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*(A Survey of Future Requirements
for Outfitting Public Scientific
Research in the Netherlands: Phase 2)*

Erik van de Linde, Erik Frinking, Andreas Ligtoet

*In opdracht van het Ministerie van Onderwijs, Cultuur en
Wetenschappen*

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1200 South Hayes Street, Arlington, VA 22202-5050
201 North Craig Street, Suite 202, Pittsburgh, PA 15213-1516
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Summary

This report presents a non-limitative survey of investment demands for outfitting scientific research in the Netherlands for the coming ten years. It is part of an assignment by the Dutch Ministry of Education, Culture and Science and the Ministry of Agriculture, Nature Management and Fisheries to gain insight in large investments that offer possibilities for international cooperation. In the first phase of this research, on which there is a separate report⁴, the focus was on universities, academic hospitals, the royal library and research institutes under the responsibility of the aforementioned ministries. This report focuses on other publicly funded research in the Netherlands.

Method

For the purposes of this project the following broad definition of outfitting has been used: facilities, infrastructure, libraries, apparatuses, instruments, databases, information-facilities and collections. Buildings were only regarded as outfitting if they are an integral part of the equipment, e.g. wind tunnels. The research focused mainly on large and very large investments (several million Euros) as only investments of that size present an opportunity for international coordination in acquisition and exploitation.

To categorise the investment demands and possibilities for coordination and cooperation, we have identified eight different focal areas. These areas were chosen in consultation with an advisory group representing different ministries and are in line with fields defined in the national science budget: energy, ICT, aerospace, materials, environment and spatial planning, public governance and justice, traffic and transport, food and health.

The following methods were used to survey the investment demands: literature research, surveys and interviews in the field and consultation with the advisory group.

To sketch the developments in the different fields we used relevant policy documents, strategic research papers and websites. When policy documents were not sufficiently available we based our overview on documents of intermediary organisations. For the inventory of investment demands we approached institutes that perform research in the areas mentioned above.

All approached institutes are financed (in part) by the government. They are, however, not the only actors within their fields of research. It is therefore possible that more investment needs could have been brought forward that are relevant to the described developments. In terms of size however, the approached institutions are

⁴ Frinking, E., A. Ligtoet, E. van de Linde and J. Vader, *Investeringsbehoefte uitrusting wetenschappelijk onderzoek* (Investment needs equipment scientific research), MR-1379, RAND Europe, Leiden, 2001

mostly the key players in publicly financed scientific research and it was expected that mainly they were to bring forward large and internationally oriented investment demands. This means that the survey forms a realistic baseline of the type of investment demands we can expect in the coming ten years.

Findings

The following sections describe in short the findings per field of interest. The table at the end of this summary gives an overview of all investment demands.

Energy

In the spring of 2002 the Dutch energy research community will develop a strategic position for their area in the context of European research. Several policy documents have pointed out that more focus is deemed necessary. The investment demands that were mentioned support this viewpoint, as they are diverse.

ICT

The investment demands in this area are closely linked to the developments that can be found in several policy documents. Distributed ICT-networks and computational capacity are strongly needed in modern scientific developments – such as genomics – and provide a multiplier for access to scientific data and thus national and international scientific excellence. Supercomputing, as well as the access of researchers and research institutes to broadband networks, will continue to play an important role in the coming ten years.

Aerospace

Many research activities and priorities in this field follow from EU and ESA policies and positions. Because of the limited cooperation possibilities within the Netherlands, Dutch institutes are dependent on bilateral or international cooperation. Investments in outfitting are partly provided for through national contributions to ESA and ESA-related research institutions. The demands that were brought forward by the Dutch Aerospace Research Laboratory NLR mainly entail large categories of investments (e.g. airplanes) or simulation facilities. Important investments regarding remote sensing equipment are mentioned in the field of 'environment and spatial planning'.

Materials

The investment needs that are found in this field share the fact that they all focus on the research and development of materials on an ever-smaller scale of control and precision. For experimental and technological developments this is the micro-scale. For fundamental scientific research it is the nano-scale.

The institutions that put forward their needs are modern organisations that emphasise public-private partnerships and multidisciplinary research. We can therefore conclude that the need to optimise exploitation of research infrastructures by consortia of knowledge institutes and industry is fulfilled by these organisations.

Environment and spatial planning

In the field of environment and spatial planning equipment for measurement and sensing and monitoring is of great importance. As a growing stream of environmental data needs to be stored and shared with researchers of other (international) institutes there is a need for databases that are accessible via (broadband) networks. Models for simulating and calculating environmental and spatial effects are also being developed further. For large projects on e.g. climate research, international cooperation is already taking place.

Public governance and justice

Although the need for investment in equipment for social scientific research is recognised, the amount of concrete investment demands in outfitting this area is limited. These demands are largely related to international cooperation on cross-border research for which setting up and making available databases is needed. Criminal justice research in the Netherlands is performed by relatively small publicly funded institutes. The orientation on investments in equipping research is still small, although the importance of international comparative research is gaining in importance.

Traffic and transport

This focal area is situated between scientific and applied research. Much research is performed by institutes that were already described in phase 1 of this project. ICT plays a significant role regarding logistics, for instance through automatically guided vehicles and intelligent transport systems.

Food and health

In the field of food and health many investment needs could be found in the growing field of genomics and connected fields such as proteomics and metabolomics. These

are truly multidisciplinary fields that will develop further with the use of ICT as enabling technology for bioinformatics.

The large expectations that arise in policy documents regarding the cross-disciplinary research on food and health are not reflected in our survey. Total investment demands are only 15 M€. It might be that the developments in this field are too recent to yield concrete investment plans.

Analysis

An important feature of our research method is that the survey is based on the supply-side. In other words, the institutes themselves have formulated research needs on the basis of our questionnaire. The result is some sixty concrete ideas for investment in the eight focal areas.

The question arises whether these ideas are necessary requirements or simply wishes of the researchers. This question is especially relevant when prioritising the ideas with regard to further (financial) support. The priority will have to be based on clearly stated societal and scientific needs. However, society in general is unable to translate research needs into infrastructure investment proposals to provide tools researchers need. Only researchers themselves can do that.

The demand-side is however able to formulate a need for types of research, although this encompasses mainly societal problems such as climate change, criminality, geriatrics and traffic congestion.

It is very difficult to determine to what extent investment proposals comply to specific needs. A distinction on the basis of importance or relevance is hard to make. There is little other alternative for the survey of investment needs for equipping scientific research than to ask the scientific institutions to carefully formulate perceived needs. In any case we can state that the survey presented here seems to connect well to the developments that take place in the focal areas that we identified.

Conclusion

Present instruments for the coordination of research

For many years R&D policy in the Netherlands has been moving towards strengthening cooperation within the National Innovation System (NIS), of which publicly financed research is an important part. Some specific points of interest are:

- Articulation of the societal demand for scientific research
- Stimulation of public-private partnerships
- Stimulation of multidisciplinary research
- Intra- and interuniversity cooperation
- Developing scientific knowledge for the economy and employment

- International cooperation
- Dynamisation

These points are being addressed using different instruments:

- Innovation oriented research programs (IOPs)
- Technological top institutes (TTIs)
- Research schools and Top research schools
- Activities in the light of the knowledge infrastructure (KIS) within the Fund for Economic Structural Improvement (FES) and the interdepartmental commission for economic structure (ICES)
- European framework programs

These instruments are mainly concerned with putting research on the agenda and performing research, but they could also contribute to coordination of acquisition and exploitation of scientific equipment. Often they are virtual institutions that generate excellent and new ideas, but the operational activities remain the responsibility of the participating institutions. This is especially true for investments in equipment. The ability of the above instruments to strengthen the acquisition and exploitation of research equipment will therefore need to be examined further.

Orientation

All focal areas show investment requirements that have an international or potentially international orientation. This is especially the case for 'environment and spatial planning' and 'materials'. In the field of energy many requirements have been mentioned, but the international orientation of those is less strong than the budget suggests. This is in line with earlier observations that the Dutch energy research area is fragmented.

Type of investment

In this second phase of our research, as well as in the first phase, the category of 'data needs' seems to be growing. Often new knowledge fields such as genomics, environmental sciences, earth observation, biodiversity studies and climate studies require large and distributed databanks. For the time being the specified budgets remain low. This might be due to a lack of definition of the term 'equipment', the fact that institutions are not yet used to this type of equipment or a lack in identifying separate budgets for equipment.

Very large specific investment requirements that are ill suited for cooperation might be necessary, but it may be expected that financing parties will require clear explanation of the need for such investments.

The table below provides a summary of the investment demands that were found in the course of this research.

Investment demands	Size (M€)
ENERGY	
Combinatorial catalysis lab	3 – 5
Fuel Processor Test facility	1,3
Infrastructure for FC systems	1,3
"Multi-purpose" gasifier	5,5
Circulating Fluidised Bed gasifiers	4,5
Oil washer	1,5
Integral test circuit BIO-CHP	5
Polymer solar cell laboratory	2
Siliceous materials for solar energy	4
Characterisation new solar cell technologies	2
Characterisation PV/T systems	3
Measurement infrastructure building integration	2
ICT	
Multimedia	5
E-Science	5
Genomics and bio informatics	5
Grid Computing	1 - 2
Wireless and mobile services	5 – 10
State-of-the-art network infrastructure	2 – 4
Collaborative/ immersive environments	2 – 3
Active buildings	p.m.
Storage area networks	1
Supercomputing	12
AEROSPACE	
Modern laboratory airplane	7 – 10
Supercomputer for construction and EM	10
Tow Placement machine	3 – 4
Flight simulator	7 – 10
Optical/infrared interferometer	8
MATERIALS	
Mini continuous pyro line	20
Gas phase polymerisation	6
Combichem	2
Functional polymers	5
ENVIRONMENT and SPATIAL PLANNING	
Measurement facility in Cabauw	8,7
Ozone monitoring station in Paramaribo	3
Ozone Monitoring Instrument databank	3
Databank Envisat – Metop	5
Historical databank	3
Network integral international water management	4,5
Open network infrastructure	2-3
European network large geo-institutes	2
Knowledge desk	4
Delft Geo Systems	4
Geo centrifuge	3
Field observational method	6
Integrated data networks	4,5
Knowledge software water	10-20
HYDRALAB network lab facilities	10
NIMM	30
Front office hydraulic research	2
PUBLIC GOVERNANCE and JUSTICE	
Research under immigrants	p.m.
European Social Survey	p.m.
Cross-national data collections	p.m.
TRAFFIC and TRANSPORT	
Simulation equipment shipping	7,4
Wind and wave models	3,5
Current measurement systems	4
Upgrade of measurement and analysis systems	12
Upgrade of inland navigation measuring device	10
Data-communication operational support	4
FOOD and HEALTH	
Websites for information exchange	3,6
Control equipment for food safety	5,6
Research information systems	10,8