

Cleantech
for Baltics



BALTICS

**BUILDING A CLEANTECH
INNOVATION
POWERHOUSE**

With the support of



Breakthrough
Energy

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EXECUTIVE SUMMARY

We live in a time of climate, energy security and economic crises. The need for smart, clean, energy and resource-efficient technologies has never been as urgent. Thanks to the EU Green Deal and ongoing progress in existing and upcoming regulatory files focusing on energy, transport, environmental protection and circularity, Europe is creating a world-leading regulative and financial environment to support growth of the cleantech sector. But how are the Baltics – the North-Eastern European member states of Estonia, Latvia and Lithuania – doing? What is the current situation of the Baltic cleantech sector?

Key innovation sector growth indicators are on an upward trajectory:

- 2021 investments into each startup growth amounted to more than 416M€, reaching record highs and almost totalling the amount raised in 2018-2020;
- investment deal volume is increasing, adding at least ten high-quality deals each year;
- startup sector employment has grown constantly, adding a record of more than 1000 jobs in 2021;
- turnover generated by startups has increased 1,5x each year since 2017, totalling more than 440M€ in 2021.

Early-stage innovation is driving the Baltics towards a Green transformation. Paired with governmental changes and industry-specific improvements, this means that Baltics is ready to become a cross-sector sustainability frontrunner.

Baltics are a rich and fruitful region for cleantech innovation because of three main reasons:

1. Its scale and agility can make the region a natural **test bed for startups** looking at scaling their business to Europe and beyond.
2. The current energy and security context create an opportunity to accelerate the deployment of key clean technologies. This process can build on technological and policy improvements and be informed by key learnings from other geographies to build **the most modern physical and virtual infrastructure**.
3. The region can leverage its tradition for foresight and innovation, as well as significant skills and competences in areas relevant to green innovation and transition. **Estonia** has high competencies in ICT, e-governance and high-quality engineering education, already visible in certain smart city developments. **Lithuania** has shown foresight and determination in deploying renewable energy infrastructure and regulation, becoming the first EU country to wean itself off Russian gas supplies. **Latvia** has strengthened its ICT competencies throughout the years, developing a solid sector now accelerating smart initiatives. This can also be seen in Latvia's rapid development of 5G networks and testbeds.

The war in Ukraine has brought energy security to the top of government agendas in the Baltic region as well as the rest of the EU. Estonia, Latvia and Lithuania have a historic opportunity to join forces and leverage the competencies and strategic advantages of each of their ecosystems to accelerate the key technological challenges needed to build sustainable and resilient economies in the region.

INTRODUCTION

WHY?

While the broader startup ecosystems in the Baltics and Central and Eastern Europe are well documented and understood [1, 2], there is little up-to-date information specifically focused on the cleantech sector [3]. **The Cleantech for Baltics** report intends to fill this gap in data and information. This report is the first in a series of quarterly outlooks that will focus on the current situation and latest developments of the cleantech [4] ecosystem, policy and support measures in Estonia, Latvia and Lithuania. The report provides recommendations on **how the region can supercharge investments in cleantech** - from boosting early-stage innovation to accelerating scale up and deployment for wide-scale impact.

This first report presents the findings of the Baltic cleantech sector analysis conducted between September and November 2022, draws comparisons between the three countries and provides recommendations for the growth of the Baltic cleantech sector and enabling policy landscape.

THE REPORT

The underlying Baltic cleantech sector analysis is divided into two general parts for each country:

1. The cleantech ecosystem.
2. Policies and support measures.

The analysis is based on desk research, e-mail correspondence, questionnaire and interviews conducted in September, October and November 2022 (see Annex 1 for more information on methodology and limitations).

3X

2021 BALTICS CLEANTECH INVESTMENTS INCREASED THREEFOLD OVER 2020, TRACKING OVERALL EUROPEAN CLEANTECH INVESTMENT TRENDS.

WITH SERIES A DEALS INCREASING AS THE SECTOR MATURES, THE TREND IS SET TO CONTINUE.

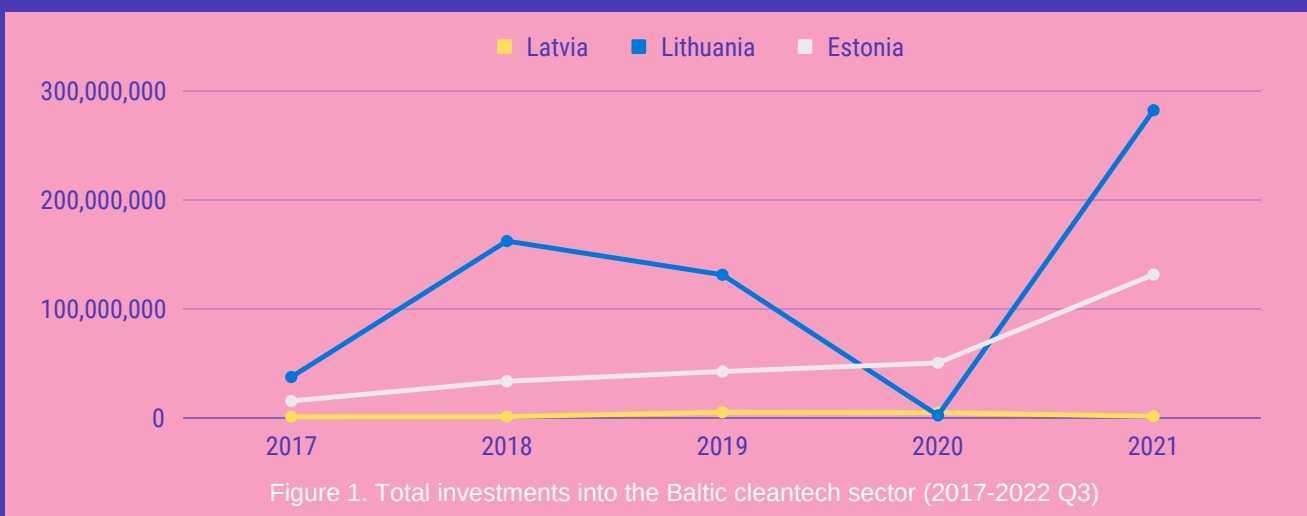
BALTICS CLEANTECH ECOSYSTEM

Each of the three Baltic countries has around 100 cleantech startups, including around 35-40 that have successfully raised significant amounts of capital. However, the three countries differ in sectoral specialization and company growth characteristics.

Investment and growth numbers

The second wave of cleantech startups (cleantech 2.0) emerged in 2014-2016, with global cleantech investments trending upwards. The Baltics followed this trend. The region, well known for its successful software solutions, has the most significant investments in software-based cleantech startups (see Figure 1). However, as all three countries share a similar history, environment and climate, the energy and transportation sectors have been getting much attention. The need to decarbonise emissions-intensive oil shale and brown coal-based electricity systems has channelled investments into startups active in demand-response, energy production, storage, efficiency, mobility electrification and last-mile delivery.

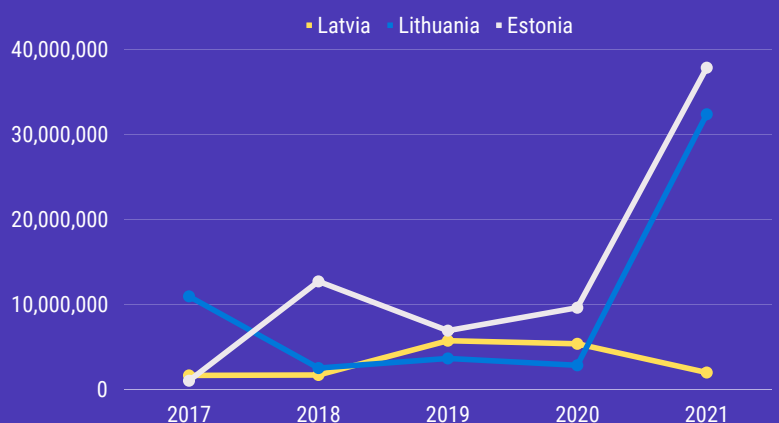
The Baltic countries are small, agile and ready to trial innovative solutions, creating an attractive test bed for both local and foreign startups wishing to validate their product before scaling to larger markets.



Removing the largest deals (startups that have raised more than 100M€ in the selected period), the sector's growth becomes more evident (see Figure 2).

It followed the European trend in 2021, more than tripling year on year investments into startups compared to 2020. The "hockey-stick curve" is set to continue, driven by ambitious global climate goals, increased regional and local support measures, facilitating regulatory developments, and a continuous increase in cleantech-dedicated investment funds.

As global demand for cleantech innovation heats up, these factors are paving the way for essential growth of the sector.



Comparing the investments in Baltic countries over the selected years, the numbers show more stable growth in Estonia. That is likely partly due to ecosystem development activities by dedicated organizations and a vibrant startup ecosystem that creates a strong base for attracting foreign generalist investors. Similarly, the closer connection (both culturally and physically) to the Nordics has enabled Estonia to capitalize on its long-term and consistent focus on supporting the cleantech ecosystem. Yet, looking at the employment figures and turnover generated by cleantech companies, Lithuania holds the fort, realizing innovation in the circular economy, solar panel manufacturing and electric vehicles, primarily by growth stage companies (see Figures 3 and 4).

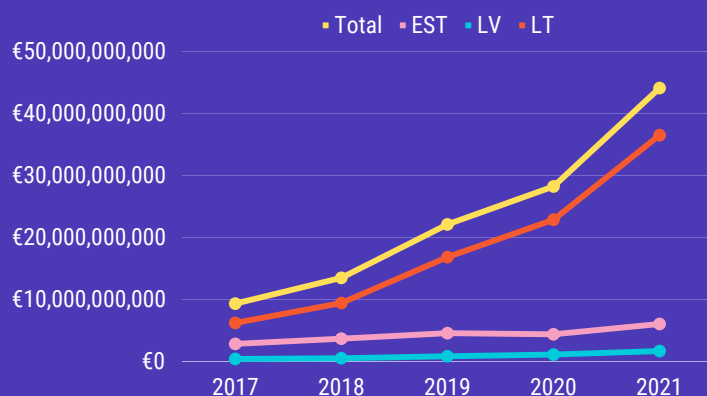


Figure 3. Turnover generated by Baltic cleantech startups (2017-2021)

Estonia

Diving deeper into the sub-sectors, in Estonia, transportation and logistics are more advanced than others regarding the number of employees, amounting to 55% of the total, followed by the energy and power sub-sector with 24% and agriculture and food with 11%. Innovation in the transportation sector has its roots in a high-level mechanical and electrical engineering education tradition that has sprouted a cluster of founders developing ICT solutions, light electric vehicles and autonomous last-mile delivery products and services. All these companies ride the global wave of electrification across all mobility solutions and data-driven opportunities posed by close collaboration with city authorities.

High employment in energy and power sub-sector startups may derive from both engineering skills as well as the ready availability of data to validate a startup idea, creating the perfect intersection of ICT and engineering. This sub-sector has significant potential in Estonia and is expected to produce many highly successful companies.

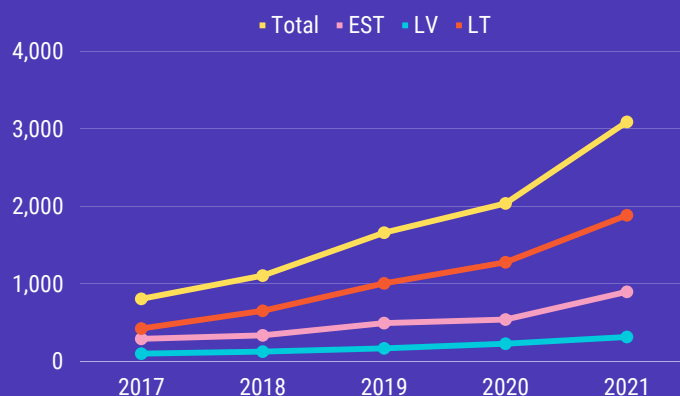


Figure 4. Employees in Baltic cleantech startups (2017-2021)

Latvia

In Latvia, 49% of the employment in cleantech falls under the transportation and logistics sub-sector, followed by 26% in energy and power and 17% in the novel materials and chemicals sub-sector. These sectors are the strongest ones within cleantech in Latvia, which may relate to the fact that Latvia had previously also a strong focus on deep tech, where these sectors are also represented. Furthermore, Latvia has defined its RIS3 priority areas where smart energy and mobility are also the main ones, providing a base to build upon current development and further strengthen these sectors.

Lithuania

Lithuania is the differentiator, with 56% of the resources and environment sub-sector workforce. The high weight of this sub-sector is likely driven by rapid growth of companies in the wider circular economy sector. Lithuania's turnover graph (Figure 3) shows fast yearly income growth, positively affecting all industries. The substantial increase in investments into cleantech start-ups over the last two years reflects the increasing activity of private equity and venture capital.

CLEANTECH BALTICS ECOSYSTEM SUPPORT ORGANISATIONS

The Baltics has a flourishing entrepreneurial support environment, with several stakeholders active in the cleantech area (see Figure 5).

In **Estonia**, financial support comes from three leading public organizations: Environmental Investment Centre, Enterprise and Innovation Foundation, and the Agricultural Registers and Information Board. Cleantech Estonia and Tallinn Science Park Tehnopol provide business development support.

Lithuania's primary financial support comes from Innovation Agency, INVEGA, and Environment Projects Management Agency. Innovation Agency, Cleantech Cluster Lithuania, Science and Technology Parks, etc., provide most business development support.

In **Latvia**, primary financial support comes from ALTUM, the state-owned development finance institution, and the Investment and Development Agency of Latvia. In addition, the Latvia Council of Science provides financial support for science and research. Split into industries and ecosystems, cluster organizations and competence centres offer business development and technology development support, respectively.



Figure 5. Business support organizations in the Baltics

BALTICS CLEANTECH ECOSYSTEM

BALTIC STARTUP FOUNDERS SAY:

"THE BALTICS CAN BECOME A TEST BED FOR NEW SMART ENERGY TECH"

"BALTIC INVESTORS LACK EXPERIENCE IN HARDWARE"

OPPORTUNITIES

The main opportunities expressed by company representatives and other sector stakeholders include:

- learning from other countries' experiences in developing local technologies (e.g., in the under-development renewable energy sector);
- pushing policymakers to create a supportive policy environment for cleantech (i.e., demand-side policies that could shape the market; regulatory sandboxes for piloting; more focused specialization on global trends like batteries, hydrogen, carbon capture, utilization and storage, sustainable materials, etc.);
- marketing Baltic ecosystem achievements to attract more investments and leading by example;
- more collaboration and integration of the Baltic market.

CHALLENGES

The main challenges include:

- policy (e.g., the renewable energy market is very dependent on regulation; geographically fixed local funds; lack of support measures for in-house R&D);
- supply chain issues (e.g., in the solar panel sector, it is hard to compete with markets strongly supported by governments);
- demand and awareness of market participants (e.g., "nice to have" climate solutions and greenwashing);
- lack of early-stage capital (e.g., on non-dilutive financing and debt; cleantech product development takes more time and resources, which is not attractive to investors);
- ecosystem building (e.g., activities that would bring more experienced founders to the ecosystem);
- industry readiness (e.g., deep-tech requires strong industry partnerships to pilot, and the lack of industrial collaboration in the region can block future venture development).

55%

of cleantech startups are developing physical products in the Baltics

€1 000,000,000

Investment into Baltic cleantech startups in 2017-2021

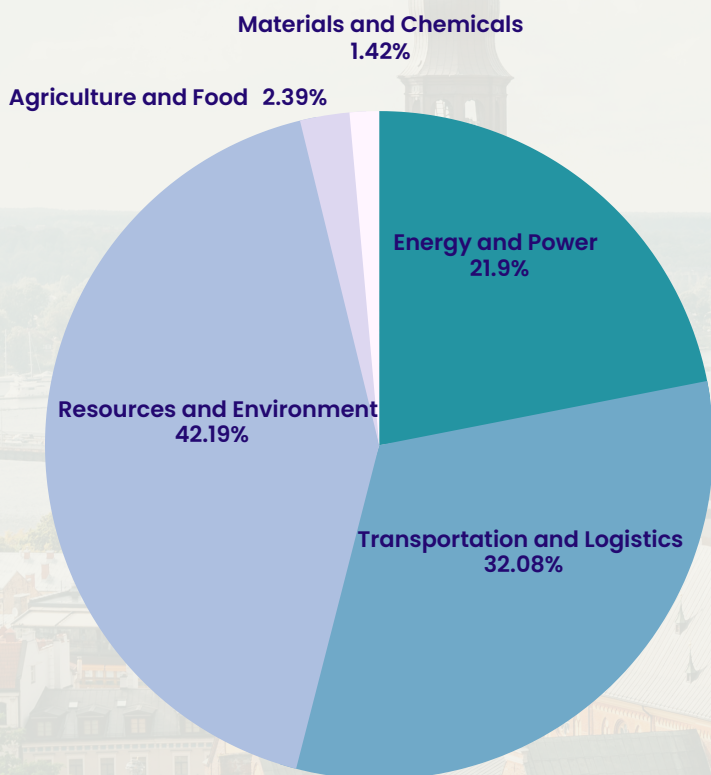


Figure 6. Investments into cleantech startups by sub-category, Baltics 2017-2022

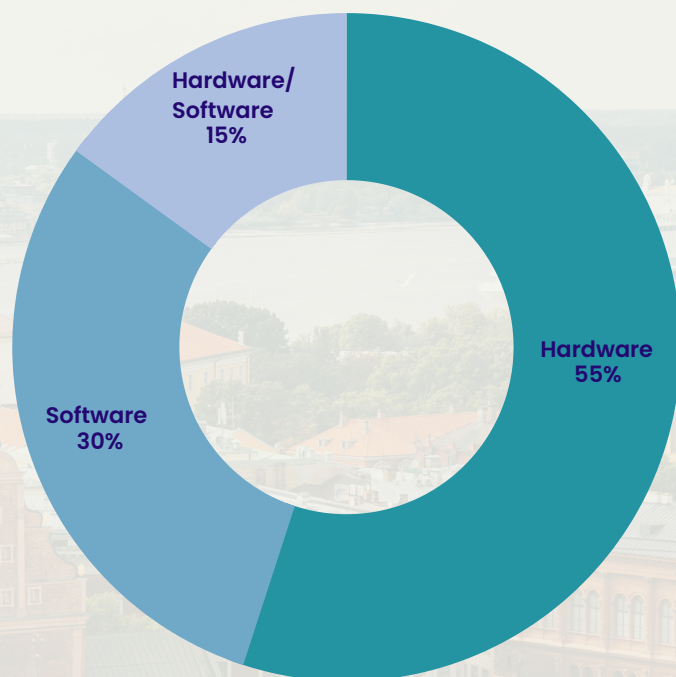


Figure 7. Startups developing hardware or software solutions or software-enabled hardware, Baltics 2017-2022

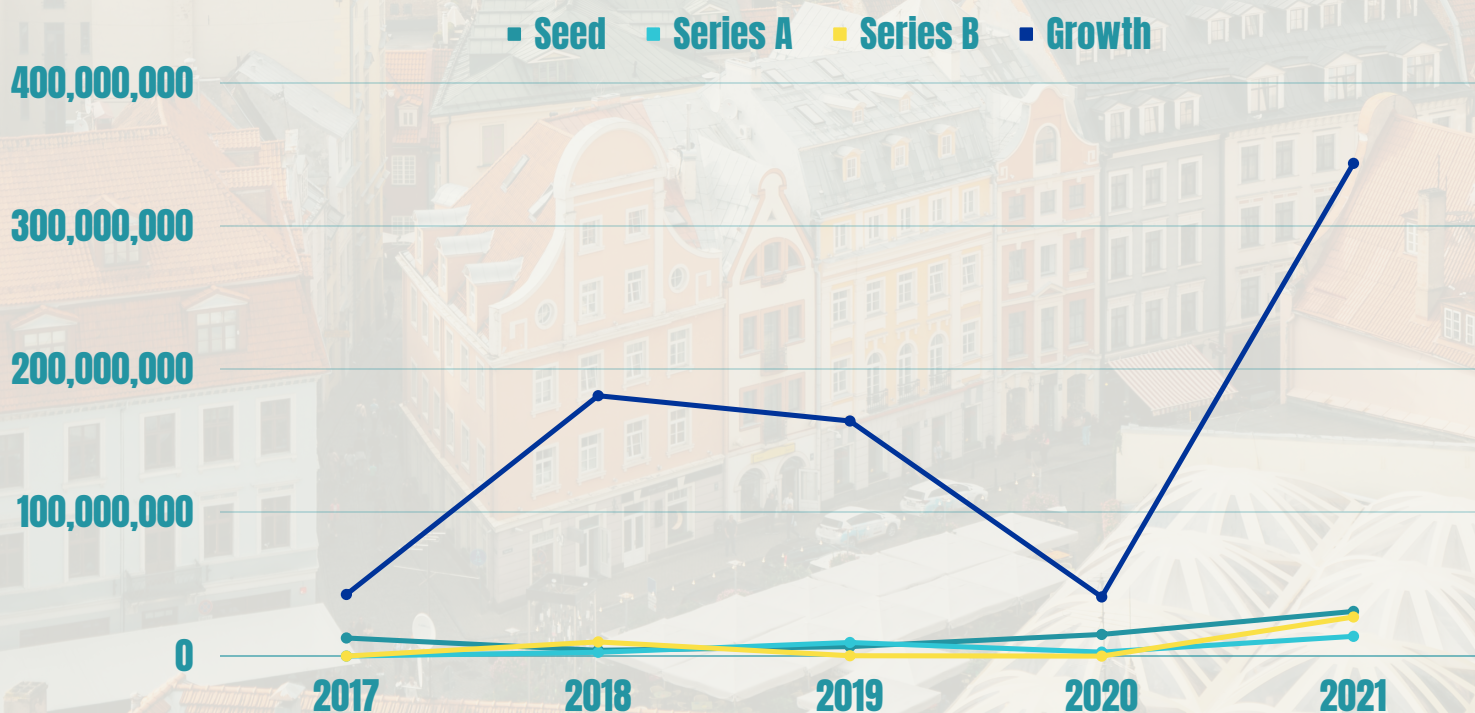


Figure 8. Amounts invested in Baltic cleantech startups by stage, 2017-2021

4 POLICY & SUPPORT MEASURES

The EU has set an ambitious target to achieve climate neutrality and an environmentally friendly economy by 2050. Figure 9 presents the main goals of the Baltic countries in the area of green transition, climate and green policy.

GREEN TRANSITION GOALS OF BALTICS

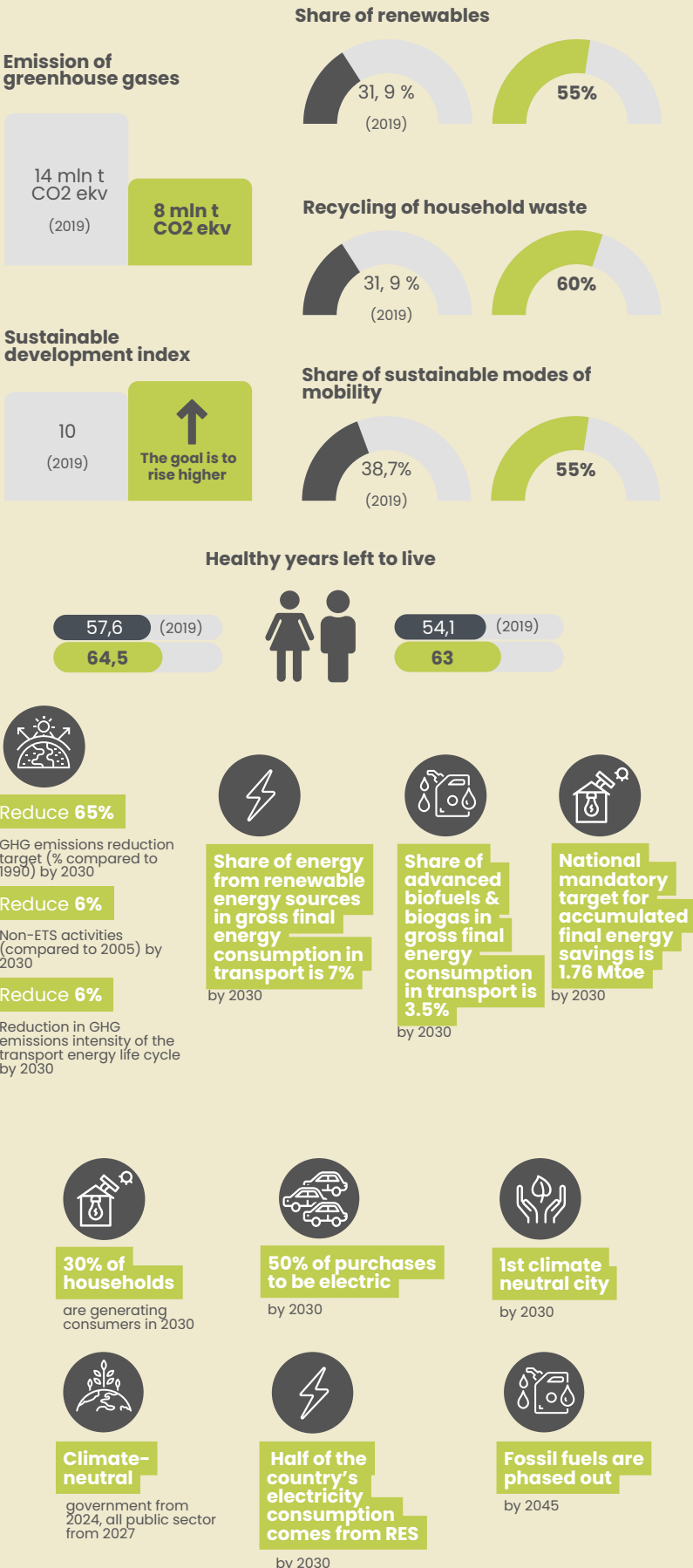
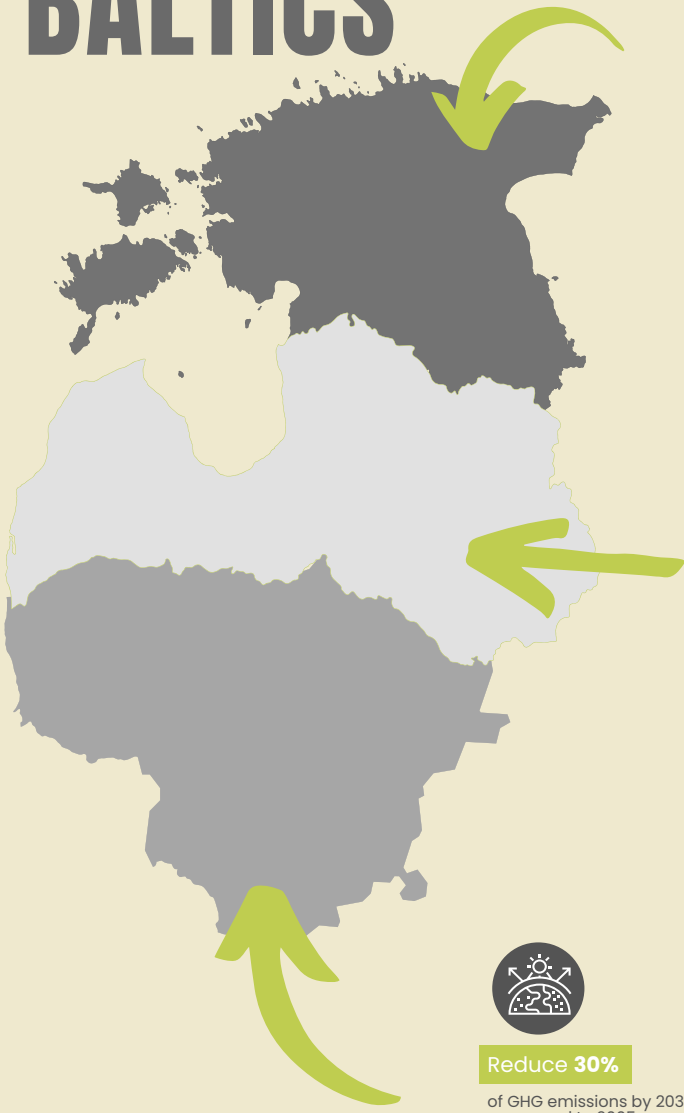


Figure 9. Overview of Baltic green policy goals

POLICY & SUPPORT MEASURES

ESTONIA

The policy narrative related to clean technologies in Estonia has been built around the green transition.

Most of the measures specifically dedicated to cleantech [5] from the past five years are related to increasing resource efficiency, digitalization of industry, renewable energy and enabling the transition from oil-shale-based [6] electricity production and industry to a more resource-efficient and renewable one. This is in line with the country's high competencies in ICT and probably the biggest sustainability problem in oil shale-based electricity production.

However, energy storage, seen as a significant obstacle and an opportunity in a world of increasingly unmanageable renewables, has not received much attention under support measures.

The study did not find any open measures for storage. Some measures can be found under the roadmap of focus areas of the new Research, Development, Innovation and Entrepreneurship Strategy 2035, however these have not yet been ratified by the parliament.

During 2021-2027 around 340 million euros are planned for "Just Transition Estonia" - the green transition of the North-East Estonian industrial area where the oil shale industry has been the primary source of employment from the beginning of the 20th century.

There are around 15 state-level strategic documents related to the cleantech area (Figure 9). The central ministries responsible are the Ministry of Education and Research, the Ministry of Environment, the Ministry of Economic Affairs and Communications and the Ministry of Rural Affairs. Under the state-level strategic documents, there are around eight programs for 2022-2025 dedicated to clean technologies with over 30 measures from 2014 to 2027 and a fixed budget of about 526 million EUR dedicated directly to cleantech. A further 70+ million is still in the application phase, with most of the funding coming from the different EU funds (RRF, ERDF, SF, SF21+, Emissions Trading Scheme (ETS), etc.) (see Figure 10).

However, if looking more broadly at the EU Funds, Estonia will receive around 2.5 billion EUR in 2021-2027 for the green transition. In terms of the RRF, Estonia will receive approximately 863 million EUR in total in 2020-2026, of which 57% (~492 million EUR) goes for clean and green activities (20 % for the digital transition and 37% for achieving climate goals). From EU SF, Estonia will receive 3,37 billion EUR in total in 2021-2027, of which 59% (~1,99 billion EUR) goes for clean and green activities [7].

The Center for Environmental Investments, the Estonian Business and Innovation Foundation (uniting Enterprise Estonia, KredEx and SmartCap) and the Agricultural Registers and Information Board are the institutions that manage the support programs and measures, organize the calls, the evaluation of applications, allocation of funding to projects meeting the requirements, support for implementing the projects and reporting.

OVERVIEW OF ESTONIAN POLICY DEDICATED TO CLEANTECH

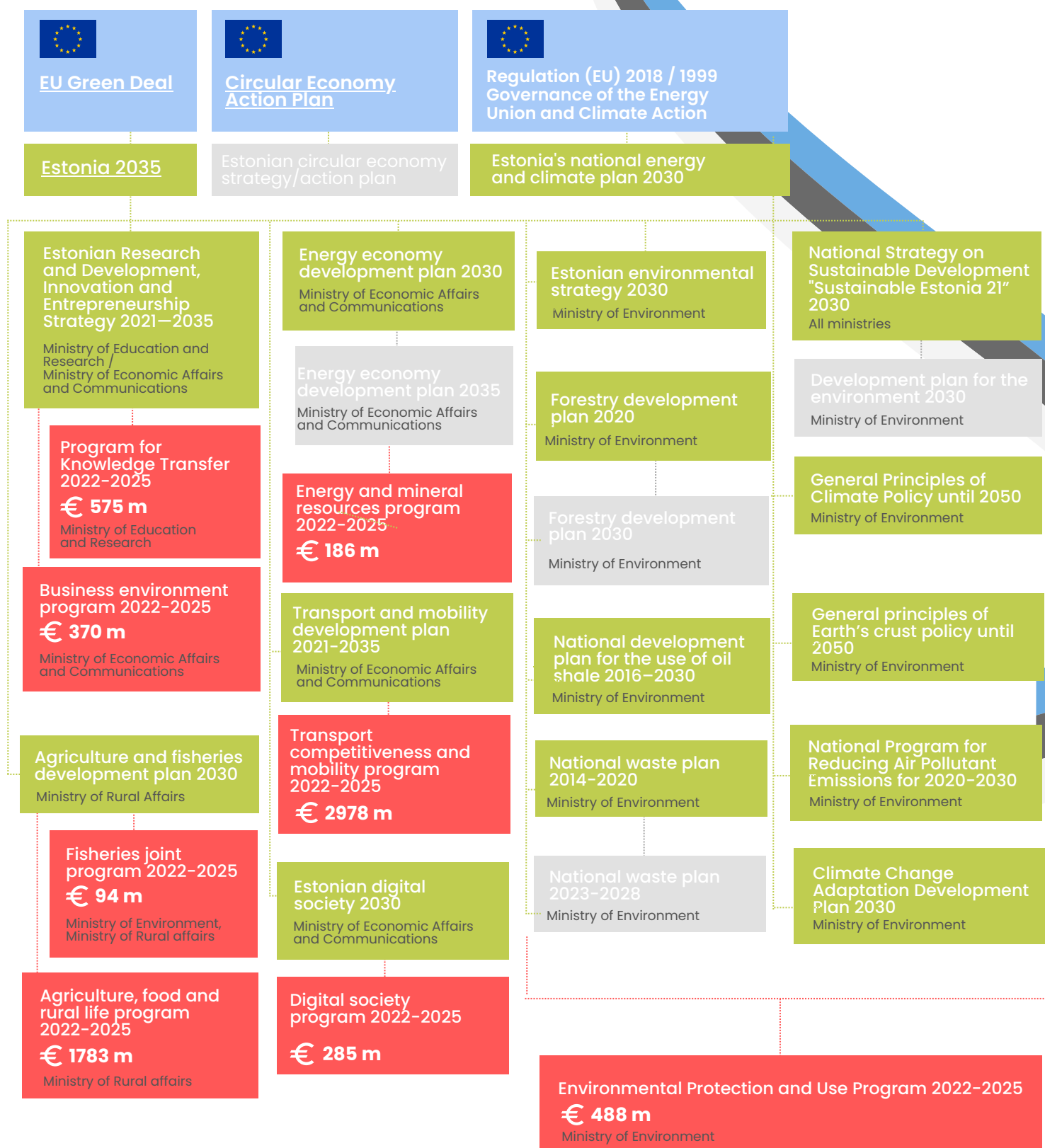


Figure 9. Overview of current strategic policy documents and programs related to cleantech in Estonia (Green - state-level strategic documents; Red - programmes; Grey - under development; Blue - EU)

OVERVIEW OF ESTONIAN SUPPORT MEASURES DEDICATED TO CLEANTECH

Center for Environmental Investments (2014–2027, 121M EUR + 68.5M EUR)

- **Green technology development programs** (2021–2027, RRF, 8.38)
- **Resource efficiency of companies** (2022–2026, RRF, 13.8M)
- **Resource efficiency of companies (investments and audits)** (2017–2023, ERDF, 80.5M)
- **Circular economy program** (every year, State budget, 1.4M)
- **Negavatt idea competition** (2014–, State budget, 0.9M)
- **Climate policy goals of developing countries** (2018–, ETS, 4.8M)
- **Support measure for the organization of development programs related to green technology** (2021–, ETS, 0.25M)
- **Waste recycling and preparation** (2014–2020, ERDF, 10.5M)

- **Resource efficiency of companies** (2023?, RRF, 9M)
- **Resource efficiency of companies** (2023?, SF21+, 34.5M)
- **Increasing recycling capacity and ensuring safe material circulation** (2023?, SF21+, 25M)

Agricultural Registers and Information Board (2019–2027?, 21.5M EUR)

- **Bioresource valorization measure** (2022–, RRF, 13.8M)
- **New products, processing methods and technologies in the agricultural, food and forestry sector** (2021–, EAFRD, 4M)
- **Fisheries Innovation Unit subsidy** (2019, 75% EMFF & 25% Estonian state budget, 1)
- **Fisheries innovation subsidy** (2020, 75% EMFF & 25% Estonian state budget, 1)
- **Aquaculture Innovation Unit subsidy** (2019, 75% EMFF & 25% Estonian state budget, 0.73M)
- **Aquaculture innovation subsidy** (2020, 75% EMFF & 25% Estonian state budget, 1)

Other (2016–, 34+M EUR)

Estonian Research Council

- SMART – applied research of smart specialization (2016–2020, ?, 18M)

FinEst Centre for Smart Cities, TalTech

- Smart city pilots (2020–, H2020 + State budget, 15M EUR)

Tallinn Science Park Tehnopol

- Urban Tech (2021–2024, H2020, 1M for pilots)

Enterprise and Innovation Foundation (2014–2027, 349M EUR + n/a)

- **Applied Research Program, Greentech Call** (n/a, State budget, n/a) total budget 51M EUR
- **Business model transition (greening) subsidy for manufacturing company** (2022–, RRF, 8.7M)
- **Industry digitalization and automation subsidy** (2022, State budget, n/a)
- **Digital transformation subsidy** (2021–2027, RRF, 56M)
- **Digitalization roadmap subsidy** (2014–2020, SF, 1.5M)
- **Ida-Viru business investment subsidy** (2022–2027, SF, 153M)
- **Horizon Europe Partnership "Key Digital Technologies"** (2022–2025, State budget, 2.4M)
- **Estonia – Norway "green ict" cooperation program** (2014–2022, Norway Grants, 27M)
- **Green Fund (investments into funds and companies)** (2022–2026, RRF, 100M) managed by SmartCap

- **Greentech visits** (export and foreign investment) (n/a, SF?, n/a)
- **More favorable conditions on green issues in the new RE loan and guarantee services** (n/a, InvestEU, n/a)
- **Increasing the share of green technology investments in the direction of foreign investments** (idea phase)
- **Development of green technologies, more sustainable sectors and ecosystems in Estonia** (idea phase)

EU Other (open for all EU)

- **LIFE program** (2020–2027, LIFE, 5400M)
- **LIFE program** (2014–2020, LIFE, 6000M)
- **EU Innovation Fund (IF)** (2020–2022, ETS, 5500M)
- **Structural Funds, Circular Economy** (2014–2027, SF; ?)
- **"Circular Economy" Kick-Start competition** (2021, ESA Space Solutions, n/a)
- **EC C-Voucher** (n/a, Horizon2020, 6M)

Figure 10. Overview of support measures dedicated to cleantech in Estonia (2014–2027) (Grey - under development)

POLICY & SUPPORT MEASURES

LATVIA

In Latvia, the green policy narrative has been developed around digitalization and an effective switch to implementing energy efficiency measures in the last years, with support mechanisms tailored towards energy efficiency and increased energy independence peaking in 2022.

However, none of these measures translates specifically to cleantech innovation support (except for [Norway Grant Scheme](#)). Instead, the innovation movement is addressed and supported by general measures. Moreover, the study did not identify measures for hydrogen energy, which has been discussed in other Baltic countries. However, digital transformation guidelines are expected to act as a catalyst for digital societal breakthroughs and strengthen innovation.

ICT is historically a vital sector for Latvia in general, and especially for Latvian startups. This, in combination with support to establish Digital Innovation Hubs (EDIH), can be expected to drive digitalization further while providing horizontal support for cleantech sub-sectors. This may also help the targets found throughout the policy documents to support an increase in productivity and R&D investments currently lacking.

Latvia's "SME competitiveness support", programme, along with other activities, significantly boosted startup development and investments: 15 business incubators with 32,8 million EUR, VC funding programmes with 60 million EUR and accelerators with 15 million EUR were implemented.

Around nine strategic documents address green and clean technologies (Figure 11). The most relevant is the National development plan for Latvia 2021-2027 (NDP2027) that entered into force in 2020. From a sectoral perspective, recent policy guidelines can be highlighted: the National Industrial Policy Guidelines 2021-2027 (Ministry of Economics), Guidelines for science, technology development and innovation 2021-2027 (Ministry of Education and Science) that are relevant to the cleantech sector as these govern the later on implemented support measures for entrepreneurial support and scientific support.

Important to highlight is the "Latvian National Energy and Climate Plan 2021-2030" adopted in 2020: while climate targets are defined and laid out, the strategy focuses highly on natural gas and misses aspects like the potential of hydrogen power and its horizontal value in decarbonising various sectors and its potential as energy storage for renewables. Therefore, the plan should be revised to match the current trends of the energy sector and support energy independence. Within the previous planning period (2014-2020), Latvia received roughly 4,4 billion EUR support as part of the ERDF, ESF and CF funding programmes (Figure 12). Support mechanisms within these programmes are now in their final phases. While exclusive funding for the cleantech sector was not implemented, the framework supported entrepreneurship and innovation in general. As a result, cleantech ventures were able to implement their activities using this channel.

Regarding current funding and support programmes, Latvia will receive around 1.82 billion EUR in total in the RRF. Of this, 57% (~492 million EUR) goes to clean and green activities (20% for the digital transition and 37% for achieving climate goals). In EU SF, Latvia will receive 4,3 billion EUR (0,7 billion EUR national co-financing) in 2021-2027, of which 47% (~2,36 billion EUR) goes to clean and digital activities.

OVERVIEW OF LATVIAN CLEANTECH POLICY

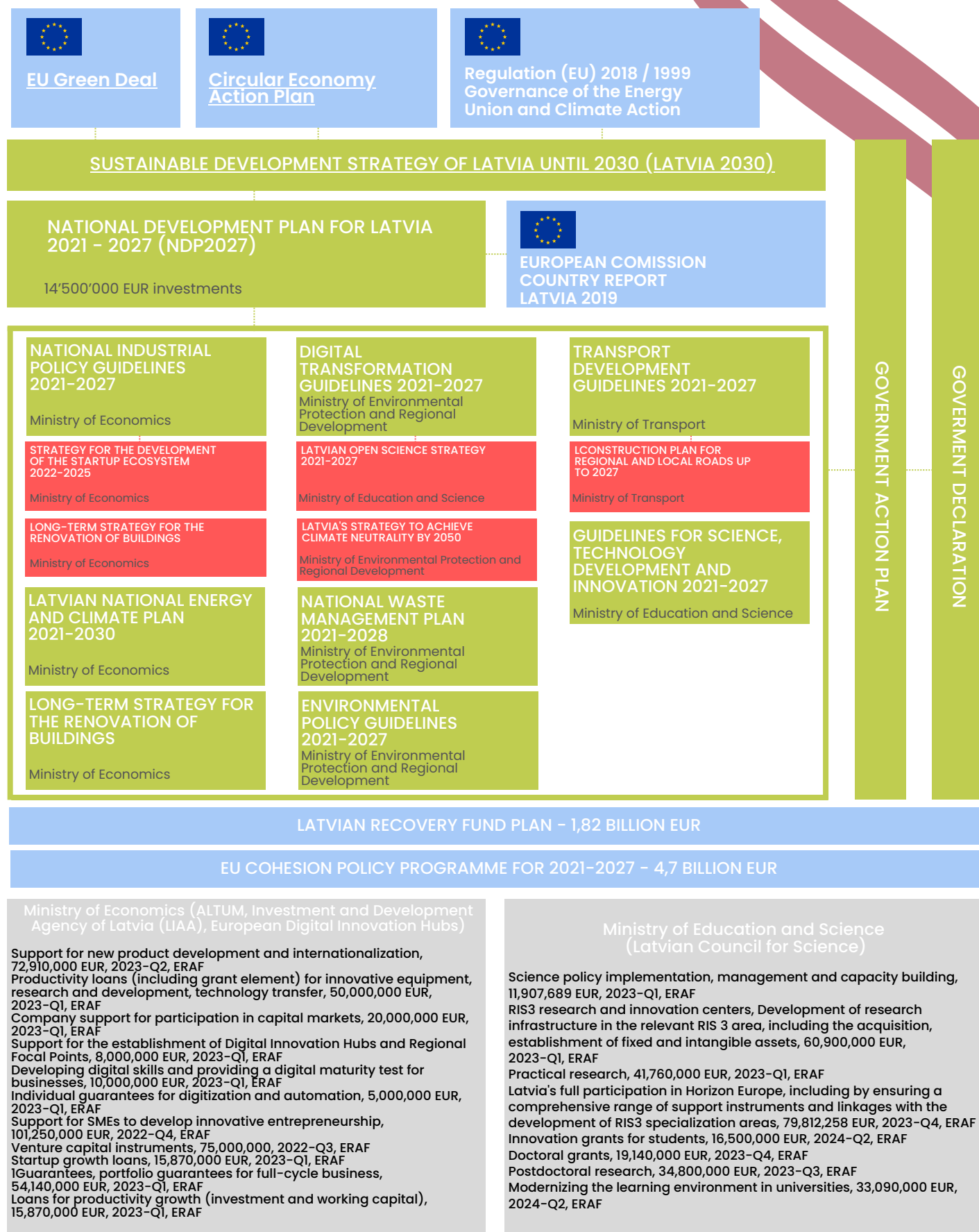


Figure 11. Overview of current strategic policy documents related to cleantech in Latvia

OVERVIEW OF LATVIAN SUPPORT MEASURES DEDICATED TO CLEANTECH

2014-2020 PLANNING PERIOD

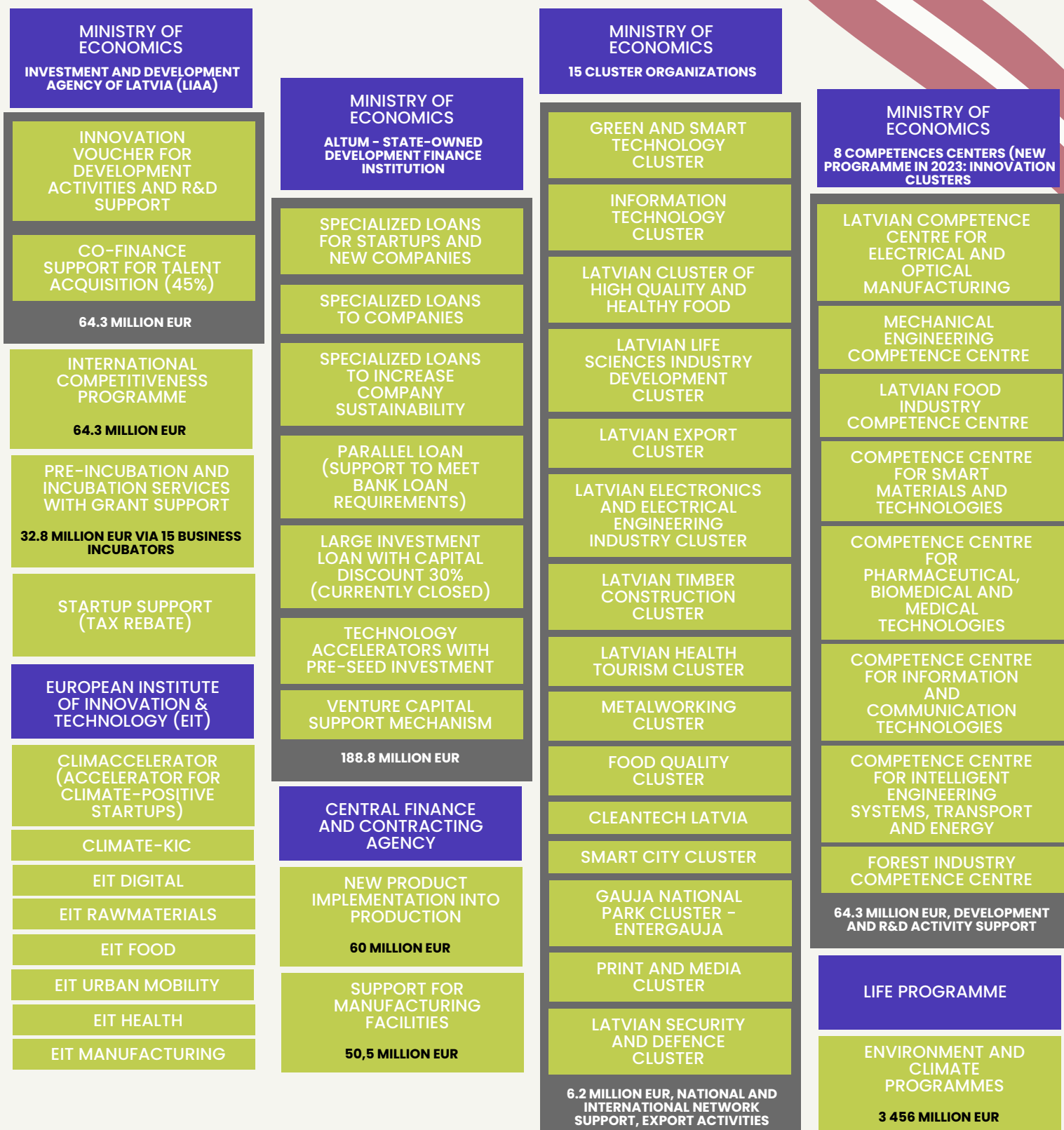


Figure 12. Overview of support measures dedicated to cleantech in Latvia 2014-2020 planning period

POLICY & SUPPORT MEASURES

LITHUANIA

In Lithuania, the green policy narrative focuses on decarbonisation. Consequently, energy, transport and industry sector measures are the most prevalent as GHG emissions are highest in those sectors.

Smart specialisation strategy for Lithuania also identifies innovation in these areas as a priority for the country's economy and competitiveness.

Striving for climate-related objectives prioritises investments to develop a low-carbon, competitive, socially just economy, create new "green" jobs and implement eco-innovations. For example, in the energy sector, Lithuania has a clear strategy to increase the local generation of RES and become a net-exporting country, compared to one-third of domestic production in 2022. Along with this shift, the development of novel technologies in the energy sector is foreseen (e.g. green hydrogen).

The industry sector was lagging, but digitalisation significantly increased in the past three years by developing local Digital Innovation Hubs and channelling additional EU funding. In addition, the circular economy is gaining momentum, especially in industry. The transport sector is also in the spotlight as it emits the most GHG in Lithuania. However, most of it is direct investments to electrify transportation, but this sector lacks innovation-related funding mechanisms.

The analysis identified support measures (see Figure 14) with a budget of 1 740 million EUR that can directly be linked to green and clean technologies. In addition, another stream of funding allocating 63 million EUR for decarbonisation programs will be launched in 2023.

However, in the 2021-2027 funding period, Lithuania will receive almost 100% more funding for innovation and digitalisation and around 50% more for green transformation than the last funding period.

As for the public sector, there is an ambitious target to become climate-neutral by 2027. As part of this ambition, the Government has decided that starting in 2023, 100% of public procurement will be "green." The road to this decision was already paved, as 50% of purchases had to follow the Green Public Procurement principles in 2022. And as early as 2011, the Ministry of Environment had set environmental criteria for the goods, services, and works purchased by the public sector, which is a significant consumer if considering critical infrastructure, construction, education, health, and other public domains.

According to the Lithuanian policy review, over 21 documents (including national strategy, strategic/programming/activity level planning documents) broadly related to clean technologies were identified (see Figure 13). The leading government institutions responsible for long-term climate and innovation policy are the Ministry of Environment and the Ministry of Economy and Innovation. In addition, the Ministry of Energy and the Ministry of Education, Science and Sport have few relevant long-term goals and objectives related to clean technologies.

Under the state-level strategic documents, eight programs deal with clean technologies. The most relevant ones seem to be National Strategy for Climate Change Management policy, the National Energy Independence strategy, the National smart specialisation strategy, and upcoming programs for Industry decarbonisation. Most of the financial support comes from the EU European Regional Development Fund (ERDF) and Recovery and Resilience Fund (RRF) (Figure 14). In addition, private funding accounts for roughly 20% of the total measures' budget.

OVERVIEW OF LITHUANIAN CLEANTECH POLICY

NATIONAL STRATEGY
(~20 YEARS)

STRATEGIC LEVEL PLANNING
(~10-20 YEARS)

ACTIVITY LEVEL PLANNING
(SHORT TERM 2-4 YEARS)

PROGRAMMING LEVEL PLANNING
(4-10 YEARS)

ACTIVITY LEVEL PLANNING,
NON-BINDING
(LONG TERM ~10 YEARS)

OTHER DOCUMENTS
(RESEARCH, ANALYSIS,
LAWS AND LEGISLATION)

Progress Strategy "Lithuania 2030" (Multi)

In 2012 over a thousand ideas have merged into a solid document outlining the development of the country for the next twenty years.

Progress Strategy "Lithuania 2050" (Multi)

Expected in 2023

2018-2023 National Energy Independence Strategy (Energy Min)

- Start exporting energy technologies
- Tech and innovation incubators
- Synergy between science and business
- 2030 - 70% domestic energy
- 2030 - 45% RE

National Research and Innovation Smart Specialization Strategy 2021-2027 (Economy and Innovation Min)

- Key areas:
- Agro innovation and food technologies;
 - Energy and sustainable environment;
 - Novel production processes, materials and technologies;
 - Transport, logistics and information and communication technologies

2021-2050 National Strategy for Climate Change Management Policy (Env. Min)

- A growing sector of RES producers and developers
- Local biofuels and biomethane are being developed
- The green hydrogen industry is being developed
- Creating a circular economy
- Growing public and private investment in green innovation

2021-2030 National Progress Program (Multi)

- 2021-2030 National Progress Program (Multi)
- Goal 1: Develop research, technology and innovation to promote sustainable development and international competitiveness (25,8% allocated budget)
 - Goal 6: Mitigate Lithuania's impact on climate change and increase its resistance to the impact, improve the quality of the environment and promote resource efficiency (25,8% allocated budget)

2015-2030 National Environmental Protection Strategy (Env. Min)

- The Strategy covers four priority areas:
- The sustainable use of natural resources and waste management
 - Mitigation of climate change and adaptation to environmental changes caused by climate change.

Lithuania's 18th Government programme

- Competitive innovation system
- Resilient energy infrastructure
- Circular and climate neutral economy
- Green energy
- Society as partner towards the Green Deal goals

2022-2030 Program for Economic Transformation and Competitiveness (Economy and Innovation Min.)

- Reorient industry towards climate neutral economy
- Encourage advanced technology and innovation development, adoption and expansion
- Encourage entrepreneurship and growth of enterprises

2022-2030 Program for Energy Development (Ener. Min)

- Expand the competitiveness of energy sector
- Increase energy production, energy resources and energy consumption efficiency and the use of renewable energy resources

2022-2030 Program for Science Development (Science, Edu, Sport Min.)

- To promote the business interested in R&I; encourage cooperation between science and business; develop an entrepreneurial culture in science and study institutions

2022-2024 Strategic plan of Ministry of Economy and Innovation

- 1.1 Encourage companies to move towards a climate-neutral economy
- 1.2 Encourage industrial companies to increase the use of renewable energy resources by partially financing projects
- 2.1 Implement mission-based science and innovation programs (#2 mission: Smart and climate neutral Lithuania)
- 2.2 Organise R&I encouragement activities
- 2.3 To participate in international and national R&D and innovation programs
- 2.4 To encourage companies to invest in scientific research, experimental development and innovation
- 2.5 Increase the productivity of small and medium-sized enterprises and encourage the introduction of eco-innovations
- 3.1 Implement measures to promote entrepreneurship and company growth

2022-2024 Strategic plan of Ministry of Energy

- 1.1 Deploy advanced technologies, gradually reducing the use of fossil fuels, prioritizing hydrogen technologies
- 1.1 Promote energy efficiency improvement projects
- 2.2 Promote the use of renewable energy resources for energy production
- 2.3 Promote the development of renewable energy resources, increase energy efficiency, research and experimental development in the renewable energy sector

2022-2024 Strategic plan of Ministry of Education, Science and Sport

- 1.1 Implement mission-based science and innovation programs (#2 mission: Smart and climate neutral Lithuania) [shared with Ministry of Economy and Innovation]
- 1.2 To implement projects promoting scientific research, technological development and innovation

National Energy and Climate Action Plan (2021-2030) (Multi)

- To ensure the quality and sustainability of the use of natural resources
- To improve the competitiveness of the energy sector
- To increase the consumption of renewable and alternative fuels in the transport sector and promote sustainable intermodal mobility
- To increase the share of renewable energy sources in domestic energy production and gross final energy consumption

Action Plan For The Strengthening Of The Innovation Ecosystem In The Energy Area (2020-2030) (Ener. Min.)

This plan sets out more than 50 measures to develop and strengthen the energy innovation ecosystem in the areas of infrastructure, human resources, products and services, the regulatory environment, science and technology. The measures set out in the action plan should contribute to the development of new businesses, including the use of hydrogen in energy, industry and transport.

Action plan for Lithuania's transition to a circular economy by 2035 (Multi)

The planned measures include the development of systems, knowledge and solutions supporting the circular economy, the formation of demand for circular products, promoting industrial transformation and technological renewal, and the use of environmentally friendly and friendly raw materials.

Recommendations For Lithuania's Sustainable (Green) Finance Action Plan (2021) (Multi)

Create a sustainable finance ecosystem which assures smooth interaction between private financial market players and public bodies

Roadmap For Lithuania's Industrial Transition to Circular Economy (2021) (Multi)

Long term goals: Circularity; Climate neutrality; Ensuring competitiveness

2021-2026 New Generation Lithuania (Multi)

30 measures. 37.8% of the plan will support climate objectives and 31.5% of the plan will foster the digital transition.

Circular Economy progress measures and solutions (2021) (Multi)

Policy recommendations for Circular Economy progress in Lithuania

Legal acts related to cleantech (Multi)

Law on Lithuanian Technology and Innovation
Law on R&D&I (Smart Specialisation)
Law on Energy from Renewable Sources
Law on Small and Medium Size Enterprise Development
The Republic of Lithuania Patent Law

Figure 13. Overview of current strategic policy documents related to cleantech in Lithuania

OVERVIEW OF LITHUANIAN FUNDING DEDICATED TO CLEANTECH



Figure 14. Overview of current and coming support measures dedicated to cleantech in Lithuania

POLICY & SUPPORT MEASURES

TOWARDS A REGIONAL APPROACH TO FOSTERING CLEANTECH PROGRESS

While looking at the Baltic cleantech ecosystem and policy, it is interesting to note that the current support measures are not totally in line with the most rapidly developing cleantech subsectors.

In Lithuania, the policy is very much focused on decarbonization, and there are no concrete measures for cleantech startups, but the most flourishing subsector is the environment and resources.

In Estonia and Latvia, the match is better observed as the policy is focused on energy efficiency, digitalization and green transition, and the most advanced subsectors are transport and logistics and energy and power.

As startups often receive funding and business development support from European initiatives (e.g., Climate KIC, KIC InnoEnergy), the alignment between state-level policy focus and the frontrunners in business might not be that clear. Furthermore, the findings show that there is also some match between global trends (e.g., transport and logistics, smart city solutions, circular economy solutions). However, areas like hydrogen and storage that probably need more resources in RDI and commercialization are underrepresented.

Fortunately, all the Baltic countries are developing and drafting new and more specific support measures for cleantech with the help of EU funds (RRF, SF21+, Horizon Europe).

POSITIONING THE BALTICS AS A EUROPEAN CLEANTECH POWERHOUSE

The region stands out with high competencies in ICT, transport and logistics and renewables. This combination of sectors and collaborative innovation in these sectors can be seen as a critical enabler of the ongoing green transition. This is because transport, energy and manufacturing are the sectors that use the most mineral resources and produce the most emissions. Therefore, it also needs more efficiency and innovation enabled by ICT. However, this is an apparent strength at regional but not at individual country levels as the competencies are scattered among Baltic countries, as presented below.

Estonia is well-positioned to build on its relatively advanced engineering (mechanical/electrical) and ICT education, supportive startup ecosystem and e-governance competencies.

Developed sectors such as energy and power, and transport and logistics, benefit from those two traits the most, as there is an abundance of available data that innovators can use to either build products and services or test out existing products (e.g., the [Estfeed](#) energy data exchange platform).

City municipalities collaborate with different innovation projects and have an "open door" policy," encouraging innovators to work together (Tartu city, Tallinn city) and use their infrastructure to help the city evolve. These activities can all be allocated under smart city developments, which can be seen as an implementation of cleantech in the city environment and relevant solutions (e.g., see the activities of the [FinEst Centre for Smart Cities](#)).

Policy-wise, Estonia seems to be going into the double-helix transition (green+digital) that encourages more ideas and innovations from this perspective.

In **Latvia**, the transport and logistics sector can be highlighted with various startups focusing on EVs, alternative fuels, intelligent transport systems, and drones. With further support for the sector, Latvia could establish itself as a leader with a broad technology portfolio that can power the decarbonization of the transport and mobility sector in Europe and beyond.

The energy sector's potential could be further exploited with specific measures that will enable technology and related innovation development, for instance, clean hydrogen technologies. This could be achieved by focusing state research programmes to prioritise hydrogen research and development. Further enhancing measures for creating industrial parks and excellence centres are needed to provide the necessary infrastructure and support for startups and companies acting in this space. These activities could be coupled with the pan-Baltic potential and collaboration potential between the three Baltic countries.

Latvia's traditionally strong ICT sector, along with current digitisation efforts that are supported both by funding of EU SF and RRF and by implementing EDIHs, can accelerate sectors like smart energy, smart city or smart mobility that extend well into cleantech. With the

POSITIONING THE BALTICS AS A EUROPEAN CLEANTECH POWERHOUSE

additional implementation of innovation areas, testbeds and sandboxes for technology validation, focusing on the same sectors, accelerated startup development and investments may emerge. Excellent examples are the VEF innovation district supported by VEFRESH, where corporations, startups and the public sector can prototype and test their latest solutions in public space.

Furthermore, Riga Technical University's hydrogen activities should be highlighted. The university is equipped with experimental hydrogen labs, runs related research programmes and is planning a cleantech campus and pilot areas.

The renewable energy industry is the most prominent in **Lithuania**. This developing industry is also driving demand for innovation in this sector. The vast amount of public and private sector support to install, buy or lease solar power plants means suppliers cannot fulfill their order books. As of October 2022, all Lithuanians can rent remote wind power online - the first program of its kind in the world.

What's more, seeking complete independence from Russian gas in response to the war in Ukraine and its repercussions, Lithuania has completely abandoned Russian oil, gas, and electricity since April 2022. All Lithuanian gas demand is satisfied through the Klaipeda liquefied natural gas terminal. In addition, most Lithuanian cities went from gas, used for district heating, to biomass, which is generated by the local forestry industry.

All that was achieved in record time, mainly resulting from the robust [National Energy Independency Strategy](#) adopted by the Lithuanian Parliament in 2012 (updated in 2018).

The next step in developing the Lithuanian energy sector is the urgent expansion of RES (offshore and onshore wind and solar parks) and the development of hydrogen and its application technologies. Green hydrogen can be produced by electrolysis, using electricity generated by wind or solar energy to split water into hydrogen and oxygen. It will play a key role in decarbonising sectors where other alternatives may not be feasible or are more expensive. After Lithuania successfully implemented significant strategic energy projects and established and developed individual energy branches, Lithuanian energy companies, business enterprises and research and education institutions have accumulated outstanding competencies in solar energy, biomass, geothermal energy, liquefied and other areas, which are being further developed and strengthened.

Cities are also implementing their strategies, e.g. in 2020, Vilnius City set up an open platform, the "Intelligent Energy Lab", to pilot energy projects.

Furthermore, the regulation impacts cleantech innovation demand - 100 % of Green public procurement, the possibility to rent remote wind power plants, etc., are putting Lithuania in a solid position among green policymakers.

COLLABORATION TO POSITION THE BALTICS AS A ACROSS THE REGION EUROPEAN CLEANTECH POWERHOUSE

EACH OF THE BALTIC COUNTRIES HAS SECTORS AND AREAS THAT CAN BE HIGHLIGHTED AS EXAMPLES OF BEST PRACTICE

These learnings can be shared and adapted within the pan-Baltic perspective to allow a faster up-take of sectors between these countries and to scale them to the EU and global level. For example, Estonia and Latvia might be good at ICT, but their renewable energy sector is still under development, where learning from the Lithuanian example and experience might be essential. In addition, the Baltic countries often share a common view on EU policy areas. Closer collaboration and shared exchange between the three Baltic countries could also benefit the cleantech sector. A united discussion and voice in adapting and implementing regional projects, e.g., for the roll-out and acceleration of clean hydrogen and taking action to enable a hydrogen economy that would also kickstart new ventures in this sector for the Baltic region.

Another factor making the Baltics a cleantech powerhouse is the flexibility, adaptability, determination, and risk-taking courage of the small countries that make it up.

The willingness to develop, test, and adapt new technologies makes the Baltics attractive to forward-looking foreign investors, traditional sector pioneers, and innovators looking to test their inventions and prototypes in real-life conditions. The Baltics, which only emerged from Russian tyranny in 1990-1991, have a short history of democracy, innovation, and economic development but are already well-developed at the economic level. This rapid rise demonstrates the entrepreneurial mindset of the region.

THE BALTICS HAVE EVERYTHING THEY NEED TO HELP CLEAN TECHNOLOGIES AND INNOVATIONS REACH THE MARKET QUICKLY - TALENT, HIGH-SPEED INTERNET, INFRASTRUCTURE, AND A DEVELOPED INNOVATION SUPPORT ECOSYSTEM. ALL THESE ELEMENTS COULD MAKE THE REGION AN ATTRACTIVE TEST BED FOR INNOVATORS, WHERE TECHNOLOGIES AND NEW BUSINESS MODELS CAN BE TESTED FAST AND WITHOUT SIGNIFICANT LOSSES.

RECOMMENDATIONS

Based on the initial findings of the Baltic cleantech ecosystem study and related policy analysis, we propose the following five preliminary recommendations.

1 "Ensure all countries are on the same page when it comes to cleantech"

The countries should agree on the definition of cleantech and the sector in general (which startups and scaleups are included and which are not) to have a more accurate picture of the Baltic cleantech sector.

Furthermore, regarding policy and support measures, governments should take a similar, more aligned approach to account for the policies and support efforts that significantly affect the cleantech sector. Agreeing on definitions is the first step to a Baltic approach to fostering cleantech, allowing for the alignment of policies and support measures for maximum effect.

2 "Cleantech development needs an all-of-government approach."

The analysis of green policy goals, documents and measures in the Baltics reveals that, in every country, more coordination between ministries is needed. Climate policy and sustainable development are overarching areas that affect all sectors and therefore need central coordination - it is not just about innovation, climate, or energy. It is also about national finance, industrial strategy and employment. For example, in Estonia, the green policy is coordinated under the State Office with all the relevant ministries participating in the steering committee and a state-level green policy action plan under development.

In terms of more systematic policy making, the support measures dedicated to cleantech could be better linked with the higher focus area programs and the overarching development plans.

Sometimes it is hard to track from which program and funding source the measure comes. For example, EU funding is usually earmarked. Governments could do the same with the national budget, e.g., green expenditures in the national budget could be reserved for having a better overview of how much of the local taxpayer money is going for the green transition and development of the cleantech sector.

3 "Smarter regulation is needed, particularly to incentivise demand for cleantech innovation."

The three Baltic governments have a significant opportunity to stimulate demand for cleantech and innovation through regulatory mechanisms. Governments can lead by example to promote a green transformation. For instance, from 2023, public procurement will have to be 100% "green" in Lithuania. Similarly, Estonia has also adopted nonbinding national targets for green public procurement for 2021-2024. Furthermore, in 2022 the country established four product groups in which green criteria are compulsory, though none related to construction and road transport.

However, it is also clear that it will be challenging to rely on consumer and business awareness to switch to environmentally friendly goods, services or business models and that sooner or later, governments will have to make "inconvenient" tax decisions that will make non-sustainable products or services more unaffordable.

Furthermore, demand-side policies are needed to shape market conditions. In addition, though smart specialization has been a critical

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RECOMMENDATIONS

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approach in STI policies since 2014, from the business side, the need for more qualitative and concrete specialization was mentioned to become leaders as countries and regions in trendy areas like batteries, hydrogen, carbon capture, utilization and storage, sustainable materials, etc.

However, it must be noted that not always more regulation is the best way forward. For example, the energy, environment and transport sectors are sometimes over-regulated, hindering innovation and business activity. Therefore, this report calls for more thoughtful and better-coordinated regulation for accounting for security, environmental, innovation, and business interests.

4 **"More pan-Baltic cooperation and information dissemination between the Baltics"**

There are already some functioning pan-Baltic programs (e.g., the Norwegian green ICT program and EIT Climate-KIC activities). Still, there is limited knowledge of successful projects in the individual countries on what is happening in the other two. Therefore, the information and know-how dissemination and sharing could be improved through collaborative platforms and used as a tool for pan-Baltic acceleration and support activities. These acceleration and support activities can streamline and facilitate the regional development of startups.

Furthermore, pan-Baltic acceleration programmes would further help validate clean technologies and business models (especially cleantech and climate tech) as quickly as

possible and provide a quick way to qualified investments that can reduce time to market.

5 **"Let's make the Baltics testbed a win-win situation for all parties"**

What has been observed over the past few years working with startups, foreign investors and corporations developing key enabling technologies are that the Baltics are often chosen for the testing and validation of specific products or services. On the one hand, each country individually is a relatively small market, so even unproven solutions for corporations developing innovations have very low repercussions. On the other hand, the Baltics, both politically and economically, can be described as a startup if not a scaleup - the region is agile, entrepreneurial, adaptable, fast response to changes in the global markets, and embrace innovation activities at all levels.

Therefore the "Baltic testbed" - a win-win situation for all parties - should be encouraged and enhanced.

7 REFERENCES

[1] <https://civitta.com/articles/the-baltic-startup-scene-today-s-realities-tomorrow-s-possibilities>

[2] <https://dealroom.co/uploaded/2022/11/Dealroom-GoogleAtomicCredo-CEE-2022.pdf?x84064>

[3] <https://www.tehnopol.ee/wp-content/uploads/2015/01/Emergence-of-the-Clean-Technologies-Sector-in-the-Baltic-Sea-Region.pdf>

[4] Under cleantech we consider technologies that are cleaner, environmentally friendlier, more energy and resource efficient and produce no or less waste than their alternatives (Tõnurist et al., 2019, 24). For cleantech classification, the report uses the taxonomy developed by [Cleantech Group](#) where cleantech is divided between 6 main sub-sectors: agriculture & food, energy & power, enabling technologies, materials & chemicals, resources & environment, transport & logistics.

[5] It is interesting to note that greentech is more widely used in policy instead of cleantech, which is not at all mentioned at the policy level, it is more a business term and widely use in the startup and scaleup ecosystem. For more reading see - <https://startupestonia.ee/startup-database>.

[6] Oil shale is the Estonian national mineral resource that is used for producing electricity and heat. It has a lower calorific value than brown coal and therefore produces even more GHG emissions. Because of the same reason Estonia has been the most polluting country in the EU in terms of square meters and number of population. Read more at - <https://www.oecd.org/environment/estonia-should-reduce-its-oil-shale-reliance-for-greener-growth.htm>.

[7] 780 million € for “Greener Estonia”, 522 million € for “Smarter Estonia” (innovation, knowledge transfer, competitiveness measures), 342 million € for “More united Estonia” (environmentally friendly transport investments measures), 340 million € for “Just Transition Estonia” (Ida-Virumaa transition fund – 80% for “Diversified and smart business development” and 20% for “Attractive living environment”, + InvestEU “Just Transition” scheme and Public Sector Loan Facility) - see more at <https://fin.ee/riik-ja-omavalitsused-planeeringud/regionaalareng-ja-poliitika/ida-virumaa#iglane-leminek>

8 ANNEX 1. METHODOLOGY

For exploring the cleantech ecosystem, countries identified startups and scale-ups that have received investments in the past five years. In addition, key public and private organisations and stakeholders were identified according to their active role in the cleantech sphere. In terms of startups, their investments, deal counts and growth numbers (turnover, profit and number of employees) were studied from local investment databases, companies' annual reports, press releases and other sector analyses. Furthermore, a questionnaire was sent out to around 200 startups to get insights into how they see the sector's situation. However, due to the low response rate, it will be continued, and the data collected will be validated with sub-sector dives in the future. Besides, in Lithuania, additional interviews were done with 14 companies to understand the local cleantech situation better. The interviews/questionnaire included open-ended questions about the main growth challenges and opportunities for the cleantech companies, the sector in each country and the Baltics in general. Various national and regional strategic documents were analysed to understand the Baltic policies and support systems landscape that influences the cleantech sector, including long-term strategies, development plans, action plans, and support programs and measures for the past five years. Official pages of government institutions, including ministries and support agencies, were studied to gather the data. In addition, for data triangulation purposes, a keyword search in legislation databases ('Riigi Teataja in Estonia', 'POLŠIS - Politikas plānošanas dokumentu datubāze' in Latvia, 'Teisės aktų registras' in Lithuania) was conducted based on 'Boolean-search' principle in local languages (("sustainable" OR "green" OR "climate" OR "environment" OR "energy") AND ("innovation" OR "technology")). In addition to desk research, e-mail correspondence with around 15 local policy experts was conducted to triangulate, structure and systemise the collected data and receive hints for further analysis.

Several limitations of this study also need to be pointed out.

- The three countries have their specialities in terms of economic structure, business practices and policy development procedures that create problems with comparisons. Therefore, the country sections might differ a little but should still be generally comparable as they try to follow the agreed structure, research objects and methods.
- There are limits to data availability and quality. We acknowledge that the list of cleantech ecosystem participants and their characteristics, the policies, programs and support measures with their budgets for cleantech are not absolute. They should be taken as the first snapshot of the sector's situation and policy that will be updated and elaborated during the following quarterly reports.
- The concept "cleantech" itself poses some challenges for analysis as it is related to almost all other sectors (energy, agriculture, environment, resources, ICT, transport, etc.), and in essence, all efficiency and innovation-related improvements can be related to cleantech. Therefore, it needs to be stated that in Estonia and Lithuania, a more narrow approach to cleantech startups and scale-ups was taken. However, a broader view was used in Latvia, resulting in more companies being identified.
- Also, locating the ones addressed to cleantech was a bit complicated regarding policy and support measures. For example, there are not that many specifically cleantech-dedicated support programs and measures in Latvia and Lithuania. In this case, other business development and research, development and innovation (RDI) measures were also taken into account.

About Cleantech for Baltics

The objective of Cleantech for Baltics is to establish a coalition as a strong community of start-ups, scale-ups and investors across the Baltic states that can act as the unified voice of the cleantech sector, inform and engage with policymakers and raise the profile of the topic in the regional public debate. The coalition will also promote regional collaboration and raise the profile of Baltic cleantech at the EU level.

It is an initiative by Cleantech Estonia, Greentech Cluster Latvia and Sunrise Valley Science and Tech Park.

About Breakthrough Energy

Breakthrough Energy was founded by Bill Gates in 2015 to accelerate the clean energy transition and help the world reach net-zero emissions by 2050. Through investment vehicles, philanthropic programs, policy advocacy and other activities, Breakthrough Energy is committed to scaling the technologies the world needs to meet its climate goals.

About Cleantech for Europe

Launched in 2021, Cleantech for Europe represents the trailblazers developing, deploying and investing in clean technologies across the EU. Our mission is to make cleantech a strategic priority in the EU by bridging the gap between cleantech and policy leaders. The initiative equips policymakers with insights about cleantech and builds coalitions to chart a new path for the continent.

Cleantech
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