Recognizing and Rewarding Talent in Today's Academia

NWO-I in a Changing Academia

Concept vision; version August 2021
1. Statement of Intent:
   Recognizing and Rewarding Talent in Today’s Academia - NWO-I in a Changing Academia

An academic career can be incredibly rewarding, offering opportunities to advance human knowledge, educate the next generations, and tackle some of society’s greatest challenges. It is, however, also a demanding career path and successful academics today are asked to take on a wide range of activities beyond only research or education including management, fund-raising, and outreach to name but a few. This wider range of activities is especially true for staff at NWO-I where research is only one aspect of fulfilling the national roles the NWO Institutes serve in the community. At the same time, academia itself is changing with large national and international collaborations becoming increasingly common and topics like team science, open science, scientific integrity, diversity and sustainability demanding more attention. Balancing these diverse responsibilities, while operating in a landscape where individual contributions can be harder to identify, make choosing a suitable career path and navigating a successful career in academia more challenging than ever.

While the conditions for academic success may have changed, the ways in which that success is measured largely have not. Traditionally, simple metrics such as publication rate and fund-raising no longer reflect the full picture of success in modern academia. There is a growing consensus that the manner in which we recognize and reward academic achievement for individuals and groups must evolve to include the full diversity in academic career paths and to reflect the unique talents and ambitions this diversity brings. This consensus has given rise to various efforts around the world such as the San Francisco Declaration on Research Assessment (DORA) principles in the US and nationally here in the Netherlands with the “Room for everyone’s talent” initiative by VSNU, NFU, KNAW, NWO and ZonMw. These initiatives, and efforts like them, seek to modernize our definitions for academic success, and the methods we use to evaluate it, to be better aligned with the complex academic and societal issues of this age.

At NWO-I, we fully support these initiatives and see the current national effort to develop a better system of recognition and reward as an important step toward that ideal of a more inclusive, balanced, and high-quality academic community. Ultimately, we envisage a change of culture in the entire global academic community. However, such a lofty ambition cannot be achieved in isolation, but only in close and continuous consultation with our national and international partners. And of course, changing culture takes time and dedication. NWO-I is committed to contributing to and leading this change.

NWO Institutes

The NWO Institutes are a unique feature of the Dutch research landscape and have a national role on behalf of their respective scientific communities. To serve this national role, NWO Institutes require an inclusive system of recognition and reward that serves its own personnel while also taking national interactions of both personnel and institutes into account. Maintaining a strong connection to the scientific communities they serve is integral to fulfilling the missions of the NWO Institutes and the most straightforward way to achieve this connection is to be an active part of those communities. All the NWO Institutes host world-leading research staff and, just as their counterparts at the universities, our researchers perform fundamental research, publish their results, and engage in collaborations with fellow researchers in the Netherlands and internationally. They also contribute to the educational mission of the universities through teaching and student supervision. By the same token, they are equally vulnerable to a recognition and reward system that does not properly acknowledge the full span of their contributions.

However, this traditional researcher profile alone does not describe the entirety of NWO-I staff. The expertise necessary to support the national roles of the institutes is reflected in a more diverse range of staff profiles. NWO Institutes also support the Dutch academic community by developing and maintaining unique capabilities and expertise to facilitate their research and collaborations. These capabilities range from crucial experimental facilities and research infrastructures to technical expertise, computing resources, and software skills. NWO Institutes also provide scientific advice to citizens, companies, and the government, whenever and wherever it is requested or necessary. Many NWO Institutes also represent the NL scientific community in various international collaborations and consortia.
To fulfil these national roles, NWO Institutes require staff with a wide range of skills and therefore a broad range of career paths. In addition to the familiar researcher, who might have many of the same responsibilities as a researcher at the universities, NWO Institute staffs include instrument specialists, technical experts, mechanical engineers, software engineers, data privacy officers, data managers, project managers, scientific communication experts, specialized support staff and more. All of these skills are required to support the missions of the institutes on behalf of the Dutch scientific community. At the individual level, we envision a cultural change where NWO-I employees have more freedom to create their own career path. Developing a system of recognition and reward that accurately acknowledges this diversity in academic careers is clearly of particular importance for NWO-I.

Scientific and Societal Impact
As a nationally funded organization, NWO-I has a responsibility to share the results of its work with the scientific community and society, a responsibility we share with the universities. The NWO Institutes also share a core mission to advance the state of the art in their respective domains and to position the Dutch scientific community at the forefront of world research. The ultimate success in pursuing these institutional missions is determined by the impact we have on our communities, our fields, and society.

Across the whole of NWO-I, these impacts can take a variety of forms, many of which parallel those at the universities. In the case of research impact, for example, we actively share our research through publications, national and international collaborations, and participation at workshops and conferences just as university researchers do. Along with these shared activities, however, NWO Institutes also play a supporting role for their research communities by providing access to facilities and expertise. This support can take many forms such as assistance utilizing experimental facilities or research infrastructure, developing data products, tools or software for use by the community, or providing technical expertise and consultation. In all these cases, the impact of the institutes is measured not in the direct research output of its own staff, although NWO-I staff may of course also be involved, but rather by the research, it enables in the community.

Similarly, the development of human capital through education, training, and outreach activities is one of the most crucial forms of impact for both universities and NWO Institutes alike. Training the next generations of scientifically literate citizens, whether they pursue academic or private sector careers, is a core responsibility for the university community and NWO Institutes support these activities by contributing to all aspects of education. In addition to formal academic education in collaboration with universities, the world-leading engineering and technical staff at NWO Institutes allow them to also provide training through technical internships directly or in partnerships with industry. Taken all together, these activities comprise one the most valued forms of impact for NWO-I.

Finally, transfer of knowledge to companies, NGOs, or governments, valorisation activities, and supporting geo-return to Dutch industry is an important form of impact for NWO Institutes. In most instances, this impact is directly related to the national or international research infrastructures that many of the NWO Institutes support as part of their national roles. Although university research groups contribute to many of these activities as well, they arguably are given more attention within NWO-I and certainly represent an important metric of societal impact for the institutes.

Although far from a definitive list, these examples already show that the forms of impact NWO Institutes have on their communities and society embrace a wide range of activities beyond pure research alone. These impacts are in fact often in tension with research activities, as they require significant staff time and resources to achieve. Moreover, they also involve a larger fraction of the staff at NWO Institutes as well, since virtually all staff may contribute to these institutional impacts in various ways, not only those following traditional research trajectories. All of which makes establishing a rewards and recognition system that sees the full range of ways in which all NWO-I staff support the impacts necessary to fulfil their institutional missions that much more crucial.
Modern Academic Leadership
The concept of modern academic leadership is at the very heart of the culture change we hope to achieve. What it means to be a leader in academia is inextricably linked with what we choose to recognize and what we choose to reward. It is these criteria by which academic leaders will be chosen and it is these values which future academic leadership will need to nurture. A more modern view of what these criteria should be is particularly relevant at NWO-I where leadership may not be focussed solely on research innovations but also include technical, team and individual development, or support activities.

In reconsidering what we mean by academic leadership, the concepts of Team Science and Diversity are particularly relevant for academic staff today, and especially so for staff at the NWO Institutes. In the case of Team Science, there is a recognition that academic leaders should focus not only on personal achievement, but stimulate group achievements as well. The overall performance of a team or group, the development of capabilities and experience in group members, and the creation of an open and supportive work environment should be seen as core tenets of modern academic leadership and developed and rewarded accordingly. Similarly, participation in collaborations and teams, even when not leading them directly, should also be recognized and valued. If researchers can count on being credited for their team’s achievements, it gives them the confidence to develop their skills and knowledge based on their ambitions and strengths, instead of merely checking the boxes for standard metrics to succeed. Such an environment is advantageous for individuals, teams, and the institutes.

This broader definition of leadership is highly applicable at NWO Institutes where, alongside traditional research groups, staff may also lead teams focussed on development or support activities. The goals for these teams may differ dramatically from traditional research outcomes, but the broader expectations for the leadership of those teams remains the same.

Encouraging diversity is another core value for modern academic leaders. In modern collaborations, this diversity can take the form of differing skillsets, experience, or career trajectories but could also include multi-disciplinary teams or mixed teams incorporating researchers, technical, and support staff. Team diversity may also encompass differences in cultural backgrounds, gender, sexual orientation, neuro-diversity, or disability. Diverse groups provide room for different competencies and tasks, and provide a climate in which inclusive thinking is the norm. A broad range of expertise, knowledge and backgrounds creates an inspiring environment that can more rapidly lead to new ideas. At NWO-I, we wish to create an environment where team science with room for diversity in career paths and personal dimensions is possible thanks to strong academic leadership in which vision and the facilitation of teamwork go hand in hand.

Path to Change
The initiative to align the rewards and recognition system in academia with the realities of a modern academic career is a truly international undertaking and, here in the Netherlands, brings together virtually all stakeholders from universities to knowledge institutes. At NWO-I, we are committed to contributing to this initiative both inside and outside the organization. In this overview, we have outlined a number of aspects of a more modern rewards and recognition system that are of particular importance for the NWO Institutes. The following chapters will address each of these topics in greater detail. In each chapter, we discuss components of the reward and recognition system that are shared with our university partners, but focus on the aspects of these components that are unique to NWO-I. We attempt to identify areas where change is necessary and possible actions to achieve these changes. This document will form the basis of further discussion with NWO-I staff as well as other academic partners. These consultations will be used to define concrete recommendations for policy changes that can be implemented within the NWO Institutes to improve the rewards and recognition system for not just our researchers but also all staff.

Culture change takes time, it takes communication, and ultimately it takes commitment. In this vision statement, the NWO-I committee on recognition and rewards presents the ambition and the strategy to achieve this change locally, but also in cooperation with other members of the academic community. NWO-I is dedicated to
making our institutes places where all our staff can excel across a broad range of academic careers and with credit and recognition for the full range of their achievements.
2. Chapter National role

At present, the list of NWO-I institutes includes AMOLF, ARCNL, ASTRON, CWI, DIFFER, Nikhef, NIOZ, NSCR and SRON. These institutes represent a portfolio of research areas covering among others physics, astronomy, mathematics, informatics, maritime and crime and law enforcement.

The role of these institutes is to support, unify and federate the activities in the Netherlands in a specific field of research as well as conducting top-level research. Thereby, these institutes not only support science at large, they also strengthen the position of the Netherlands in the international research landscape and connect to other research institutions, groups or activities. An institute must therefore have a clear focus, sufficient mass and foreseeable continuity. The institutes constitute centers of excellence where the necessary knowledge and know-how to carry out research is maintained and further developed. They give home to excellent researchers and engineers with a wide variety of backgrounds and skills. A stable as well as responsive environment for the research is provided through the mission budgets of the institutes and research grants of individuals or groups, respectively. Some institutes can have additional roles such as providing access to (inter)national infrastructures, instruments, fleets or facilities or sharing heritage, collections, data and technologies. The national role can also involve other tasks related to among others science diplomacy (e.g. formation of, participation in and leading of (inter)national consortia), a user community (e.g. computing for the analysis and storage of data) and engineering (e.g. conception, design, construction and operation of large infrastructures or facilities). The institutes also make the importance of research visible to society and liaise with (Dutch) industry.

Several tasks are linked to the other areas, which are addressed in chapters Education, Impact and Leadership. The national role can be seen as a junction between many areas and the mission of the individual institute as well as NWO-I.

Vision

The NWO Institutes aim to offer an inspiring and diverse working environment with skilled researchers, interdisciplinary collaborations, modern equipment and access to large (international) infrastructures and facilities. The work of a researcher at a national institute is motivated by science. It can range from a flash of genius to a multi-year project and from a single person to a collaboration with thousands of persons from many different countries.

As NWO Institutes, we have a national role to strengthen research fields and the Dutch scientific community in general. This also encompasses working with an open access mind-set. The institutes should adhere to the FAIR (Findable, Accessible, Interoperable, Reusable) and DORA (Declaration on Research Assessment) principles, and Open Access guidelines.

Many of the tasks that we view as part of the national role require a diverse staff, with different expertise’s and experiences. Without our research and technical staff, we would not be able to fulfil our national role and the Dutch research community would be affected. Therefore, the work all staff do to execute our national role should be recognized and rewarded as such.

Currently recognition of the national role is done indirectly by appraising successful collaborations and research output of the infrastructures and facilities. In our current performance appraisal, there is emphasis on individual productivity. We want the activities that contribute to science at large and the national role therein to weigh more.

The goal is to increase awareness of our national role among our researchers, specify tasks linked to the national role, make efforts of all staff in these tasks more visible, and recognize and reward them accordingly.

Mobility on a wide scale must be stimulated as this endorses exchange of knowledge and provides easy access to new career paths. Sharing knowledge and personal interaction between staff from institutes needs to be enforced.
Considering the national role of the institutes, they should fulfil a role model for a diverse and inclusive working environment, which is endorsed by NWO-I.

**Changes needed**

In order to achieve this, NWO-I should:
- Define and communicate the national role of the institute.
- Identify tasks linked to the national role of the institute.
- Encourage internal and external mobility.
- Reward and recognize the efforts on the national role.
- The institutes should adhere to the FAIR and DORA principles and Open Access.
- Encourage a diverse and inclusive working environment and raise awareness on (gender) bias.

**Actions**

- Each institute communicates its national role and corresponding tasks.
- The national role should be taken into account in the various evaluations of individuals and institutes e.g. R&O and SEP, respectively.
- Support on granting proposals that contribute to the national role but are difficult to define in research results.
- Stimulate mobility by providing meeting points for sharing knowledge and interaction between institutes. (input workgroup sharing knowledge?).
- Make a plan to facilitate and encourage exchange of people (periodically, temporary and permanently) in between institutes and beyond.
- Each institute should work on a Gender Equality Plan (GEP) and include bias training.
3. Chapter leadership

Science is the result of human effort, which takes shape more and more in teams. Small groups of people routinely work together within NWO-I institutes but also larger collaborations between different NWO-I institutes and universities exist, which are often the result of joint project funds. In some cases, international collaborations are formed which continue for a large number of years and involve many different funding authorities. As science is a continuous process, the NWO-I institutes constitute a common place to maintain and develop the required knowledge, know-how and skills to sustain research.

Vision

Leadership is the action of leading a group of people or organisations to achieve objectives and develop a long-term vision/strategy. In the NWO-I context this can be leading a research group, leading a support department, leading an institute or leading a consortium or the supervision of individual students. In the context of science, it is the skill to lead a team towards combined success. This involves more than transfer of knowledge and skills does, effective leadership is also adapting leadership style towards the individual needs of the team members.

Changing a culture will need leaders to lead by example as they represent standards in the organisation and in their team. Effective leadership in a changing environment requires self-awareness and personal development, these are necessary to put yourself in an independent position to understand and therefore be understood by your team.

Through effective leadership, researchers can stimulate the growth and effectiveness of their co-workers. Furthermore, leaders are also socially connected, supporting researchers in more areas than research. Employees coping with stress (either work or non-work related) need support and a trustful relationship with their team leader so this will be addressed for example with help from HR advisors.

Open science, Diversity and Team Science

Open Science, according to NWO, is the movement that aims at more open and collaborative research practices in which publications, data, software and other types of academic output are shared at the earliest possible stage and made available for reuse. Leaders play a key role in implementing Open science practices within and outside the institutes. The investments that are needed to implement Open science practices will bring the quality and reproducibility of the research process to a higher level, open up new career paths and provide opportunities for cross-disciplinary research.

Research is becoming more and more multidisciplinary, involving teams of people with variable backgrounds (e.g. grants for international consortia). This is a good thing, because it connects expertise and knowledge from different fields, which leads to new insights and more knowledge flow, making the combination of diversity and inclusive leadership a strength as science benefits from diversity. (ref. Science benefits from diversity and Delivering through Diversity). Leaders have a responsibility to maintain an open and safe environment where there is room for social diversity but also diversity in knowledge and skills.

Team science requires leadership, as leaders are the ones that set the standards in an organisation and in their team. The more complex a group, the more important the role of leadership. In addition to the progress of science, various aspects of leadership cover human relations; internal and external communication; and project, budget and crisis management. Of course, in an international context; each researcher can play a leading role in his or her field of expertise. Team Science may cross national borders and involve foreign resources, facilities and sites as well as different cultures, time zones and legal systems.

Changes needed:
The growth and development of (junior) researchers, social safety, team diversity, science integrity and career coaching are all important aspects on which leaders have a big impact. However, these aspects do not always play a big role in the evaluation of leaders.
More emphasis should be placed on effective leadership in the recruitment and assessment of leaders at NWO-I. When someone in a leading role gets evaluated, questioning his or her group members should be part of the assessment procedure. Training and InterVision of leadership should continue throughout leadership careers, because leadership is a skill. People should be stimulated to develop this skill from early on in their careers (e.g. at the PhD stage).

The way leaders assess their team members should provide more room and recognition for initiatives besides working towards publications, so they can also be rewarded.

**Actions**
Concrete actions that can contribute to a balanced recognition and rewarding of leadership include:
- The incorporation of feedback from team members and former team members in the evaluation of new and existing leaders. Furthermore, it is important that leaders create an open and safe atmosphere in which team members feel free to provide feedback.
- Leadership courses that communicate modern insights into leadership (i.e. situational leadership) should be offered and incorporated into the evaluation of leaders.
- Leaders should be aware of the importance of personal development and career development of their team members, therefore they should facilitate possibilities to explore career development with a career coach and stimulate this orientation.
- The way leaders assess their team members should give more room to everyone’s talent, initiatives to work on subjects with regard to the mission of the institute, open science, impact, education and leadership should be mentioned and rewarded in evaluations.
4. Chapter Research

Research concerns all activities of investigation, experimentation, exploration, theory, method development and discussion and collaboration that lead to new insights. This also includes scientific support tasks that lead to (scientific) innovations, such as the creation of software and instrumentation, scientific engineering, and operations. However, the theme ‘research’ is broader than research performed in institutes. It also involves hiring new researchers, reviewing papers and proposals, training and guiding early-career researchers, and sharing knowledge through collaborations and open-science practices (e.g. publication of data and software). It is important that researchers can contribute to and are recognized for this full suite of research activities.

Research positions and funding for research are limited, which inevitably creates competition between researchers. The outcome in this competition is determined during evaluations of researchers and their research output (publications, software, data sets etc.) during job applications, when ranking grant applications and for deciding on promotions. It is challenging to rate the quality of researchers and their research, which has resulted in the fact that evaluations of research are often based on measures such as acquired funding, and number of papers and citations. High quality research and related activities that do not directly or visibly translate into these metrics are often insufficiently recognized and remain undervalued, partly because it is difficult to know upfront which research will have an impact and at what timescale this impact will be seen. Positive impact should therefore be more accurately identified - so it can be properly evaluated and stimulated.

Vision
The quality of a researcher should be evaluated within the broad term ‘knowledge creation’. Research should be reproducible and transparent with open science practices adopted. The scientific integrity of a researcher is crucial and NWO-I adheres to the Netherlands Code of Conduct for Research. According to the European Code of Conduct for Research Integrity, researchers should be reliable, honest, respectful and accountable. Furthermore, research should also be evaluated based on quality even before the impact of this research is seen, because the impact is not always immediately clear (e.g. research with a ‘negative’ result). At the same time, a balance needs to be found to include concrete evidence in evaluations and prevent attributing value to unprovable claims.

Changes needed
In order to achieve this, NWO-I should:
- focus on creating a good environment where internationally recognised scientific practices, e.g. DORA, are the norm and where everyone feels that they and their colleagues are accountable;
- reward and recognize researchers based on a broader definition of quality of their research and their contribution to team- and open science;
- coordinate specifications of high quality research and good research practices and use these to allocate funding within their own research institute and with other research institutes, universities and research funders.

Quality of research
Part of our task is to define the quality of a researcher and research products and we have come to the following, non-mutually exclusive aspects:
- Impact in science, including the impact of a single article or of a person or group leading a field over a longer period of time;
- Innovation and novelty, including development of new instrumentation, infrastructure or software;
- Correctness and accuracy;

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1 Informatics Research Evaluation, 2018, Informatics Europe.
https://www.informatics-europe.org/component/phocadownload/category/10-reports.html?download=76:research-evaluation-2018

2 Declaration on Research Assessment (DORA), signed by NWO in 2019
- Reproducibility, including transparent data processing and data management;
- Risk appropriate to potential gain;
- Relevance to society;
- Provide a safe working environment and feedback mechanisms;
- Communication of scientific results in a broad sense.

We recognize that it will be a major challenge to 'objectively' rate these quality aspects of research in the competition of researchers for funding and positions. Yet, this challenge alone should not stop us from adopting a broader definition of quality.

**Open Science, Diversity and Team Science**

Open science is important for internationally competitive research practices and quality, because research should be reproducible, usable and, where research is publicly funded, publicly available. Open science stimulates the flow of knowledge between researchers and research institutions, which ultimately benefits science as a whole.

Diversity is important for good research practices and quality, because it leads to diversity in views, practices, and skills. It is also a fundamental principle of a fair society that researchers with, for example, different cultural backgrounds, genders and political views, all have an equal chance to contribute to the research community.

Team science is another important element of good research practices and quality. Within teams, group members that directly or indirectly benefit research can develop their specific set of knowledge and skills and get recognition for their contribution to science.

**Changing the system**

If a new system is to be developed to better appreciate the points mentioned above, it is crucial that research is evaluated based on quality and good scientific practice and that this is used during the allocation of positions and funding. It is also important that researchers are evaluated based on a diverse set of individual achievements as well as team efforts, and that contributions to science are valued even when they do not directly translate into publications. In addition to objective metrics, researchers can be evaluated based on narrative. Furthermore, there should be a work environment that is transparent and collaborative, in which colleagues feel free to ask and receive feedback.

Changing a system will inevitably cause friction and resistance, because for many scientists it is the system in which they matured and thrived. Hence, it will be important to work towards a commitment throughout the whole of NWO-I to contribute to this initiative. Ultimately, the goal of changes in the recognition and reward system is to improve research culture, make individual recognitions and rewards fairer and, most of all, result in more effective research.

Some (members of) hiring committees or funding agencies will continue to evaluate researchers and research based on their existing ways, either because they value this most, or simply because they do not know how to do it differently. It is imperative that workshops are given to guide researchers in this new way of evaluating each other. These workshops could be integrated in the workflow of an evaluation committee.

The Netherlands is taking an internationally leading role in this culture change. This may present worries with regard to international careers, because in other countries researchers and research might still be evaluated based on publication numbers and citation scores alone. However, in a new recognition and rewards system, performing high quality research remains the primary goal of research institutions, which will reflect in the careers of individual researchers. Moreover, in the new recognition and rewards system, the recognition of publication records will not be abandoned and so, individual researchers will still have the opportunity to focus on publication records if they are convinced that this is necessary for pursuing an international career.
Actions
- To develop an action plan to involve researchers in this new system of evaluation.
- To have committees specify a priori what skills and experience they value most for the position. This will ensure that all applicants are evaluated on the same criteria.
- When hiring new people or promoting research staff to higher positions, committees should evaluate candidates based on their research quality following the broad definition and quality criteria mentioned above. A first suggestion is to include narratives (e.g. a wider set of individual achievements beyond metrics) in CVs and evaluations when hiring or promoting staff.
- When hiring new people or giving promotions, committees can work with a priori defined research profiles that fit well into their strategy and/or department. This enables researchers to choose diverse career paths, based on their skills, experience, and interest. Institutes should also help and guide its researchers in choosing such a career path and to align their individual development with the strategy and development of the institute.
- To improve accountability and good research practices, institutes should adopt feedback strategies, where there is two-way feedback between leaders and subordinates and peer feedback. NWO-I could even adopt feedback loops between institutes.
- It is important that the NWO-I adopt good data management practices, to contribute to and advance open science. One can for example implement this with awards or funding schemes to establish data management as an integral component of good science.
- Apply the Netherlands Code of Conduct for Research and increase awareness.
5. Chapter Impact

Defining research impact
Research impact is the process of creating a beneficial change or contribution to the world. Internal impact concerns the contribution within academia. It concerns the shifting of understanding, expansion of knowledge, the training of individuals through internships, PhDs, temporary visits to (international) collaborators and finally open-science including open access works, codes, data, experiments and techniques.

Research also has an impact beyond academia with contributions to the economy, society, public policy’s and the environment. Economic impact is expressed through patents, joint collaborations with f.e., industry, training of students with companies, the establishment of advanced scientific hubs, the creation of spinoffs from research projects and direct knowledge, methods, and code transfer to commercial parties. These all can be quantified as return on investment in research. Research is also essential for society as it provides a knowledge pool and critical expertise for the community and the decision makers. It supports the writing of laws and local, national, or international public policies, as well as enables the integration of the current state of knowledge in prevention and intervention efforts. Through outreach, researchers participate in the education of the entire society and increase common knowledge. In addition, research plays a vital role in environment protection and global warming.

Assessing the economic and societal impact of fundamental research is challenging as it usually takes place over long time-scales and often involves a variety of individuals and institutes. Currently, this is not viewed as one of the core tasks of academic researchers. Also, research designed for addressing questions that are relevant to the economy, society, or specific commercial or societal partners does not always receive similar acknowledgement as research design for addressing fundamental questions. Both types of research have merit and should be appreciated as such.

Vision
We envision a cultural change that properly acknowledges any effort towards knowledge exchange not limited to the internal academic community or a short-term economic drive.

Moving towards this system is pivotal to develop a general practice around evaluating impact by discussing and sharing best practices and building on that. To establish this, researchers need to be made aware of the various activities they can engage in to translate their research findings to economic or societal benefit. It is also vital to create language through which researchers can communicate their outreach efforts to others, to ensure sufficient acknowledgement of their work in national as well as international contexts.

For this, we need new incentives to engage broader audiences (e.g., citizen-science), recognize the role of scientific communication experts, engage actively in debates about current affairs in the media whenever expertise is needed, and get involved in scientific advisory positions, particularly the ones related to the missions carried out by the institutes.

Research impact can happen at different scales, international, nation-wide, at institutions and at the scale of individuals. Sometimes these levels are at odds and individual research activities and team or institute roles might not align. Even between researchers and the institute, they work at, societal and scientific impact might differ. The different missions for each size scale need to be clearly defined, so that possible divergent views can be detected and solved through discussions. These conversations ask for commitment, involvement and competences of all members of the institute organizations.

The methods for determining the impact of research can be divided into two categories. The first comprises methods that assess the impact a certain amount of time after the research has been carried out (ex-post assessment). The second category consists of methods that try to estimate in advance the impact that scientific research can have (ex-ante assessment). The latter can be evaluated by taking into account the interactions that take place with the outside world, i.e. the actions that can potentially lead to impact. In addition, new
parameters and criteria need to be defined to emphasize aspects such as collaborative, transparent, reproducible and accessible work.

**Changes needed**

- Recognition that impact can go beyond scientific impact, and acknowledgement of the time it takes to establish such impact.
- Creating awareness of the possibilities to establish societal and/or economic impact among researchers.
- Stimulate broad impact by providing skills and information to researchers.
- Have clear agreements between researcher and supervisor on the amount and type of activities that the researchers wants to or is expected to do to establish societal and/or economic impact.

**Actions**

Possible actions that can be taken include:

- Provide new skills and best practices to researchers in all stages of their careers to reach wider audiences and to perform better outreach activities. For example, by including outreach-training activities in the PhD course. As a recognition of outreach during the PhD, supervisors need to adjust their expectations of the number of academic publications to allow the PhD candidate time for engaging in outreach activities or other forms of impact.
- In a given project, one or more persons should focus on open-science (uploading codes, methods etc. in repositories, write user manuals) outreach (popular summaries etc.) and other forms of impact and receive a similar kind of credit for it.
- Provide new skills to researchers to be able to communicate their outreach efforts in grant proposals and other evaluations.
- Encouraging and recognizing actions that increase diversity in research (speaking in schools and universities etc.).
- Encouraging and recognizing dialogue in the media aimed at providing a scientific perspective on current affairs.
- Encouraging and recognizing research projects developed to address questions that arise in society or that follow from collaborations with commercial and societal partners.
- Encouraging and recognizing knowledge exchange processes, not only contacts with industrial partners, but also with societal partners, public agencies.
- Actively stimulate open science.
6. Chapter Education

In NWO-I context, education is about acquiring, communicating and sharing knowledge and skills in any form to any type of students. It addresses a variety of purposes and different target groups. The target groups can be categorised into i) team members (e.g. PhD students and postdocs); ii) students via supervision of internships and lectures; and iii) peers via seminars. The education of NWO-I staff is important to maintain a high standard and good practices for the research carried out. Supervision, seminars and lectures can be considered part of the larger scheme for education. As such, the national institutes supplement schools and universities. Examples are internships from MBO, HBO and WO projects. The education of fellows is about connecting people inter-institutionally and interdisciplinary. This includes visiting professors or other kinds of visits.

Providing and receiving education spreads knowledge, motivates people and improves research. So, there is benefit for the teacher, the pupil and the institute. The connection to schools and universities contributes to an open, diverse and dynamic environment, which inspires people and enriches research. It also provides an opportunity to attract people from diverse backgrounds for a subsequent career path in research. The motivation for lecturing can differ from person-to-person and may also relate to career perspectives within the institute or at a university. For themselves, it can be useful (it is often said that one really learns a science when you lecture it), inspiring (e.g. by working in a different setting) and rewarding (e.g. via feedback). For some researchers, the drive to give education can go beyond the obvious benefits. They may simply like to teach and share knowledge and of course lecturing by someone from a national research institute can enrich the curriculum of universities and keep it up-to-date with the latest developments in the field.

Vision

Each NWO-I Institute aims at top-level research and should therefore provide an inspiring environment for education and training of people, with programmes that are geared towards equipping them with the highest possible level of knowledge and skills. The mixture of students, engineers and researchers working in such an environment should also offer opportunities to learn from each other.

Education involves an active engagement and a transparent attitude from all NWO-I employees. For the national role of an institute, education is particularly important as a means to maintain the knowledge and skills to continue the research in a specialised field and to explore new research opportunities e.g. via R&D. In view of the fundamental nature of the research carried out, this is not driven by commerce but solely by curiosity. NWO-I nonetheless sees a clear connection between education in the NWO-I context and impact on society and our national role.

Education is tightly linked to the national role and the mission of the institutes. It connects our researchers to the wider Dutch research community. Therefore, NWO-I supports our researchers in their educational tasks and have a cooperative attitude towards possibilities or wishes with regard to career-oriented measures that may occur in individual cases. NWO-I also supports means to focus or redirect research activities, for example in the form of sabbatical leave and stimulating mobility. And NWO-I would like to see more support in making the connection to future employment, for example when a PhD candidate or postdoc wishes to obtain a BKO (Basis Kwalificatie Onderwijs, a useful tool for connecting to the labour market), NWO-I must recognise this wish, comply with it and give it due recognition.

In the position of professor by special appointment, ('bijzonder hoogleraar') education is seen as an important part of the job, which is performed at the universities. The teaching could be formalised (e.g. part time job rather than professor by special appointment), thereby establishing an enduring connection between a national institute and a university. Finally, seminars and the like are means of personally communicating science to a possibly wide audience. NWO-I also supports career paths when an assignment of professor by special appointment ('bijzonder hoogleraar') ends, it should be clear this is a temporary position and efforts need to be taken to make it into a part time job at university, when researchers wish to continue their teaching.
Changes needed
In order to achieve this, NWO-I should:
- Create awareness of the possibilities of teaching and stimulate them.
- Create awareness of the possibilities of (interdisciplinary) mobility and stimulate them.
- Have clear agreements between researcher and supervisor on the amount of teaching that the researcher wants to or is expected to do, stimulate these tasks and make recognition for these tasks more visible.
- Assess teaching skills and enforce relationships between professor by special appointment (‘bijzonder hoogleraar’) and university.
- Train group leaders to broaden their supervision to coaching and make career development and guidance for researchers more broadly available.

Actions
- Make teaching possibilities more visible and transparent.
- Make (interdisciplinary) mobility possibilities more visible and transparent.
- Have clear agreements on the time spent and do not exceed full time equivalent so staff is not appointed to work more than maximum of 100 percent employment.
- Develop a clear policy on rewarding when appointing professorship by special appointment (‘bijzonder hoogleraar’).
- Have feedback from universities on teaching skills as a part of R&O process and PhD evaluations.
- Training of group leaders and make coaching part of the job.
- Career development and guidance for researchers.
- Gather a PhD board once a year to collect PhD’s training needs and suggestions.
7. Executive summary

The current academic standards to evaluate and reward researchers need to be modernised to achieve a more inclusive, balanced, and high quality academic community. The work of researchers does not merely focus on publishing anymore but touches upon multiple different tasks and domains, in varying degrees. At NWO-I these tasks mainly revolve around research, education, leadership, impact and the national role of the institutes. With this vision NWO-I embraces the national and international effort to modernise our definitions for academic success.

The NWO-I committee on Recognition & Rewards has developed a vision on the cultural change with regard to research, education, impact, leadership and the national role including proposed changes and action points. The vision is not an end point for the cultural change, but only the start of the cultural change at the institutes. The intended changes and action points link to many different disciplines, such as communication and HR, and the outcomes depend on the commitment of all researchers and staff at the institutes.

The committee welcomes ideas from inside and outside the organisation to further improve the vision and stimulate the cultural change. The committee recognizes that these changes take time and will require a continuous dialogue on a local, national and international level. There will not be one approach to achieve this cultural change but several solutions that will help academia forward.
8. Summary of proposed actions per chapter

**National role**
- Each institute communicates its national role and corresponding tasks.
- The national role should be taken into account in the various evaluations of individuals and institutes e.g. R&O and SEP, respectively.
- Support on granting proposals that contribute to the national role but are difficult to define in research results.
- Stimulate mobility by providing meeting points for sharing knowledge and interaction between institutes.
- Make a plan to facilitate and encourage exchange of people (periodically, temporary and permanently) in between institutes and beyond.
- Each institute should work on a Gender Equality Plan (GEP) and include bias training.

**Leadership**
- The incorporation of feedback from team members and former team members in the evaluation of new and existing leaders. Furthermore, it is important that leaders create an open and safe atmosphere in which team members feel free to provide feedback.
- Leadership courses that communicate modern insights into leadership (i.e. situational leadership) should be offered and incorporated into the evaluation of leaders.
- Leaders should be aware of the importance of personal development and career development of their team members, therefore they should facilitate possibilities to explore career development with a career coach and stimulate this orientation.
- The way leaders assess their team members should give more room to everyone’s talent, initiatives to work on subjects with regard to the mission of the institute, open science, impact, education and leadership should be mentioned and rewarded in evaluations.

**Research**
- To develop an action plan to involve researchers in this new system of evaluation.
- To have committees specify a priori what skills and experience they value most for the position. This will ensure that all applicants are evaluated on the same criteria.
- When hiring new people or promoting research staff to higher positions, committees should evaluate candidates based on their research quality following the broad definition and quality criteria mentioned above. A first suggestion is to include narratives (e.g. a wider set of individual achievements beyond metrics) in CVs and evaluations when hiring or promoting staff.
- When hiring new people or giving promotions, committees can work with a priori defined research profiles that fit well into their strategy and/or department. This enables researchers to choose diverse career paths, based on their skills, experience, and interest. Institutes should also help and guide its researchers in choosing such a career path and to align their individual development with the strategy and development of the institute.
- To improve accountability and good research practices, institutes should adopt feedback strategies, where there is two-way feedback between leaders and subordinates and peer feedback. NWO-I could even adopt feedback loops between institutes.
- It is important that the NWO-I adopt good data management practices, to contribute to and advance open science. One can for example implement this with awards or funding schemes to establish data management as an integral component of good science.
- Apply the Netherlands Code of Conduct for Research and increase awareness.

**Impact**
- Provide new skills and best practices to researchers in all stages of their careers to reach wider audiences and to perform better outreach activities. For example, by including outreach-training activities in the PhD course. As a recognition of outreach during the PhD, supervisors need to adjust their expectations of the number of academic publications to allow the PhD candidate time for engaging in outreach activities or
other forms of impact.
- In a given project, one or more persons should focus on open-science (uploading codes, methods etc. in repositories and write user manuals) outreach (popular summaries etc.) and other forms of impact and receive a similar kind of credit for it.
- Provide new skills to researchers to be able to communicate their outreach efforts in grant proposals and other evaluations.
- Encouraging and recognizing actions that increase diversity in research (speaking in schools etc.).
- Encouraging and recognizing dialogue in the media aimed at providing a scientific perspective on current affairs.
- Encouraging and recognizing research projects developed to address questions that arise in society or that follow from collaborations with commercial and societal partners.
- Encouraging and recognizing knowledge exchange processes, not only contacts with industrial partners, but also with societal partners, public agencies.
- Actively stimulate open science.

**Education**
- Make teaching possibilities more visible and transparent.
- Make (interdisciplinary) mobility possibilities more visible and transparent.
- Have clear agreements on the time spent and do not exceed full time equivalent so staff is not appointed to work more than maximum of 100 percent employment.
- Develop a clear policy on rewarding when appointing professorship by special appointment ('bijzonder hoogleraar').
- Have feedback from universities on teaching skills as a part of R&O process and PhD evaluations.
- Training of group leaders and make coaching part of the job.
- Career development and guidance for researchers.
- Gather a PhD board once a year to collect PhD’s training needs and suggestions.