

Scenarios for Export-Led Green Growth in Estonia

Data-Driven Roadmaps for Catalyzing Green Growth in Eastern Europe

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EXECUTIVE SUMMARY

This research examines economic development opportunities arising for Estonia from Europe's green industrial transition by analysing trade patterns, technological capabilities and import dependencies in low-carbon and environmental goods. Combining qualitative scenarios with quantitative export-potential analysis, the report explores how geopolitical fragmentation, technological competition, energy insecurity and the green transition may reshape Europe's industrial development and Estonia's export opportunities in the coming decades.

The scenario analysis examines how Estonia's export-led green growth prospects may evolve under four alternative futures shaped by two critical uncertainties: the level of international policy coordination and the intensity of future energy-system shocks. Across all scenarios, Europe's green transition continues, although its pace, geography and industrial logic differ substantially.

In the ***Managed Techno-Globalisation*** scenario, stronger international coordination and moderate energy shocks support stable investment conditions, strategic trade and rapid diffusion of low-carbon and digital technologies. Estonia benefits from broad export markets and opportunities in industrial automation, smart infrastructure, analytical systems and specialised engineering.

In the ***Electrostates vs Petrostates*** scenario, severe energy disruptions accelerate electrification and deepen cooperation among countries seeking to reduce dependence on fossil-fuel suppliers. Estonia's opportunities become more concentrated within allied electrification systems, particularly in smart grids, control systems, monitoring technologies and infrastructure-resilience solutions.

In the ***Competitive Techno-Nationalism*** scenario, technological rivalry, export controls and industrial subsidies fragment global markets. Estonia's competitiveness depends on becoming a trusted specialist supplier within selected European and allied industrial ecosystems, particularly in precision instrumentation, AI-enabled industrial control systems and cyber-secure infrastructure solutions.

In the ***Defensive Regional Fragmentation*** scenario, severe energy shocks combine with weak international coordination, increasing the importance of regional resilience. Estonia's strongest role lies within Baltic–Nordic–Polish–German infrastructure systems, where reliability, servicing capacity and geographical proximity become key competitive advantages.

Across the scenarios, Estonia's low-carbon technology opportunities vary more by market context and strategic logic than by core product groups. Estonia's strongest opportunities lie in specialised engineering and infrastructure integration rather than scale-intensive manufacturing. The most promising areas are AI-enabled industrial control systems, smart electrical infrastructure, monitoring technologies and specialised machinery. More advanced activities in electronics, batteries and photonics depend more heavily on foreign investment and on integration into wider European industrial ecosystems. The main strategic risk for a small open economy is not betting on the wrong technologies. It is remaining optimised for a gradually disappearing world of stable geopolitics, frictionless trade and low-cost global supply chains.

The report translates these findings into a development roadmap for low-carbon technology exports. The IMF-defined set of low-carbon products is assessed at the detailed product level along four dimensions: existing export strength and revealed comparative advantage, relatedness to capabilities already present in the economy, product complexity and complexity outlook gain, and estimated export potential. The evidence distinguishes three action lines, which differ in their distance from Estonia's current capability base and therefore in the measures and time horizons they require. The detailed product-level indicators and market opportunities are available through green.goodtrade.ai.

The first and most immediate action is to scale existing export strengths: electrical control boards and integrated control systems, precision measurement and regulation technologies, electric motor, generator and transformer components, and specialised machinery and process equipment. Here, the objective for 2026–2027 is export scaling rather than diversification, through market expansion, certification, procurement access and deeper value-chain integration.

The second is to develop adjacent capabilities, where Estonia lacks an export position but is close to establishing one: electrical switching systems, physical and chemical analysis instruments, gas filtration and purification technologies, and specialised electrical measurement components. The horizon here is 2028–2034, and the instruments are applied R&D, demonstration projects, supplier development, and standards and certification support.

The third is to build a limited number of strategic platforms with high complexity and market potential but a larger capability gap, such as lithium-ion accumulators, multilayer ceramic capacitors, lasers and advanced optical instruments. Entry depends on foreign investment, technology partnerships, research and testing infrastructure, and European value-chain

integration; long-term capability building should start now, even if major export effects take several years to appear.

Three conditions cut across the scenarios. Competitiveness depends increasingly on implementation capability rather than on technology availability, with infrastructure deployment, engineering capacity, industrial digital skills and systems integration recurring as binding constraints, and a competitive and predictable electricity supply remaining a foundational condition under every scenario. Trusted-supplier status matters as much as the technology itself, resting on certification capability, cybersecurity competence and long-term servicing capacity.

Baltic–Nordic–Polish–German integration also becomes more important across all futures, since Estonia’s position within Northern European infrastructure systems favours participation in regional industrial ecosystems and strengthens its place in European value chains.

Upgrading is likely to proceed along two complementary routes: gradual expansion by domestic firms into adjacent engineering-intensive products, and foreign-investment-led entry into higher-complexity activities, where anchor investments may also build wider ecosystems of specialised suppliers, engineering firms and maintenance services.

We conclude that Estonia’s long-term competitiveness depends less on scale or cost competition and more on becoming technologically specialised, operationally reliable and hard to replace within European low-carbon industrial and infrastructure systems.

1. INTRODUCTION

The current report aims to identify strategic opportunities for Estonia's green industrial transition by analysing trade patterns, diversification capabilities, and import dependencies in low-carbon and environmental goods. At its core is a scenario-analysis framework that combines quantitative trade and industrial data with qualitative geopolitical, technological, and policy analysis, enabling policymakers and industry to design strategies under conditions of heightened uncertainty.

The export-led green-growth opportunities identified in this report sit within a large and rapidly expanding global market. According to the International Energy Agency, global manufacturing output of key clean-energy technologies - including electric vehicles, batteries, solar PV, wind technologies, heat pumps and electrolyzers - could increase from around 0.9 trillion euros in 2024 to approximately 2.1 trillion euros by 2035¹. These trends suggest that low-carbon technologies² may represent strategically significant export opportunities for Estonia, subject to existing export specialisation and capabilities for product diversification.

Earlier cross-country work under the project³ mapped the major trends and uncertainties likely to shape Europe's green transition over the coming decades. A subsequent country-level study examined how these trends and uncertainties affect Estonia's green transition and low-carbon-technology export potential⁴. The resulting uncertainty landscape includes geopolitical fragmentation, the future of the global trade regime, industrial competition between major powers, energy insecurity, supply-chain vulnerabilities, societal resilience under climate and security stress, and the growing interaction between decarbonisation, economic security and

¹ Energy Technology Perspectives 2026. Paris: International Energy Agency, 2026.

<https://www.iea.org/reports/energy-technology-perspectives-2026>

² The IMF defines low-carbon technologies as technologies that produce substantially lower greenhouse gas emissions than conventional alternatives across sectors such as energy, transport, industry, and buildings. This includes renewable energy technologies, energy efficiency solutions, electrification technologies, batteries, hydrogen, and carbon capture systems that support the transition to a net-zero economy. See: <https://climatedata.imf.org/>

³ Tiits, Marek; Tiik, Johanna Maarja; Kalvet, Tarmo; Koeppen, Marius; Vladimirov, Martin; Maki, Nadia; Arsani, Alina; Langkau, Sabine; Kunze, Sven (2025). Global Megatrends and Major Uncertainties for the Green Growth. Data-Driven Roadmaps for Catalyzing Green Growth in Eastern Europe. Tartu: Institute of Baltic Studies. <https://doi.org/10.23657/g3ec-7b90>

⁴ Tiik, Johanna Maarja; Tiits, Marek; Kalvet, Tarmo; Kuk, Johann Erik (2026). Estonia in the Context of Global Megatrends and Uncertainties for Green Growth. Tartu: Institute of Baltic Studies. <https://doi.org/10.23657/ibs.2026.2>

industrial policy. Together, these developments suggest that Europe's green transition can no longer be analysed solely as a climate-policy challenge. It increasingly depends on the stability of the international system, the resilience of energy and industrial infrastructures, and the ability of states to sustain long-term green investment under conditions of geopolitical and socio-economic stress.

2. METHODOLOGY

2.1. Scenario Framework

The scenario framework focuses on two external drivers that are simultaneously highly impactful, deeply uncertain, and outside Estonia's direct control. The first axis captures the degree of international policy coordination and geoeconomic fragmentation shaping global industrial, climate, and trade relations. The second captures the intensity of energy-system shocks affecting Europe, particularly disruptions linked to fossil-fuel dependence, geopolitical instability, and strategic competition in global energy markets.

Together, the axes reflect a central strategic tension shaping Europe's green transition: whether international coordination remains sufficiently strong to sustain industrial transformation under mounting geopolitical and energy-security pressures, or whether fragmentation and repeated systemic shocks increasingly undermine investment capacity, competitiveness, and long-term resilience.

The two axes were selected through a staged process combining earlier project analysis with stakeholder deliberation. The cross-country megatrends report identified the principal forces and uncertainties affecting green growth, while the Estonia country report examined how these could shape national opportunities and vulnerabilities. These findings provided the starting point for three stakeholder workshops, including a dedicated scenario-development face-to-face workshop. The selection focused on drivers expected to have a strong influence on Estonia's export-led green transition, remain genuinely uncertain over the 2035–2050 horizon, and lie largely outside Estonia's direct control. Workshop discussions were then used to refine the axes and assess whether their interaction produced four coherent, sufficiently distinct and strategically useful futures. International policy coordination and the intensity of energy-system shocks met these criteria most clearly.

2.2. Axis 1 - International Policy Coordination

This axis describes the degree to which major powers maintain cooperation across geopolitics, climate governance, industrial strategy, and geoeconomic rules. In this framework, trade increasingly functions as a downstream expression of broader geopolitical alignment rather than as an autonomous sphere governed primarily by multilateral rules.

At the high-coordination end of the axis, major economies preserve relatively stable frameworks for trade, investment, technology exchange, climate cooperation, and industrial coordination despite growing strategic rivalry. International institutions remain sufficiently functional to support cross-border investment, supply-chain diversification, and coordinated infrastructure development. Although competition persists, it remains partially embedded within negotiated rules and cooperative mechanisms.

At the low-coordination end, geopolitical rivalry increasingly dominates economic relations. Industrial policy becomes more protectionist and security-oriented, trade fragmentation deepens, and strategic technologies are increasingly organised around competing geopolitical blocs. Access to critical materials, technologies, and industrial inputs becomes more politicised, while climate cooperation weakens or becomes secondary to security and competitiveness concerns.

The axis is highly consequential because the green transition increasingly depends not only on domestic climate policy, but also on international industrial cooperation, technology access, critical-material supply chains, financing conditions, and infrastructure coordination. Higher levels of coordination generally support more predictable investment environments, faster diffusion of low-carbon technologies, and more stable industrial ecosystems. Lower coordination increases trade friction, supply-chain vulnerability, industrial duplication, and strategic competition over critical technologies.

2.3. Axis 2 - Energy Shock Intensity

This axis describes the severity, duration, and frequency of disruptions affecting Europe's energy system. These disruptions may emerge from military conflict, geopolitical instability, supply interruptions, infrastructure attacks, fossil-fuel market volatility, or broader strategic competition affecting major energy-exporting regions such as Russia, the Middle East, and parts of Latin America.

The axis distinguishes between moderate shocks that remain difficult but manageable and severe shocks that overwhelm institutional, fiscal, and industrial delivery capacity.

At the lower end of the axis, energy disruptions remain temporary or moderate in scale. Although they increase costs and create political pressure, they also reinforce incentives for electrification, renewable-energy deployment, energy efficiency, grid modernisation, and diversification away from fossil-fuel dependence. Under these conditions, energy insecurity can accelerate managed adaptation and strengthen long-term resilience.

At the higher end, repeated or prolonged disruptions generate persistent instability across energy markets and infrastructure systems. High energy prices, supply shortages, and infrastructure stress undermine industrial competitiveness, increase fiscal burdens, weaken public support for transition policies, and constrain governments' ability to sustain long-term investment programmes. Rather than accelerating adaptation, severe shocks begin to overwhelm implementation capacity and distort long-term strategic planning.

The axis is highly consequential because energy-system stability directly affects industrial competitiveness, inflation, infrastructure investment, fiscal sustainability, and political support for climate policy. It is also deeply uncertain beyond the current policy horizon because the timing, duration, and geopolitical drivers of future energy disruptions remain largely external to Europe's direct control.

2.4. Scenario Matrix

Combining the two uncertainties produces four analytical settings (Figure 1), each with a distinct balance of constraints and room for strategic action. The scenarios are not ranked by probability. Instead, they make it possible to compare how investment incentives, market access, value-chain organisation and implementation capacity may change under contrasting external conditions. The subsequent chapters develop each setting and assess which opportunities for Estonia remain attractive across different futures and which depend on a particular international environment.

Figure 1. Scenario matrix for Estonia's export-led green growth



2.5. Methodology for Assessing Estonia's Export Opportunities

The export-opportunity analysis identifies where international demand, Estonia's existing capabilities and realistic market access overlap. It is designed to support strategic choices: which product-market combinations deserve closer attention, where export-promotion resources can be concentrated and which longer-term opportunities may justify capability development. The results are therefore a structured shortlist rather than a forecast of what Estonian firms will export.

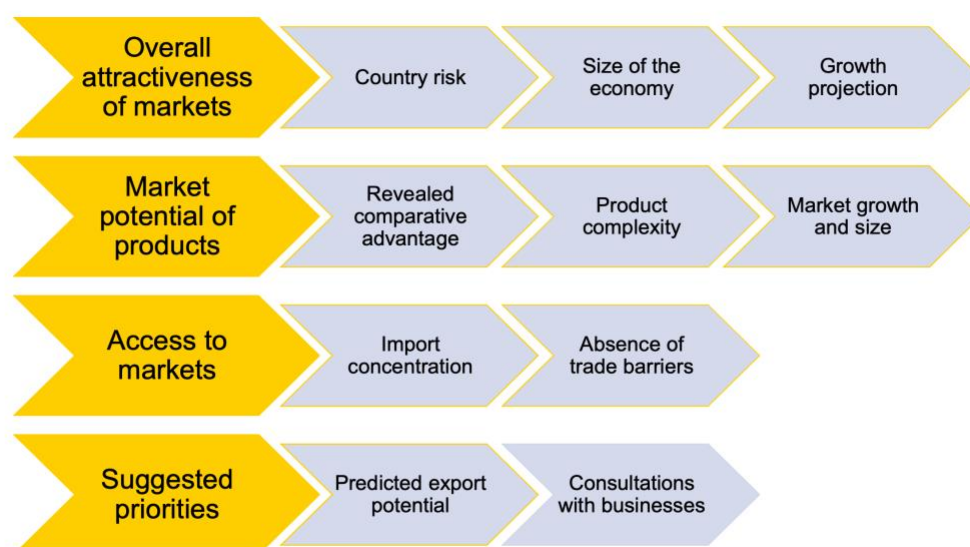
The analysis applies a streamlined version of the Decision Support Model (DSM), adapted and tested for Estonia through the Goodtrade.ai export-strategy analytics platform⁵. It screens trade flows across more than 5,000 six-digit Harmonized System (HS) product groups and more than 200 destination markets. For this report, the analysis focuses on 123 low-carbon technologies included in the IMF Climate Change Dashboard taxonomy⁶.

⁵ Tiits, M., Kalvet, T. and Mehide, I. (2022) Goodtrade.ai export strategy analytics platform. Tartu, Estonia: Policy Lab. <https://doi.org/10.23657/goodtrade-2022>

⁶ IMF (2026). IMF Climate Change Dashboard. <https://climatedata.imf.org/>

The method narrows this large field in four stages. It first identifies markets with sufficient economic potential and acceptable risk. It then tests whether a product is compatible with Estonia's existing or related capabilities, whether the destination market is realistically accessible and how much demand may be attainable. The final result combines market evidence with a requirement for business consultation, because trade statistics cannot reveal firm-level production capacity, certification readiness or customer relationships.

Figure 2. Methodology for identifying export opportunities⁷



Market attractiveness

The first stage removes destinations where political or commercial risk is exceptionally high, the economy is too small to offer a meaningful opportunity or recent trade data are unavailable. Market size, purchasing power and expected growth are considered together. Fast-growing smaller economies can remain in the analysis even when their present market size is modest, allowing emerging opportunities to be retained rather than screened out too early.

Product and market fit

The second stage compares demand in each destination with Estonia's demonstrated export strengths. Revealed comparative advantage is calculated from domestic exports so that re-exports do not create a misleading picture of production capability. Multi-year averages reduce the effect of temporary fluctuations. The screening also retains products close to Estonia's

⁷ Source: Tiits et al. 2022.

existing strengths and more complex products that may offer realistic routes for diversification, provided that demand in the target market is sufficiently strong.

Market access

The third stage asks whether an attractive market is also open enough to enter. Highly concentrated markets dominated by a small number of suppliers are less favourable, particularly when demand is growing slowly. Tariff and non-tariff barriers are assessed indirectly as well as directly. If comparable neighbouring economies already export the same product successfully to the destination, this is treated as evidence that the main entry barriers are manageable.

Attainable demand and priorities

The final stage estimates a plausible market opportunity for each product-destination pair. It uses the size of the import market and the position of established suppliers to approximate the share that a new entrant might reasonably seek. The opportunities are ranked for further investigation and discussion with businesses, not treated as automatic investment or export-promotion decisions.

Estimated export potential describes accessible demand in foreign markets. It does not measure Estonia's current production capacity and does not guarantee that a particular firm can enter a market. Product quality, certification, technology, production inputs, logistics, customer relationships and the ability to provide long-term service all affect whether the opportunity can be realised. The model is most useful as a transparent evidence base for selecting priorities that can then be tested with firms and sector experts.

2.6. Estonia's Export Opportunities

Assessment using 2024 data identifies roughly USD 15 billion of unrealised export potential for Estonia in low-carbon technologies — the market share the country could plausibly capture as a globally competitive supplier in product groups where it already holds a revealed advantage⁸. Twenty-five destination markets account for 82% of that opportunity (USD 12.3 billion).

Geographically the priorities are conservative. Europe supplies 56% of the identified potential, led by Germany (USD 1,500 million), the United Kingdom (731), France (726), Italy (637), Poland (447), Spain (434) and Austria (412); the Central European group of Poland, Czechia, Romania and Hungary adds over USD 1.3 billion between them. The single largest destination, however, is the United States (USD 1.7 billion), which together with Germany represents 27% of the priority-

⁸ Tiits, M., Kalvet, T. and Mehide, I. (2026) Goodtrade.ai export strategy analytics platform: Low carbon technologies. Tartu, Estonia: Institute of Baltic Studies. <https://green.goodtrade.ai>

market total. Asia-Pacific contributes 18%, concentrated in Korea (USD 531 million), India (414), Viet Nam (391) and Indonesia (295) — markets where Estonian exporters have the thinnest commercial infrastructure and where the gap between statistical potential and realisable sales is widest.

On the product side the concentration is sharper still: 25 six-digit HS lines cover 96% of the opportunity, and four lines alone account for half of it — electrical control boards and panels (HS 853710, USD 2,438 million), machines and mechanical appliances n.e.s.⁹ (847989, 1,623), measuring and checking instruments (903180, 1,601) and parts for electric motors and generators (850300, 1,521). Grouped by chapter, electrical equipment (HS 85) holds 38% of the potential, machinery (HS 84) 31% and precision instruments (HS 90) 28%. The profile is unmistakably one of components, control systems and instrumentation: Estonia's opening in the low-carbon transition lies upstream in others' value chains rather than in finished energy hardware.

Two qualifications matter for strategy. The figures indicate market share attainable in principle, not confirmed demand, and take no account of input availability, logistics or competitive response. They also cover only the near-term leg of the analysis; the complementary track — new high-complexity products where Estonia could build fresh capability — implies a different and longer-horizon set of priorities.

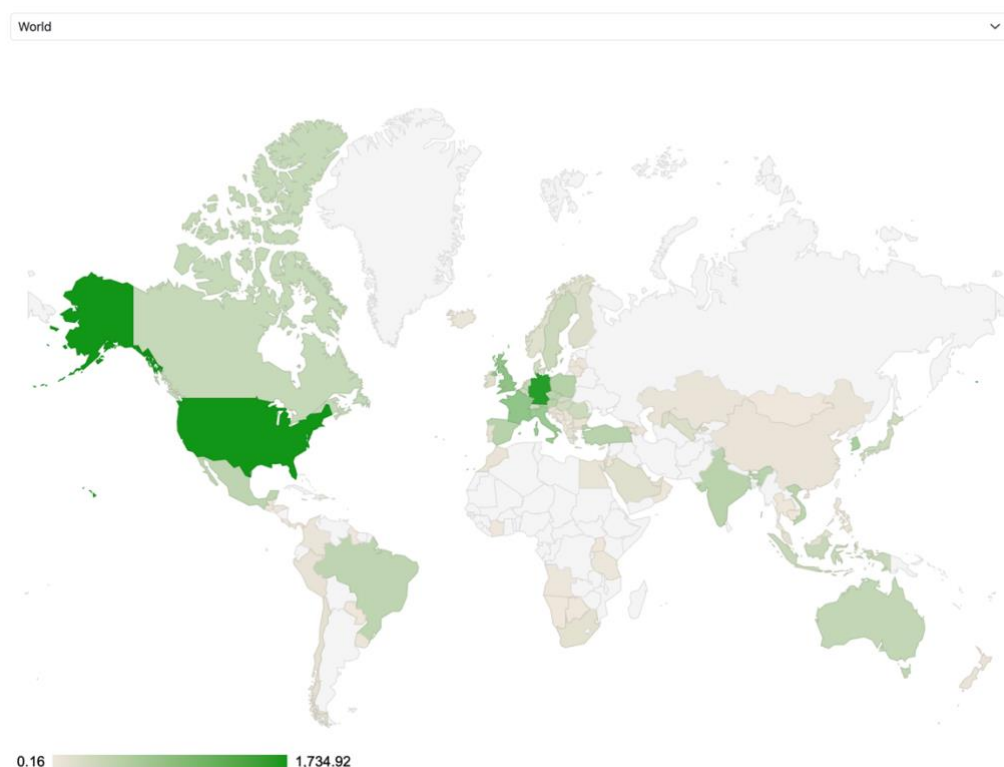
⁹ not elsewhere specified

Figure 3. Estonia's export potential in low-carbon technologies by destination market (USD million)¹⁰

In the following, we summarise the Estonia's opportunities for export promotion in terms of key markets and products.

The current export potential analysis takes a two-fold approach. First, it identifies product groups where Estonia has already a competitive advantage, and looks for the opportunities for gaining greater export market share. Secondly, it brings out opportunities in terms of [new high-complexity products](#), where Estonia is more likely to succeed and ought to consider development of export capabilities. This allows, from an export strategy point of view, to address both the products and markets where substantial results can be achieved relatively quickly and longer-term opportunities that allow to maintain and increase the living standards.

In short-term, the following 25 countries represent 82% of the opportunities for gaining export market share: [United States of America](#) (1734.9 mUSD), [Germany](#) (1559.1 mUSD), [United Kingdom of Great Britain and Northern Ireland](#) (730.8 mUSD), [France](#) (726.2 mUSD), [Italy](#) (636.7 mUSD), [Korea, Republic of](#) (531.2 mUSD), [Poland](#) (447.2 mUSD), [Spain](#) (433.5 mUSD), [India](#) (413.8 mUSD), [Austria](#) (412.1 mUSD), [Türkiye](#) (409.2 mUSD), [Czechia](#) (405.6 mUSD), [Viet Nam](#) (390.7 mUSD), [Brazil](#) (378.3 mUSD), [Mexico](#) (370.6 mUSD), [Australia](#) (339.8 mUSD), [Netherlands](#) (313.3 mUSD), [Canada](#) (308.4 mUSD), [Indonesia](#) (295.1 mUSD), [Sweden](#) (272.8 mUSD), [Romania](#) (262.7 mUSD), [Belgium](#) (250.9 mUSD), [Japan](#) (246.4 mUSD), [Switzerland](#) (230.4 mUSD), [Hungary](#) (217.5 mUSD).



¹⁰ Tiits et al. 2026.

3. SCENARIO A - MANAGED TECHNO-GLOBALISATION

3.1. Introduction

Following the geopolitical turbulence of the early and mid-2020s, the global economic system gradually stabilises during the second half of the decade without returning fully to the hyper-globalised and purely efficiency-driven model that characterised earlier decades. Strategic rivalry between major powers persists, yet repeated supply-chain disruptions, moderate energy-market volatility and accelerating climate damages convince governments and industrialists that unmanaged fragmentation would impose excessive economic costs, weaken productivity growth and slow technological development.

Rather than collapsing into rigid geopolitical blocs, the global economy evolves towards a more selective and strategically managed form of globalisation. International trade and capital flows remain broadly open, but increasingly operate through trusted partnerships, monitored dependencies and industrial cooperation in strategic sectors. Major powers continue competing technologically, particularly in artificial intelligence, advanced manufacturing and low-carbon technologies, yet maintain sufficient coordination to avoid systemic economic decoupling.

Between 2026 and the early 2030s, rapid advances in artificial intelligence, industrial digitalisation, cloud computing, robotics and low-carbon technologies generate a new wave of productivity growth comparable to earlier techno-economic revolutions. Artificial intelligence increasingly reduces coordination costs across logistics, infrastructure management, manufacturing and energy systems. Electrification accelerates across transport, industry, buildings, logistics and infrastructure systems, while falling renewable-energy and storage costs reinforce long-term investment confidence.

Unlike in the more crisis-driven scenarios, industrial transformation in this pathway is driven primarily by technological upgrading and productivity growth rather than emergency resilience measures. Economic development policy increasingly focuses on accelerating innovation, scaling strategic technologies and improving long-term competitiveness rather than protecting domestic industries from systemic instability. Financial conditions remain sufficiently stable to support large-scale infrastructure investment, industrial modernisation and sustained private-sector R&D spending.

Europe deepens trade and industrial cooperation with selected partners while simultaneously reducing its exposure to concentrated import dependencies. Current Europe-30 evidence identifies particularly important dependencies in photovoltaic components, batteries and certain specialised technologies, often involving highly concentrated external supply¹¹. Under this scenario, European diversification gradually extends to industrial electronics and other critical-infrastructure technologies rather than proceeding through abrupt decoupling. International technology ecosystems remain substantially interoperable, supporting continued cross-border investment, standardisation and industrial integration.

Moderate energy-market disruptions linked to instability in fossil-fuel-exporting regions continue to reinforce investment into renewable energy, storage systems, industrial efficiency, smart grids and intelligent infrastructure, but these disruptions remain manageable and do not overwhelm political or institutional delivery capacity.

Under this pathway, Europe broadly remains on track to achieve the 2030 climate targets, while the emerging 2035 trajectory remains credible due to accelerated electrification, industrial upgrading and sustained productivity growth during the 2028-2034 period. The longer-term 2040 and 2050 climate-neutrality objectives remain technologically and politically feasible in Europe. Globally, progress towards Paris-aligned pathways remains uneven, but clean technologies increasingly align with competitiveness, productivity growth and energy-security interests across many major economies.

3.2. World in 2035-2050

Social

Public support for the green transition strengthens as low-carbon technologies increasingly support industrial renewal, productivity growth and economic stability alongside emissions reduction. Labour shortages intensify across engineering, automation, software, energy systems and infrastructure construction due to sustained investment growth. Regional inequalities within Europe narrow moderately as industrial investment spreads into cohesion regions and Central and Eastern Europe. Climate adaptation costs continue rising globally despite stronger mitigation progress in advanced economies.

Technological

¹¹ Tiits, Marek; Kalvet, Tarmo (2026). Europe-30's Import Dependence in Environmental Goods. Tartu: Institute of Baltic Studies. <https://www.ibs.ee/en/publications/europe-30s-import-dependence-in-environmental-goods/>

Artificial intelligence, industrial digitalisation and electrification generate major productivity gains across manufacturing, logistics, energy systems and infrastructure management. Europe strengthens capabilities in grid technologies, industrial software, automation systems, power electronics and specialised machinery while reducing selected strategic dependencies through diversification and selective reshoring. Industrial innovation increasingly focuses on intelligent systems integration, interoperability and infrastructure efficiency.

Economic

Europe experiences relatively stable green-industrial growth driven by electrification, infrastructure modernisation and AI-enabled productivity improvements. Trade remains broadly open, though increasingly organised around strategic partnerships and managed dependencies rather than purely cost-driven globalisation. Europe partially rebuilds capabilities in clean technologies and advanced manufacturing while remaining broadly on track towards long-term emissions-reduction objectives despite continuing transition challenges in aviation, shipping and heavy industry.

Environmental

Europe substantially reduces fossil-fuel dependence through renewable deployment, electrification and energy-efficiency improvements. Global emissions peak before the mid-2030s, although decarbonisation remains uneven across regions and climate damages continue increasing due to accumulated warming. Paris temperature goals remain difficult but not unattainable if major economies maintain long-term decarbonisation momentum.

Political

International cooperation remains functional in climate finance, industrial standards, strategic technologies and critical infrastructure despite continued geopolitical rivalry. Europe increasingly integrates climate, industrial, trade and economic-security policy into a more coherent strategic framework. Trade disputes persist, but major powers avoid deep economic fragmentation because technological interdependence remains economically valuable.

3.3. Estonia: Opportunities and Actions

Short-term (2026-2027)

Under managed techno-globalisation, Estonia benefits from a relatively stable and investment-rich international environment in which low-carbon and AI-enabled digital technologies diffuse rapidly across advanced and emerging economies. The defining feature of this scenario is the continued openness of globally integrated industrial ecosystems, which favours countries

capable of supplying specialised intermediate technologies for electrification, automation and industrial modernisation.

In the short term, Estonia's priority is to strengthen existing export positions while selectively broadening market reach beyond its current European core. Germany, the United Kingdom, France, Italy and the Nordic region remain the main anchor markets, while North America, India and parts of Southeast Asia become increasingly attractive diversification destinations.

The strongest immediate export opportunity remains electrical control boards, panels and integrated control systems (HS 853710), which support smart manufacturing, distributed energy systems, building automation and electricity-grid modernisation. Demand is geographically broad, with especially strong opportunities in the United States, India, Türkiye and Southeast Asia alongside established European markets. Estonia's advantage lies primarily in combining electronics, software and industrial automation capabilities rather than manufacturing scale alone.

Specialised industrial machinery and process technologies (HS 847989 and HS 847990) also remain important growth areas, particularly in the United States, France, the United Kingdom and Italy. Viet Nam stands out as a promising diversification market linked to industrial upgrading and supply-chain relocation. Estonia's strongest position is likely to remain in customised and digitally integrated industrial systems rather than standard equipment manufacturing.

Industrial sensing, monitoring and regulation technologies (HS 903180, HS 903289 and HS 903290) gain importance as electrified and data-intensive production systems expand globally. Korea, India, Mexico, Brazil, Spain and the Netherlands appear especially attractive because these products align closely with Estonia's strengths in digitally integrated engineering and industrial software.

Additional opportunities emerge in components for electric motors, generators and transformer systems (HS 850300 and HS 850490), particularly in the United States, France, Poland, Sweden, Italy and Korea, as well as in environmental infrastructure technologies such as water purification machinery (HS 842121) and filtration-system parts (HS 842199), where India, Korea, Belgium, Italy, Spain and the Netherlands stand out as promising markets.

The broader implication is that Estonia should prioritise integration into globally connected industrial ecosystems while gradually preparing capabilities for movement into higher-complexity low-carbon technologies.

Medium-term (2028-2034)

As managed techno-globalisation deepens through the late 2020s and early 2030s, low-carbon markets become increasingly shaped by intelligent infrastructure, industrial automation and digitally managed energy systems. Estonia's medium-term opportunities therefore shift gradually from exporting individual components toward deeper participation in globally integrated industrial technology ecosystems.

Electrical control systems and smart-energy management technologies (HS 853710) are likely to remain the largest and most internationally scalable export category. Demand increasingly centres on AI-assisted energy optimisation, distributed grid balancing and software-integrated industrial automation. Germany, the United States and the United Kingdom remain anchor markets, while India, Korea, Japan, Singapore and selected Southeast Asian economies become progressively more important as industrial electrification accelerates globally.

Industrial instrumentation and sensing technologies (HS 903180, HS 903289 and HS 903290) also move into a more strategic position because electrified production systems require continuous optimisation, predictive maintenance and automated process control. Estonia's comparative advantage increasingly stems from combining hardware engineering with industrial software, remote diagnostics and systems integration. Korea, Japan, Singapore, Germany and the United States emerge as especially important destinations.

By this stage, product diversification becomes more visible. Indigenous firms are likely to expand further into adjacent medium- and high-complexity sectors such as physical and chemical analysis instruments (HS 902780), gas filtration and purification systems (HS 842139), electrical switching systems (HS 853690) and specialised electrical measurement components (HS 903090). These sectors align closely with Estonia's existing engineering base while offering substantially larger export opportunities than many current niche products.

More ambitious diversification pathways increasingly depend on FDI-led capability formation. If Estonia succeeds in attracting strategic investors and integrating into allied industrial ecosystems, sectors such as lithium-ion accumulators (HS 850760), multilayer ceramic capacitors (HS 853224), lasers (HS 901320) and advanced optical instruments (HS 902750 and HS 903149) may gradually emerge as longer-term export platforms. Korean, Japanese, German and North American firms are likely to become the most plausible strategic partners in such development.

The export-potential analysis also points toward growing opportunities in laboratory and analytical technologies, especially chromatographs and electrophoresis instruments (HS 902720) together with spectrometers and spectrophotometers (HS 902730). Singapore, Japan,

Germany, Canada and the United States appear particularly promising because industrial decarbonisation increasingly depends on advanced materials analysis, environmental testing and battery-related process optimisation.

Compared with the more fragmented scenarios, this pathway produces the broadest export geography. Europe remains Estonia's core industrial platform, but North America and selected Indo-Pacific economies become increasingly important both as export destinations and as sources of investment and technology partnerships.

The broader implication is that Estonia's competitiveness increasingly depends on occupying specialised positions within globally integrated industrial ecosystems while gradually moving toward higher-complexity technologies through engineering capability, systems integration and selective foreign investment.

Long-term (2035+)

In the long term, Estonia's strongest position under managed techno-globalisation is likely to emerge at the intersection of electrification, industrial automation and digitally managed infrastructure systems. As global energy and industrial systems become increasingly software-intensive and interconnected, demand grows for suppliers capable of combining engineering capability with intelligent systems integration.

The most competitive Estonian firms are therefore likely to operate in areas such as smart-grid coordination, industrial optimisation, advanced sensing technologies, energy-management systems and specialised infrastructure software. Earlier diversification efforts may also generate visible capabilities in photonics, industrial optics, analytical technologies and selected advanced electrical components where domestic engineering capability combines successfully with foreign investment and external technological partnerships.

Under this scenario, Estonia benefits from relatively open industrial ecosystems and broad international market access. The country's strongest role is therefore likely to emerge as a specialised provider of intelligent industrial subsystems embedded within globally integrated low-carbon infrastructure systems.

Early indicators

Early signals supporting this scenario would include stabilising trade relationships, deepening transatlantic and Indo-Pacific industrial integration, and rapid growth in industrial automation and smart-grid investment.

For Estonia, key signals would include export growth in industrial control systems, specialised machinery and precision instrumentation to India, Korea, Singapore, Viet Nam and North America, alongside foreign investment in advanced electronics, photonics and analytical technologies.

4. SCENARIO B - ELECTROSTATES VS PETROSTATES

4.1. Introduction

The late 2020s are marked by a rapid deterioration of relations between economies accelerating electrification and decarbonisation and fossil-fuel-exporting economies seeking to preserve geopolitical influence, export revenues and the value of long-lived hydrocarbon investments. Instability in the Middle East and Russia, disruptions to maritime trade routes, infrastructure attacks and growing strategic coordination among major fossil exporters generate severe and prolonged energy-market volatility between 2027 and the early 2030s. Oil and gas increasingly become geopolitical instruments rather than ordinary commodities.

Unlike in Scenario A, energy shocks become system-shaping rather than merely disruptive. Europe experiences repeated energy-price spikes, industrial cost surges, inflationary pressure and growing political tensions around affordability and industrial competitiveness. However, the severity of the shocks also accelerates coordination among “electrostates” seeking to reduce structural dependence on imported fossil fuels and raw materials. Climate policy increasingly merges with energy security, industrial strategy, defence planning and geopolitical positioning.

The transition therefore evolves from a primarily climate-led agenda into a resilience-driven industrial mobilisation. Electrification, renewable deployment, storage systems, grid expansion, industrial efficiency, nuclear options, demand management and strategic manufacturing capacity accelerate not only because of emissions targets, but because they become essential for economic stability and geopolitical security. Competitive electricity prices and reliable infrastructure increasingly become strategic industrial-policy objectives rather than purely market outcomes.

This is not the productivity-led transition of Scenario A. Artificial intelligence, automation and industrial digitalisation advance, but their primary function is to manage instability rather than to generate broad-based productivity growth. AI is used for grid balancing, predictive maintenance, emergency logistics, energy-demand forecasting, infrastructure protection and industrial continuity.

Europe deepens industrial cooperation with trusted partners while reducing exposure to concentrated external dependencies in batteries, photovoltaic components, industrial electronics, critical raw materials and energy infrastructure technologies. Industrial policy

becomes more directive, procurement-driven and security-oriented. Governments intervene more actively in infrastructure planning, strategic manufacturing, permitting, energy pricing and supply-chain coordination.

Global trade remains functional but increasingly fragmented between competing geopolitical and energy blocs. Trade frictions, tariffs, sanctions, investment screening and industrial subsidies intensify, particularly between electrostates and petrostates. Despite severe disruption, Europe broadly preserves the credibility of the 2030 climate targets because the crises reinforce structural fossil-fuel substitution. The emerging 2035 trajectory remains technically achievable, while the longer-term 2040 and 2050 climate objectives remain politically viable within Europe. Globally, however, convergence towards Paris-aligned pathways weakens as many fossil-exporting and developing economies struggle to adapt to the accelerating energy transition.

4.2. World in 2035-2050

Social

European societies become more security-oriented following repeated energy disruptions and geopolitical tensions during the late 2020s and early 2030s. Public support for electrification, renewable energy and infrastructure investment strengthens because energy independence becomes closely linked to economic stability and resilience. At the same time, inflationary pressure and industrial restructuring generate lasting social tensions around affordability and regional inequality. Labour shortages intensify across engineering, grid management, industrial automation and infrastructure construction.

Technological

Artificial intelligence and low-carbon technologies accelerate rapidly under crisis conditions. Europe expands electricity grids, storage systems, industrial electrification and digital energy-management infrastructure while strengthening capabilities in industrial software, automation systems, power electronics and grid technologies. Innovation increasingly prioritises robustness, redundancy, interoperability and operational resilience rather than lowest-cost optimisation alone.

Economic

The late 2020s and early 2030s remain economically turbulent due to repeated energy-price spikes, infrastructure disruptions and industrial restructuring. However, the crisis environment also triggers a large wave of strategic industrial investment focused on electrification,

infrastructure resilience and energy independence. Industrial policy becomes more interventionist and coordinated than in Scenario A, particularly in electricity systems, storage technologies and critical infrastructure. Europe broadly remains on track towards long-term decarbonisation objectives, though at significantly higher economic cost.

Environmental

Europe reduces fossil-fuel dependence rapidly as repeated crises weaken the political attractiveness of imported hydrocarbons. Renewable deployment, electrification and energy-efficiency investment accelerate significantly during the 2030s. Globally, however, emissions decline more unevenly as geopolitical crises and fiscal pressures constrain transition capacity in many developing and fossil-exporting economies.

Political

Repeated crises strengthen coordination among “electrostates” while intensifying geopolitical competition with fossil-fuel-exporting economies. Climate policy, industrial strategy, infrastructure security and economic policy become increasingly integrated. International cooperation persists selectively around shipping security, infrastructure stability and climate finance, but the broader international system becomes more bloc-oriented and strategically competitive than in Scenario A.

4.3. Estonia: Opportunities and Actions

Short-term (2026-2027)

In this scenario, energy insecurity and geopolitical instability accelerate the green transition rather than slowing it down. Repeated fossil-fuel price shocks, supply disruptions and infrastructure vulnerabilities force governments and industry to prioritise electrification, resilience and strategic infrastructure investment. For Estonia, this creates a more security-driven export environment than under managed techno-globalisation.

In the short term, Estonia’s priority is to deepen its position within European and allied electrification ecosystems rather than pursue broad global diversification. Germany, Poland, Sweden, Finland, the Netherlands and the wider Nordic region become increasingly important because they combine large-scale infrastructure investment with strong incentives to reduce dependence on vulnerable supply chains.

Electricity-system resilience becomes the central organising logic of export opportunities. Industrial control boards, integrated electrical systems and smart-grid technologies (HS 853710) support emergency grid modernisation, distributed power systems and industrial electrification

programmes across Europe. Germany, Poland, Sweden, the United Kingdom, Czechia and the Netherlands therefore become especially important markets.

The accelerated expansion of electrification infrastructure also increases demand for electric motor, generator and transformer components (HS 850300 and HS 850490). Heat pumps, upgraded transmission systems and renewable deployment create bottlenecks across electricity infrastructure supply chains. Estonia's strongest opportunities emerge within European and allied industrial ecosystems, particularly in Poland, Sweden, France, Italy and Korea.

Industrial efficiency and process optimisation also become increasingly important as firms seek to reduce exposure to volatile energy costs. Specialised machinery and process technologies (HS 847989 and HS 847990) therefore remain attractive, especially where machinery can be combined with automation, monitoring and energy-efficiency capabilities. Germany, France, the United Kingdom and Canada emerge as particularly promising markets.

Precision monitoring and industrial control technologies (HS 903180, HS 903289 and HS 903290) also gain strategic importance because highly electrified systems require more sophisticated balancing, predictive maintenance and infrastructure management. Germany, Nordic economies, Korea, Japan and the Netherlands become especially attractive destinations.

Compared with Scenario A, industrial heat and thermal-process systems become more important already in the short term. Resistance heated industrial furnaces and ovens (HS 851410) together with boiler-system components (HS 840290 and HS 840490) benefit from accelerated decarbonisation of industrial heat systems under energy-security pressure. Korea, Germany, Canada and Türkiye emerge as promising markets.

Water purification and filtration systems (HS 842121 and HS 842199) also gain importance as climate adaptation, industrial water reuse and infrastructure resilience become more urgent across many economies. India, Korea, Belgium, Italy and Spain remain particularly relevant destinations.

The broader implication is that Estonia should prioritise participation in resilient electrification ecosystems centred on infrastructure reliability, industrial continuity and strategic integration within allied industrial networks.

Medium-term (2028-2034)

As crisis-driven electrification accelerates through the 2030s, industrial strategy becomes increasingly tied to energy security, infrastructure resilience and strategic manufacturing capability. The global economy does not fully deglobalise, but industrial integration becomes

more bloc-oriented and politically filtered. Estonia's medium-term opportunities therefore depend less on broad market openness and more on becoming embedded within allied electrification ecosystems.

Control boards, smart-grid systems and integrated electrical-management technologies (HS 853710) are likely to remain Estonia's most important export category. Demand increasingly centres on autonomous grid balancing, storage coordination, industrial microgrids and cyber-secure electricity-management systems. Germany, Poland, Sweden, Finland, the Netherlands and the United Kingdom remain the core markets because they sit at the centre of Europe's accelerated electrification agenda.

Electric machinery components (HS 850300 and HS 850490) also become more strategically valuable as Europe intensifies efforts to reduce dependence on geopolitically exposed suppliers. Estonia's opportunity lies primarily in specialised engineering, advanced components and trusted subcontracting relationships within European industrial ecosystems linked to electric mobility, renewable systems and industrial automation.

Precision instrumentation and industrial optimisation technologies (HS 903180, HS 903289 and HS 903290) gain further importance because highly electrified infrastructure systems require continuous monitoring, predictive maintenance and operational control. Korea, Japan, Germany, Singapore and Nordic economies emerge as especially attractive destinations due to strong demand for resilient industrial systems and trusted infrastructure technologies.

By this stage, diversification begins to differentiate more clearly between indigenous upgrading and FDI-led capability formation. Domestic firms are likely to expand further into electrical switching systems (HS 853690), analytical and testing instruments (HS 902780), filtration technologies (HS 842139) and specialised electrical measurement components (HS 903090), all of which remain relatively close to Estonia's industrial base.

More ambitious diversification pathways - particularly lithium-ion accumulators (HS 850760), multilayer ceramic capacitors (HS 853224), lasers (HS 901320) and advanced optical instruments (HS 902750 and HS 903149) - depend increasingly on strategic European industrial policy, allied-country investment and integration into resilient industrial ecosystems. Nordic, German, Korean and Japanese firms are likely to become the most plausible partners in such capability formation.

Analytical and laboratory technologies also become more important under this scenario. Chromatographs and electrophoresis instruments (HS 902720) together with spectrometers and spectrophotometers (HS 902730) support advanced manufacturing, hydrogen technologies,

battery systems and industrial quality control. Singapore, Japan, Germany and Canada appear particularly promising because crisis-driven industrial transformation increases demand for advanced materials analysis and process optimisation.

Industrial thermal technologies become more important than in Scenario A because heavy-industry electrification proceeds under energy-security pressure rather than gradual optimisation alone. Resistance heated industrial furnaces (HS 851410) and related industrial heat systems may therefore become a more durable export niche, particularly in Germany, Korea, Canada and Türkiye.

Compared with Scenario A, this scenario produces a more concentrated export structure centred on Europe and selected allied Asian economies. Germany, Poland, Sweden, Finland and the Netherlands remain the core industrial markets, while Korea, Japan and Singapore become strategically important technology partners.

The broader implication is that Estonia's competitiveness increasingly depends on becoming a trusted engineering and infrastructure supplier within resilient allied electrification systems rather than pursuing maximum global market breadth.

Long-term (2035+)

In the long term, Estonia's strongest position under crisis-driven electrification is likely to emerge within highly interconnected "electrostate" systems where energy security, digital infrastructure and industrial resilience become closely integrated.

The most competitive Estonian firms are likely to operate in areas such as smart-grid coordination, industrial optimisation systems, advanced monitoring technologies and integrated infrastructure-management solutions. Earlier diversification efforts may also generate visible capabilities in specialised instrumentation, electrical components and selected photonics-related technologies, particularly where capability formation has been supported by allied industrial investment and European resilience programmes.

Rather than competing in commodity clean-technology manufacturing, Estonia is more likely to succeed as a provider of specialised industrial intelligence embedded within resilient European and allied electrification systems.

Early indicators

Early signals supporting this scenario would include persistent energy-price volatility, rapid investment in grids, storage and electrification infrastructure, and stronger reshoring within allied economies.

For Estonia, key signals would include export growth in control systems, transformer components and industrial monitoring technologies to Germany, Poland, the Nordic countries, Korea and Japan, alongside allied investment in advanced electrical and infrastructure technologies.

5. SCENARIO C - COMPETITIVE TECHNO-NATIONALISM

5.1. Introduction

By the late 2020s, the global economy avoids a severe energy crisis but enters a period of intensifying technological and industrial rivalry between major powers. Competition increasingly centres on artificial intelligence, semiconductors, industrial software, digital infrastructure, low-carbon technologies and control over technological standards and platforms. Energy markets remain volatile but broadly manageable, allowing technological competition - rather than immediate energy insecurity - to become the dominant force shaping industrial development.

Globalisation does not collapse, but it becomes increasingly selective, politically conditional and technologically fragmented. Trade flows continue, yet market access increasingly depends on industrial subsidies, export controls, technology restrictions, data governance rules, cybersecurity requirements and alignment with competing industrial ecosystems. Technological systems become less interoperable as rival powers promote partially incompatible standards, platforms and supply chains.

China, the United States and Europe each attempt to secure stronger positions within emerging industrial systems, but with different strengths. China combines manufacturing scale and control over many clean-technology supply chains. The United States remains dominant in frontier AI, cloud infrastructure and digital platforms. Europe retains regulatory influence and specialised industrial capabilities, but faces growing pressure to reduce strategic dependencies in semiconductors, industrial electronics, batteries and critical infrastructure technologies.

Unlike in Scenario B, the absence of acute energy-system shocks prevents deeper crisis-driven coordination across Europe. Instead, fragmentation accumulates gradually through diverging industrial strategies, technological ecosystems and geopolitical alignments. Climate cooperation weakens operationally as governments increasingly prioritise technological sovereignty, industrial competitiveness and strategic control over coordinated decarbonisation.

The result is a more uneven and strategically competitive transition. Europe continues advancing electrification and low-carbon deployment, but implementation becomes slower and more fragmented than in Scenarios A and B. The 2030 climate targets remain formally achievable but increasingly costly and politically contested. The longer-term 2040 and 2050 climate-neutrality objectives remain technically possible, yet their credibility weakens as global decarbonisation pathways increasingly diverge.

5.2. World in 2035-2050

Social

European societies remain divided over the pace, costs and industrial implications of the green transition. Public support for climate policy persists, but concerns over technological dependence, industrial competitiveness and economic sovereignty increasingly shape political debate. Labour shortages continue across engineering, software, automation and cybersecurity, while industrial investment remains concentrated in larger economies with stronger fiscal and industrial-policy capacity.

Technological

Artificial intelligence, semiconductors, industrial software and low-carbon technologies become central arenas of geopolitical competition. Technological progress remains rapid, but diffusion slows as competing industrial ecosystems increasingly operate through incompatible standards, platforms and supply chains. Europe strengthens capabilities in industrial software, automation systems, infrastructure management and specialised manufacturing, while remaining dependent on external suppliers in semiconductors, battery systems and critical electronics.

Economic

Global trade remains functional but increasingly fragmented into competing technological and industrial spheres. Industrial policy becomes more subsidy-intensive and nationally oriented, generating inefficiencies and recurring trade disputes even among allied economies. Europe partially avoids deindustrialisation but struggles to rebuild strategic manufacturing capabilities at sufficient scale across several key technologies. Clean-technology deployment continues, though fragmented technological ecosystems increase costs and slow implementation.

Environmental

Europe continues reducing emissions through electrification, renewable deployment and industrial modernisation, but progress becomes more uneven and politically contested than under Scenarios A and B. Global emissions peak later because geopolitical fragmentation weakens climate cooperation and slows technology diffusion across emerging economies. Paris temperature goals become increasingly difficult to achieve as global climate trajectories diverge.

Political

The international system becomes increasingly shaped by technological rivalry, industrial competition and strategic economic positioning. Trade disputes, export restrictions, industrial subsidies and technology controls become normal features of international economic relations.

International climate cooperation survives formally but weakens operationally as major powers prioritise technological leadership, industrial sovereignty and control over strategic supply chains.

5.3. Estonia: Opportunities and Actions

Short-term (2026-2027)

Under competitive techno-nationalism, the green transition continues, but markets become more politically and technologically filtered. Export controls, industrial subsidies, standards competition and selective friend-shoring increasingly shape which suppliers and technologies gain access to advanced industrial ecosystems. For Estonia, the most realistic opportunity is therefore not broad global expansion, but becoming a trusted specialist supplier within allied industrial systems.

In the short term, Estonia's priority is to preserve and deepen positions in technologically advanced European markets while selectively expanding into trusted Asian and North American ecosystems. Germany, Poland, Sweden, the Netherlands, France and the United Kingdom remain the main anchor markets, but export success increasingly depends on certification capability, interoperability, cybersecurity and long-term supplier reliability rather than production scale alone.

Precision measurement, monitoring and regulation technologies become particularly important in this environment. Instruments for measuring industrial processes (HS 903180), regulating and control instruments (HS 903289), and related components (HS 903290) support industrial automation, energy optimisation and advanced manufacturing systems. The United States, Korea, Japan, Germany, the Netherlands and the United Kingdom emerge as especially attractive destinations because these markets increasingly prioritise trusted technical systems and standards-compliant suppliers.

Industrial control boards and electrical control systems (HS 853710) also remain one of Estonia's strongest export opportunities, particularly as electrified infrastructure becomes more strategically sensitive. Germany, France, Italy, Poland, Czechia and the United Kingdom remain core European markets, while Korea and Japan gain importance through technology partnerships and industrial integration.

Electric motor, generator and transformer components (HS 850300 and HS 850490) remain strategically relevant because electrification continues despite geopolitical fragmentation. Estonia's role is most credible as a specialised supplier within allied industrial ecosystems seeking to reduce dependence on concentrated or politically exposed supply chains.

Specialised machinery and process equipment (HS 847989 and HS 847990) also remain attractive, especially where hardware can be combined with automation, monitoring, diagnostics or cyber-secure systems integration. Germany, France, the United Kingdom, Italy and Canada remain the most promising markets.

This scenario also increases the importance of analytical and testing technologies. Chromatographs and electrophoresis instruments (HS 902720) together with spectrometers and spectrophotometers (HS 902730) support advanced manufacturing, battery chemistry, hydrogen systems and industrial quality assurance. Singapore, Japan, Germany, Korea, Canada and the United States appear particularly promising because advanced industrial ecosystems continue investing heavily in trusted analytical technologies.

The broader implication is that Estonia should increasingly position its exports as trusted industrial technologies embedded within allied infrastructure and manufacturing systems rather than as standalone green products.

Medium-term (2028-2034)

By the late 2020s and early 2030s, competitive techno-nationalism produces a more fragmented and standards-driven industrial landscape. Low-carbon technologies continue expanding, but industrial ecosystems increasingly operate through competing technical standards, certification systems and supply-chain alliances. Estonia's medium-term opportunity is therefore not broad global scale, but becoming difficult to replace within selected European and allied industrial ecosystems.

Precision measurement and monitoring technologies (HS 903180) are likely to become one of Estonia's most important medium-term export categories. Electrified factories, smart grids, environmental compliance systems and automated industrial processes all require reliable data, diagnostics and operational control. Estonia's advantage increasingly lies in combining precision hardware with digital diagnostics, remote monitoring and secure industrial integration. Germany, Korea, Japan, Singapore, the United Kingdom and the Netherlands become especially important because they combine advanced industrial systems with strong supplier-trust requirements.

Regulating and control technologies (HS 903289 and HS 903290) also gain strategic importance as standards diverge across competing technological blocs. Estonia should focus particularly on applications linked to industrial automation, grid balancing, building systems, storage integration and infrastructure management.

Control boards and smart electrical systems (HS 853710) remain central export categories, but market selection becomes more disciplined than under Scenario A. Germany, Poland, Czechia, France, the United Kingdom and the Nordic region remain the core European markets, while Korea, Japan and Singapore are best approached through long-term industrial partnerships and integration into larger value chains.

Transformer, motor and electrical-machine components (HS 850300 and HS 850490) also remain strategically relevant as Europe seeks to strengthen autonomy within electrification supply chains. Estonia's opportunity lies primarily in specialised components, engineering-intensive subsystems and trusted subcontracting relationships with larger European manufacturers.

By this stage, diversification becomes more visible in advanced instrumentation and photonics-related sectors. Indigenous firms are likely to expand further into analytical instruments (HS 902780), specialised electrical systems (HS 853690), gas filtration technologies (HS 842139) and electrical measurement components (HS 903090), while FDI-led capability formation may gradually support development in lasers (HS 901320), optical instruments (HS 902750 and HS 903149) and advanced electronics components such as multilayer ceramic capacitors (HS 853224).

Large-scale battery manufacturing remains a more uncertain pathway than under Scenarios A or B because the sector becomes increasingly dominated by heavily subsidised and vertically integrated industrial blocs. Estonia may therefore find more durable opportunities in instrumentation, industrial electronics, photonics and engineering-intensive subsystems rather than full-scale battery-cell production.

Analytical technologies, particularly chromatographs and electrophoresis instruments (HS 902720) together with spectrometers and spectrophotometers (HS 902730), become increasingly attractive because advanced manufacturing and clean-technology R&D continue despite geopolitical fragmentation. Singapore, Japan, Korea, Germany, Canada and the United States remain promising markets.

Compared with Scenario A, Estonia's export strategy becomes more selective and partnership-driven. Germany, Poland, Sweden, the Netherlands, France and the United Kingdom remain the core European markets, while Korea, Japan and Singapore emerge as the most important Asian partners for high-complexity industrial technologies.

The broader implication is that Estonia's competitiveness increasingly depends on occupying specialised positions within trusted industrial ecosystems where engineering capability, interoperability and operational reliability create strategic value.

Long-term (2035+)

In the long term, Estonia's competitiveness under competitive techno-nationalism depends on becoming technologically specialised within trusted industrial ecosystems. The most durable opportunities emerge in sectors where interoperability, engineering capability and operational reliability remain strategically valuable despite fragmented technological systems.

Estonia's strongest long-term role is likely to centre on precision sensing, industrial control systems, smart electrical infrastructure, analytical technologies, photonics and specialised industrial machinery. Earlier diversification efforts may gradually establish internationally competitive positions in optical instrumentation, industrial diagnostics and selected advanced electronics niches, particularly where Estonia succeeds in combining domestic engineering capability with integration into allied industrial ecosystems.

Rather than competing in scale-intensive commodity manufacturing, Estonia is more likely to specialise in industrial intelligence: technologies that measure, regulate, optimise and secure electrified industrial and infrastructure systems.

Early indicators

Early indicators of this scenario would include expanding export controls, technology-screening rules, industrial subsidies and standards competition without a collapse of global trade.

For Estonia, key signals would include export growth in precision instruments, industrial control systems and analytical technologies to Germany, Poland, the Netherlands, the United Kingdom, Korea, Japan and Singapore, alongside investment in photonics, industrial electronics and advanced instrumentation.

6. SCENARIO D - DEFENSIVE REGIONAL FRAGMENTATION

6.1. Introduction

The late 2020s become defined by the simultaneous escalation of geopolitical fragmentation and repeated disruptions to global energy, trade and technology systems. Instability across fossil-fuel-exporting regions, disruptions to maritime trade corridors, infrastructure sabotage, cyberattacks against critical systems and intensifying confrontation between major powers generate prolonged volatility in global energy, commodity and technology markets.

Unlike in Scenario B, these crises do not produce stronger international coordination. Instead, governments increasingly prioritise immediate economic security, domestic industrial protection, infrastructure sovereignty and defence capability over long-term efficiency or coordinated climate governance.

By the early 2030s, global trade has become more unstable and politicised. Export controls, sanctions, industrial subsidies, technology restrictions and local-content requirements increasingly shape international economic relations. Europe attempts to maintain its decarbonisation agenda, but repeated energy shocks, fiscal strain, industrial stress and political polarisation weaken implementation capacity across many sectors.

The transition therefore becomes increasingly reactive rather than strategic. Infrastructure investment is shaped less by long-term optimisation than by crisis management, supply security and industrial continuity. Persistently high and volatile electricity prices increasingly weaken industrial competitiveness and constrain investment capacity across Europe. Europe accelerates selected electrification and domestic manufacturing efforts out of necessity, yet fragmented markets, unstable supply chains and investment uncertainty reduce coordination and economies of scale. Strategic dependencies in semiconductors, batteries, photovoltaic components and industrial electronics remain difficult to resolve quickly.

Under this pathway, the 2030 climate targets remain formally in place but become increasingly difficult to fully achieve. The period between 2028 and 2034 is dominated by infrastructure security, industrial protection and emergency energy measures rather than orderly long-term transformation. Europe continues decarbonising, but more slowly and unevenly than anticipated, while the credibility of the 2040 and 2050 climate objectives weakens substantially under prolonged geopolitical fragmentation and institutional strain.

6.2. World in 2035-2050

Social

European societies become more security-oriented and economically defensive following repeated crises during the late 2020s and early 2030s. Public support for climate policy weakens in several regions as affordability, energy access and industrial survival increasingly dominate political priorities. Social inequalities widen due to prolonged energy volatility, inflation and uneven industrial adjustment, while fiscal pressures constrain governments' ability to address long-term workforce and infrastructure needs.

Technological

Technological progress in artificial intelligence and low-carbon systems continues but becomes fragmented across competing geopolitical blocs. Europe accelerates deployment of renewable energy, electrification and digital infrastructure where possible, but repeated supply disruptions and investment uncertainty slow implementation significantly compared to earlier scenarios. Innovation increasingly prioritises resilience, redundancy, repairability and domestic control over efficiency and global scalability.

Economic

The global economy becomes less efficient, more regionalised and increasingly politicised. Trade remains functional but unstable, characterised by recurring export restrictions, sanctions, industrial subsidies and supply-chain disruptions. Europe faces prolonged industrial competitiveness pressures due to elevated energy costs, fragmented markets, high defence expenditure and major infrastructure-investment needs. Fiscal strain remains persistent as governments simultaneously support energy systems, domestic industry, defence capability and crisis management.

Environmental

Europe continues reducing emissions gradually through electrification and renewable deployment, but implementation delays and fragmented investment slow decarbonisation. Fossil-fuel dependence declines more slowly because repeated crises encourage temporary extension of fossil infrastructure and emergency energy-security measures. Globally, climate impacts intensify while geopolitical fragmentation weakens coordinated mitigation and slows clean-technology diffusion.

Political

The international system becomes increasingly dominated by power politics, strategic competition and defensive industrial policies. Climate governance weakens substantially as governments prioritise economic security, infrastructure sovereignty and domestic resilience over multilateral coordination. Europe remains more cooperative internally than many other regions, but internal divisions widen under fiscal, industrial and energy pressures. Regional blocs and ad hoc coalitions increasingly replace broader international coordination structures.

6.3. Estonia: Opportunities and Actions

Short-term (2026-2027)

Under defensive regional fragmentation, the export environment becomes narrower, more volatile and more security-driven than in the other scenarios. Severe energy shocks coincide with weak international coordination, unstable logistics, industrial protectionism and growing geopolitical distrust. Estonia therefore cannot rely on broad global market expansion as its primary strategy. The more realistic objective is to become a specialised supplier within Nordic-Baltic and wider European resilience systems.

In the short term, Estonia's priority is to defend existing export positions in nearby European markets while adapting products and business models to a more regionalised and resilience-oriented environment. Germany, Poland, Sweden, Finland, the Netherlands, Czechia and the Baltic states become increasingly important because proximity, servicing capability and trusted procurement increasingly determine market access.

Electricity infrastructure and regional energy security become the central organising logic of export opportunities. Control boards, panels and smart electrical control systems (HS 853710) become critical infrastructure technologies supporting grid reinforcement, emergency power management, distributed electricity systems and industrial continuity. Germany, Poland, Sweden, Finland, the Netherlands, Czechia, Latvia and Lithuania should therefore become the principal focus markets.

Components for electric motors, generators and transformers (HS 850300 and HS 850490) also gain importance because fragmented conditions increase the value of nearby specialised suppliers within European electrification systems. Estonia should focus primarily on Nordic, Baltic, Polish and German industrial ecosystems where logistics reliability and regional integration reinforce competitiveness.

Precision measuring, monitoring and regulating technologies (HS 903180, HS 903289 and HS 903290) become increasingly important for infrastructure survivability, predictive maintenance and operational control across electricity systems, district heating, industrial facilities and water infrastructure. Germany, Poland, Sweden, Finland and the Netherlands remain the most important destinations because standards alignment and operational reliability increasingly outweigh broad global market access.

Building-efficiency technologies become more central than in the other scenarios because reducing energy demand directly improves resilience. Multiple-walled insulating glass units (HS 700800) and heat-insulating materials (HS 680690) therefore gain importance across Nordic, Baltic and Central European markets facing persistent energy and infrastructure stress.

Water purification and filtration systems (HS 842121 and HS 842199) also remain strategically relevant as climate impacts, infrastructure pressure and emergency preparedness increase demand for modular and maintainable environmental infrastructure systems across Northern and Central Europe.

Specialised industrial machinery and machinery parts (HS 847989, HS 847990 and HS 841990) increasingly shift toward repairability, retrofits, spare parts and industrial continuity rather than new large-scale industrial expansion. Nearby suppliers capable of customised equipment and rapid servicing become more valuable under unstable supply-chain conditions.

The broader implication is that Estonia should concentrate resources on becoming operationally reliable and difficult to replace within European resilience ecosystems rather than pursuing broad but fragile global expansion strategies.

Medium-term (2028-2034)

By the late 2020s and early 2030s, defensive regional fragmentation produces a more regionalised industrial economy. Climate policy continues, but it is increasingly filtered through energy security, defence readiness, infrastructure protection and industrial continuity. Estonia's export geography narrows, while nearby trusted suppliers become more valuable inside Europe.

Control boards, panels and smart electrical infrastructure systems (HS 853710) should remain Estonia's principal medium-term export priority. Their role expands from electrification equipment to operational resilience technology supporting grid segmentation, emergency power control, storage integration, industrial microgrids and distributed energy-management systems. Germany, Poland, Sweden, Finland, Denmark, the Netherlands, Czechia, Latvia and Lithuania should form the core destination markets.

Electric motor, generator and transformer components (HS 850300 and HS 850490) become Estonia's most direct contribution to European electrification resilience. Estonia is unlikely to compete as a large-scale producer, but can create value through specialised components, custom assemblies, repair services and trusted subcontracting relationships within Nordic, German and Central European industrial ecosystems.

Precision monitoring and control technologies (HS 903180, HS 903289 and HS 903290) gain importance as infrastructure systems operate closer to stress limits. Estonia should focus on cyber-secure monitoring, predictive maintenance, industrial diagnostics and critical-infrastructure management systems, where reliability and maintenance capability matter more than global market scale.

Building-efficiency technologies, especially multiple-walled insulating glass units (HS 700800) and heat-insulating materials (HS 680690), become more central than in the other scenarios because reducing energy demand directly strengthens resilience. Denmark, Sweden, Finland, Poland, Czechia and the Baltic region are likely to become structurally important markets.

Water purification and filtration systems (HS 842121 and HS 842199) also gain importance as climate impacts and infrastructure stress intensify. Estonia should focus on modular, maintainable and digitally monitored systems for municipalities, industry and emergency preparedness across Northern and Central Europe.

Under this scenario, diversification becomes more cautious and incremental than in the other futures. Indigenous firms are best positioned to expand into adjacent sectors such as electrical switching systems (HS 853690), gas filtration technologies (HS 842139), electrical measurement components (HS 903090) and industrial analysis instruments (HS 902780), where capabilities remain relatively close to Estonia's existing industrial base.

By contrast, diversification pathways dependent on globally integrated supply chains or very large-scale investment - such as lithium-ion accumulators (HS 850760), multilayer ceramic capacitors (HS 853224) or large-scale advanced electronics manufacturing - become substantially harder to realise. More specialised photonics and optical technologies (HS 901320, HS 902750 and HS 903149) may remain viable primarily within niche European industrial and security-related applications.

Geographically, Scenario D requires the clearest narrowing of ambition among the four futures. Germany, Poland, Sweden, Finland, Denmark, the Netherlands, Latvia and Lithuania should form the core export geography, while France and the United Kingdom remain selective markets.

Distant markets in Asia, Latin America and the Middle East become opportunistic rather than strategic.

The broader implication is that Estonia should treat resilience, maintenance, repairability and regional indispensability as industrial assets. The most valuable firms are those that become difficult to replace inside Nordic-Baltic-European infrastructure systems.

Long-term (2035+)

In the long term, Estonia's strongest position under defensive regional fragmentation lies in becoming an indispensable niche supplier within resilient Nordic-Baltic-European infrastructure systems. As the international economy becomes more regionalised and security-driven, geographically proximate and operationally reliable suppliers gain strategic value.

Estonia's most defensible long-term export niches are therefore likely to include smart-grid control systems, electrical infrastructure components, industrial monitoring technologies, building-efficiency systems, modular water infrastructure, specialised machinery and digitally integrated maintenance systems. More advanced diversification may still emerge in industrial sensing, specialised photonics and security-related instrumentation, but primarily within regional European ecosystems rather than globally integrated production networks.

The central strategic priority under this scenario is not scale, but indispensability. Estonia's comparative advantage increasingly depends on reliability, repairability, infrastructure integration and trusted regional positioning within European resilience systems.

Early indicators

Early indicators of this scenario would include repeated disruptions to energy markets and trade corridors, expanding export controls and growing reliance on regional suppliers and security-driven procurement.

For Estonia, key signals would include export growth in control systems, transformer components, industrial monitoring technologies and building-efficiency systems to Germany, Poland, the Nordic countries and the Baltic region, alongside deeper integration into Nordic-Baltic resilience value chains.

7. FROM EXPORT OPPORTUNITIES TO STRATEGIC PRIORITIES

7.1. Roadmap for Development of Estonia's Low-Carbon Technology Exports

The scenario analysis indicates that Estonia's strongest low-carbon technology (LCT) opportunities remain relatively stable across the four alternative futures. The main differences concern the geography of demand, the organisation of value chains and the conditions for market access rather than Estonia's underlying capabilities and product opportunities. Across the scenarios, the strongest prospects consistently emerge in industrial control systems, electrical infrastructure, monitoring and regulation technologies, specialised machinery and related engineering-intensive products.

To translate these findings into a development sequence, the roadmap assesses the IMF-defined set of LCT products at HS6 level along four dimensions: existing export strength, reflected in current exports and revealed comparative advantage; relatedness, indicating how close a product is to Estonia's existing export capabilities; product complexity and complexity outlook gain; and export potential, capturing the scale and accessibility of international demand. The resulting product-level evidence is used to distinguish between opportunities that Estonia can scale from its existing base, products into which domestic firms may diversify through related capabilities, and more distant activities requiring investment and ecosystem development. The four scenarios are then used as a qualitative robustness check on these opportunities rather than as part of the quantitative ranking itself.

The roadmap should not be interpreted as a forecast of individual products that Estonia will necessarily export in the future. It provides a way of sequencing development priorities according to the strength of the existing capability base, the distance to potential new activities and the scale of the associated market opportunity.

Scale existing LCT export strengths

The first pathway covers products where Estonia already has an export base, capabilities are established or closely related to the existing industrial structure, and international demand offers scope for further growth. These products provide the most direct route to increasing LCT exports in the short term. Policy support should therefore focus primarily on scaling firms, entering additional markets, certification, participation in international procurement and deeper integration into industrial value chains.

The scenario analysis identifies several product groups that fit this logic. Electrical control boards and integrated control systems (HS 853710) emerge repeatedly as one of Estonia's strongest opportunities. Other recurring areas include precision measurement and regulation technologies (HS 903180, 903289 and 903290), electric motor, generator and transformer components (HS 850300 and 850490), and specialised machinery and process equipment (HS 847989 and 847990).

For these products, the main objective for 2026–2027 is therefore export scaling rather than industrial diversification.

Develop adjacent LCT capabilities

The second pathway covers products in which Estonia does not yet possess a strong export position but which are closely related to existing capabilities and offer sufficient complexity and market potential to justify deliberate diversification. These products represent a medium-term opportunity because firms may be able to enter them by extending and recombining capabilities already present in Estonia.

The scenario analysis points to several such areas, including electrical switching systems (HS 853690), physical and chemical analysis instruments (HS 902780), gas filtration and purification technologies (HS 842139), and specialised electrical measurement components (HS 903090). These products are linked to Estonia's existing strengths in electronics, industrial automation, engineering and instrumentation while offering opportunities to move into more complex activities.

The relevant policy instruments differ from those used for established exports. Development should combine applied R&D, product development, demonstration projects, supplier-development programmes, standards and certification support, and stronger links between manufacturing firms, engineering companies and digital technology providers.

The main horizon for this pathway is 2028–2034, although capability development should begin before then.

Build selected strategic LCT platforms

The third pathway covers products with high long-term market and complexity potential but a larger distance from Estonia's current capabilities. These should not be treated as ordinary export-promotion or diversification targets. Entry is more likely to require foreign investment, technology partnerships, research and testing infrastructure, or integration into European industrial value chains.

Examples identified in the scenario analysis include lithium-ion accumulators (HS 850760), multilayer ceramic capacitors (HS 853224), lasers (HS 901320) and advanced optical instruments (HS 902750 and 903149). The report already distinguishes these activities from the more incremental expansion of domestic firms: higher-complexity activities in photonics, industrial electronics and selected battery technologies are more likely to depend on foreign investment, strategic partnerships and integration into wider European industrial ecosystems.

For these areas, policy should concentrate on a limited number of strategic capability-building propositions rather than attempting to develop a broad range of technologies simultaneously. Relevant instruments include targeted FDI attraction, anchor investments, research and testing infrastructure, participation in European industrial alliances and support for specialised domestic supplier ecosystems. Capability building should begin during the current and next policy periods, while significant export effects are more likely to materialise over the longer term.

Roadmap structure

The three pathways can be summarised as follows.

Development pathway	Main evidence	Indicative LCT areas	Main policy focus	Main horizon
Scale existing strengths	Existing exports, high RCA, high relatedness and market potential	Control systems, instrumentation, electrical components, specialised machinery	Market expansion, certification, procurement access, scale-up	2026–2027
Develop adjacent capabilities	High relatedness, attractive product complexity and export potential, but limited current exports (modest RCA)	Switching systems, analytical instruments, filtration, electrical measurement	Applied R&D, demonstration, supplier development, standards	2028–2034
Build strategic platforms	High complexity and market potential, but larger capability gap (low RCA and low relatedness)	Photonics, advanced electronics, selected battery technologies	FDI, anchor investors, research infrastructure, European value-chain integration	Capability building 2026–2034; major export impact 2035+

Individual HS6 products are allocated to these pathways on the basis of the quantitative indicators rather than judgement alone. The detailed product-level indicators, rankings and market opportunities have been made available through green.goodtrade.ai, while the report itself presents only the highest-priority product groups and the development logic behind them. This keeps the roadmap concise while retaining a transparent link to the underlying evidence.

The scenarios provide an additional robustness test. Products that remain attractive across all four futures can be treated as robust opportunities, while others may depend more strongly on particular market, investment or geopolitical conditions. This distinction does not require four separate roadmaps. Instead, the scenarios help identify how the same underlying capabilities may need to be positioned in different markets and value-chain configurations.

The resulting roadmap therefore provides a sequence rather than a fixed sectoral plan: a) scale existing strengths, b) diversify into related LCT activities where Estonia has a credible capability base, and c) pursue more distant high-complexity opportunities selectively through investment and international partnerships. This provides the product-level foundation for the broader strategic considerations set out below.

7.2. Strategic Priorities for Export-Led Green Growth Under Uncertainty

The scenarios demonstrate that Europe's green transition is likely to continue under all futures, although at different speeds and under different geopolitical and economic conditions. Electrification, AI-enabled industrial digitalisation and infrastructure modernisation remain central drivers of industrial transformation across all scenarios because electricity increasingly underpins manufacturing, transport, buildings, logistics and digitally integrated operations.

For Estonia, this creates sustained opportunities for export-led green growth in engineering-intensive products linked to industrial infrastructure and systems integration. The strongest opportunities consistently emerge in AI-enabled industrial control systems, smart electrical infrastructure, monitoring technologies, industrial optimisation systems, specialised machinery and infrastructure-management technologies. Across all scenarios, demand remains strongest for technologies that improve operational reliability, energy efficiency, infrastructure resilience and industrial integration.

The analysis further suggests that competitiveness increasingly depends on implementation capability rather than technology availability alone. Infrastructure deployment, engineering capacity, industrial coordination and systems integration emerge repeatedly as critical constraints shaping long-term industrial performance. As infrastructure systems become AI-enabled, more digitally integrated and operationally complex, supplier reliability, certification capability, cybersecurity competence and long-term servicing capacity become increasingly important competitive advantages. Competitive and predictable electricity supply also remains a foundational condition for long-term industrial investment, electrification and export competitiveness across all scenarios, particularly for energy-intensive infrastructure and manufacturing activities.

Baltic-Nordic-Polish-German integration also becomes strategically more important across all futures. Estonia's geographic position, digital capabilities and integration into Northern European infrastructure systems create favourable conditions for participation in regional industrial ecosystems linked to electrification, infrastructure resilience and industrial modernisation.

The scenarios also indicate that Estonia's industrial upgrading is likely to proceed along two complementary pathways. Domestic firms are best positioned to expand gradually into adjacent engineering-intensive products such as industrial instrumentation, automation systems, analytical technologies and specialised electrical infrastructure. Higher-complexity activities in photonics, industrial electronics and selected battery technologies are more likely to depend on foreign investment, strategic partnerships and integration of Estonia into wider European and allied industrial ecosystems. In several product domains, large anchor investments may also generate wider ecosystems of specialised suppliers, engineering firms, software providers and maintenance services around strategically important industrial platforms.

Several strategic priorities follow from these conclusions. The first is strengthening implementation capacity through faster infrastructure deployment and stronger coordination between climate, energy, industrial and innovation policy. The second is expanding engineering capability, industrial digital skills and systems-integration competence. The third is strengthening trusted supplier status through certification capability, AI and cybersecurity competence and long-term servicing capacity.

Overall, the scenarios suggest that Estonia's long-term competitiveness in exports of low-carbon technologies depends less on industrial scale and more on becoming technologically specialised, operationally reliable and strategically indispensable within European low-carbon industrial and infrastructure systems.

ANNEX. SCENARIO COMPARISON

Dimension	A - Managed Techno-Globalisation	B - Electrostates vs Petrostates	C - Competitive Techno-Nationalism	D - Defensive Regional Fragmentation
Core logic	Open but strategic global integration	Crisis-driven electrification and resilience	Technological rivalry and standards competition	Fragmented regional survival under repeated crises
Trade and supply chains	Diversified global networks	Resilient allied networks	Trusted technological blocs	Regional and redundancy-focused
Investment climate	Stable and innovation-led	State-supported and infrastructure-driven	Uneven and subsidy-intensive	Weak and risk-averse
State intervention	Strategic coordination	Strong industrial mobilisation	Techno-sovereignty and standards policy	Defensive crisis management
Speed of electrification	Fast	Very fast	Moderate	Slower and uneven
Technology systems	Highly interoperable	Allied-system integration	Competing standards and ecosystems	Fragmented regional systems
Estonia's export geography	Europe + North America + Indo-Pacific	Europe + allied Asian partners	Selective trusted ecosystems	Primarily Nordic-Baltic-Europe
Estonia's strongest role	Integrated industrial systems supplier	Electrification and resilience supplier	High-trust specialist technology supplier	Regional resilience and maintenance provider
Strongest Estonian niches	Automation, smart infrastructure, analytical systems	Grid systems, infrastructure resilience, industrial optimisation	Precision instrumentation, photonics, industrial intelligence	Smart-grid resilience, retrofit systems, maintenance technologies
Product diversification potential	Broadest	Strong but alliance-dependent	Selective and partnership-driven	Narrow and incremental
Climate-transition outlook	Most stable and investment-rich	Accelerated by energy insecurity	Slower and fragmented	Repeatedly disrupted and uneven

Scenario	Strategic Logic	Main Opportunity for Estonia	Main Strategic Risk	Key Enabling Factor
A. Managed Techno-Globalisation	International cooperation remains relatively strong; energy shocks remain manageable; green and digital technologies diffuse rapidly.	Access to large export markets for industrial automation, smart infrastructure, digital solutions, and specialised engineering.	Estonia remains a peripheral subcontractor while larger economies capture most value-added activities and scale advantages.	Continued international policy coordination and stable investment conditions supporting cross-border technology diffusion.
B. Electrostates vs Petrostates	Recurrent energy disruptions accelerate electrification and strengthen cooperation among countries seeking energy independence.	Strong demand for smart-grid technologies, energy-management systems, monitoring technologies, and resilient infrastructure solutions.	Technological and market fragmentation limits access to non-aligned markets and creates dependence on a narrower alliance system.	Sustained electrification investment and political alignment among countries prioritising energy security and clean-energy systems.
C. Competitive Techno-Nationalism	Global markets fragment into competing technology blocs; industrial policy, export controls, and strategic subsidies intensify.	Estonia becomes a trusted specialist supplier within selected European and allied industrial ecosystems.	Exclusion from key industrial ecosystems due to insufficient scale, investment, or technological capability.	Deep integration into European strategic value chains and strong reputation as a secure, trusted technology partner.
D. Defensive Regional Fragmentation	Weak international coordination combines with severe energy and supply-chain disruptions; resilience becomes the dominant priority.	Regional demand for maintenance, infrastructure resilience, cybersecurity, industrial services, and localised supply solutions.	Economic stagnation caused by shrinking markets, lower investment, and reduced innovation dynamics.	Strong Nordic-Baltic-Polish-German regional cooperation and investment in critical infrastructure resilience.