

TNO's Strategy: a summary.

*“Innovation is the market introduction of a technical or organisational novelty, not just its invention”  
[Joseph Schumpeter]*

TNO's mission is to generate maximum impact for a safe and secure, healthy, sustainable and digital society, by performing two core tasks:

Our second core task (role) is to strengthen the earning power of the Dutch economy and to increase **employment through applied research, valorisation, innovation, and collaboration** ('innovation orchestration'). **The Netherlands has always been very good at fundamental research. Converting** fundamental scientific insights into successful products, services and solutions, however, has been a less well-developed capability. Moreover, relatively few companies in The Netherlands invest significantly in high-risk and radical innovations at relatively low TRL levels. As a result, our country's 'valley of death' is relatively wide and deep. This is where TNO has a natural role to play. We introduce innovations commissioned by businesses and civil-society organisations (contract research) and through public-private partnerships (PPPs), but also on our own initiative. Throughout the process, we raise issues, initiate movement, and connect industry and government so as to create greater social value together.

In addition, TNO develops intellectual property, for which licences are granted. We also set up new innovative companies (start-ups) around technological innovations, as well as engaging in other forms of valorisation and technology transfer. The number of start-ups is not so much an end in itself – it is all about the impact and economic value generated by our technology transfer programme, including spin-off companies. This is how TNO supports the pursuit of a competitive, innovative and dynamic knowledge economy, one that will ensure prosperity in the Netherlands well into the future and provides the financial and economic capacity necessary to finance major societal challenges.

The correlation between these roles is substantial and could be increased further. In terms of creating impact for a safe, healthy, sustainable and digital society, the two roles are in fact two sides of the same coin. Both roles are necessary, especially where complex system transitions are necessary to achieve societal goals. That said, the two roles do not coincide entirely and they place different **demands on the organisation, processes, and our employees. Nor is the definition of 'impact' entirely** the same for the two roles. The definition of impact for the second core task is intrinsically more economic in nature and more business-oriented than for the first. Also, the first core task serves the public interest, while the second may involve serving sub-interests or indeed the interests of individual companies. It is therefore essential to create a performance system that differentiates between, and does justice to, both roles. It is also important to avoid conflicts of interest between the two roles. Conflicts of interest could affect TNO's authority and credibility, and this is why we pay special attention to this topic.

To support our core tasks, it is crucial that we have a strong knowledge base and so we monitor relevant scientific and technological trends (including emerging technologies) closely. Going forward, we continue to focus on translating scientific insights into practical applications with a view to our two core tasks, and not on fundamental research. TNO sees research universities and universities of applied

sciences as important knowledge partners in the innovation landscape. Universities, more so than TNO, tend to focus on fundamental and curiosity-driven research, where practical use is not immediately obvious, and academic freedom plays a major role. In contrast, TNO focuses almost exclusively on applied research and valorisation aimed at creating societal impact. A key trend in this context is the stronger emphasis that research universities and universities of applied sciences have increasingly been placing on impact and valorisation. We see this as an opportunity to seek and strengthen collaboration, as TNO has a great deal of experience and a lot to offer to research universities and universities of applied sciences in this area. Various collaboration models are conceivable and will be explored further, together with research universities, universities of applied sciences, and businesses. and infrastructure built up over the past decades provide an excellent basis for taking a major next step in the organisation's development. Especially at a time when we are facing important and complex societal challenges. The starting point in using the resources available to create maximum positive impact will be the total societal return generated by the organisation as a whole. Over the last 20 years, for example, TNO has received well over 10 billion euros in funds. The question, therefore, is not just whether we have instigated appealing innovations (which we have), but whether the total impact generated by TNO is in proportion with the cumulative investment in our organisation. Preferably, that impact should be many times larger. Although individual successes provide anecdotal evidence of the value of this investment in TNO, they paint only a limited picture of the total return. This way of thinking, i.e. in terms of 'societal return' and cost awareness, should become part of our DNA.

Some key elements of the strategy formulated to achieve these goals are explained in more detail below.

#### Customer excellence and customer focus

Only with a keen understanding of the complex context in which TNO's customers and partners operate can the organisation further increase its societal impact and potential. This applies to both government and the various different segments of the business community. With regard to government, this involves having a good understanding of policy priorities, on the one hand, and of the issues and practical obstacles that play a key role in carrying out statutory tasks, on the other. We also need to understand how we can make implementation of those tasks more effective and more efficient, for example by using new technology. With regard to the business sector, TNO needs to be able to distinguish between the different market segments, but also to identify the specific strategic and practical contexts in which customers and business partners within those different segments find themselves. We need to understand the 'question behind the question' to become even more effective. This is also because customers and business partners themselves are often unable to articulate their innovation needs clearly. All this requires a high degree of 'customer intimacy' and a systematic study of the sectors relevant to TNO. It also means that TNO should always be mindful of 'real world constraints', i.e. the legal, practical or other limitations that exist in the real world. If only to avoid thinking and working from an ivory tower or from the drawing board only. TNO is, after all, an organisation of real-world applications and solutions. This means that we need to invest in market knowledge and a proper understanding of the context. All these considerations will be addressed as part of our Customer Excellence programme. This programme will also look at the internal processes, organisation and measures necessary to make it all happen. Attracting new business partners and customers, but certainly also retaining them and other relationships (customer retention), will be a key priority.

#### Impact entails valorisation and implementation

Scientific insights, technological inventions, or even demonstrators are not yet innovations that have an impact. The last few - difficult - steps towards successful implementation and/or market introduction of a product or service require some hard work. TNO should not therefore shy away from the higher TRL levels. On the contrary, it is the result, i.e. the impact, that counts. This does not mean that we must or can do it alone. It will often be a process of co-creation with government and

businesses that have considerable knowledge of the relevant end markets and value chains. TNO's role in those final stages of valorisation and market introduction will be different than earlier in the process, but the metaphor of a relay race in which the 'baton is passed to someone else' is in many cases not the right one. In addition, our research portfolio (upstream) will focus even more strongly on promising valorisation (downstream). The funding of the units will also be brought in line with this, by allowing them to benefit directly as well as indirectly from valorisation revenues. Finally, obstacles in TNO's IP policy as perceived by customers will be removed, where possible and appropriate.

### SMEs

SMEs are a major employment driver of the Dutch economy. At the same time, it has been clear for years that innovation-driven productivity growth is lagging behind in this sector and there is much to be gained here. This has also for years been part of government policy. SMEs, in particular, fear the valley-of-death because it could directly jeopardise their business continuity. In addition, many SMEs do not have the often expensive knowledge infrastructure needed for RD&I. This is precisely where we at TNO can play an important role. This calls for a different approach, a different business model.

Because SMEs are far from homogeneous and their needs vary greatly from one sub-sector to the next, it is very important to segment the SME sector. SMEs include the 'corner shop', but also tech start-ups and small but fast-growing companies in a range of sectors such as construction, logistics, food, and many others. Proper segmentation will identify those sub-sectors where TNO can add maximum value. These sectors will then be approached in a focused, low-threshold manner with a range of products and services appropriate to their needs and the reality in which they operate. In addition, pilots will be carried out using new business models that deviate from TNO's usual way of working based on hourly rates, as for many SMEs this appears to be a serious obstacle to work with TNO. In order to control costs for SMEs (and TNO), we will also need to standardise our range of products and services for SMEs. That is to say, rather than delivering a customised solution to each individual SME, we will instead **provide more 'productisation' so that multiple SMEs can benefit on a larger scale from our offerings.** Replicable innovation tools and services can reduce costs for individual SMEs and speed up the process. In addition, short-cycle innovation will be high on TNO's agenda (and, in fact, also on the agenda of large companies and the Ministry of Defence) as SMEs usually lack the resources and time for large investments in RD&I; instead they usually look for quick innovative solutions to concrete problems.

Scale-ups are an important SME sub-sector. Despite the fact that the Netherlands has created a large and dynamic tech start-up sector over the last few years, the total number of companies that are rapidly growing and truly break through is lagging. Working with capital providers, TNO can play a key role as a knowledge provider to increase the number of start-ups that successfully turn into scale-ups. To this end, discussions are ongoing with regional investment companies, venture capitalists, private equity investors, pension funds, and other capital providers, amongst others. And of course with the entrepreneurs themselves.

### Time-to-market (“accelerate”)

Businesses and governments worldwide have been investing heavily in RD&I over the last few decades. With the rise of countries such as Korea and China - in addition to the US, Japan and European countries - new ambitious players have entered the markets, making the innovation landscape significantly more competitive. Major innovations that can take place will take place. Examples include the quantum computer and clean tech. The question is not so much whether an innovation will emerge, but who will be the first. It has increasingly become a race to be the first and so to reap (what will invariably be temporary) economic, military, or geopolitical benefits. Time-to-market, speed, and agility have become crucial - also for TNO. This awareness will need to infuse all parts of the organisation, and management culture will also need to adapt.

### Focus and mass

Based on its historical mission, TNO has grown into a very widely diversified organisation. The question is **sometimes asked whether TNO might perhaps have too much “scope”**. After all, an organisation cannot excel in all disciplines, and too much fragmentation leads to loss of effectiveness, manageability, and efficiency. Besides an open and alert attitude towards unexpected ('emerging') developments, applied research also requires a mission-driven or goal-oriented and tenacious approach focusing on valorisation and impact. In addition, much of the work TNO does is more or less demand-driven. This is one of the differences between curiosity-driven scientific research, which usually takes place at universities, and research aimed at application and valorisation. In other words, TNO can achieve greater impact and gain in strength, effectiveness and efficiency by bringing greater coherence and focus to its research portfolio and organising greater mass in areas where TNO wants to make an impact.

A first major step has been taken by defining four themes around which TNO primarily wants to be active and where it is likely to be able to achieve the biggest impact: safety and security, health, sustainability, and digitalisation. Across these themes, we will also focus on 'enabling technologies', such as the high-tech manufacturing industry, which is booming in the Netherlands with companies such as ASML and VDL. An additional step in this context will be to more clearly articulate which impact goals TNO intends to pursue; what does TNO aim and stand for? To get this process going, concrete 'moonshots' are being worked out, which should produce impact by or before the end of this decade. However, further additional steps will follow in order to further streamline the research portfolio.

On the other hand, TNO's large scope is also a strength, which TNO's customers and partners have come to expect, for example when advising government. Even so, we will need to discuss this, especially where the relevant knowledge areas are not only covered by TNO but also, for example, by one or more Dutch universities or other European institutions.

#### Systems thinking and system innovation

Introducing potentially valuable and disruptive technical inventions (or solutions) into organisations, value chains, or complex societal systems (such as the energy system) is often a much slower process than one would expect. What is often overlooked is that new inventions impact a system as a whole and so an integrated review should take place. Social, institutional, infrastructural and legal innovations in many cases do not keep pace with technical innovations. In some cases, this may even prevent valuable innovations and positive changes from coming about at all. Many disparate elements must come together simultaneously before a technology which on paper looks like a 'game changer' actually lives up to its promise. Because TNO's main goal is to achieve a demonstrable impact, our strategy involves understanding these types of systemic change and how they can be accelerated.

#### Vital organisation

Our employees make TNO. Geopolitical, social and economic developments are driving substantial growth at TNO and this creates challenges. Not only will we need to recruit large groups of new talented employees in a tight labour market, but we will also have to offer them an inspiring, safe and diverse working environment, so they can develop and want to stay at TNO for a longer period of time. A whole range of measures will be put in place to achieve these goals.

In addition, collaboration across the organisation will be strengthened and consistency and collectivity promoted. Some initial steps have already been taken by reducing the number of units and introducing an Executive Committee (ExCo), in which unit directors and the Executive Board regularly discuss strategic issues affecting the organisation as a whole. Measures will also touch on the culture within TNO; less 'compartmentalisation', more collectivity, more collaboration. In addition, steps will be taken to further simplify and streamline the organisation, work practices, and processes and to reduce bureaucracy.

We will be taking these strategic topics along as we further develop our strategy going forward.