivalent CO₂ footprint to driving 3.6 km in a gasoline car. With around 40.000 invasively ventilated patients in the Netherlands

each year, all requiring one or more daily interventions, the cumulative environmental impact becomes substantial. Robust evidence supporting these widely used interventions is, however, limited. This research project explores ways to improve sustainability by applying the R strategies: refuse to use without an indication, preference for reusable materials and explore options for redesign. ■



Case study

SPRINGS

Dr. Vanessa Harris
Global Health and Internal Medicine – infectious diseases



SPRINGS aims to understand how climate change affects water quality, water availability, and childhood diarrhea to inform policy decisions. The project adopts a planetary health approach, examining how environmental degradation impacts human health through interdisciplinary and cross-sector collaboration.

A key focus is on interventions beyond traditional health sectors, recognizing that actions improving water quality and quantity can yield multiple benefits, including environmental outcomes like biodiversity. The challenge lies

in quantifying these co-benefits to support effective policy-making and prioritize interventions.

The research includes cost-effectiveness evaluations that incorporate environmental measures, helping policymakers understand mechanistic links between climate, environment, and health. Vulnerability is a central consideration; while children under five in both low- and high-income countries are considered inherently vulnerable, other factors such as exposure to flooding, precipitation, and socioeconomic insecurity also define vulnerability. ■



05

Collaborating for impact

Environmental sustainability in (bio)medical, healthcare and public health research requires strong partnerships. Therefore, we actively collaborate with other university medical centers, universities, and research consortia, both nationally and internationally. We work with other knowledge institutes in Amsterdam (UvA, VU, HvA). With SEVEN, the University of Amsterdam's interdisciplinary climate institute, we collaborate on several projects, including one on reducing PFAS in healthcare. Our research collaborators also include many partners outside academia. We contribute to and benefit from agreements such as the [Green Deal Duurzame Zorg](#) and the [Integraal Zorgakkoord](#), which help align goals across healthcare providers, policymakers, and researchers.

Within and beyond the city of Amsterdam, we engage with municipal health services, urban planners, and community organizations to ensure our research reflects local health needs and supports climate resilience in neighborhoods. We also partner with patients and advocacy groups to understand their perspectives on sustainability and co-create solutions that are fair, practical, and inclusive. Internationally, Amsterdam UMC is increasingly

involved in European programs and global networks on planetary health and sustainable health systems. These partnerships allow us to contribute our expertise, learn from others, and accelerate progress through joint initiatives and funding opportunities. By strengthening these networks, we not only amplify the reach of our research but also help build a healthcare system that is scientifically grounded, socially just, and environmentally responsible: a healthy future for all.

Finally, sustainability encourages researchers to reflect more broadly on the systems they work within. For example, when studying new technologies or care pathways, it is worth considering whether they contribute to overuse, overdiagnosis, or a growing environmental burden; and whether alternative approaches might achieve better balance between clinical outcomes and ecological responsibility. We invite all researchers to engage with others outside their own area of expertise to enable optimal knowledge creation on the topic of sustainability in healthcare, because everyone holds a piece of information and we can only collectively complete the sustainable healthcare puzzle.



Case study

HealthIntelAct Doctoral Network- Actionable Performance Intelligence towards Health and Care Systems for People, Planet, and Prosperity



Dr. Óscar Brito Fernandes, Prof. dr. Dionne Kringos – Pereira Martins
Public & Occupational Health

HealthIntelAct is a European doctoral network with 17 PhD projects that develop actionable performance intelligence to strengthen data-driven decision making in health systems. The aim is to help systems achieve their ambitions in a balanced way across three pillars: People (improving access, outcomes, and equity), Planet (reducing environmental impact and building climate resilience), and Prosperity (ensuring social sustainability, with particular focus on the health workforce and system capacity).

Health systems are both vulnerable to climate-related risks and major contributors to emissions and resource use. Four PhD projects respond to this by creating indicators, methods, and governance approaches that enable the measurement and management of environmental impacts. Embedding these tools into decision-making in clinical practice, hospital management, and national policy enhances accountability and supports balanced priority setting. This enables decision-makers to improve access, outcomes, and equity today, while safeguarding resilience and social sustainability for the future. ■



06

Reflecting on the societal implications of research

(Bio)medical, healthcare, and public health research have long been a driving force behind breakthroughs in understanding disease, developing treatments and prevention strategies, and improving health worldwide. These advances have transformed the lives of billions of people. Yet in the context of climate change, depletion of resources, and environmental pollution, it may no longer be self-evident to pursue innovation, without reflecting on its broader consequences. Research requires energy, materials, laboratories, travel, and infrastructure, and the results of that research often translate into treatments and technologies that further increase healthcare's footprint. While it is possible to reduce the environmental impact of (research on) healthcare, it will always continue to use precious resources. In this light, it becomes important to balance our needs and ambitions: should we always strive to make every possible intervention available to every individual, or do we need to draw lines for the sake of future generations?

Such questions do not yield simple answers. They require weighing the immediate needs of patients and other stakeholders against the long-term viability of the systems

that support health and care. They touch on ethics, justice, and responsibility across generations. What is clear, however, is that researchers themselves cannot stand aside. Their responsibility does not end with generating evidence or publishing results. It extends to reflecting critically on the consequences of their work, and to participating in the broader conversation about what limits ought to be set. This does not mean doing research for the sake of innovation or research as a sole purpose, it means directing those energies toward approaches that balance human health with planetary health.

By engaging with these dilemmas, researchers help society to see that the question is not how far we can go, but how far we should go. Accepting limits is difficult in a culture accustomed to growth and expansion, yet it may be the most important step in ensuring that healthcare remains possible at all. In the end, it is precisely the individual responsibility of each researcher - to question, to choose, and to contribute thoughtfully - that can open the way toward a form of (bio)medical, healthcare and public health research that does justice to both present and future generations.

