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Knowledge and Innovation Covenant (KIC)

Where science and society find and strengthen each other

Cyber security, the nitrogen problem, the housing shortage and the ageing population: our society faces considerable challenges. These require more knowledge and ground-breaking innovations. So there are plenty of opportunities for scientists, companies and public parties to make a difference. Each year, NWO invests more than 100 million euros in research in which private and public parties collaborate to realise societal impact.

Via the Knowledge and Innovation Covenant (KIC 2020-2023), NWO actively contributes to the Mission-Driven Top Sectors and Innovation Policy of the Dutch government. How? Through a combination of funding, programming and support. The basis of the Mission-Driven Top Sectors and Innovation Policy is formed by four major societal themes, the key enabling technologies and societal earning capacity. The four major themes are:

- Energy Transition & Sustainability
- Agriculture, Water & Food
- Health & Care
- Security

Knowledge and Innovation Agendas (KIAs) have been drawn up for these themes.

NWO's financial contribution to the KIC is available for scientific, application-oriented and practice-oriented research. This research is carried out in collaboration with companies that co-fund the innovation projects, with attractive possibilities for SMEs. Thanks to this approach,

the economic earning capacity of the Netherlands can be strengthened substantially.

NWO also initiates collaborations, makes connections between researchers, private – including industrial – and public parties and stimulates the exploration of new pathways. By bringing parties together like this new, unexpected consortia arise and innovative research develops.

Successful innovation

Mission-driven (“thematic”) research requires an integral approach in which researchers from the humanities, natural sciences and social sciences work together and adopt an interdisciplinary approach to an issue. Only when technological and social innovation go hand-in-hand can successful innovations arise.

Initiating new solutions and working on the realisation of the intended impact – pivotal and significant changes in society – of the KIC missions will place considerable demands on the Dutch labour force in the coming years. Focused



'Via the Knowledge and Innovation Covenant, NWO actively contributes to the Dutch Top Sectors and Innovation Policy through funding, programming and support. For example, the problems that our society faces are considerable, and we need knowledge and groundbreaking innovations to tackle these. Researchers, companies and also public parties must join forces. NWO-KIC has 100 million euros per year available for research in which public and private parties work together to address these issues.'

KIC – **Dr René Penning de Vries**
chair KIC programme committee

efforts and new insights in the area of learning, working and innovation are necessary to bring the labour potential to the required level and increase the innovative strength – an important KIC priority to ensure the success of the innovation policy. Due to its focus on the Human Capital Agenda, the KIC sets the future course for improving the connection between education and the labour market.

Supervision and matchmaking events

Within the KIC, NWO actively supervises innovation clusters and initiatives to maximise the exchange of knowledge and the chances of achieving impact. This involves the organisation of matchmaking activities and the provision of workshops about complex consortium formation, such as sandpit procedures to explore possible collaboration for research initiatives in an early phase.

Contours Knowledge and Innovation Covenant (KIC) at NWO

NWO distinguishes four main KIC lines:

1 Mission

Within the main line Mission, NWO annually develops several large thematic programmes that each have a budget of between 5 and 11 million euros: the mission-driven programmes. The choice of subjects is partly determined on the basis of a ranking within the KIAs. Researchers may submit proposals for collaborative projects with a budget between 750,000 to 4 million euros per proposal.

2 Demand

Through partnerships with private and/or public partners, NWO provides the opportunity to elaborate

knowledge and/or development questions from these partners. A proposal for a partnership can also be submitted in the form of an elaborated consortium. These innovation questions need to be in line with (parts of) one or more KIAs, of course, and should result in societal impact. The NWO contribution is between 1.5 and 5 million euros and the partners are required to match this amount in cash.

3 Strategy

Strategy-driven consortia with impact are long-term programmes that connect with the KIAs and have structural funding for sustainable collaboration. NWO offers strong public-private consortia the possibility to apply for funding for a ten-year programme.

4 Practice

Via the Temporary Taskforce for Applied Research SIA, NWO makes 18 million euros available each year for practice-oriented research. That makes it possible for practice-oriented researchers to build up innovation networks and collaborate with partners from the region. Here, there is a strong focus on SMEs.

For the four main lines, the KIC has an annual budget of **118 million euros**.

Would you like to know more?

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Photo: ANP / Rolandse Hoogte / Robin Utrecht

KIC main line Mission

Integral approach to societal issues

How do we keep healthcare affordable? What are our solutions to climate change? How do we retrieve valuable raw materials from our waste? How can we withstand threats to our security? How do we ensure a sustainable food supply? These are just a handful of the questions that the government asks knowledge institutions and innovative entrepreneurs to ensure a future-proof the Netherlands.

NWO contributes to the Dutch innovation policy through part of its programming. Since 2020, this programming has been based on the Mission-Driven Top Sectors and Innovation Policy of the Dutch government that is aimed at solving major societal challenges. The underlying Knowledge and Innovation Agendas (KIAs) and the contributions of NWO and other parties are part of the Knowledge and Innovation Covenant (KIC) 2020-2023.

Collaboration with impact

KIC aims to realise groundbreaking innovative solutions with societal and economic impact. Companies, knowledge institutions, and government bodies jointly invest in developing and applying knowledge so that major societal challenges can be solved with the help of smart technologies. This also secures jobs and income in the future. An integral approach is crucial in the mission-driven (“thematic”) research of the Knowledge and Innovation Covenant (KIC). That approach comes about when researchers from the humanities, natural sciences and social sciences join forces with public and private parties. They approach issues from the perspective of their different disciplines. In this way, technological and

social innovation go hand-in-hand, as a result of which successful innovations arise.

Mission-Driven Top Sectors and Innovation Policy

Four societally important themes lie at the heart of the Mission-Driven Top Sectors and Innovation Policy (Energy Transition & Sustainability; Agriculture, Water & Food; Health & Care; Security), which are elaborated in 25 missions that encompass concrete ambitions. In addition, we focus on the themes key enabling technologies and societal earning capacity. Based on these ambitions, the top sectors jointly wrote Knowledge and Innovation Agendas (KIAs) for each of the six themes stated above. In consultation with relevant stakeholders from science and society, multiannual mission-driven innovation programmes (MMIPs) were developed as part of these KIAs. For the innovation areas, these MMIPs describe the intended objective, the (sub-)programme lines and the specific research and development questions to be answered. For the key enabling technologies, potential multiannual programmes (MAPs) have been identified and supplemented with knowledge and development questions.



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Seaweed: source of biomass and proteins

'Seaweed is a highly promising but scarcely exploited source of biomass and proteins. Small-scale cultivation experiments demonstrated that seaweed often becomes detached from its substrate. That results in the inefficient and unpredictable cultivation of seaweed, with high economic risks and an unknown impact on marine ecology. As a result of this, the sector is not attracting investments, and that hinders the upscaling of operations to a profitable level. Our consortium will improve the attachment of seaweed to the substrate, quantify the consequences of large-scale seaweed cultivation on marine ecology and create business models for Dutch seaweed production. That is necessary for the **transition to a sustainable, blue economy**.'

Dr Tijs Ketelaar, Wageningen University & Research

Consortium partners: Brandfriend, Friedrich Schiller University of Jena, Ghent University, Wageningen Economic Research, Wageningen Marine Research, Hortimare, North Sea Farmers, ReShore, Touwfabriek Langman.

NWO and KIC: research brings solutions closer

The input from scientific and practice-oriented research is indispensable for realising solutions for the challenges posed. Each year, NWO invests 55 million euros in the main line Mission for research in which public and private parties collaborate on societal problems. The NWO research and innovation programmes for the KIC 2020-2023 contribute to answering the research and development questions linked to societal issues.

The main line Mission has two public-private partnership (PPP) approaches per Call for proposals. These have different co-funding conditions: to increase "knowledge" (with 10% co-funding) and to increase "innovation" (with 30% co-funding). For each thematic call, a choice has to be made between the two approaches.

The approach *innovation* is the standard default and is aimed at economic and societal innovation.

- Co-funding: 30%, of which at least half must be private investment

The approach *knowledge* is specifically used for knowledge acquisition in the case of knowledge gaps.

- Co-funding: 10%, of which at least half must be private investment

The following applies to both approaches:

- the themes are determined by the priorities from the KIAs or are related to these
 - at least half of the co-funding is in cash
- Deviations per call are possible.

In the period 2020-2022, NWO has **so far developed 19 mission-driven calls** with a total budget of about **108 million euros**. The first projects were awarded funding at the start of 2022.

Would you like to know more?

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Climate-robust production systems and water management

'Due to climate change, periods of extreme drought will occur more frequently in the Netherlands. That could lead to societal unrest and major economic damage. We will try to gain a better understanding of how soil and vegetation behave during prolonged drought periods. The consortium will actively collaborate with farmers, water managers and other decision-makers and **develop practical use cases** for the daily monitoring and prediction of drought.'

Prof. Bob Su, University of Twente

Consortium partners: TU Delft, Wageningen University, HAS University of Applied Sciences, Deltares, Wageningen Environmental Research, VanderSat, HKV, Waterschapshuis, Rijkswaterstaat, Royal Netherlands Meteorological Institute, Stichting Voedselbosbouw Nederland, Netherlands Agricultural and Horticultural Association (Section North), Sencrop, Veenink Akkerbouw, Water Board Aa en Maas, Waterboard Vallei en Veluwe, Herenboeren Wenumseveld.



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KIC main line Demand

Demand-driven partnerships for partners and consortia

Each year within the Knowledge and Innovation Covenant (KIC 2020-2023) several partnerships are elaborated in which the focus is a knowledge and/or development question from partners. The NWO contribution for such a partnership lies between 1.5 and 5 million euros. The partner, or consortium of partners, matches that amount exactly in cash.

Demand for partners

NWO offers two types of opportunity for potential partners. Does the partner want extra visibility in an existing market, is it seeking a radically different market, does it want to expand by utilising other disciplines or is it searching for new talent that can support its organisation in a development phase? That is what “Demand-driven partnerships” is about.

The partnership can be elaborated into a call for associated project proposals that are assessed by an independent selection committee. In some cases, this can be a sandpit procedure, but a lighter variant with less overheads is also being developed.

Demand for consortia

Has the consortium already established the innovation gap in the market, and does it seek like-minded people that it can work with? In that case, NWO offers the option “Demand-driven Partnerships for Consortia”, for which consortium partners jointly elaborate a grant proposal. A proposal for such a partnership can be submitted in the form of a pre-existing stable consortium.

An important aspect of the KIC partnership is that the problem to be investigated is freely chosen. There is no “pressure” due to disciplinary frameworks or pre-determined themes (for this, please see the mainline Mission), as long as there is a connection with one or more Knowledge and Innovation Agendas (KIAs).

Call: Demand-driven Partnerships for Consortia:

in response to a Call for proposals, a public-private consortium formulates a research proposal (including co-funding) that is submitted to NWO by a main applicant on behalf of the consortium. This can concern an existing or a new consortium of **at least two knowledge institutes**, public and private parties or industrial parties. A research proposal should seek to answer a self- chosen knowledge and development question that connects with (parts of) one or more KIAs. The proposal for a demand-driven partnership is typically larger in scope and the co-funding requirement is larger than in the case of proposals for the KIC main line Mission, but it is smaller than the scope required for long-term programmes (KIC main line Strategy).



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Breed4Food increases effectiveness

In the partnership programme **Breed4Food**, four Dutch animal breeders who are **normally each other's competitors** have instead joined forces. That has boosted the effectiveness of their research. 'In the past, you had a master breeder and that person determined everything. He or she sought the finest or best-presented animal and that was allowed to reproduce. Animal breeding has become far more knowledge intensive. We use and develop increasingly newer techniques, and the investments that you must make are growing in size. One such example is genetic research where we directly read off an animal's performance from its DNA.'

Gerard Albers, head R&D at animal breeding company Hendrix Genetics

Incubator for consortia

Demand-driven Partnerships for Consortia are the ideal incubator for consortia of knowledge institutions, public and private parties that want to jointly translate a knowledge and development question into a coherent project proposal with focus and mass, and aimed at societal impact. Namely: focus on the theme and mass in the form of a joint deployment of people and resources. At the same time, it is also a place where consortia that have the ambition to grow into strategic, long-term programmes can mature further.

Demand-driven Partnerships for Partners: such a partnership starts from an urgent question in a public or private organisation. This public or private partner* submits an intention to form a partnership to NWO and publicises the question and its willingness to co-fund a partnership. After selection by NWO, the partner works in co-creation with NWO to develop a thematic Call for proposals.

* The public or private partner cannot and may not apply for any funding from NWO.

The instrument is particularly suitable for public and/or private/industrial parties that want to initiate a thematic research programme of considerable size with regard to a knowledge and/or development question that is important for them. Such parties need new knowledge to be able to discover new directions, bring about innovation in existing R&D or increase their visibility. By putting the knowledge and/or development question on the agenda through helping to publish a Call for proposals, partners can fill the gap of knowledge that is still missing and connect with new knowledge of high quality. Via that Call for proposals, researchers are asked to make a contribution to answering the knowledge and development question of the partner(s).

Would you like to know more?

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Combating cancer together

NWO and KWF Dutch Cancer Society have joined forces in the partnership programme Technology for Oncology. They challenged technical and medical researchers to join with other scientists and with companies to enter into new collaborations that are aimed at technical innovations for the prevention and treatment of cancer. In Technology for Oncology **19 projects** were awarded funding in two rounds. KWF Dutch Cancer Society and NWO jointly contributed **2.59 million euros**.



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KIC main line Strategy

Large, long-term, strategic collaborations

Within the main line Strategy of the Knowledge and Innovation Covenant (KIC) 2020-2023, NWO will establish a limited number of long-term programmes (LTPs). The strategic objective of an LTP is to provide a long-term and powerful stimulus for the national development of the scientific field in the Netherlands aimed at a societal theme and/or a key enabling technology.

An LTP is characterised by a 10-year funding period that is vital for achieving the desired scientific and societal impact. A contribution by NWO is needed to get the collaboration of the ground or develop it further. An LTP is characterised by the cooperation between knowledge institutions and private parties. In addition, public parties can also be involved. LTPs have a budget of between 30 and 100 million euros, in which the matching NWO contribution can amount to a maximum of 25 million euros.

The knowledge institutions and the private and public parties involved provide an in-kind and in-cash contribution to the LTP that amounts to two-thirds to three-quarters of the total budget. The NWO contribution stops by definition after ten years even if the LTP continues to exist for a longer period of time. NWO has set up a transparent process for the selection of LTPs.

Strategic importance

Just as for the KIC main line Mission, the budget for the long-term programmes is intended for all Knowledge and Innovation Agendas (KIAs) together. The allocation of funds takes place in a

KIA-overarching manner. NWO makes this allocation with the help of an assessment framework, which encompasses the following important criteria:

- scientific quality
- the national strategic importance (scientific, societal, economic)
- (national) collaboration

Context

NWO has current obligations for previously awarded LTPs (ARCNL, ARC CBBC, Oncode, QuTech en Wetsus) that were entered into at the request of the top sectors and government ministries. These obligations amount to about 10 million euros per year and are part of the KIC main line Strategy. That leaves about **20 million euros** per year available to start new LTPs.

In 2021-2022, two **LTPs** were given the opportunity to further elaborate their research plans. The proposals will subsequently go through the standard assessment process, after which NWO will contribute a maximum of **40 million euros** in all.



Plant-XR – A new generation of intelligent breeding tools for extra resilient crops (LTP under development)

'The world must satisfy a growing demand for affordable food and at the same time adjust to climate change and reduce the use of fertilisers, pesticides and natural resources. Instead of plants that only do well under perfect and strictly managed conditions, **we need robust crops** that are resilient to extreme and unpredictable stress, such as droughts, floods and diseases.

The current plant breeding techniques cannot effectively select for such complex characteristics. We need a **new generation of smart, targeted breeding instruments** based on new data, insights and artificial intelligence to rapidly create many extra resilient crops. The aim of Plant-XR is to develop these instruments and accelerate the implementation.'

Prof Guido van der Ackerveken, Utrecht University

Consortium partners: University of Amsterdam, Wageningen University & Research, TU Delft, BO akkerbouw, Greenports Nederland, Top Sector Horticulture and Starting Materials, Plantum, Rijk Zwaan, Enza Zaden, Bejo Zaden, Keygene NV, HIP consortium, Flower consortium including Dekker Chrysanten, Deliflor Chrysanten and Dümme Orange (Chrysanthemum plus other flowers and ornamentals)

ROBUST: Trustworthy AI-based Systems for Sustainable Growth (LTP under development)

'A key component in fulfilling the promise that artificial intelligence will help solve current societal challenges is developing trust in the interaction between people and systems based on artificial intelligence. ROBUST is aimed at facilitating the technological support of reliable systems in terms of accuracy, reliability, repeatability, resilience and security. ROBUST intends to realise economic impact and contribute to the objectives for sustainable development. We achieve this in a **network of labs in which knowledge institutions and industrial stakeholders jointly seek to realise research agendas.**'

Prof Maarten de Rijke, University of Amsterdam and ICAI

Consortium partners: Amsterdam UMC, TU Delft, TU Eindhoven, Erasmus MC, Erasmus University Rotterdam, JADS, Leiden University Medical Center, Leiden University, Maastricht University, Radboud university medical centre, Radboud University, University Medical Center Groningen, University of Twente, University Medical Center Utrecht, Utrecht University, Avans University of Applied Sciences, Fontys University of Applied Sciences, HAN University of Applied Sciences, Saxion University of Applied Sciences, University of Curaçao, Abbott, Alliander, ASM Pacific Technology, BioMax, Delft Imaging Systems, Deloitte, DPGMedia, DSM, General Electric Healthcare, GN Hearing, Integrated Utility Holding, LaNubia Consulting, MeVis Medical Solutions, NS, NXP, NV GEBE (St. Maarten), Philips, ProRail, SiemensHealthineers, Thirona, Verily, Water and Energy Company Aruba, Water and Energy Company Bonaire, Ministry of Economic Affairs Curaçao, NLAIC, Partnership on AI, Rotterdam Stroke Service, SDG Nederland, TTT.AI, Laurens-Rijndam and other rehabilitation centres and patient organisations.



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Would you like to know more?

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KIC main line Practice

Practice-oriented instruments

Each year, the Taskforce for Applied Research SIA contributes 18 million euros to the Knowledge and Innovation Covenant (KIC 2020-2023) by encouraging practice-oriented research that connects with this. This amount is part of the 118 million euros that NWO annually allocates to the KIC.

The Netherlands Association of Universities of Applied Sciences and the Taskforce for Applied Research SIA are partners of the Knowledge and Innovation Covenant. In the practice-oriented research, knowledge development and dissemination takes place in networks of universities of applied sciences, knowledge institutions, companies, public organisations and provinces. Lectors and Centres of Expertise at universities of applied sciences provide the mutual connections. The universities of applied sciences will contribute at least 32 million euros each year to realising the missions with the help of practice-oriented research. In regional incubators for innovation (such as campuses, testbeds and living labs), universities of applied sciences work together with their regional partners from the field: SMEs, public institutions, and educational and knowledge institutions. Universities of applied sciences make a valuable contribution to the Mission-Driven Top Sectors and Innovation Policy through research, the translation of research results into practice and education, and attention for human capital. For each Knowledge and Innovation Agenda (KIA), there is a university of applied sciences thematic roundtable. These have been established to ensure that everybody active with respect to a certain theme is involved in the discussions that are led by universities of applied sciences board members. Possible

parties from universities of applied sciences are Centres of Expertise, lectors platforms, field labs, SPRONG consortia and representatives from the Sectoral Advisory Bodies of the Netherlands Association of Universities of Applied Sciences. More information about the thematic roundtables can be found on the [website of the Netherlands Association of Universities of Applied Sciences](#).

Four instruments

There are four instruments that make it possible for practice-oriented researchers to build up innovation networks and jointly work with partners from the region and SMEs. These are SPRONG, L.INT, KIEM and Innovation Traineeships.

- SPRONG is aimed at encouraging powerful research groups at universities of applied sciences. A SPRONG group consists of a collaboration between (at least) two universities of applied sciences and partners from the field such as companies from professional practice (e.g. SMEs), public institutions and government bodies. Strong SPRONG groups have a powerful influence on the quality of the research conducted at the universities of applied sciences involved. In the first round of SPRONG, **17 research groups** were awarded funding with a total budget of **17 million euros**.



SPRONG project: The Circular Leap

'The Netherlands will be 100% circular in 2050. We can only achieve that if we design products differently and find other ways to organise processes. Many companies have not yet adjusted to this fact. As an innovative industrial region, the South Netherlands has a higher than average amount of challenges, but is also strongly organised to tackle these. The Circular Leap lays the foundation for an **industrial circular transition**.'

Dr Jifke Sol, Fontys University of Applied Sciences

Consortium partners: Brainport Smart District, Midpoint Brabant

- L.INT is aimed at creating new lector positions with a connection between the university of applied sciences and a research organisation (such as TO2, an NWO institute, a KNAW institute and government knowledge institutions). This connection strengthens the knowledge and innovation chain by bringing together science, policy and practice. The scheme provides opportunities for senior researchers, lectors and students, and contributes to a larger availability of well-trained professionals.
- KIEM/GoChem/GoCI – KIEM is a low threshold scheme to encourage SMEs to do exploratory research in collaboration with a knowledge institution. The KIEM scheme is open for universities of applied sciences, universities and other institutions for scientific research. GoChem and GoCI are thematic programmes aimed at, respectively, the chemical and creative industry in which SME representatives, knowledge institutions and

financiers jointly work on facilitating innovation in the SME sector.

- Innovation Traineeships (pilot) is a new c aimed at encouraging collaboration between SMEs
- and universities of applied sciences through Innovation Traineeships that are linked to educational programmes at universities of applied sciences. An innovation trainee does 18 months of practice-oriented research at an SME, first as an intern and, after graduating, as an employee of the company. The university of applied sciences supervises the trainee throughout the entire research project.



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L.INT lector: Healthy Urban Development

Utrecht University of Applied Sciences and the National Institute for Public Health and the Environment have jointly appointed **Dr Hanneke Kruize** as lector of Healthy Urban Development. She will focus on the development of evidence-based, practice-oriented design principles for a healthy living environment. The lector Healthy Urban Development will work in living labs with researchers, students and residents on the design and monitoring of green urban spaces and how people use and experience these. Examples are living labs at Cartesiushoek Utrecht, Merwedekanaalzone Utrecht, Stille Stad Amersfoort and Zusterparken in municipalities of the Province of Utrecht.

