

Roadmap institute for a Circular Society (i4CS)

April/May 2023

B. Mission and objectives

Mission

The mission of the Institute for a Circular Society (i4CS) is to inspire students and professionals at companies, societal organizations and governments with circular knowledge & innovations, and to provide them with effective tools for circular solutions. Through multi- and transdisciplinary education and research, i4CS serves as a navigator to scalable circular systems. Together, we can accelerate the transition to a circular society.

Our impact lies in professionals acquiring meaningful knowledge, ideas, skills and action perspectives to tackle barriers and develop, implement and up-scale circular systems. Systems that are accessible to all, safe to use, with optimal value retention of raw materials & products, using renewable resources and preserving natural capital.

Objectives

The overall objective of i4CS is to inspire and facilitate inter- and transdisciplinary scientific cooperation, aimed at understanding, assessing and developing scalable and circular socio-technical systems. Accordingly, we aim to connect different *technology-nature-society* disciplines, underpinning and deepening the knowledge needed. Cooperation will be intensified between EWUU's home institutions on this topic, while strengthening relevant national and international networks.

We aim to play a highly impactful role for two specific types of socio-technical systems: **Circular Safe Hospitals (CSH)**, and circularity in urban-rural areas (**Urban-Rural Circularity: URC**). Interactive research in these two domains – for example through Living Lab approaches – feeds our Circular Society education program, and generalisations in developing circular theory, methodology and discipline oriented scientific contributions.

Research objectives:

We aim to integrate scientific *technology-nature-society* knowledge domains, joining forces with external partners in coalitions of the willing. I4CS wants to be an ambassador for the relevance of such integrative systemic research and a facilitator for making this happen, with the deployment of innovative tools and methods.

Education objectives:

We offer students and professionals integrated education on circularity, aimed at developing the knowledge and skills they need for solving circular issues in their later or current careers. We use innovative forms such as challenge-based learning. We hereby strengthen the basis of the four alliance partners to be attractive for highly demanding students and professionals, for whom the notion of sustainability is a *must* and not a *may*.

Societal impact objectives:

Through our transdisciplinary approach we seek cooperation with different relevant innovation ecosystems. Jointly we have a unique group of industrial and societal partners: Brainport Eindhoven, Regio Food Valley, Utrecht Science Park and more – including the Amsterdam Institute for Advanced Metropolitan Solutions (AMS, an established partnership with WUR already participating). We aim to share experiences and build connections between practices and ecosystems, also in wider (international) networks and to the broader public.

Overview how this mission relates to other EWUU initiatives:

	Linkage with Circular Society mission
Preventive Health	<ul style="list-style-type: none">• Exploration of how preventive health measures and reduced use of raw materials can be addressed simultaneously• Inclusive character (including lower income class) is in both programs addressed
Living Technologies	<ul style="list-style-type: none">• Synthetic microbial co-cultures (SMCs) are potentially useful for circular product design, industrial production of materials and clean-up of waste and pollution
AI	<ul style="list-style-type: none">• Data management and pattern recognition are essential in a circular society (logistics of resources, materials, products and waste, usage patterns)• Serious gaming is a relevant means to interact with stakeholders as to raise awareness and build innovation ecosystems
CuCo	<ul style="list-style-type: none">• Joint interest in ‘unusual’ transdisciplinary living labs and creative methods for stakeholder inclusion• Training of EWUU researchers in doing inter- and transdisciplinary research
Education	<ul style="list-style-type: none">• Strong cooperation in developing an EWUU Circular Society (master) program, EWUU packages and Life Long Learning• Circular Society as relevant category in EduXchange
Impact	<ul style="list-style-type: none">• Shared interest in building innovation ecosystems relevant for EWUU

B. Description of thematic focus

Circular Society aims to contribute to the long-term policy goals of reaching a circular economy by 2050, and 50% circularity by 2030.

The transition from a linear to a sustainable circular society – with less waste and more value retention of raw materials and natural resources – is more urgent than ever but still in its infancy. Our current production and consumption patterns lead to the reduction of resources, and intensifies climate change, environmental pollution, and loss of biodiversity. Moreover, it increases geopolitical dependence and social inequality. While the Netherlands is a leader in recycling, this is the least qualitative form of circularity. For more impact, higher value retention strategies, as well as behavioral and system changes are desperately needed, but stakeholders lack sufficient knowledge and action perspective in this area. This is where science has a crucial role to play: to develop socio-technical innovations and independent knowledge about the complex behavioral and system changes needed, thus driving acceleration of the transition.

Theme 1. Circular Safe Hospitals (CSH)

The Dutch healthcare sector is responsible for 13% of the national footprint of material extraction and for 7% of the national emissions. As one of the most carbon-intensive sectors in the Netherlands, it is a major contributor to climate change, loss of biodiversity and pollution of water, air, and land which, controversially, all negatively impact human health and wellbeing. Also, the current dependency of health care on (critical) raw materials and complex and increasingly vulnerable supply chains is an increasing risk to the continuation of daily operations.

The Green Deal Sustainable Healthcare 3.0, signed in November 2022 by the national government and relevant parties in the health care sector, contains about 50 ambitions which aim to reduce to overall environmental impact of the health care sector and make it sustainable for the future.¹ The overall goal of CSH to make relevant and meaningful contributions in reaching a selection of these goals. CSH aims to become an (inter)nationally recognized and leading collaboration in accelerating the transition to circular hospitals in 2050.

CSH focusses on:

- Circular alternatives for medical disposables
- Medication without harm – preventing wastage and pollution
- Circular strategies for medical devices & procedures
- Future proof patient diets: balancing nutrition and circularity

These four research lines are clarified in the next INTERMEZZO.

Next to research, CSH focuses on **education of healthcare professionals**, with the aim to educate the current and future generation about the controversial effects of healthcare on global- and planetary health, and strategies for reducing negative impacts. In addition, we offer them the necessary skills to enable them to contribute towards a circular health sector. This aligns with the Green Deal goal of introducing and including the concept of Planetary Health into all levels of medical and related education.

Theme 2 Urban-Rural Circularity (URC)

A focus on the interface between cities and their surroundings is essential for a successful and rapid transition to a sustainable circular society. This transition is hampered by increasing tensions between urban and rural areas. The challenge is to close cycles regionally, connecting cities and rural areas, which requires integrated institutional, social and technological transitions.

We investigate how – often systemic – circular solutions can contribute to the sustainable development of urban-rural areas. Smart circular innovations can promote urban-rural (social) cohesion and the regional economy, while lowering different kinds of emissions and reducing resource dependencies at the same time. Closing cycles at the interface between cities and the surrounding rural areas can only be successful with an integral approach that takes into account planetary boundaries as a precondition, as well as inclusion, equity and social integration. We promote systemic and stakeholder-inclusive approach that can lead to circular solutions which are socially accepted, safe and sustainable. The research in our URC theme contributes to the 'regional commitment' agenda of the National Program Circular Economy 2023 – 2030, in particular to the agenda of a knowledge infrastructure for a circular economy in Dutch regions (KICER, aiming at helping regional hubs forward).

¹ <https://www.greendeals.nl/green-deals/green-deal-samen-werken-aan-duurzame-zorg>

For potential research directions within URC are currently explored:

- Connecting humans and nature in circular – nature based – solutions
- Regional circular services
- Closing nutrients and water cycles
- Circular materials and energy

These four explorative research directions are clarified in the next INTERMEZZO. Section D (Collaboration strategy) shows how we want to cooperate with the Global South within URC.

A further focus of URC will be developed in the period Q3 2023 – Q2 2024. We build forth on already successful consortia, which we aim to connect to novel research ideas that are submitted to our URC 2023 Q2 seed money call for proposals.

Integration of theories, methods and disciplines

On an overarching level, we aim to do the following:

- I. Contesting and improving existing systemic and integrative circularity perspectives
Principles we find relevant are: A) *Value retention* in designing circular strategies for the technological cycle. Here we use the so-called R-ladder for materials, summarized as Refuse – Rethink – Reduce – Reuse (of products and components) – Recycle. For water and organic resources (biological cycle) various hierarchies of measures can be considered including the Resource Harvest Approach – demand minimization, output (waste) reduction (cascading, recycling), and multi-sourcing (shifting to alternative resources); B) *Connecting technical and biological cycles*, and C) A model with a *social foundation*, to ensure inclusiveness and an *ecological ceiling*, to respect planetary boundaries that protect the earth's life-support systems, thus defining the operating space for innovative circular solutions.
- II. Use and improvement of methods and tools for circular solutions
The joint scientific EWUU staff has a wide range of relevant methods, which are constantly evolving, and have extensive experience in applying them in various situations, including modelling, data analysis, (integrated) impact assessment, design, serious gaming, living labs, transition approaches and stakeholder engagement.
- III. Identifying and mobilizing new (trans-) and -disciplinary pathways for circularity
Scientists most interested in inter- and transdisciplinary research work together with experts that prefer a greater disciplinary depth (for instance in specific material sciences). In this way, we optimize the chances of impactful solutions and create a breeding ground for new in-depth research with high societal relevance.

INTERMEZZO 1: Circular Safe Hospitals (CSH) research lines

CSH investigates how circular solutions in hospitals can be developed, contributing to sustainable healthcare. The Dutch healthcare sector is responsible for 13% of the national footprint of material extraction and for 7% of the national emissions. Four research lines are addressed.

1. Circular alternatives for medical disposables

Hospitals need to move away from their “take-make-waste” culture with regards to medical single-use products. The use of disposables has increased in the past decades as they are low cost, have low infection risk, are labor extensive and easy to use and (previously) always available. However, this increase of single-use products is in conflict with the objective of making healthcare circular. The transition to circular hospitals requires the development, validation, and implementation of safe circular alternatives for such medical disposables. While for many disposables a reusable variant is (still) available, for others a safe reusable alternative should be developed. Moreover, economic, logistic, regulatory, and behavioral barriers need to be resolved. We focus specifically on the OR (Operating Room) and ICU (Intensive Care Unit).

2. Medication without harm - preventing wastage and pollution

As we cannot imagine health care without medicines, this research line aims to develop safe strategies and scalable solutions to lower the environmental impact of medication. There are at least two major issues to solve. The first is disposal of unused medication which leads to a large waste of resources that were used for the production, packaging, and transport of medication. The second issue relates to medication residues in surface and ground water, having a major negative impact on the environment and eventually on human health. In this research line we investigate the problem and develop circular strategies and scalable solutions to minimize the environmental impact of medication.

3. Circular strategies for medical devices & procedures

Medical devices and procedures are optimized to deliver high quality healthcare. However, the production of those devices and/or their use in clinical procedures often require substantial resources (energy, water, fossil plastics, (rare) metals, etc.) that negatively impacts our ecological environment. In this research line we investigate the ecological impact of medical devices and procedures, design circular safe strategies (rethink, refuse, reuse, refurbish, recycle) and validate those in clinical practice. A first area of interest is to lower the ecological impact of hemodialysis.

4. Future proof patient diets: balancing nutrition and circularity

An important aspect for the transition towards a Circular Society is the need to provide nutritious food that is both healthy and environmentally sustainable. The current food system is responsible for around 35% of all anthropogenic greenhouse gas emissions. In contrast, a circular food system is produced within the planetary boundaries and dedicated towards reducing, reusing, recycling, and recovering resources. In combination with nutritious diets (i.e., the Planetary Healthy Diet) such circular food systems are especially interesting to implement in hospitals. In this research line we investigate options for nutritious food with a minimal ecological footprint from farm to fork.

Next to research, CSH will **contribute to EWUU education** with a special focus on **education of healthcare professionals**. A rapid introduction of the concept of planetary health into all levels of medical (and related) education, is one of the ambitions of the Green Deal 3.0. The EWUU offers a unique opportunity to create real interdisciplinary modules on this.

INTERMEZZO 2: Urban-Rural Circularity (URC) research lines

For potential research directions, described below, are currently explored. A further focus of URC will be developed in the period Q3 2023 – Q2 2024. We build forth on already successful consortia, which we aim to connect to novel research ideas that are submitted to our URC 2023 Q2 seed money call for proposals.

1. *Connecting humans and nature in circular – nature based – solutions*

Collaboration between various groups of people in urban and rural social communities is essential to creating effective and durable circular systems. Research is needed on how social inequality between urban and rural communities affects the transition to circular solutions, and how urban-rural cohesion can be re-established as part of such a transition. New governance models are needed to change existing economic structures and demand-supply infrastructures. In this context, the full transformative potential of nature based solutions (NBS) can be used.

2. *Regional circular services*

Alignment, as well as frictions between “the urban” and “the rural” can inspire radical circular solutions in the search for the highest value retention strategies (R strategies, Harvest Approaches). New narratives, coalitions and circular business models can emerge, such as the extension of circular (nowadays only urban) mobility solutions into rural areas, like combining car sharing with autonomous driving. Another example is urban-rural Farm to Table services that can reduce logistics, transportation and preservation requirements and can encourage regional understanding.

3. *Closing nutrients and water cycles*

The global nutrient crisis resulted from non-cyclic use of phosphorous, nitrogen, sulphur, potassium and micronutrients (Zn, Se, ..) in the agri-food, industrial and urban processes. The city of Amsterdam, for instance, has a nutrient surplus which is still unused by regional farming initiatives. Systemic solutions must be developed to reconnect (urban) consumption via residual recirculation to (rural) agricultural food production. Water circularity between cities and their nearby areas is needed to appropriately address climate mitigation and adaptation, resilience to floods and droughts, and restoring and maintaining connected biodiverse landscapes. Mining nutrients from waste water is part of such circular water system redesigns.

4. *Circular materials and energy*

Closing regional loops, especially for building materials, is needed to avoid depletion of scarce materials. Urban mining on the one hand, and (rural) bio-based production on the other can offer a meaningful interaction. However, many recycling and alternative production activities cause higher energy usage. This means that the overall sustainability of the interaction between materials and energy is an important one to assess.

These four research lines are already in an integrative way addressed in three Launching programs: AquaConnect, on circular water and lead by WUR, Eindhoven Sustainable Metropolitan Region (Lead by TU/e) and Delta Climate Centre in Zeeland (by UU and WUR).

Next to research, URC will **contribute to EWUU education** via contributions to student challenges, EWUU education packages and participation in a joined EWUU master program. Life-Long Learning contributions will be explored.

C. Overview of contributing (research) groups

The further building up of a scientific Circular Society community within EWUU is at the core of our work. The program of i4CS is open to all tenured staff across our mother institutes, but we typically aim for beginning or mid-term career tenured UD – UHD level scientists for whom participation in the EWUU initiative clearly aligns with their academic aspirations, helping them to further shape their careers.

An important prerequisite is that their EWUU participation is valued by their mentors and managers – informally, yet also in formal yearly appraisals and promotions in a tenured career track, in line with the latest *Recognition and Rewards* developments in academia. Support from different departmental boards in our institutes is needed to arrange this.

The table below maps expertise at our four home institutions which is relevant for the Circular Society program, as currently foreseen, is indicative and manifold, which reflects the integrative, multi- and transdisciplinary research ambitions of i4CS, and the nature of the complex societal transition we are facing. In principle, the program is open to any group willing to join. Which groups will play a leading role will become clear when our program matures. An important part of the connections to specific scientists have already been built up in the period before 2024 through our seed money projects, shared EWUU postdoc supervision and collective participation in wider consortia. Other connections still have to be established in the period 2024 - 2027.

TU/e

Built Environment (BE)

- Architectural scenarios, real estate area development and sustainable renovation
- Transformation of urban wasteland/water related post-industrial landscapes
- Circular design, guidelines, frameworks, indicators & measurement
- Smart or biobased materials and skins – including lightweight and adaptive
- Resource, impact (LCA) and behaviour modelling and transition simulation models
- GIS, urban informatics

Chemical Engineering and Chemistry (CEC)

- Polymer science for closed-loop recycling
- Membrane technology for water filtering

Electrical Engineering (EE)

- Cross connecting water resources management with smart energy grid design

Industrial Design (ID)

- Material driven design & programmable interactive materials
- Food behaviour & (data system) design
- Design for public awareness, participation and transforming practices
- (Re-)imagining sustainable futures
- Modelling and design of real-life systems

Industrial Engineering and Innovation Sciences (IE&IS)

- Sustainability transitions, innovation, entrepreneurship and business models
- Technology & Life Cycle Assessment
- Logistics, supply chain & operations planning, information systems
- Human performance management: new ways of working
- Smart green cities and municipalities
- Philosophy and ethics of technology

Mathematics and Computer Science (M&CS)

- AgriFoodTech, i.e. stimulating cross-overs between AgriFood and engineering including data, materials, robotics, sensors, logistics and business models

Mechanical Engineering (ME)

- Robotics for product, materials and waste sorting & logistics

EIASI institute

- Artificial Intelligence (AI), digital twinning and data sciences

EIRES institute

- System integration (energy)

WUR

Environmental Sciences

- Environmental System Analyses
- Landscape Architecture and Planning and Design
- Environmental technology:
 - resource quality; water technology and management, wetlands, soils, aquifers
 - recovery technology, biobased chemistry and urban/rural nutrients
 - resource system engineering, modelling, design and AI solutions
- Environmental policy, law
- Wageningen Graduate school WIMEK
- WR-WEnR

Agrotechnology and Food

- Human nutrition and health
- Consumer behaviour, marketing and healthy life sciences
- Biobased Chemistry and Technology
- Environmental Technology
- Microbiology
- Wageningen Graduate School VLAG
- WR-WFBR, WFSR

Animal Sciences

- Animal production systems
- Wageningen Graduate School WIASS
- WR-WLSR, WBVR, WMR

Plant Sciences

- Agricultural Systems Engineering
- Metropolis, AI and applied Mathematics
- Wageningen Graduate School PERC
- WR-Wageningen Glas Tuinbouw

Social Sciences

- Health and society
- Rural/development and change sociology and cultural geography
- Environmental/agricultural economics, rural policy and natural resources
- Business management, operational research and logistics
- Graduate School Wageningen School of Social Sciences (WASS)
- WR-WEcR

Research and Education Institutes relevant for Circular Society where WUR is partner:

- AMS: Institute on Advanced Metropolitan Solutions – Amsterdam, with TUD, MIT, and municipality of Amsterdam
- WETSUS: European institute on Sustainable Water Technology – Leeuwarden, with UT and UG, a.o. partners
- DCC: Delta Climate Centre - Vlissingen/Middelburg, with UU-Roosevelt Academy, HZ, a.o. partners

UU

Faculty of Geosciences

- Copernicus Institute of Sustainable Development
- Energy and resources
- Innovation studies
- Environmental governance

- Human Geography and planning
- Urban transitions

Faculty of Law, Economics and Governance

- Utrecht School of Law
- Utrecht Center for Water, Oceans and Sustainability Law (UCWOSL)
- Utrecht School of Economics

Faculty of Humanities

- Centre for Environmental Humanities

Faculty of Science

- Pharmaceutical Sciences
- Chemistry
- Institute for Sustainable and Circular Chemistry

Strategic theme Pathways to Sustainability

- Towards a Circular Economy
- Transforming cities, including transforming infrastructures, citizen engagement and urban sustainability (CITEUS)
- Future Food
- Energy in Transition
- Water, Climate and Future Deltas

UMCU

Overall: green health care professionals in different fields and working in different departments, including eye surgery, OR, ICU, urology and anaesthesiology

Clinical pharmacy

Green Office

Sustainability program

Julius Centre for Health Sciences

- Epidemiology and global health
- Planetary health and exposome

Facility Management

- Food services

The Circular Society working group has a living document reflecting a closer mapping of the expertise of individual scientists to the specific research lines within our two themes (Circular Safe Hospitals and Urban-Rural Circularity) and the more general approaches and methods that are relevant to our program.

D. Collaboration strategy

Societal and knowledge partners

In our program, we build on existing collaborations where EWUU partners have already found each other and jointly cooperate with other academic and societal partners, for instance the with AquaConnect NWO TTW Perspectief program², NWO-NWA PACER project on 'collaborative,

² AquaConnect NWO TTW Perspective Program, 2021-2026 with 6.2 M€, 2.2 M€ co-financing of 40 Societal stakeholders in which WUR is coordinator, and UU (Geo, SSH/legal - Herman-Casper Gilissen) and TUE (Jeroen Voeten, Elec. Eng.) are co-applicants.

digitized and integral processes to achieve circular and emission-free renovation' and cooperations for digital twinning of the Metropole Region Eindhoven. In addition, we built forth on our work for the NWA-ORC proposal on 'evidence based strategies to create circular hospitals', with a strong and intense collaboration in a large nationwide consortium, also including Erasmus MC, TU Delft and private sector parties.

The overview below shows a number of societal partners and knowledge partners to which scientists involved in our programme already have good connections. Especially for URC we expect further focus after our explorative phase.

Circular Safe Hospitals (CSH)	Urban-Rural Circularity (URC)
<p><i>Societal partners:</i></p> <ul style="list-style-type: none"> • Companies for medical devices and services, including Philips and Medtronic • Network organizations (e.g. national Green Deal sustainable healthcare, MVO, BlueCity Rotterdam) 	<p><i>Societal partners:</i></p> <ul style="list-style-type: none"> • Construction and demolition companies • (Social) housing foundations • Architects • Law firms • Network organizations (e.g. Cirkelstad, GlastuinbouwNL: greenhouses, het Groene Brein) • Norms and certification institutes • SMEs for digitization • Chemical industry and ports • Regional water authorities and Union of Dutch Water Authorities • Water supply companies & authorities • Agro-food companies
<p><i>Knowledge partners:</i></p> <ul style="list-style-type: none"> • National federation of academic hospitals NFU • Medical Delta 	<p><i>Knowledge partners:</i></p> <ul style="list-style-type: none"> • AMS Amsterdam Institute for Advanced Metropolitan Solutions • KWR Water Research Institute • PBL Netherlands Environmental Assessment Agency: knowledge infrastructure for a circular economy in Dutch regions (KICER)

How we extend our collaborations

We facilitate the further building up of an EWUU Circular Society scientific community, as the corner stone of our programme on which extended collaborations are built:

- In this community, scientists are highly interested in actively collaborating with EWUU partners in new research projects – way beyond conference-like sharing of earlier research results only;
- We work towards a culture of trust, where the sharing of relevant contacts and networks in this community becomes the norm and not the exception;
- We do not minimize internal competition for grants at all cost. Yet, scientists in this community are expected to be transparent about plans and participations in consortia;

- Where it makes sense, we will facilitate the merging of research proposal ideas or facilitate a discussion about what would be the most promising one;
- We go for lasting success in acquiring grants on the longer term throughout the community, implying that people can also rejoice in other people's success and also understand that careful choice of partners is often essential in becoming the winning proposal;
- We actively seek cooperation with the existing research institutes and Research Support Offices across our institutes where relevant;
- We will explore the desirability and feasibility of internal EWUU temporal exchange of scientists (a TU/e scientist holds base at UU for six months, for instance).

We will extend our stakeholder network as follows:

- A large part of our external cooperation goes via the transdisciplinary consortia wherein EWUU researchers participate;
- Next to that, we will actively try to create new opportunities, by working on creating new innovation ecosystems or very actively creating new connections to already established ones, not in a broad sense but for a limited, selected number of our research lines that seem most promising. We will involve local governments and ROMs in this process.
- We will explore the desirability and feasibility of a (paid-for) membership model for stakeholders from a selected number of innovation ecosystems. The model of the WETSUS institute is a relevant example here.

Collaboration with the Global South

As a densely populated but highly intensive agricultural country, the Netherlands can pioneer as a vibrant living lab for promising urban-rural circular solutions worldwide. For the EWUU alliance there are already relevant connections with the Global South on this theme. This provides opportunities to learn from local (low-tech) solutions elsewhere that are often overlooked in our Western (high-tech) environment. At the same time, we can support international partners in making the leap to sustainability and circularity rather than investing in linear economy approaches.³ Also, a loss of their capacity in human talents can be mitigated.

Collaboration with other EWUU working groups

i4CS seeks to intensify cooperation with other EWUU working groups over time. We will benefit from sharing resources and leveraging mutual strengths, as to achieve our shared goals more efficiently and effectively. This includes alignment in tone of voice and messaging for reaching our target audiences. As to avoid scheduling conflicts, we will coordinate activities such as seed calls, webinars and conferences.

³ The Horizon Europe NATURESCAPE project, for example, seeks to prevent such pitfalls and aims at developing circular, nature based solutions together with partners from different areas of the Global South. Developed by an international consortium, led by UU.

E. Agenda

Our agenda for research, education and societal impact is described below, while the specific timelines are part of the next section F. Milestones and deliverables.

RESEARCH

The building of a scientific Circular Society community within EWUU is at the core of our work. An important foundation for this is the foreseen succession of our current (2023) scientific working group members; three out of four are retiring. As successors, we typically aim for beginning or mid-term career tenured UD – UHD level scientists for whom participation in the EWUU initiative clearly aligns with their academic aspirations, helping them to further shape their careers. We see the scientific director typically having a more senior HL profile, with a good overview of the complete field and able to provide a mentoring role within our program where needed.

Our regular rounds of seed grants, in combination with well organized sandpit sessions, are an important way of getting research projects started and bringing them to the next level. Acquiring additional external research funding on top of that is paramount. In cooperation with the research support units at our institutes, we will develop targeted research support packages, in preparing larger research grants, such as pressure cooker sessions for proposal development and a dedicated pool of internal reviewers of draft proposals.

As a relatively quick way to help establishing the Circular Society program, we have three postdocs that already have been recruited. They contribute to theoretical reflection & (digital) method development and help to firmly embed the programme with tenured staff, which is the goal for the 2024 – 2027 period. We see the ‘acknowledgements’ to EWUU in scientific papers of tenured staff as an indication of their commitment. The scientific papers that our three postdocs produce can be seen as direct output of our program.

EDUCATION

We work closely together with the EWUU Education team in working towards an integral EWUU Circular Society master program. There are several steppingstones in this process, including updated overviews of relevant courses on EduXchange, active approaching of relevant departments across our four institutes and the development of EWUU education packages. Summer schools, open to international students, will be organized. Next to that, we will work on Life Long Learning programs, for especially healthcare professionals.

Given the nature of the subject, international collaboration and exchange is appropriate. Several international collaborations already exist in the medical education field: the ePlanet (Erasmus+ project with Karolinska Stockholm, Charite Berlin and Univ. Gent) and the Planetary Health Alliance (founded in Harvard Boston, European hub started in 2022, secretariat based in UMCU and Maastricht). We aim to further develop these and other international collaborations.

SOCIETAL IMPACT

A large part of our societal impact goes via the transdisciplinary consortia wherein EWUU researchers participate. Next to that, we will actively try to create new opportunities, by working on creating new eco innovation systems or very actively creating new connections to them, not in a broad sense but for a limited, selected number of our research lines. Broader societal impact goes via symposia or conferences, regular communication channels (website, social media, white papers or contributions to grey literature, interviews and opinion pieces) and an i4CS honorary doctorship. We will also explore options for contributing to science communication activities, such as a kids university. Creation of PDENG positions in our consortia can enhance our impact.

F. Milestones and deliverables

i4CS= Institute for a Circular Society
CSH = Circular Safe Hospital theme
URC = Urban-Rural Circularity theme
AI = Artificial Intelligence
RSO = Research Support Office

RESEARCH

Building scientific community	Follow-up of existing scientists in i4CS steering group	2024
	Active connection-making with tenure trackers for i4CS themes	ongoing
	Organize lunch talks, lectures and workshops	quarterly
	Provide seed-funding (per year: 4 projects CSH, 4 URC, 2 AI)	yearly
	Explore and connect i4CS to other relevant alliances internationally	2024
	Explore desirability and feasibility of internal EWUU exchange of scientists	2024
	Have a group of active scientists around all eight CSH & URC research lines	2025
Targeted support for researchers	Identification of relevant calls for proposals	ongoing
	Broad support in proposal preparation + consortium building, with RSOs	ongoing
	Arrange review pool for draft proposals	2024
	Dedicated support of selected > 1 MEuro proposals	½ yearly
Scientific contributions	Joint academic position paper on need for multi-and transdisc. research	2024
	Organization of international scientific conference (URC)	2025
	9 academic papers by EWUU i4CS postdocs	2027
	15 Academic papers by other EWUU scientists with i4CS acknowledged	2027

EDUCATION

Student courses	Input on existing student challenges	2024
	Develop new student challenges: 5 for CSH & 5 for URC per year	2025-'27
	Courses relevant for i4CS on eduXchange	2024
	eduXchange courses accepted by study programs at departments	2025
	Contribute to introduction Planetary Health concept (medical) education	2024
	EWUU i4CS education packages	2025
	Summer school Circular Society	yearly
Master program	Accreditation of EWUU Master Course with Circ. Society as specific topic	2024
	Start of master course	2025
Life Long Learning	First toolkit/modules for healthcare professionals released (CSH)	2024
	Exploration of need and feasibility executive board level training (CSH)	2025

SOCIETAL IMPACT

Building innovation ecosystems	Overview of relevant stakeholders & their agendas for circularity	2024
	Symposium Circular Safe Hospital (CSH)	2025 + '27
	Symposium Urban-Rural Circularity (URC)	2024 + '26
	Exploration paid-for stakeholder membership model (CSH)	2024
	EWUU i4CS as co-signer of Green Deal Sustainable Care 4.0 (CSH)	2026
	Circularity taken into account in healthcare pathways UMCU	2027
	2 Digital Twin/Serious Game prototypes (2 selected URC research lines)	2026
	8 substantial participations in > 1 Meuro public-private research proposals	2027
	Cooperating with Global South partners in at least 2 research proposals	2027
External communication	Website and social media	ongoing
	Explore contributions to science communication (e.g. kids university)	2024
	Honorary doctorship (for resource preservation or sustainable innovation)	2026
	9 popular publications (e.g. opinion pieces) (3 CSH, 3 URC, 3 generic)	by 2027

G. Governance

i4CS has a governance structure wherein **all four EWUU home institutes are properly represented**. Roles are not *a priori* assigned to any of the home institutes; choices for positions are made based on expertise and availability, taking the balance between the four institutes into account, not only within this program but also on the generic EWUU level. The scientific director is overall responsible for i4CS, reporting to the supervisory board, and supported by a program manager that takes operational responsibility. The coordinating scientists link their theme (clarified in the next section H. Management) to the overall program strategy. A societal advisory board intensifies strategic connections with society. The figure below shows this governance structure and is further explained below.

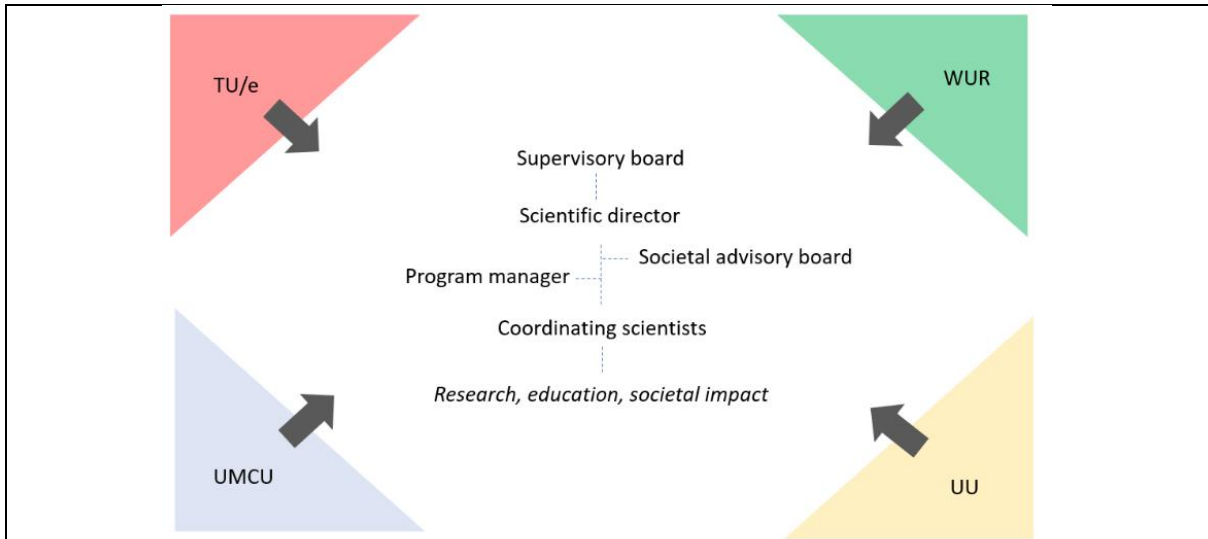


Figure 1. Governance structure i4CS

- **Supervisory board** members are appointed by the EWUU board, typically on dean or managing director (WUR) level, unremunerated.
- **Societal advisory board** members are invited by the scientific director and formally appointed by the supervisory board for a period of 2 years, unremunerated.
- **Scientific director (0,4 fte) and coordinating scientists (4 x 0,2 fte)** are appointed by the supervisory board
- The **program manager (0,8 fte)** is appointed by the scientific director and approved by the supervisory board
- **Representation of all four EWUU institutes** is essential throughout our alliance and will also be reflected by carefully appointing people from all four institutes at the various positions available the governance model.

Foreseen members of our societal advisory board will be recruited from our community of stakeholders. They come, for example, from PBL Netherlands Environmental Assessment Agency, one or more network organisations such as De Groene Zaak and MVO, a municipality and/or province, industry (including fossil based industry that is or should undergo a transition to renewable based industry), financial sector, an environmental NGO, a care organisation and organisation representing an agenda of active participation of lower class income in society.

The table below reflects the foreseen governance meetings.

Meeting	Who	Frequency
Supervisory board (SUB) meeting	SUB members, scientific director and coordinating scientists, program manager	Every 4 months
Societal advisory board (SAB) meeting	SAB members, scientific director and coordinating scientists, program manager	Twice a year

H. Management

Representation of all four EWUU institutes is essential for true collaborations in our alliance and will also be reflected by carefully appointing people from all four institutes at the various positions in the management structure. The EWUU startup period before 2024 has shown that this liaising

function is an ongoing priority that requires continuous attention, time and effort. For the managing/coordinating positions also goes that these are not *a priori* assigned to any of the home institutes; choices for positions are made on the basis of expertise and availability, taking the balance between the four institutes into account. The figure below shows this management structure and is further explained below.

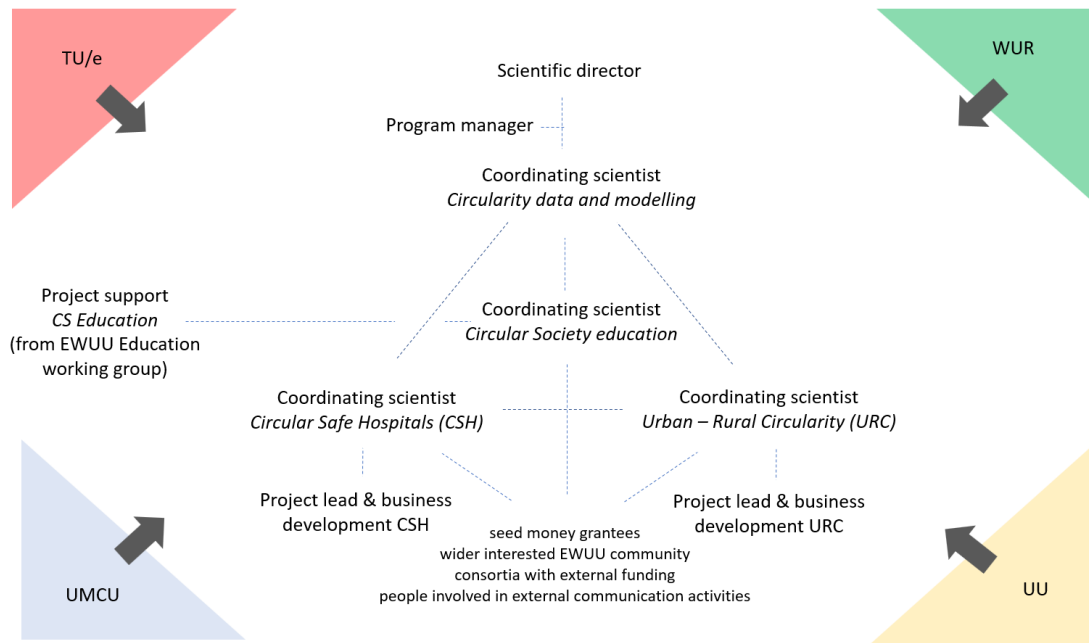


Figure 2. Management structure i4CS

- **Project lead & business development CSH and URC (both 0,9 fte)** are appointed by the i4CS program management: program manager, scientific director and coordinating scientists

The table below reflects the foreseen management and coordination meetings.

Meeting	Who	Frequency
i4CS program management	Program manager (PM) and scientific director	Weekly
i4CS liaising, ecosystems and funding coordination	Complete management and coordination team	Support staff every month, scientists join every other month
CSH coordination	Project lead & business development CSH, coordinating scientist CSH, PM	Weekly, PM joins every other week
URC coordination	Project lead & business development URC, coordinating scientist URC, PM	Weekly, PM joins every other week
i4CS education coordination	Coordinating scientist i4CS education, Project Support i4CS Education, PM	Bi-weekly, PM joins every four weeks
i4CS strategy day	Complete management and coordination team + MarCom officer + Project Support i4CS Education	Yearly

I. Membership model

The building of a scientific Circular Society community within EWUU is at the core of our work. The program is open to all tenured staff across our institutes, but we typically aim for beginning or

mid-term career tenured UD – UHD level scientists for whom participation in the EWUU initiative clearly aligns with their academic aspirations, helping them to further shape their careers. An important prerequisite is that their EWUU participation is valued by their mentors and managers – informally, yet also in formal yearly appraisals and promotions in a tenured career track, in line with the latest *Recognition and Rewards* developments in academia (*Erkennen en Waarderen*).

This implies the following:

- In section H. Management, we described that three scientists out of this internal UD-UHD target group will be formally appointed as members of the i4CS coordinating team by our Supervisory Board, coming with thematic and overall responsibilities for our program, next to the senior HL level scientific director. Apart from these positions, there is no formal membership for Circular Society.
- Only tenured staff can serve as main applicant for our seed grants, including staff on HL level. Postdocs, PhD students, support staff and students can be co- applicants and can take part in projects granted.
- The i4CS scientific director and coordinating scientists are responsible for arranging a sound review process of seed grant proposals, with the clear option of inviting specific scientists or support staffers from within but also outside EWUU as to enhance quality, speed and efficiency of the review process.
- We regularly organize thematic content related lectures and meetings that are open to all staff of our institutes, including postdocs, PhD students, support staff and students.
- Activities we organize for community building are described in section E. Agenda and F. Milestones and deliverables. They include lunch lectures, pressure cooker sessions for proposal development and a dedicated pool of internal reviewers of draft proposals.
- Open sandpit sessions and more targeted thematic meetings with tenured staff will be organized regularly as to further shape our i4CS research and education agenda. For this, we have a hybrid approach: these meetings will be advertised openly via EWUU channels, while also inviting individual scientists who’s research portfolio relates to the topic being discussed.
- During the first half of the program period (2024 – 2025), we will explore the desirability and feasibility of a (paid-for) membership model for stakeholders from relevant innovation ecosystems. The model of the WETSUS institute is one relevant example here.

J. Support team

The following table summarizes the support roles which have mostly been described in previous sections:

Role	i4CS budget	Other budget
Project lead & business development CSH	0,9	
Project lead & business development URC	0,9	
MarCom officer i4CS (shared with i4PH)	0,4	(0,4 i4PH 0,2 EWUU)
Project support i4CS Education		0,2
Financial controller for i4CS		0,1

K. **Finance:** see the separate format for the budget.