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**Paving the way towards sustainable economy  
- alleviating the “Valley of Death” through Nordic  
Testbed collaboration**

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Position Paper by Nordic Research and Technology Organisations

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*Nordic countries have leading national Research and Technology Organisations (RTOs) operating with public mandates, supporting sustainable development and innovation. The Nordic RTOs, GTS in Denmark, VTT in Finland, RISE in Sweden and SINTEF in Norway host a majority of open-access testbeds available in the Nordics and are willing to embark on a strengthened cooperation on testbeds. Nordic collaboration has a long history, based on shared values, culture and democracy, shared economic structures in industry and financial market, and climate of course. Nordics are global leaders in innovation capacity.*

# *Paving the way towards sustainable economy - alleviating the “Valley of Death” through Nordic Testbed collaboration*

*With this position paper the Nordic RTOs are proposing a range of measures in order to strengthen collaboration between Nordic Testbeds. Increasing collaboration and strategically investing in Nordic testbeds, or technology infrastructures, is key to establishing the Nordic region as a global hub for transformative research and innovation.*

## **Collaboration between the private and public sectors is becoming ever more important**

More than ever, we need firm action that is based on forward-looking dialogue, knowledge-based decision making and directionality. We are facing challenges that can only be tackled if we join forces, pool resources and take a direction towards sustainability. Environmental, economic and social sustainability largely depends on investment in research and innovation. The Nordic countries have a recognised capability to innovate, founded on our strong education and research systems, globally competitive companies and a culture of collaboration. To address major societal challenges, the Nordic countries have in place innovation policies that are mission-driven.

A similar direction is also being taken at the EU level: the European Green Deal is an integral part of the European Commission’s strategy to implement the United Nation’s 2030 Agenda and The Sustainable Development Goals. Also, work on the EU’s Strategic Value Chains (SVCs) has been a new and transformative process at the EU level, facilitating cooperation between the EU, all Member States and key industrial stakeholders. The mission-driven value chains, or rather networks, are essentially looking for collaborations. By ensuring the right circumstances for strategic Nordic collaborations we could have a powerful contribution toward the implementation of the Green Deal.

## **What is a testbed?**

Testbeds in our definition are technology infrastructures where new products, processes and services can be developed and tested under real conditions or close to real conditions. Testbeds are operated by professional staff and they focus on scale-up and innovation. As such, they differ from research infrastructures who focus on scientific discovery at earlier stages.

Access to international industrial value networks is becoming crucial for companies to grow and develop their future competitive portfolio of products and services. There are huge opportunities for industries and the public sector to develop more resource efficient solutions, but no one can do it alone. We need to explore, experiment and develop solutions together, across borders. Moreover, when developing new, sometimes game-changing technologies, it is important to adopt a market-oriented approach early on. The availability of state-of-the-art testbeds is key for companies when they need to test and verify the early versions of a product. Research and Technology Organisations (RTOs), operating open-access testbeds and collaborating across sectors, often have a key role in helping companies to deliver solutions that will create impact for society.

The Nordics have leading national RTOs representing a combined staff of more than 11 000 highly-skilled researchers and engineers, managing a wide range of testbeds and technology infrastructures. The Nordic RTOs’ public mission is to provide research as a service for society and industry. To achieve this, they cooperate with companies, large and small, as well as a wide array of public actors. The RTOs’ technologies cover many scientific fields and they have the capacity to combine various technologies. Their work ranges from basic research to new products and services development. The Nordic RTOs are crucial in the implementation of national innovation policy goals, as well the collaborative parts of the EU Framework Programmes.

## ***Nordic region for transformative research and innovation***

**The most successful companies will be those who innovate, perform most experiments and build capability to scale-up new opportunities. The more companies need to experiment and scale-up, the more they need testbeds.** As a consequence, effective access to state-of-the-art testbeds has become a key element in 21st century innovation ecosystems.

Across the Nordic countries, there is already a wide array of testbeds available. However, collaboration and access across borders is currently limited due to a range of bottlenecks and barriers.

By better connecting Nordic testbeds and intensifying collaboration among them, there is a prospect for the Nordics to become a hub for testbed infrastructure attracting investors and companies to develop and innovate in the Nordics. New technologies, and solutions and services based upon them, need to be demonstrated and verified as quickly as possible to solve global challenges in due time to comply with the goals set out in the Paris Agreement and the 1,5°C target. This kind of collaboration should be developed and communicated as a “Nordic Opportunity”.

Investing strategically in state-of-the-art testbeds in the Nordic countries and improving cross-border access will be key to this end, and can significantly increase the attractiveness of the Nordic region as a globally leading innovation hub.

First, intensified collaboration can enable companies to leverage their innovation capabilities by accessing

a portfolio of testbeds spanning the Nordics, thereby reducing barriers for accessing testbeds across borders, such as lack of knowledge of available testbeds and high search cost.

Second, by increasing collaboration and knowledge transfer between testbeds, testbed operators will be able to offer local and regional industry better technology services, as well as advising on possibilities abroad which the local provider cannot supply.

Third, increasing collaboration between Nordic testbeds is an important step towards the establishment of a common Nordic market for testbed services. By being able to address a combined Nordic market, testbed providers will find it easier to invest in new facilities and equipment due to access to a larger market. This will also help to increase the utilization rates of facilities and equipment.

Finally, the strategic importance of testbeds, or technology infrastructures, has been recognised by the European Union as well. Ideally, Nordic collaboration could be a forerunner in building a “Testbed Europe”.<sup>1</sup>

The Nordic RTOs provide a backbone of testbeds in the Nordic Region. RTOs not only provide the physical facility and test environment, but also technical and scientific expertise, and often act as nodes in networks with other actors such as universities and companies. Such innovation infrastructures provide customers and partners with independent, confidential services as well as experience to work with a broad range of stakeholders, from academic institutions to small companies.<sup>2</sup>

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<sup>1</sup> See for example

<https://op.europa.eu/en/publication-detail/-/publication/0df85f8b-7b72-11e9-9f05-01aa75ed71a1/language-en>

[https://ec.europa.eu/commission/presscorner/detail/en/IP\\_19\\_6204](https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6204)

<https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs>

[https://www.interregeurope.eu/fileadmin/user\\_upload/plp\\_uploads/policy\\_briefs/TO1\\_policy\\_brief\\_Research\\_and\\_innovation\\_infrastructure.pdf](https://www.interregeurope.eu/fileadmin/user_upload/plp_uploads/policy_briefs/TO1_policy_brief_Research_and_innovation_infrastructure.pdf)

<sup>2</sup> Nordic Council of Ministers (2018) Nordic test and demonstration facilities. A mapping of test and demonstration facilities in the Nordic Region

Building on these strengths, and the collaborative culture and trust in the Nordic region, we have good opportunities for establishing the Nordics as a globally leading region for transformative research and innovation.

### ***Barriers to overcome***

Many testbeds operate in close collaboration between RTOs and universities within local and regional ecosystems in the Nordics. Furthermore, international collaboration is abundant when it comes to research projects. However, keeping up with the international state-of-the-art and providing cross-border access to testbeds faces serious hurdles.

Firstly, in all Nordic countries there is a highly worrying lack of long-term funding for strategic capability build-up and testbed development.<sup>3</sup>

Secondly, collaboration with the aim of providing companies with an efficient access to testbeds across borders is scarce. What we have currently is limited to loose network collaboration in some cases today, building either on a strong industry customer's demand, or based on strong relations between scientists and research groups cross-borders. Those "Loose Collaboration Networks" are fragile, as they more or less depend on passionate individuals.<sup>4</sup> However, the establishment of such collaboration is highly complex. At present, the development of more close and intense collaboration is hampered by barriers at various levels ranging from a lack of awareness of synergies that could be achieved from closer collaboration, to possible organizational lock-ins, and to a lack of commonly agreed best-practise models for organizing cross-border collaboration between testbeds.

Thirdly, as the natural national home markets are lacking in size, achieving the necessary utilization rates to justify testbeds and complex infrastructures is difficult. Investment and maintenance costs of such infrastructures are high and the need to attract investments, talents and cooperation partners, both locally and internationally, is of paramount importance.

Furthermore, a new PPP model to leverage investments should be explored when setting up testbeds and technology infrastructures. Potential problems with state-aid rules need to be taken into account. Here we should work on a solution and transparent criteria at the EU level that can be used by all. Business models for testbed offerings with a long-term vision and connection to Nordic regional strengths and cross-sectorial collaboration are needed. Common ground for funding, voucher schemes for SMEs and common principles when charging for publicly funded multi-RTO testbed projects are also needed.

To increase testbed collaboration and to bolster the Nordics as a leading region for transformative research and innovation, strategies and long-term initiatives at both the national and Nordic level are needed. By securing a long-term framework for how to work on a strategic and operational level in the Nordics, we can start building up a capability for a "Nordic Opportunity".

### ***Recommendations to enhance Nordic Testbed collaboration***

Connecting Nordic testbeds will be key to establishing the Nordic region as a global hub for transformative research and innovation. Even though a silver bullet to enable broad cross-border collaboration hasn't been identified so far, we can move forward incrementally, and such a process will presumably take several years.

<sup>3</sup> DTI (2020) Building a Nordic innovation ecosystem around technology infrastructures and testbeds. A feasibility study of Nordic testbed collaborations; Christian Ketels, et al. (2019) Peer review of the Danish R&I System. Ten steps, and a leap forward: Taking Danish Innovation to the next level. European Commission, DG Research and Innovation

<sup>4</sup> DTI (2020) Building a Nordic innovation ecosystem around technology infrastructures and testbeds. A feasibility study of Nordic testbed collaborations

The Nordic RTOs take a strategic approach to the development of their testbeds and technology infrastructures and we have gathered considerable experience from engaging in infrastructure collaboration in European projects. The following recommendations rely on this knowledge pool, which also has informed our common feasibility study on Nordic testbed collaboration.<sup>5</sup>

### ***Recommendations at national level***

We cannot predict the future, but we can build the technologies for the future. Efficient industry access to state-of-the-art testbeds and technology infrastructures will be crucial to this end. Furthermore, testbeds and technology infrastructures should also be seen as environments for horizon scanning and foresight, equipping Nordic societies for making knowledge-based decisions. However, investments and maintenance costs are high, and in all Nordic countries a strategic approach and long-term funding for capability build-up and testbed development is currently missing. In the future, testbeds and technology infrastructures must be given a clear role and priority in national innovation policies in the Nordic countries, building on a strategy. At national level, we therefore recommend the implementation of strategic foresight dialogues and mainstreaming testbeds in funding schemes:

- 1) **Take testbeds and technology infrastructures into consideration when deciding on R&I strategies, programmes and funding priorities**
- 2) **Implement foresight dialogues at national level to support future strategic decisions.** National actors need to develop and implement processes

for strategic dialogue between industry and RTOs in order to identify future industry needs for access to testbeds and technology infrastructures. The strategic dialogues should be recurrent and focus on national positions of strength. Inspiration can be taken from:

- a) Growth ecosystems as a tool in the new industrial and innovation policy in Finland<sup>6</sup>
- b) Long-term programmes and perspectives on innovation in Sweden<sup>7</sup>

- 3) **National funding schemes for supporting the establishment and maintenance of testbeds and technology infrastructures.** (If not already present) funding schemes for the establishment and maintenance of testbeds and technology infrastructures should be coordinated and implemented at national level. The ability to offer access to state-of-the-art testbeds and technology infrastructures is not only a precondition for supporting domestic industry. It is also a precondition for qualifying for international collaboration. That is, Nordic testbeds must qualify as attractive partners within areas of complementarity if collaboration is to take place. Inspiration can be taken from:

- a) The Danish Green Labs Programme<sup>8</sup>
- b) The Norwegian Catapult Programme<sup>9</sup>

- 4) **Voucher-schemes for cross-border access to testbeds and technology infrastructures.** We recommend the development and implementation of national voucher schemes that enable companies to access testbeds across borders. Such vouchers will not only help companies in accessing a broader

<sup>5</sup> DTI (2020) Building a Nordic innovation ecosystem around technology infrastructures and testbeds. A feasibility study of Nordic testbed collaborations;

<sup>6</sup> <https://tem.fi/en/ecosystems>

<sup>7</sup> <https://www.vinnova.se/sa-framjar-vi-innovation/>

<sup>8</sup> <https://stateofgreen.com/en/partners/green-labs-dk/>

<sup>9</sup> <https://norskkatapult.no/information-in-english/>

portfolio of testbeds. They will also function as an important lever to the establishment of a common Nordic market for testbed services. Currently such a scheme is not likely to be present. We therefore recommend that national funding agencies develop or modify already existing voucher schemes in order to allow beneficiaries an access to testbeds and technology infrastructures cross-borders. Experiences regarding such vouchers already exist at European, regional and national level. Inspiration can be taken from:

- a) ROBOT-NET (Horizon 2020 programme)<sup>10</sup>
- b) HYPERREGIO B2B (Interreg programme)<sup>11</sup>
- c) SmartPilots (Interreg programme)<sup>12</sup>
- d) Innobooster (Denmark)<sup>13</sup>

### ***Recommendations to Nordic Council of Ministers, Nordic Innovation and NordForsk***

There is a critical moment for developing a Nordic strategy for technology infrastructures to support industry scale-up, technology diffusion, and green transition. To develop a shared vision, to strengthen the Nordic region's innovation capacity and to pave the ground for exploiting synergies through intensified testbed collaboration, we recommend the following:

- 1) Take testbeds and technology infrastructures into consideration when deciding on R&I programmes and funding priorities**
- 2) Implement a series of “Nordic Testbed Days”.**  
We recommend setting up a medium- to long-term program of Nordic Testbed Days. The aim of the Nordic Testbed Days is twofold: 1) to intensify

dialogue between industry, RTOs, universities and political stakeholders at national, Nordic and also EU level; and 2) to showcase the “Nordic Opportunity” within the Nordics as well as internationally.

- 3) Implement a common Digital Portal for finding and promoting Nordic testbeds and technology infrastructures,** learning about testbed benefits and different technology or market readiness levels that testbeds could support. The portal should be implemented by merging information from all Nordic RTOs into a [www.nordictestbeds.com](http://www.nordictestbeds.com). Inspiration can be taken from:

[www.testbedsweden.se/](http://www.testbedsweden.se/)  
[www.teknologiskinfrastruktur.dk](http://www.teknologiskinfrastruktur.dk)  
<https://biopilots4u.eu/home>

- 4) Identify areas for initial testing of cross-border collaboration by implementing a series of foresight studies and roadmap processes.**  
Possible Nordic opportunities for cross-border collaboration between testbeds can be identified within **Digital Economy, Circular- and Bioeconomy<sup>14</sup> and also Smart Health<sup>15</sup>**
- 5) Implement a series of pilot projects for testing cross-border collaboration between testbeds.**  
Testbeds and technology infrastructures related to Nordic priorities should become an integral part of Nordic programme design.

<sup>10</sup> <https://robott-net.eu/vouchers/>

<sup>11</sup> <https://hyperegio.eu/voucher/>

<sup>12</sup> <https://www.interregeurope.eu/smartpilots/>

<sup>13</sup> <https://innovationsfonden.dk/en/programmes/innobooster/innobooster>

<sup>14</sup> DTI (2020) Building a Nordic innovation ecosystem around technology infrastructures and testbeds. A feasibility study of Nordic testbed collaborations

<sup>15</sup> <https://www.nordicinnovation.org/2017/nordic-infrastructure-test-facilities>

## ***Positioning the Nordic testbeds within European Collaboration***

In order to maximise the interregional innovation potential of the Nordic region, it is recommended to **create synergies between EU Programmes (e.g. Horizon Europe<sup>16</sup> and Digital Europe<sup>17</sup>), Nordic Programmes and programmes managed by national funding agencies or regional authorities in Nordic countries (e.g. national funding schemes and European Regional Development Fund ERDF).**

To maximise Nordic participation in European collaboration within the Horizon Europe and Digital Europe Programmes, which are currently being shaped, we emphasise the following:

- 1) National research and innovation agencies should propose a policy where testbed collaborations between actors in the Nordic countries are encouraged.<sup>18</sup>
- 2) National funding for testbeds and technology infrastructures should match broader EU goals. This is particularly important for the Horizon Europe Partnerships and Missions, as well as Strategic Value Chains, Regional Smart Specialisation Strategies and the new Industrial Policy that is aligned with the European Green Deal.

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<sup>16</sup> [https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme\\_en](https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en)

<sup>17</sup> <https://ec.europa.eu/digital-single-market/en/news/digital-europe-programme-proposed-eu92-billion-funding-2021-2027>

<sup>18</sup> E.g. establishing Digital Innovation Hubs in the Nordics based on existing testbeds and technology infrastructures could form a backbone for Nordic collaboration