

## ***The use of the large technological institutes Summary of advisory report 32***

This advice relates to the position of the large technological institutes - the LTIs as they are known - within the Dutch knowledge infrastructure. In preparation for this advice, we spoke to some seventy people from the LTI environment and similar institutions outside the Netherlands.

The LTIs constitute part of the public knowledge infrastructure and carry out research and consultancy work for both the public and the private sector. The public sector gives the LTIs an annual subsidy to enable them to carry out their mission. The total turnover of the LTIs in 1996 was NLG 400 million. The institutes concerned are the following (ranked according to turnover):

- NLR (National Aerospace Laboratory NLR; turnover NLG 139 million);
- ECN (Netherlands Energy Research Foundation; turnover NLG 130 million);
- WL (WL | delft hydraulics; turnover NLG 64 million);
- GD (Delft Geotechnics; turnover NLG 35 million);
- MARIN (Maritime Research Institute Netherlands; turnover 34 million).

This summary does not follow the structure of the advice, but concentrates on answering the questions put to the Council. These questions were grouped into four themes in the request for advice:

1. The significance of the LTIs as links between fundamental research on the one hand and its applications on the other;
2. The international context;
3. Competition and collaboration;
4. The responsibility of the government and the shape of this responsibility through administrative and financial relationships.

The Council will go into each of these themes separately, although it will discuss themes 1 and 3 together.

### **x The significance of the LTIs as links between fundamental research on the one hand and its applications on the other (question 1) x Competition and collaboration (question 3).**

The request for advice states that in the present accepted view the LTIs perform a linking function between the institutes for fundamental research and the applications sectors. It is obvious that the LTIs cannot and do not wish to perform this linking function alone. In practice there is a wide variety of organisations - both public and private - which provide for this interaction. In the private sector more and more companies - among them large engineering consultancies - are increasingly shaping their own research and development policy; they are, as it were, moving from the practical side towards R&D. In the public sector, for example, universities can be seen to be increasingly establishing links themselves between fundamental research and the fields of application. The linking function of the LTIs is therefore coming under

pressure, as it were, from two sides, both from fundamental research and from the applications sectors.

In practice, the LTIs only acted as a link between fundamental research and the applications sectors to a limited degree. The institutes generally maintain very limited relationships with the universities. Often, there is little they can obtain from them; the fact that the LTIs exist has presented the universities with fewer opportunities to develop in these LTI areas. The LTIs are primarily geared to developing their own technology. Encouraged in part by the government, the institutes are presently entering the commercial market to an increasing extent. As a result, further pressure is being put on the possibilities for 'linking'. Institutes who make or have to make money from their knowledge tend by nature to be very careful with their own knowledge as it is their source of income. The companies consulted are observing this trend in the LTIs as well. In addition, as a result of their commercial activities the specialist depth of the institutes is being jeopardised. This depth is, as experience in practice shows, impossible to finance from commercial assignments. That, after all, is the reason for government subsidies.

The LTIs have a task that is broader than linking in the narrow sense, as referred to above. They have their own technology development programmes and large research facilities at their disposal. In the first instance the Council gathered information from the target groups of the LTIs. How do they see the importance of the LTIs? Do they provide added value by raising the level of knowledge of the target groups in question? In the latter case the Council draws a distinction between the public and the private sector.

The people talked to in the private sector see the contribution of the LTIs to the increase in the level of knowledge in their sector as marginal; the contribution consists largely of carrying out tests and measurements. A number of companies even feel themselves hampered in their own development by the competition from the subsidised LTIs.

The picture from the public sector is different. In a number of areas the government has opted to lean on the LTIs for its knowledge and expertise requirements. Generally speaking, the knowledge that the LTIs have ties in reasonably well with the government's requirements.

From the above observations the Council draws the conclusion that the position of the LTIs should be reconsidered. The missions of the LTIs are formulated at present in such a way that they can operate, without exception, in the entire knowledge chain - from fundamental research to and including assignment research and consultancy work for the market. The Council thinks that the tasks set for the LTIs need to be more specific, although the position of the individual LTIs could differ. In its view a choice needs to be made. Either an LTI positions itself as an institute focusing primarily on research, i.e. developing new knowledge and technology in its field; the Council would like to see this type of institute called a *research-oriented organisation*. Or an LTI positions itself as an institute focusing primarily on anticipating the needs of its customers, in as far as is possible on the basis of existing knowledge; the Council would typify this type of institute as a *market-oriented organisation*. The different activities require different people and different cultures. Naturally, the situation in practice is not black and white and it is impossible to draw sharp lines of demarcation. But the Council does think that the leitmotif for an institute should be either one or the other. Attempts to unite both cultures within one research group prove very difficult to realise in practice. The criticism found with regard to the various LTIs illustrates this. It is, of course, conceivable for an institute to split into different units, one unit positioning itself as a research-oriented organisation and one positioning itself as a market-oriented organisation. But then the question arises of whether that is efficient from the macro point of view.

LTIs that position themselves as *research-oriented organisations* have the task of developing new knowledge and technologies. Their relationship with the market lies not in the LTI itself becoming commercial, but in joint ventures in research with companies and other - market-oriented - organisations. The Council advocates placing these LTIs close to the universities through structural collaboration - perhaps even mergers. For LTIs wishing to position themselves as *market-oriented organisations*, knowledge transfer will constitute the core of their

activities. The task of these LTIs is to anticipate the needs of the customer, who may come from the public or the private sector. It is the mission of these LTIs to carry out as much contract research as possible, naturally within the parameter that unfair competition with private parties should be avoided. These institutes will be 'fed' only to a limited degree by their own technology development. Their nourishment will come mainly by way of mobility among their staff and by collaborating with other, fundamentally strategic research institutes such as the universities and the LTIs that position themselves as research-oriented organisations.

#### **x The international context (question 2)**

According to the Council, there is only room for LTIs as *research-oriented organisations* in areas that are explicitly a subject of state concern, e.g. safety, the environment, infrastructure and defence. The government only has an explicit responsibility of its own for knowledge and technology development in areas that are of concern to the state. In these fields commercial interests are in general not (yet) very large, which presents prospects for far-reaching forms of collaboration and a distribution of tasks among different countries. This only occurs to a very limited degree at present; countries often want an institute 'of their own'. The Council advises the government to explore much more explicitly the possibilities for collaboration with other countries, in particular EU countries, when commissioning the research it requires from institutes. Within the framework of the European Union it is possible to achieve great advantages of efficiency through closer collaboration with and a distribution of tasks among the various Member States. As by the nature of the matter it is not the obvious thing for the LTIs in question to develop initiatives themselves in this respect, the government always needs to take the lead.

The LTIs that position themselves as *market-oriented organisations* are, according to the Council, in the first place themselves responsible for their international collaboration. Internationalisation of their field of work should not be a goal in itself for these institutes, which are subsidised by the Dutch government, as their goal ultimately lies in supporting Dutch market parties. It is primarily up to the LTIs themselves to judge whether this goal is served by activities for foreign parties. For example, it is quite conceivable for an institute to become so much stronger from this foreign market that ultimately the Dutch parties can be better served. Whether this works out in practice as well will remain to be seen from the degree to which the institute manages to win assignments from Dutch customers. The government will ultimately need to assess the support given to the institute on this point as well.

#### **x The responsibility of the government and the shape of this responsibility through administrative and financial relationships (question 4)**

The missions of the LTIs have been laid down in consultation with the government. The institutes are given a specific task and the government provides a subsidy for this task to be performed. The subsidy concerned may be to develop new knowledge and technologies in specific areas. In the case of the LTIs the research mainly involves areas which the government considers objects of state concern. The government may also provide the subsidy to enable an institute to take sufficient advantage of immediate market needs. In this case it is in general a question of funding the background research and the purchase and maintenance of large research facilities.

Whatever task the government formulates, in every case the subsidy needs to be large enough to be able to actually carry out the task assigned. The Council finds that this is not always the case in practice. The government sometimes assigns institutes tasks without sufficient funding, with the result that the government in effect forces the LTIs in question to find funding for part of the research concerned and for the associated facilities elsewhere. This seems fine in theory; after all, what is wrong in others contributing? In practice, this 'underfunding' often proves to

turn out wrong. The need to obtain as much money as possible from the commercial market, brings with it unfair competition with other parties, both private enterprises as well as other LTIs and TNO (the Netherlands Organisation for Applied Scientific Research). The need to supplement government subsidies drives the LTIs away from the basic research for which they were in fact established and reduces their willingness to share with others the knowledge they have acquired using public funds. In short, with a funding policy of this kind the government is undermining the real objective of the LTIs and consequently their right to exist in the long term.

The Council feels that the government should formulate a clear and explicit framework of assessment for the institutes. It will need to be fleshed out differently for the two types of LTI the Council differentiated above, namely the research-oriented and the market-oriented institutes.

For the LTIs that position themselves as *market-oriented organisations*, the final test criterion is the degree to which the institutes succeed in winning assignments from Dutch market parties. Government and industry experience in the market shows that it is impossible to accomplish a mission of this kind satisfactorily in many fields without a subsidy. The market parties appear in general unwilling or unable to pay for the necessary basic conditions (technology readiness) for that mission. From the macro point of view it is important, however, that the knowledge infrastructure be equipped in such a way that the market can be effectively served. This justifies government subsidies for background research and the availability of large and small research facilities. The responsibility for spending this subsidy (mission subsidy) lies in the first place with the institutes themselves. In its strategic plan an LTI must make clear to the government how it will spend the subsidy and what goals it aims to achieve in due course in the market. The government will need to assess whether these activities are covered by the institute's mission. It will need to settle up with the institutes ultimately on its specified goals. The task of the government is to assess on the basis of considerations of efficiency whether an independent institute is desirable to fulfil the mission in question. Possibilities of working together or merging with other market organisations, for example TNO, must in the Council's view form an explicit point for attention.

The framework of assessment will need to be fleshed out differently for the LTIs that position themselves as *research-oriented organisations*. It is the task of these institutes to develop new knowledge and technologies in specific areas. In the view of the Council, government subsidies in this sense can only be justified if the areas in question are ones that are explicitly the object of state concern. The primacy for the programme of research of these institutes must lie with the government. The government must state what it wants, what type of research qualifies for a subsidy, what the objectives are and on what conditions third parties may profit from this research. Periodic assessment of the subsidies on the aspects mentioned is necessary, of course. When the government opts to subsidise knowledge and technology development in specific areas via an LTI, the question of whether structural collaboration or a merger with a technical university is advisable and possible must be explicitly considered. On the basis of the above views the Council has made recommendations for government policy with regard to the individual LTIs.

#### *National Aerospace Laboratory NLR*

The government is the principal player for the NLR directly (aviation safety and air traffic control) and indirectly (aircraft construction and space travel, two sectors that are internationally characterised by a large degree of government interference). This strong involvement of the government produced a relatively stable environment for the NLR until recently. This is now changing considerably. Forced in part by external circumstances such as the disappearance of Fokker and the discussion surrounding ESA, the government is currently reexamining the provision of support in these areas. Depending on the type of concrete support opted for, the consequences must be drawn with regard to the nature and scope of the activities of the NLR. It is clear that in every area in which the NLR operates, government involvement is shifting from the national to the international level. A shift of this kind can be seen even within the industry, due to concentration in larger units. These developments are making a concentration of the

research infrastructure on a European scale inevitable. The Council takes the view that the government must anticipate this internationalisation by encouraging structural joint ventures between the research institutes concerned. Coordinating and dividing up tasks with foreign institutes presents the only opportunity for NLR to survive in the long term within these government-(read: big country)dominated areas. Primary responsibility for this rests with the Transport and Economics Ministers. It follows that they need to play a guiding role.

#### *Netherlands Energy Research Foundation (ECN)*

The ECN's mission has broadened considerably in the course of time; from an atomic energy research centre to a general energy institute focusing on long-term research and medium-long-term development as well as the resulting short-term services and knowledge transfer. The ECN is increasingly moving into the commercial market - for the shorter term, applied research as well. The Council does not welcome this development. Fleshing out this broad mission effectively requires substantial investments in the building up of a unit that can position itself as a market-oriented organisation. From the macro point of view the Council does not consider this efficient. It can better be left to organisations that are already well-equipped for this purpose. It is more effective and more efficient to create structural joint ventures. Where commercialisation is possible, the activities of the ECN must be hived off; these activities can be passed on to TNO, for example, or the business sector. If there is a need for an independent energy research institute, the Council thinks that the ECN should be a research-oriented organisation with a research programme focusing on the long term.

The Council did not see it as its task to assess the individual parts of the programmes of the LTIs on their merits. As regards the ECN this assessment is primarily a task of the Economics Minister, who is responsible for sustainable energy provision in the Netherlands. It is therefore he who must establish the main lines of the ECN's research programme. The Council considers it important that the Economics Minister weigh up in the short term the importance of fuel cell research (29 % of turnover) and nuclear research (25 % of turnover). When weighing this up, he should pay attention in particular to the importance of this research to the Dutch business community. In addition, the Council deems it necessary that it be explicitly considered whether services relating to radiation technology (22 % of turnover) still accord with the mission of a subsidised research institute like the ECN. If these elements of the ECN package of activities are no longer necessary or are necessary to a substantially lesser degree, or can be hived off, then the question arises as to whether the ECN should continue to exist as an independent institute.

#### *WL | delft hydraulics (WL)*

WL was originally an hydraulics laboratory whose mission has been expanded in the course of time to create an institute for water management and water quality research. If WL enters the commercial market in these areas it will be competing with TNO and private parties such as engineering consultancies. For this reason the Council does not consider it desirable that its mission be expanded with a necessarily broader structure of expertise. The Council advocates a position as a research-oriented organisation for WL, with its task being research in the field of hydraulics. In the Council's view WL should refrain from market activities - development and consultancy work - where private parties can offer a good alternative. Admittedly, market demand is increasingly multidisciplinary in nature, but others, including the business community, can meet this demand. They can then bring in WL for hydraulics research. The path is one of collaboration, not of competition. The Council thinks that the Transport Minister should provide more clarity concerning the government need for external research capacity and expertise, in the first place dividing tasks between the Directorate General for Public Works and Water Management and WL. Major gains in efficiency can be achieved by a clearer distribution of tasks. After these tasks have been demarcated the question of the role of the physical research facilities at WL can be answered. At the same time it will be necessary to look at the possibilities for collaborating with or dividing up tasks among similar institutes in Europe. Within the Delft cluster as it is known moves are currently under way towards closer collaboration between a number of Delft research institutes that are active in the civil and hydraulic engineering sector. The Council thinks there are good opportunities for structural

collaboration or a merger between WL, the scope and nature of whose work must be adapted to that of an aforesaid research-oriented organisation and the Civil Engineering Faculty of Delft University of Technology. The government needs to take the lead in exploring these possibilities more closely and fleshing them out.

#### *Delft Geotechnics (GD)*

GD is faced with the strategic decision of whether to expand its activities in order in this way to take advantage of the multidisciplinary demand from the market or to go for depth and invest in new knowledge, methods and techniques. Achieving both options far exceeds the institute's current capabilities.

The government is a major commercial customer in the 'construction market' and for this reason it is easy to defend subsidies for basic research. In the first instance it is the Transport Minister who stipulates the need for knowledge and in doing so establishes the financial capacity. The Council advises the Minister to position GD as a research-oriented organisation carrying out research in the geotechnics field. Assigning GD a task of fighting for its continuity on the commercial market does not fit in here. The emphasis should be on research and not on design and consultancy work. The latter can increasingly be performed by the private sector, in particular the engineering consultancies. The private sector can be fed from the fundamental, strategic angle by GD (among others) and GD can be fed from the world of practice by entering into joint ventures with engineering consultancies, i.e. collaboration not competition. Positioning GD as a research-oriented organisation also provides a good basis for collaboration within the so-called Delft cluster. As the Council also advocated in respect of WL, it advises structural collaboration or a merger of GD with Delft University of Technology.

#### *Netherlands Maritime Research Institute (MARIN)*

The maritime sector is not a specific object of state concern. The Council therefore sees no reason for special treatment of this sector within the more general policy on technology support. This does not mean that the government cannot for reasons of its own decide to provide special incentives for a specific sector. For example, the government recently decided to guarantee continuation of the institute's activities by making NLG 100 million available for renewing its research facilities. Given this choice, it advises a position for MARIN as a market-oriented organisation under the terms set out in this advice. The mission of the institute is to anticipate the existing demands from the maritime market. The institute will need to have some subsidy for this for the requisite background research and for the facilities.

The institute has traditionally focused on shipping construction, with the offshore industry becoming a major target group in the course of time. It sees the shipping companies as a major target group for the future. This is the perfect target group for an overall approach, whereby in addition to technical aspects, aspects of safety, energy and the environment also need to be included. This desired expansion, which still needs to be built up substantially in MARIN, ties in well with the knowledge and expertise of TNO. For this reason the Council advises a further study of the possibility of bringing MARIN under the TNO umbrella. This would make the institute less vulnerable to economic changes in the market. It is the Council's view that the decision on the necessary size of the subsidy for the MARIN mission cannot be made properly until the option proposed here has been further explored.

