

Starter Memorandum for the First National Strategic Conference – Version 2

Permanent Committee on National Institutes (PCNI) – 9 July 2021

Background

In recent years, the Dutch science system has been under great pressure due to a combination of factors, for example increasing student numbers, shifts in research funding and in the research system, and increased attention to societal impact and knowledge valorisation. This forces us to constantly reconsider how the joint efforts of researchers working in the Netherlands can best be organised. How can we facilitate scientific breakthroughs through cross-fertilisation between scientific fields and universities? How can we ensure that the Netherlands retains its leading international research position, now and in the next ten to twenty years? How can the science system assist researchers in contributing to major scientific and societal challenges? Cooperation – in all kinds of ways – would seem to be an important prerequisite for this.

Unlike in many countries, the vast majority of scientific research in the Netherlands takes place at universities. The national research institutes under the aegis of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Dutch Research Council (NWO) represent a relatively small part of the total system, with about 5% of the funding and research output. Although the role and position of each institute differs, they are all closely interlinked with university research, a situation further encouraged by the appointment of staff members as professors (or endowed professors) at universities and by participation in/coordination of national research programmes.

In recent years, various developments have led to the decision to strengthen the position of the NWO and Academy research institutes within the national science system. This is based on the realisation that the interwoven nature of research and education is a core value of the Dutch system. One important aspect, also in the light of international developments, is the increased possibility – and necessity – of having major research themes tackled by broader consortia. This has led in recent decades to the establishment of a number of interuniversity research schools and research centres with substantial funding for the longer term (10–15 years). These virtual institutes or centres play an increasingly important role in bringing together knowledge and expertise from different universities. Questions thus arise as to how the national institutes will relate to such initiatives and to what extent they can or should be specifically deployed, whether or not with a special focus, as national coordinating institutes or trailblazers.

Frenkel Advisory Committee

In 2018/2019 the Boards of the Academy and NWO installed the Portfolio Committee, chaired by prof. Frenkel, to evaluate the entire portfolio of institutes. The committee's remit was to advise on the desirable balance between continuity and dynamics within that portfolio and how the roles of the institutes should be structured as regards generating added value (for the entire science landscape) and complementarity (with university research). The Frenkel Committee made recommendations for how each of the institutes might contribute more to this national role. As regards the dynamics of the portfolio, the committee concluded: *"In order to maintain and increase its effectiveness across the full breadth of the knowledge landscape, the portfolio must be able to keep pace with scientific and societal challenges. The portfolio as a whole can only continue to offer added value if there is scope for the development of new initiatives and for winding down activities whose national added value is not clear (or no longer clear)."*

Permanent Committee on National Institutes (PCNI)

In 2020, the Boards of the Academy and NWO set up the Permanent Committee on National Institutes (PCNI) to implement this recommendation by the Frenkel Committee. The PCNI has been asked to advise the Boards in the coming years on broad scientific and societal developments to which the portfolio of national research institutes can respond and, as part of that advice, to organise a strategic conference every two years with representatives of the field and stakeholders from the universities and other relevant research organisations.

Initial exploratory survey

As an initial survey of its remit, the committee conducted a number of discussions, both with relevant parties

in the Netherlands and with foreign colleagues. Those discussions made clear that within the Dutch context – with its many forms of cooperation and consortia – the issue of the role and dynamics of the national institutes cannot be viewed separately from the issue of the kinds of themes or research for which a separate national institute would offer major added value that cannot be achieved, or is difficult to achieve, with a less highly organised form of cooperation comprising one or a number of universities.

Infrastructure as key theme for the first strategic conference

An overarching theme that emerged from the discussions is that there is in fact a need for more *infrastructures* – of sufficient size and with sufficient support – in all scientific fields. Because such infrastructures increasingly exceeds the possibilities of an individual university, there appears to be broad support for a special role, specifically of the national institutes, in establishing and upholding such infrastructures. The term “infrastructure” is understood here in a broad sense and can include equipment, laboratories, physical collections, software and digital data, to mention just a few obvious examples.

Because the topic of “infrastructure” is relevant in all scientific fields, albeit in different ways, the PCNI proposes to make that topic the focus of its first strategic conference. Because the scope and form of “infrastructure” differ for each scientific field, the following survey outlines them for each field; the same applies to preparations for the conference. This does not alter the fact that initiatives and proposals that go beyond individual fields are very welcome. One frequent suggestion is already included below as an example. The committee is aware that the term “infrastructure” is often linked to the field of the natural sciences and technology, but it notes that there are also increasing needs in the other fields to which that term applies and which exceed the possibilities of an individual university. The term “infrastructure” must therefore also be interpreted broadly.

The PCNI wishes to emphasise that infrastructure will not be the sole criterion for an institute’s existence, in either the current or the future portfolio. Creating a national coordinating role or strong commitment to a research theme that is of importance to science or society can also be valid reasons for a new initiative or shifts within the portfolio, or for modifying the mission of existing institutes. Future strategic conferences will therefore certainly address such issues.

Exploration of the role, developments, and future cross-institutional requirements for infrastructure in the various scientific fields

In preparation for the strategic conference, the theme of “infrastructure” is explored below for each scientific domain. The PCNI expressly seeks input from all four domains. In the run-up to the conference, the outlines below will be fleshed out and deepened through discussion with stakeholders.

Social sciences

The social sciences in the Netherlands are highly sophisticated and also very well attuned to each other. The Netherlands is a pioneer in “open science” and – given the rapidly increasing digital capabilities – sharing data is also a development in which the country is an international leader. Due to the Netherlands’ geographical advantages (small area, high population density), the Dutch social sciences are strong, for example, as regards acquiring “cohort data”, i.e. data from individuals followed in studies over a lengthy period of time. Other broad datasets are also available from various disciplines in the social sciences. This compilation of data covers, *inter alia*, research on behaviour, brain function, and large-scale twin studies, as well as data that would have been useful for analysing the impact of the COVID-19 pandemic. However, researchers find themselves running up against limitations because there is no common substantive agenda for making this research and the associated data available for fundamental and applied research. One example is the ending of the “Gravitation” programmes that have collectively acquired a wealth of broad datasets but are unable to aggregate and continue them. Universities often encounter limitations regarding organising this jointly and effectively. A national institute where these cohort and data facilities were available would strengthen the international research position and would also be able to respond quickly to societal issues for which these datasets can be utilised. Here too, active involvement on the part of direct users is crucial.

Discussion topic for strategic conference:

Is there indeed a need for a nationally designed research agenda around cohort data, and how should a national initiative in this area, combined with the possibilities of open science, be designed?

Humanities

The Dutch humanities are very internationally oriented, but inevitably much of the research is culture-specific. “Infrastructure” therefore consists to a large extent of collections of research material, which are actually often international in nature (for example concerning Indonesia and Suriname). It is no coincidence that most Academy institutes in the field of the humanities grew up around such collections and to a large extent still derive their *raison d’être* from them. In recent decades, however, digitalisation has created a whole new type of collection, namely in the form of “data”. Until recently, that term was relatively unknown in the humanities, because most humanities scholars were concerned specifically with separate entities (the paintings of Rembrandt, an event in the Second World War, etc.). That is now rapidly changing. Cultural collections are being digitalised on a large scale and therefore lend themselves, in addition to new research on individual entities, to research in which aggregated data plays a major role. Although various facilities already exist, including at Academy and NWO institutes, strengthening the national infrastructure in this field in a way that is less dependent on project funding offers major opportunities for accelerating that development. Collaboration with the social sciences is an obvious step in this regard.

The PCNI also envisions a cross-institutional position for the national institutes that conduct research on the Netherlands’ history and culture. No specific attention was given to this by the Frenkel Committee when formulating the criteria. It is the core task of these institutes to play a role in the area of the scientific research-based interpretation of issues such as the distinctive nature of Dutch culture or the Netherlands’ action within the international arena, and debate on those issues.

Discussion topic for strategic conference:

- How can developments in the field of digital humanities be accelerated, and is it possible to combine forces further?
- Is strengthening research and interpretation of *national history and national culture* (in the light of a resilient society) and further joining of forces desirable and/or possible?

Medical and life sciences

Many of the outstanding issues in the medical sciences concern complex or rare diseases. Research into effective treatments for the associated syndromes can benefit enormously from the availability of large volumes of high-quality clinical and diagnostic data. Large datasets and high-quality data science are also essential for unravelling the link between genetic abnormalities and complex diseases. The Dutch healthcare system is of a high standard, and the quality of the data collected is also generally high. However, the usefulness, size, and accessibility of the datasets collected is often insufficient for sound data-driven research. In addition, co-morbidity plays an increasing role in the treatment of an ageing population, but linking up clinical data from different sources is not always an easy matter.

For the medical sciences, the PCNI sees, first of all, the need for a national initiative for biomedical data sciences, i.e. a national institute to bring together as much clinical data as possible, preferably linked to a national biobank. Much is already being done through such initiatives as HealthRI to exchange clinical data between different research institutions, but that exchange is still sluggish. The Netherlands is in danger of lagging seriously behind compared to China, where large centres bring together enormous amounts of data.

For this initiative to have the maximum impact, it is very important for it to be set up with the active involvement of the end users. It should preferably also bring together groups that are active in biomedical data sciences, so that they are directly involved in creating the database, thus avoiding a discrepancy between the initiative as set up and the optimum design (considered from the perspective of the manager versus that of the user). The right form can only be created by also assigning the work of management to the users, with the task of making the initiative accessible nationally.

Discussion topic for strategic conference:

Is there a widely supported need for the above or other initiatives? Can the objectives be achieved by strengthening and broadening previous initiatives or is a new initiative or institute needed for this purpose? If so, what should it look like?

Natural sciences and technology

Almost every laboratory must have its own advanced equipment, but increasingly there are extremely advanced technologies that call for a national centre and/or national coordination due to the sky-high investments involved in terms of money and knowledge. This could include new national centres (or further expansion of existing ones) for:

- 1) correlative microscopy (advanced combination of high-resolution optical, electron microscopy, SAXS-WAXS) especially for research in the life sciences, chemistry, pharmaceuticals, and biology;
- 2) nanotechnology production and analysis laboratories (including a national centre of excellence in materials analysis);
- 3) energy-related facilities for all translational projects (such as for battery research and/or hydrogen formation or carbon dioxide conversion);
- 4) an ultra-high magnetic field NMR facility (liquid, solid phase, imaging) with associated synthesis facilities for isotope-labelled biologically interesting compounds, biomolecules, and materials;
- 5) a climate computing centre: high-end computing facilities for climate research coupled with experimental research on aerosols, clouds, and the atmosphere;
- 6) bioinformatics and artificial intelligence (machine learning) to accelerate development of interesting biomolecules and biotechnology routes;
- 7) tissue-engineering facilities, as now being developed via the growth fund and Gravitation programme;
- 8) quantum computer facilities, as now being developed via the growth fund and Gravitation programme.

The Netherlands is active within many international partnerships, but it cannot participate in all international projects and infrastructural institutes or new initiatives. Scientifically sound choices therefore need to be made.

The Netherlands has a large number of consortia of leading researchers, an approach with which it is at the forefront internationally. National coordination ensures effective coordination between people and

infrastructure. In the field of the natural sciences and technology, this applies, for example, to the Netherlands Research School for Astronomy (NOVA), complex molecular systems, and quantum computers. There are numerous consortia, however, that already amount to a virtual national institute, with a finite but lengthy existence somewhere between a bricks-and-mortar institute and a Gravitation programme. New initiatives in the fields of artificial intelligence and sustainability also call for such national coordination.

Discussion topics for strategic conference:

- Which of the above subjects for a national infrastructure is particularly in need of national initiatives?
- How can national prioritisation in the area of international cooperation be strengthened?
- Is it wise or desirable to give the national institutes a stronger role in drawing up the “roadmaps” and prioritisation for the Permanent Commission for Large-Scale Scientific Infrastructure?
- What large national themes call for national coordination and what role can national institutions play in this?
- Can or should the national institutes play a stronger role as regards the aforementioned themes, such as AI, sustainability or energy, or are other initiatives desirable?

Initiatives that go beyond individual fields

It goes without saying that one of the greatest challenges in the coming decades will be to tackle the climate problem, together with the associated energy problem. This is pre-eminently a theme for which efforts and cooperation are necessary across all fields of science, given that the required transition in the area of the climate and energy is not only a technological transition but also a societal one that will change the structure of society. Fundamental research and societal applications are therefore closely intertwined. There are a number of NWO and Academy institutes and many university groups that conduct research on elements of the climate problem or related topics; the Royal Netherlands Meteorological Institute (KNMI) also has a clear position in the field of climate research. There is, however, no nationally coordinated approach from science as a whole or a national research institute that focuses on this issue. The urgency of climate change also throws up enormous scientific challenges in the field of the earth sciences and life sciences, and should be allocated greater critical mass at current or new institutes.

Discussion topic for strategic conference:

Could the creation of a broad national institute help strengthen and coordinate scientific research on the climate and energy, and enhance cooperation between universities and partners such as the KNMI (climate) and the Netherlands Organisation for Applied Scientific Research (TNO) (energy)?