Investing in technology and engineers for a sustainable world

The Netherlands faces huge and **complex societal transitions** in the areas of energy, climate, care, digitalisation, security, sustainability, mobility, food and housing. New technologies and engineers are crucial for realising transitions [1]. The **four technical universities (4TU)** make an essential contribution by educating ± 9000 engineers and technological designers a year, conducting innovative technical-scientific research, developing new technologies and making this knowledge and technologies applicable to society ('valorisation'). The 4TU has the following four recommendations to realise this transition to a sustainable world.

1) More engineers for social transitions

The Netherlands has had an engineering shortage for years. That shortage continues to grow and now manifests itself across the education line, from MBO, to HBO and WO and from electrical engineers to IT engineers, (mechanical) construction engineers and architects[2]. The Research Centre for Education and the Labour Market (ROA) predicts an annual shortage of over 3,000 college-educated technicians. The Netherlands Environmental Assessment Agency (PBL) and ROA have recently shown that for the implementation of climate policy, the demand for engineers will increase even further[3]. So the number of engineering graduates will have to increase enormously to meet the demand from society.

It is therefore important that **more Dutch students choose a technical study programme**. After a clear growth in the early '10s, the number of Dutch pupils choosing an NG or NT profile and an advanced technical study programme has been declining in recent years. This calls for decisive policy to interest and encourage pupils to choose the N-profile and an advanced technical study much more than now. 4TU is investing heavily in this itself. In addition**, international intake in technical studies** and a **higher stay rate** remain an absolute necessity.

2) Capacity funding in higher education to do what is needed for society

To meet the growing demand for engineering graduates, a new, future-oriented way of funding higher education is needed, geared towards the needs of Dutch society: **capacity funding**. This means funding based on agreements on educational, research and valorisation capacity to be realised, based on society's need to realise the necessary transitions, instead of funding based on the number of enrolled students. A **good substantive lead** is indispensable here, to properly determine and align the needs of a country like the Netherlands for scientific education, research and knowledge valorisation.

3) Invest at least 3% of GDP in research & development for a strong and innovative economy

A sustainable innovative economy is important for a strong Netherlands in a resilient Europe with broad prosperity. It is therefore important to **invest in research and development** and to ensure that these investments **grow towards the European ambition of 3% of GDP** (Lisbon target; in 2021: 2.26%). To achieve this, we advocate maintaining and continuing investments through OCW and the National Growth Fund (NGF), which requires a coherent strategy for all (existing and new) instruments for research and innovation, leading to a structural growth of private R&D spending in close cooperation with public partners, as also advocated by the Knowledge Coalition (kenniscoalitie.nl). This will increase the scientific position of the Netherlands and the investments in research and development at universities, other knowledge institutions and industry reinforce each other.

4) Investing in technological innovation ecosystems to increase the impact of science and innovation

Technological innovation ecosystems are essential pillars for a sustainable innovative economy in the Netherlands. A breeding ground has developed around all four TUs with successful startups and scale-ups and there is enhanced cooperation with other universities, knowledge institutions, large and small companies, governments, citizens and civil society organisations - with solid ramifications to non-technological disciplines. This has **increased knowledge utilisation and the impact of scientific research and innovations**. For maintaining broad prosperity, realising transitions, increasing the strategic autonomy (of NL and EU), and the earning capacity of our society, it is crucial to make **targeted and structural investments in these technological innovation ecosystems** spread across the Netherlands. The four TUs, which form the foundation of these technological innovation ecosystems, play an essential role in this.

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[1] https://www.4tu.nl/nieuws/nieuws/ingenieurs-en-de-vormgeving-van-welvarend-en-duurzaam-nederland/

[2] https://www.pbl.nl/publicaties/inzicht-in-arbeidsmarktknelpunten-voor-de-uitvoering-van-het-klimaatbeleid

[3] https://www.pbl.nl/publicaties/inzicht-in-arbeidsmarktknelpunten-voor-de-uitvoering-van-het-klimaatbeleid