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Report on the potential for EU market acceptance and recognition opportunities for ETV
PART II: Boosting the ETV potential for market acceptance and recognition

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Responsible Partner: **IETU**

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EXPLANATION OF PARTNERS ACRONYMS

Acronym	Full name
IETU	Institute for Ecology of Industrial Areas
CET	CETAQUA, Centro Tecnológico del Agua, Fundación Privada
EIT RM	EIT RawMaterials GmbH
ENEA	Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile
INSAV	INSAVALOR
IOS	Institute of Environmental Protection- National Research Institute
KA	KÖVET Egyesület a Fenntartható Gazdaságért
ZAG	Slovenian National Building and Civil Engineering Institute

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ABOUT THIS REPORT

The aim of this report is to define the potential of market acceptance and recognition of the Environmental Technology Verification scheme with an objective to advance this potential towards making ETV the EU leading scheme for market uptake of innovative environmental technologies under the full-scale EU ETV Programme.

The report is based on the implementation of the preparatory actions of the LIFEproETV project. It summarises the EU ETV status quo of implementation and performance in Europe, defines the potential and proposes actions to move ETV forward as an EU environmental scheme taking into account the findings of the EU ETV Pilot evaluation[1], the objectives set up for the development of the full-scale EU defined in the Commission Staff Working Paper on the ETV Initiative[2].

The scope of the report concerning ETV potential addresses the EU level and 6 focus countries where the LIFEproETV project is implemented including 3 countries that have participated in the EU ETV Pilot: Poland, Italy, France as well as countries outside the pilot: Slovenia, Spain, Hungary.

This report aims to provide a basis for designing future measures concerning policy, market, finance and promotion to support the uptake and recognition of ETV.

The report consists of 2 parts: Part I is dedicated to the assessment of the status quo of ETV market acceptance and recognition while Part II capitalizes on these findings to propose a set of strategic directions and actions necessary to improve this acceptance and recognition in view of the geographical and technology areas extension of the EU ETV Programme.

The findings of this report are aimed to serve as a basis to co-design together with the ETV stakeholders a roadmap towards setting up a mutually supporting framework for ETV market acceptance and recognition that can be used by policy makers to aid the implementation of the scheme at EU level as well as at Member State level.

For policy makers in countries already participating in the EU ETV Programme, this report aims to highlight certain aspects that needs to be taken account of in order to give visibility and strengthen the role of ETV as a market and policy tool for sustainable transitions, whereas for countries where EU ETV scheme has not been presented so far, this report may provide guidance on the aspects that need to be addressed for integrating ETV as an element of their innovation systems for sustainable transitions.

[1] The evaluation involves 3 external studies: Support study for the evaluation of the EU ETV Pilot Programme including an ex-ante assessment of possible options for the future of an EU ETV scheme, Synopsis report on the stakeholder consultation, and a Feasibility study report. All three reports are available at: https://ec.europa.eu/environment/ecoap/etv/evaluation_en

[2] COMMISSION STAFF WORKING PAPER The Environmental Technology Verification (ETV) initiative Helping Eco-Innovations to reach the Market Accompanying the document Communication from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions Innovation for a sustainable Future - The Eco-innovation Action Plan (Eco-AP) https://ec.europa.eu/environment/ecoap/sites/default/files/etv-files/documents/sec_2011_1600_f1_other_staff_working_paper_en_v3_p1_674169.pdf

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1. INTRODUCTION

In Part I we have made an attempt to summarise the status quo of ETV market acceptance and recognition focusing on the key factors that drive these processes on EU and national level and their current standing in the 6 LIFEproETV focus countries.

Part II is about how to addresses the challenge of ETV market acceptance and recognition and switch the ETV market push into the ETV market pull capitalising on the observations concerning the key driving factors as presented in Part I. Similarly as in Part I, we analyse the challenge at EU level and national level of the 6 countries involved in the LIFEproETV project.

In our understanding, this challenge should be approached taking into account **meeting the demands and fulfilling the expectations** of:

- ETV target groups (direct impact) i.e., providers of innovative environmental technologies, mainly SMEs, startups, industry-academia consortia, technology buyers and users including public and private entities;
- stakeholders (indirect impact) involving policy and decision makers responsible for environmental, climate and innovation policies, regulatory bodies at EU and national/regional level, bodies responsible for stimulating the GPP and IP, funding bodies (public and private capital providers) responsible for creating funding opportunities for ETV and purchase of green innovations, business support organisations as service providers to innovative companies, test bodies and certification programme operators as facilitators of ETV compatibility and finally verification bodies as ETV service providers.

Therefore, in Part II we are looking into the key contributors that may boost the factors determining the market uptake of ETV based on which we define the strategic directions for increasing ETV market acceptance and recognition on EU and the national level of the 6 LIFEproETV focus countries. With them, we want to achieve the status where ETV becomes a sustainable element of transformative innovation ecosystem delivering a level of satisfaction that meets the demands and fulfils the expectations of the target groups and the stakeholders.

2. KEY CONTRIBUTORS TO BOOST THE FACTORS DETERMINING THE ETV MARKET UPTAKE, ACCEPTANCE AND RECOGNITION

The following aspects of ETV resulting from the factors that determine its current market acceptance and recognition presented in Part I need to be considered as key contributors to boost that market acceptance and recognition at the EU and national level[3]:

- Extended objectives

The objectives of the scheme can be modified or extended to pursue also other aims and thus expand the rationale for decision making for ETV investment development and the ETV business case.

[3] The approach has been adopted from the approach suggested for improving the performance of EMAS scheme explained in the report Final Report: Supporting the Evaluation of the Implementation of EMAS https://www.researchgate.net/profile/Fabio_Iraldo/publication/318094827_Supporting_the_Evaluation_of_EMAS_the_EcoManagement_and_Audit_Scheme/links/5958d08aaca272c78abf030b/Supporting-the-Evaluation-of-EMAS-the-EcoManagement-and-Audit-Scheme.pdf

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- Strengthened credibility and certainty

The current quality and impartiality framework of ETV can be strengthened using market relevant and policy factors beyond the current ISO standards applicable to EU ETV scheme (i.e. ISO 14034, ISO 17020 and ISO 17025) to maximise the impact of ETV and demonstrate the value of the scheme towards different stakeholders.

- Extended scope

The technological and geographical scope of ETV needs to be extended to match the verification offer with the technology needs resulting from policy objectives of the EU Green Deal as well as national priorities and challenges, develop the portfolio of the verified technologies.

- Upgraded infrastructure

The ETV infrastructure on national level needs to be adjusted to the extended scope of ETV. and improve accessibility of the ETV service.

- Collaborative institutional framework

The ETV institutional framework on the national level should be based on active participation and clear division of roles and responsibilities of stakeholders including industrial/business stakeholders as well as policy stakeholders to maximise the uptake of ETV as preferred alternative for accelerating the process of placing a new technology on the market with high strategic value and low risk.

- Favourable external framework

The external framework for ETV should ensure the possibility to create and enact different forms of external incentives resulting from linking ETV with environmental and climate policies, cross-compliance with innovation supporting schemes (including funding) to facilitate access to the EU market, particularly for SMEs offering new environmental technologies (supply side) and increase interest in verified technologies among the buyers (demand side).

2.1. Extended objectives of ETV

Borrowing from the EMAS/Ecolabel improvement methodology[4], extending and complementing the key objectives of ETV will allow to better reflect the most impactful use cases of the scheme identified based on the analyses in Part I. They will allow to expand the basis for meeting the demands and expectations of target groups and stakeholders as well as to reach new, important stakeholders groups. The resultant synergies between the demands and expectations and the ETV use cases, especially when combined with policies enhance the effectiveness of ETV as a policy support tool in a broad context of addressing the innovation challenge of sustainable transitions and as an element of systemic innovations fostering green transformation of the current technical systems.

Figure 1 presents the proposed areas of ETV objectives extension that are described below in further detail, taking into account their potential to increase the market acceptance and recognition of ETV and factors that may weaken the push.

[4] EVER: Evaluation of EMAS and Ecolabel for their Revision, Report 1: OPTIONS and RECOMMENDATIONS for the REVISION PROCESS https://www.ioew.de/uploads/tx_ukioewdb/ever_final_recommendations.pdf

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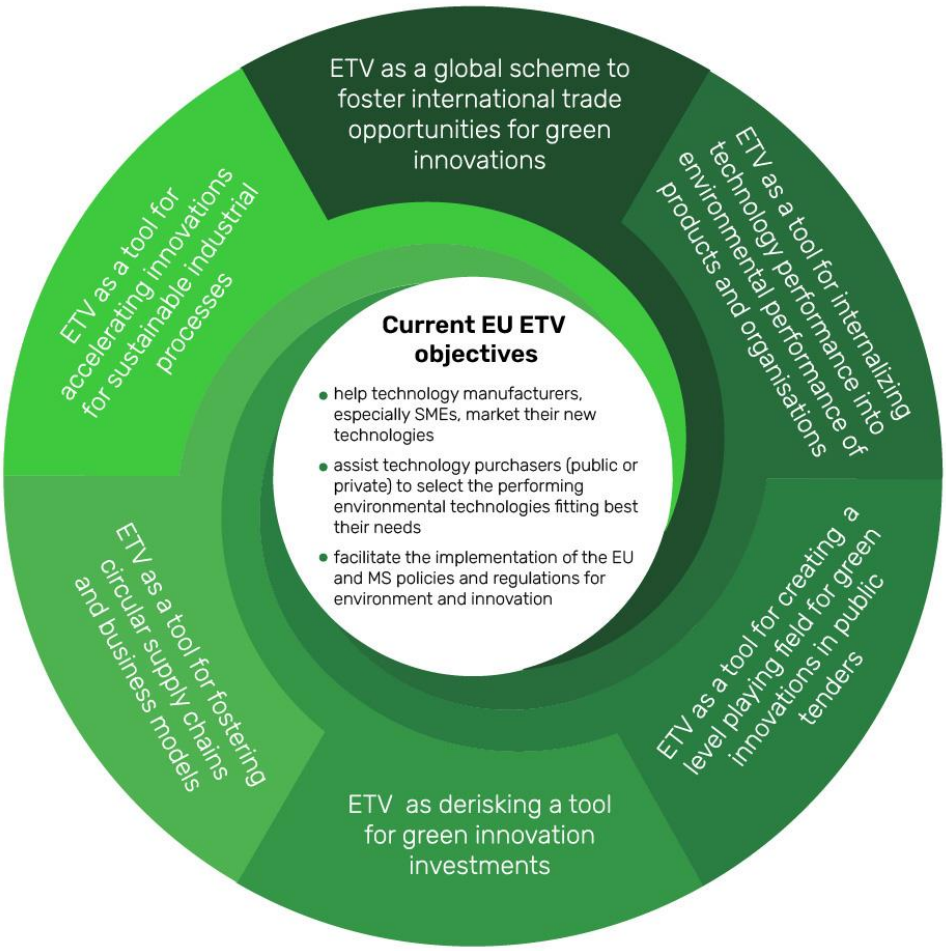

Figure 1 Proposal of the EU ETV objectives extension

ETV as a tool for accelerating innovations for sustainable industrial processes

Sustainable industrial processes meeting the circularity and zero-pollution objectives of the EU Green Deal require adopting new technologies. Large industries however, demonstrate high risk-aversion with regards to the adoption of untested innovations being concerned that taking on a new technology risk may disrupt their production processes, even despite reducing their environmental impacts. At the same time the Zero Pollution Action Plan calls for revision of measures and accelerating innovations uptake to address environmental impacts caused by pollution emission from large industrial installations. Large industrial facilities must adhere to emission limits set up by Member States based on Best Available Techniques (BAT) reference documents (BREFs) defined under the Industrial Emissions Directive (IED)[5], the main EU instrument that is the backbone of the environmental legislation applicable to our industrial installations. BREFs are developed in an ongoing process, they are also revised at regular intervals in order to embed new technologies defined as Emerging Techniques which leads to a progressive upgrade of standards that must be met by industrial installations. In order to become an Emerging Technique, an innovation must be commercially developed and provide either a higher general level of protection of the environment or at least the same level of protection of the environment and higher cost savings

[5] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) Text with EEA relevancehttps://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1579186952334&uri=CELEX:32010L0075

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compared to current BATs. ETV provides a mechanism and a source of credible information on performance of innovative environmental technologies that satisfies the requirements of an Emerging Technique and thus can potentially feed the development or upgrade of BREFs reference documents[6] regarding the chapter on Emerging Techniques. ETV could in particular support implementation of IED (Art 15(5)) to facilitate development and testing of emerging techniques. It could also contribute to shortening the BREF cycles providing innovations with proven performance to set up a forward looking perspective based on Emerging Techniques Associated Emission Levels (ET-AELs).

This could be done through the Innovation Observatory under the IED (if the initiative is upscaled) that will play a key role in monitoring innovations and accelerating the identification of new techniques with proven technical feasibility.

Potential for supporting ETV market acceptance and recognition: high due to transposition of IED into national regulations and strong links with EU and national policies related to zero-pollution, pollution prevention and control, sustainable industrial processes and circular economy.

This push can be weakened by such factors as:

- Difference in the definitions of Emerging Technique under IED and technology under ETV (ISO 14034). IED defines the term "technique" as both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned, while ETV defines technology as a process, product or service. Although there is no clear contradiction in the definitions, in order to enable consideration and potential inclusion of technologies with performance verified under ETV, the compatibility of the definitions must be clearly explained and agreed upon between the EU ETV scheme operator and the European IPPC Bureau;
- No direct operational link established between the Innovation Observatory and the EU ETV scheme operator (e.g. EU ETV Secretariat) to present the verified technologies for consideration by the Innovation Observatory;
- The verified technologies and their intended applications do not correspond to the key environmental aspects referred to in BREFs dedicated to specific sectors;
- Lack of reference made to ETV in relevant policies or documents supporting their implementation (e.g. Zero Pollution Action Plan, Sustainable Products Initiative, revised IED Directive).

ETV as a tool for fostering circular supply chains and business models

The circularity objective of "closing the loop" of material flows requires feeding the industrial production system with re-used, repaired or upgraded products, or with recycled materials in order to make industrial processes keep the value, materials and energy embedded in industrial products longer in use. At the same time the Sustainable Products Initiative assumes that industrial products will need to meet new requirements related to reparability, upgradability, durability and recyclability criteria in addition to the current requirements regarding energy consumption. This will be regulated by the revised Ecodesign directive. Maximising the chances of retaining and generating value in the industrial production systems

[6] [2] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) Text with EEA relevancehttps://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1579186952334&uri=CELEX:32010L0075

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will require new collaborations and business models based on standards that industries can share in order to redesign their processes. They could be a very strong demand side measure for ETV as it offers such a standard with multiple applications to verify the performance of: new technologies enabling conversion of waste to resources, secondary raw materials for industrial applications or secondary raw material based products.

Potential for supporting ETV market acceptance and recognition: high due to transposition of Ecodesign directive and regulations stemming from the Sustainable Products Initiative related to e.g. green claims into national regulations, strong links with EU and national policies and strategies related to waste management, resource efficiency and circular economy, market surveillance system.

This push can be weakened by the following factors:

- Lack of reference to ETV in Sustainable Products Initiative policies, the revised Ecodesign directive and similar regulations at EU and national level;
- Competition from other certification schemes either regulatory or voluntary that are already mentioned in policies and regulations e.g. PEF or product specific certification schemes.

ETV as a derisking tool for green innovation investments

Many SMEs struggle to finance projects aimed at development and commercialisation of innovations. In the case of new environmental technologies, these projects may be especially capital-intensive due to the need of extensive testing, validation and demonstration required to commercialise the innovation. Also, the process of market adoption for environmental technologies is much longer than in the case of e.g. IT technologies and much more challenging in terms of funding. While there is funding available in many programmes on EU and national level to cover the costs of the R&D phase of technology development in the innovation cycle (up to TRL 7), less support is available for the more risk intensive phases of the innovation cycle like full scale demonstration and commercialisation. These can be addressed for example by some close-to-market programmes on EU level (EU LIFE Programme, Innovation Fund) imposing, however, some limitations concerning technology areas or by different innovation support mechanisms on national but also sectoral levels including e.g. innovation vouchers etc. This commercialisation gap could be bridged by attracting private or public investments to demonstrate and/or scale up green innovations with focus given to their market uptake for example through commercial funding tools (e.g. preferential credits, low interest loans etc.) offered by institutional investors (private and public), innovation procurement or cleantech funds investments in green startups. Regardless of the source, all of these alternative funding sources are associated with challenges, especially for SMEs, in satisfying the requirements of investors' due diligence procedures and meeting their risk profile. Financial actors seek credible information sources allowing them to assess the risks and the sustainability aspects of such investments. In their risk assessment methodologies, they often rely on data sources that are either publicly available information, or externally gathered data originating from 'private' disclosure, which often do not include third-party verification, which is costly. Lack of such information raises uncertainties around data quality and trustworthiness required in investment decisions[7]. For financial institutions ETV could serve as an "external data provider" delivering third party data on technologies performance meeting also the requirement of transparency and

[7] Developing Risk Profiling Methodologies – insights from financial services in the quantification of sustainability risk at different spatial scales, EFECA, 2020 https://www.isealalliance.org/sites/default/files/resource/2020-08/Risk-Profiling-Methodologies_Efeca_08-2020.pdf

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robustness demanded in the case of certification to be used in investment decisions. Such use of ETV could work as a lever for green innovations supply measure.

As indicated in Part I, innovation procurement is a strong innovation policy instrument of the demand side. Among the challenges in implementing innovation procurement, the ones related to technology assessment and selection for scale-up and commercialisation with reference to the specifications, and, later, its successful diffusion and utilisation are mentioned[8] They require a substantial multidisciplinary in-house expertise within innovation procurer organisation to manage its processes, as well as knowledge development and diffusion to substantiate the selection of the best technology design fitting the challenge. Diffusion, interpreted as implementation and upscaling, of these new technologies is, however, often impaired by their inferior performance characteristics and can be hampered by industry resistance and a mismatch with existing regulations. In the case of using IP for environmental technologies, this could be particularly challenging for innovation procurer as such assessments may or rather should take into account not only the aspect of meeting the minimum technical/functional performance criteria but also the environmental aspects of the innovation from the life cycle perspective to ensure the superiority of the new solution over conventional technologies in terms of its sustainability. ETV could play a role similar to environmental certificates/ecolabels in green public procurement reducing the burden of technology assessment including its innovation aspect combined with achieved performance, assessment of the compliance of the innovation with the definition of environmental technology provided in ETV standard ISO 14034 and the environmental benefits from the procurer. The flexibility of parameters choice enables adjusting the verification process to the procurement needs while impartiality of ETV gives the guarantee of an objective, credible assessment. Also, the objective of ETV is to verify that the technology design allows to achieve the claimed technical/functional performance and the resulting environmental benefits. Thus, ETV can serve as an effective mechanism demonstrating in a credible way the compliance of the developed innovations with the level of ambition presented in the procurement specification. ETV can be used as a method enabling benchmarking of the developed innovations and thus derisk the investment in the best choice solution.

Potential for supporting ETV market acceptance and recognition: moderate to high, depending on the country due to increasing role and promotion of innovation procurement through application of innovation partnerships and the private cleantech investment culture in a given country . The potential can increase due to implementation of the EU Green Taxonomy as a policy and the resulting sustainable financing regulations[9] which could trigger ETV demand by funding bodies including banking sector and private capital as well as public buyers including innovation procurers as overarching regulations with a strong and extensive impact on redirecting capital flows towards sustainable activities and making sustainability an important part of investment risk assessment.

This push can be weakened by such factors as:

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[8] Joeri H. Wesseling, Charles Edquist. Public procurement for innovation to help meet societal challenges: A review and case study, August 2018, Science and Public Policy 45(4):493-502, DOI: 10.1093/SCIPOL/SCY013
https://www.researchgate.net/publication/328553993_Public_procurement_for_innovation_to_help_meet_societal_challenges_A_review_and_case_study

[9] https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

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- Limited use of innovation procurement as a practice for public investments in innovation;
- Lack of reference to ETV in programmes dedicated to close-to-market phases of green innovations;
- Lack of clear reference to ETV in policies relevant to sustainable financing;
- Lack of recognition of ETV as external data provider by institutional investors;
- Limited scope of environmental parameters considered by institutional investors focused mainly on carbon/GHG footprint;
- Insufficient reputation and credibility of ETV due to limited number of verifications. The 2020 EFECA report on Risk Profiling Methodologies in financial services clearly indicates that the certifications need to be rigorous to be recognised for sustainability risk assessments. Currently certifications are often used in lending or investment decisions as confirmation or validation of other acquired data as part of due diligence processes. Also, ISO standards are under discussion in green bonds. As the financial sector needs to trust certification to 'use' it, it is essential that the scheme in question has a strong reputation – something that the risk approach can ensure and support;
- ETV costs that may be an issue for SMEs/startups if no dedicated ETV funding scheme is provided or an opportunity to include ETV as eligible costs under funding schemes providing financing of close-to-market projects;
- Lack of institutional capacities and skills to use ETV by innovation procurers;
- Lack of sufficient good practices in IP for green innovations;
- Low interest of national capital providers in cleantech investments.

ETV as a tool for creating a level playing field for green innovations in public tenders.

As presented in Part I, green public procurement is a strong market driver, especially for SMEs that could stimulate high demand for verifications of technology providers especially when combined with green criteria. ETV provides a non-regulatory, technology neutral, credible mechanism to overcome the barrier of lack of a uniform approach to the application of green criteria for purchasing green technologies as a technology assessment standard applicable even to innovations with outstanding performance that cannot be categorised under the current standards and regulations for performance. In this way ETV creates a level playing field for green innovations that enables value based, transparent procurement decisions allowing to recognise the market value of environmental benefits, prevents locking in one technology over another and thus helping drive the single market for green innovations.

Potential for supporting ETV market acceptance and recognition: moderate to high, depending on the country due to a diversified use of GPP across EU Member States.

This push can be weakened by the following factors:

- Optional character of green public procurement in many countries;
- GPP uptake mainly by governmental procurers (administration) less by utilities etc.;
- Limited scope of GPP application in terms of types/domains of its use;
- Lack of competences, skills and knowledge of public procurers in implementing green procurement criteria in public tenders (both at the specification development stage and the tender bids assessment stage) and assessing the market value of environmental benefits;
- Lack of guidance and understanding among public procurers on how to use ETV Statements of Verification in the context of public procurement regulations;

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- Different types of certifications relevant for GPP: from third party certifications to self-declarations;
- Complex character of environmental technologies purchase that may involve more than one category of purchase involving e.g.: a combination of product and construction works, or service and construction works or all three categories: service, product and construction works;
- Lack of clear guidance and practices in purchasing environmental technologies under GPP.

ETV as a tool for internalising technology performance into environmental performance of products and organisations

ETV as a scheme provides relevant information on the technical/functional performance of new technologies and their environmental added value enabling businesses make choices of innovations that may help them optimise their processes to achieve the desired levels of environmental performance required by performance based environmental regulations or cross compliance with other certification schemes e.g., environmental management schemes (e.g. EMAS, ISO 14001, Product Environmental Footprint, Organisation Environmental Footprint, Ecolabels, etc.) as we have described in Part I in section 6 on compatibility.

Potential for supporting ETV market acceptance and recognition: high, due to an increasing role of environmental certifications related especially to product markets under Sustainable Products Initiative and the revision of the Ecodesign directive.

This push can be weakened by one major factor: lack of understanding on the complementarity and synergies between ETV and other environmental performance schemes related both to products and organisations (e.g.: EMAS, ISO 14001, Ecolabels, PEF etc.).

ETV as a global scheme to foster international trade opportunities for green innovations

The ETV provides an internationally accepted approach to the assessment of innovative environmental technologies based on the standard ISO 14034: Environmental Management: Environmental Technology Verification in order to enable diffusion of green innovation on home markets, single market as well as worldwide. Currently, the ISO 14034 standard has been approved or is planned to be approved in 35 countries around the world including 18 countries outside Europe representing world's leading environmental and innovative technologies markers e.g.: US., Canada, China, Japan, South Korea. The principle behind the ISO ETV standard was to ensure that a verification performed under one ETV scheme-based programme is recognised by the other programme according to the rule "verified once accepted everywhere" and in this way maximise the utility of ETV and the ISO 14034 standard as a scheme offering a level playing field of green innovation on global markets.

Potential for supporting ETV market acceptance and recognition: moderate, supported by expectations expressed by technology providers concerning the support of ETV when competing on global markets and the efforts of the VerifiGlobal[10] initiative. This is mainly due to an underexplored potential verifications recognition, reducing the trueness of the statement *"verified once accepted* everywhere" as an automatic consequence of having a technology verified under the EU ETV scheme based on ISO 14034 standard.

This push can be weakened by the following factors:

[10] https://www.verifiglobal.com VerifiGlobal is an international alliance operating on global level with an ambition to provide a global platform for testing and verification and enhance global performance of verification capacity.

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- Lack of any formal agreement or at least networking between the schemes and their operators enabling verification results recognition;
- Lack of use of ISO 14034 as an obligatory standard for ETV including the required quality and impartiality framework referred to in the standard i.e., the verifiers meeting the requirements of ISO 17020 and test data meeting the requirements of ISO 17025;
- Lack of ISO 14034 promotion and recognition by international actors / organisations having a say on global markets of technologies e.g.: OECD, UNIDO, etc.

2.2. Strengthened credibility and certainty of ETV

The credibility and certainty of the scheme have a high impact on the market acceptance and recognition of ETV, in particular its value perception. As presented in Part I, the current cornerstones of the credibility and certainty of ETV are: the international standard ISO 14034 that defines the principles and procedures of verification and a quality and impartiality framework concerning verification bodies based on ISO 17020 for verification organisations and ISO 17025 for test data used for verifications. Nevertheless, as our analyses carried out in Part I show, these elements are only a part of the credibility and certainty picture of ETV.

The potential for supporting ETV market acceptance and recognition by strengthening the credibility and certainty of the scheme is very high if enhanced by 3 main boosters:

- promotion and communication efforts based on facts and figures to strengthen the demand side e.g.
    - showcasing ETV performance based and promoting the portfolio of the verified technologies,
    - national ETV web sites provided by national ETV operators (authorities),
    - third party proofs of benefits and promotion of ETV business cases (testimonials, interviews, articles) demonstrating ETV in different contexts and use cases and stakeholders ,
- collection and promotion of good practices applied for ETV implementation related to different aspects (ETV funding schemes, use of ETV as national/ sectoral policy, use of ETV in GPP and IP, use of ETV in deriskig tool for cleantech investments, such as schemes at national level to facilitate ETV development in the countries already involved in the scheme and promote ETV towards new Member States,
- a legislative proposal for ETV promotion similar to the one applied for EMAS[11] visible commitment and involvement of the EU/national actors and key stakeholders creating the institutional framework for ETV together with favourable external frameworks. Similarly as in the case of EMAS, an ETV Regulation would ensure promotion of a coherent approach between the legislative instruments developed at Community level in the field of environmental protection and allow the Commission and the Member States to consider how a verification of a new environmental technology under EU ETV may be taken into account in the development of legislation or used as a tool in the enforcement of legislation. It will also allow to better consider ETV in procurement policies and, where appropriate, refer to ETV as an equivalent to third party certifications as e.g.

[11] REGULATION (EC) No 1221/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC with later amendments.

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means of proof for meeting the technical specifications of products, contract award criteria for works and service.

At the same time the push can be weakened if not combined with adequate supply-side policies and measures ensuring that the portfolio of the verified technologies is adequate to the needs of the users. Moreover, the push can also be reduced by the fact ETV as a demand-side measure can represent significant costs for firms, but this can be balanced if ETV is linked with funding opportunities and financial incentives dedicated to SMEs together with a definition of a clear business case for technology providers.

2.3. Extended scope of ETV

The technology scope of EU ETV technology including the 7 technology areas should be aligned with the current EU Green Deal policy objectives as it has a cross–effect: unless the technology areas addressed by the scheme do not match the objectives of the EU Green Policies and regulatory performance-based requirements relevant for e.g. aspects of sustainability of products design and industrial processes, the zero-waste, zero-emission or zero-pollution objectives, the corresponding portfolio of the verified innovations will not be developed. As the benchmarking of the various ETV schemes shows, the most successful schemes are policy driven, whereas the technology areas are defined by the public actors of the scheme, typically ministries of environment, to correspond to the actual environmental priorities and needs of the country that they identify. For example, in Denmark environmental technologies for agricultural applications are an important technology area due to high impact of agricultural sector on the environment. It adds also to the credibility and certainty of the scheme while allowing some flexibility in its use adjusted to national priorities. It may result in different modalities of ETV use on national level e.g. national calls for verification of specific types of new technologies combined with a funding scheme to address an environmental priority issue or use of ETV under innovation procurement.

The extended scope refers also to ensuring equal access to the verification service for technology providers across the Member States. It is important in the context of ETV use in public purchases (see section 2.2).

Potential for supporting ETV market acceptance and recognition: high if clearly linked with policies implementation on EU and national or even regional level and use of ETV as a policy/environmental challenge driven scheme.

This push might be weakened primarily by:

- Insufficient or lack of relevant infrastructure i.e., verification bodies with appropriate accreditation scopes;
- Lack of interest of the accreditation bodies to establish accreditation schemes on national level to accredit verification bodies and/or extend their accreditation scopes;
- Lack of interest and understanding of ETV among policy makers on national level;
- Lack of national market demand for verification in some technology areas;
- Strong competition from other certification schemes in some ETV technology areas (either voluntary with an established position or mandatory)
- already existing, strong national branding of green innovations or innovations in general that may also be highly competitive to ETV.

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2.4. Upgraded infrastructure

The infrastructure enabling equal access to verification service in all technology areas is related to the extension of the scope of ETV both in terms of technology areas covered and geographically to ensure that technology providers in Member States have equal opportunities to benefit from ETV. Although the existing verification bodies can accept clients regardless of their country of origin, at a minimum, verification capacities corresponding to the extended technological scope of ETV should be provided. Optimally, the service should be available on national level by establishing new verification bodies as it could be linked with the national funding schemes. Also, such issues as language barrier may be an obstacle to technology providers, especially SMEs in applying for verification when no service is available. Verifying a technology abroad may also increase the verification costs due to site visits that the verification bodies might need as a part of the process. Moreover, the aspect of establishing better access to verification service is directly linked with the credibility of ETV and the institutional framework where national verification bodies are recognised, supported and promoted by ministries or agencies responsible for the ETV scheme operation as described below.

Potential for supporting ETV market acceptance and recognition: high to moderate if linked with the extension of the technological scope of ETV and building a collaborative institutional framework to support the demand side measures for verification in new technology areas.

The key factors limiting the push are similar to the ones relevant for extending of the technology scope of ETV combined additionally with lack of interest and motivation of the verification bodies to extend their accreditation scopes without clear signals of demand for their service from the market and national public bodies governing the scheme.

2.5. Collaborative institutional framework

As the benchmarking of the most successful national ETV schemes presented in Part I shows, a properly built and balanced institutional framework of the scheme is a very strong contributor to market acceptance and recognition based on a co-created ETV value. It is particularly true at a national level, where the operation of best performing ETV schemes involves such entities as ministries or agencies responsible for environment/climate entities performing verifications either public or private (verification bodies that are recognised by these ministries or agencies) to ensure ETV market push, and industrial stakeholders to ensure ETV market pull.

Figure 2 presents a configuration of a collaborative institutional framework for ETV at national level as an element of ecosystem supporting innovation for sustainable transitions

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Figure 2 A configuration of a collaborative institutional framework for ETV at national level

A strong public bodies based institutional framework facilitates creation of a favourable external framework for ETV through linking the scheme with national policies, public and innovation procurement, availability of different forms of national public funding to support either directly technology providers or to provide financing to verification bodies to cover some costs of the verification process and to make the ETV business case more attractive. This is currently missing. Involvement of public entities contributes directly to the certainty and credibility of the scheme, especially when combined with promotion of the verified technologies on global market as a national portfolio of innovations. It also ensures a comprehensive, forward-looking approach to ETV and the use of its potential.

The sole fact of accreditation of the verification bodies by national accreditation bodies seems not to be sufficient to provide for a market uptake of ETV especially on national level. Therefore, the role and importance of the verification bodies should be additionally reinforced by the ministries or agencies operating the programme through support (possibly also financial) and promotion of the verification bodies as entities of the national institutional framework for ETV.

Participation of industrial stakeholders in the institutional framework of ETV is crucial and has a two-fold aim: first to ensure that the environmental issues corresponding to technology needs represented by the demand side are taken into account and addressed by the innovation offer of the verified technologies (demand side perspective), secondly that the scheme is organised on a national level in such a way as to make ETV a preferred alternative with a competitive advantage rather than additional burden to technology providers, particularly SMEs. Therefore, involvement of industrial stakeholders also allows to provide a proper balance between a policy driven and market driven ETV scheme and has an impact on the success of using ETV in line with the proposal of the extended objectives as presented in section 3.1.

In countries with a strong role of regional governments and innovation policies, e.g. Italy, institutional frameworks can also be established based on actors involved in regional innovation strategies.

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The institutional framework of ETV can be fostered by the involvement of business support organisations, especially these with an objective to provide assistance to companies in their business development involving commercialisation of innovations.

The accreditation bodies are important yet not critical for the establishment and operation of the ETV scheme at national level, mainly due to the fact that they enable ensuring infrastructure and accessibility to ETV service in a given country, however ETV can be also applied at national level benefitting from infrastructures established in other countries. This could be the case for smaller countries, where establishing a dedicated accreditation scheme may be considered not economically viable for the accreditation body.

2.6. Favourable external framework

Beside a strong institutional framework of ETV as presented above, the market uptake of the scheme following the extension of ETV objectives as presented in section 3.1 is to a large extent dependent on creating an enabling external framework or environment for ETV through:

- linking the scheme with environment and climate relevant policies and regulations as a tool helping address challenge and performance based policies and regulations through innovation ,
- providing a competitive advantage to verified technologies in public tenders,
- linking ETV with financial incentives that are part of innovation support framework for SMEs or startups involving both private and public funding especially dedicated to commercialisation of early market products with innovative features (e.g. innovation procurement),
- cross-compliance with EU and national/regional funding schemes for close to market projects, sustainable financing initiative, cleantech funds and fiscal instruments dedicated to fostering innovation in SMEs (e.g. tax reliefs/incentives for covering the pre-commercialisation phase of technology development as well as purchase of innovative technologies etc.).

It is critical, that the elements constituting the external framework for ETV market acceptance and recognition are mutually supportive both at EU and national levels.

Beside policy relevant and funding aspects, the external framework should also explore the compatibility of ETV benefiting from the opportunities for synergies between ETV and other environmental schemes as described in Part I section 6.

The potential for increasing the market acceptance and recognition of ETV is obviously high both at EU and national level. It can be, however, weakened by:

- lack of awareness, knowledge and understanding of ETV among policy and decision makers and other environmental scheme owners,
- potential perception of ETV as another costly burden imposed on SMEs on their way to commercialise their technologies,
- lack of clear guidance to demonstrate the utility of synergies between ETV and other environmental schemes,
- lack of integrity in the overall policy approach to ETV in Member States and EU

general scepticism of policy makers/authorities due to low number of verified technologies (credibility and certainty aspect of ETV).

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3. STRATEGIC DIRECTIONS FOR INCREASING THE ETV MARKET ACCEPTANCE AND RECOGNITION

Based on the analysis of the key contributors to boost market uptake of ETV presented in the previous section as well as taking into account the benchmarking of the best performing ETV schemes presented in Part I, we have identified the following strategic directions that all together create a mutually supportive framework for increasing the ETV market acceptance (Figure 3):

- Improve ETV value perception
- Unleash the potential of ETV use in GPP and IP
- Promote ETV as a tool fostering execution of challenge and performance led environment and climate policies
- Make ETV a sustainable mechanism of transformative innovation ecosystem
- Strengthen ETV compatibility
- Make ETV more accessible to SMEs

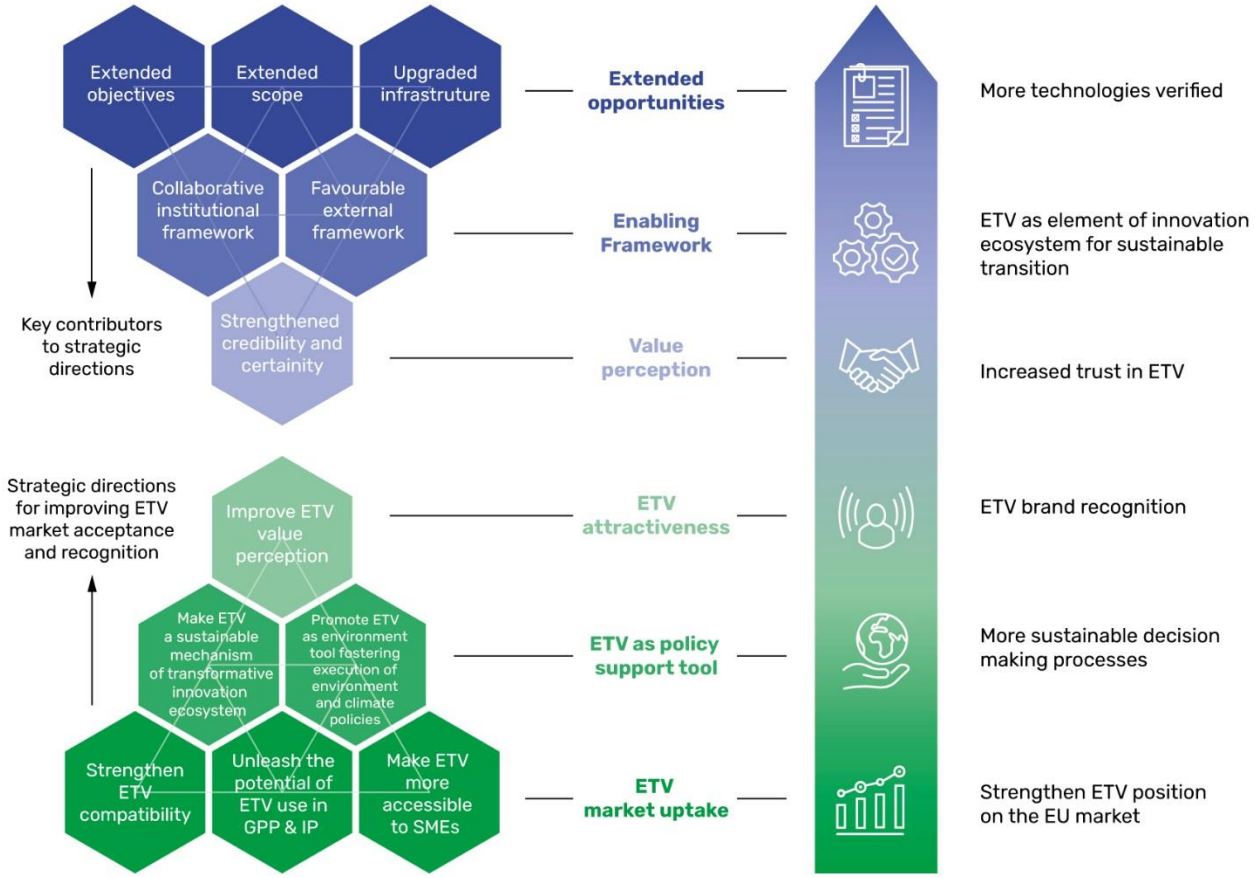

Figure 3 Mutually supportive framework for increasing ETV market acceptance and recognition: from key contributors to strategic directions.

These strategic directions are presented in the following sections. They have been based on the assumption that they involve areas where there is a possibility of action to change and/or influence the application of the scheme at EU and national level so as the combined effect produces an impact focused on the following effects:

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1. Increased awareness, business case attractiveness and interest in verifications resulting in a higher number of verified technologies;
2. Extended opportunities;
3. Increased number of verified technologies for industrial applications with high environmental added value leading to an improved environmental and climate performance of industry and thus resulting in an increased total environmental performance of ETV;
4. Improved market uptake of verified green innovations resulting in increased revenues from their sells.

These resulting impacts can be considered as direct effects and when combined they can generate an overall improvement of the performance of the ETV scheme in terms of market acceptance and recognition.

Other indirect effects can also arise that can be recognised as beneficial consequences for policy and decision makers responsible for environmental, climate and innovation policies and programmes and stakeholders other than the ETV target groups of technology providers and buyers (e.g. certification/testing bodies, regulatory bodies, funding bodies and investors, business support organisations, R&I projects consortia, etc.). They include:

- Improved information basis on technology performance for governments, enabling regulators and decision makers an evidence-based approach to pursue their innovative practices that will lead to an improved public sector innovation;
- Improved uptake of green criteria in procurement practices relevant for both green public procurement of technologies and innovation procurement of green innovations;
- Fostered market penetration of innovations delivered by publicly financed R&I projects resulting from the use of ETV as a tool for building post R&I business models;
- Reduced risks for investors leading to an increased interest in cleantech investments;
- Enriched portfolio of business development services offered to innovative SMEs to support market entry of green innovations by ETV;
- Increased attractiveness of ETV as a business case for test bodies/certification bodies due to an opportunity for creating a combined offer of testing for compliance or other certification schemes and ETV thanks to the test data recognition option offered by ETV.

3.1. Improve value perception

The aim of this strategic direction is to instill a high value perception of ETV so as to better demonstrate the differentiated advantage offered by the scheme in accelerating the way of an innovation to the market while reducing the existing, perceived risks associated with the ETV process, its complexity, duration and costs. It could be achieved by amplifying the sense creating values of ETV as elements of the ETV business case relevant to ETV compatibility in terms of role, positioning and added value of ETV in the innovation management chain (ETV compatibility case 1 presented in Part I, section 6.1) in ETV promotion and communication.

As described in Part I of the report, the current values on which ETV perception is currently built and which are used for its promotion include the following :

- credibility, quality and impartiality,
- certainty,
- transparency,
- recognition,

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- completeness,
- flexibility.

The survey[12] carried out in 6 LIFEproETV countries identified that the **specific features that create the sense of ETV value its potential users** (Figure 4) .

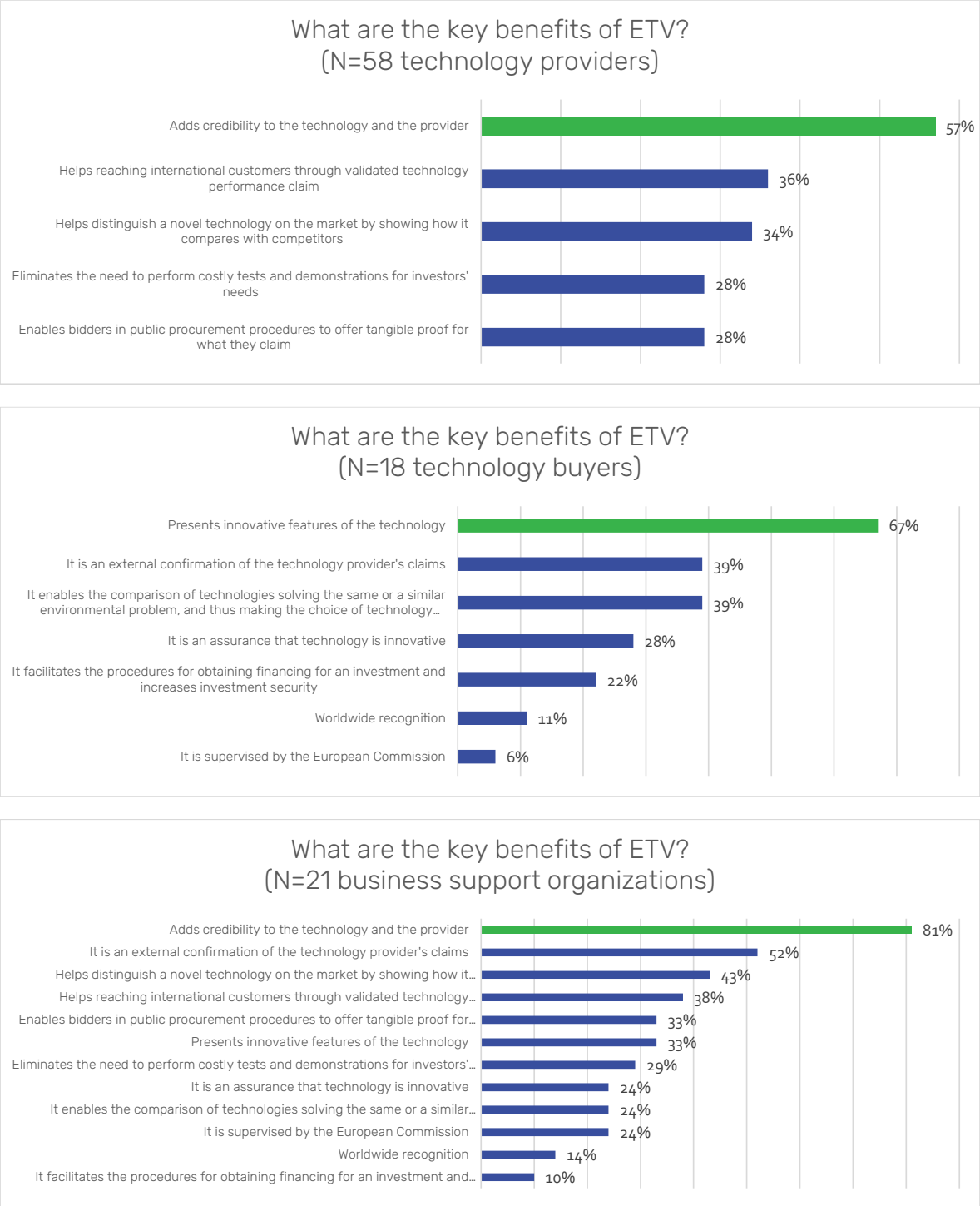

Figure 4 Sense-making values of ETV for different scheme users in the 6 LIFEproETV countries

[12] The survey was caried out carried out in 6 countries: PL, SI, FR, ES, IT, HU among N=521 technology buyers, providers and business support organisations

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For each target group, one of the benefits always received significantly more indications than other ones. For technology providers, the key perceived benefit was "adding credibility to the technology and the provider" (57%). For technology buyers, the key perceived benefit was "presenting innovative features of the technology" (67%). For business support organizations, the top indication was the same as for technology providers – "adding credibility to the technology and the provider" (81%).

Based on the survey results concerning the perceived benefits of ETV and the compatibility of the scheme with the needs of its users, the sense-making values for all investigated ETV user groups can be summarised as follows: :

- utility of ETV to demonstrate the credibility of the technology and its provider,
- utility of ETV to demonstrate innovation and the environmental effect of the technology,
- the EU market range of ETV recognition,
- completeness of information on the technology provided by ETV enabling distinguishing a technology on the market and comparison by technology buyers
- the presentation of ETV results in the form of certificates (Statements of Verification) which meets the demand and expectations of technology buyers,
- impartiality, credibility, quality of ETV,
- potential of offering a competitive edge in public tendering.
- certainty of the scheme guaranteed by its operation as an EU Programme of the European Commission supported by national authorities and policies,

At the same time however, the survey showed that the **leading factors affecting the current value perception of ETV are the uncertainty and perceived complexity of the scheme**. ETV is now considered a complicated, long and rather expensive process with an unsure return on investment. The perceived risks among technology providers regarding the decision to verify a technology under ETV that need to be eliminated involve:

- risk associated with verification costs: high total verification costs, difficulty in predicting them upfront (especially if testing is to be involved) like in the case of certification schemes, and unsure return on investment,
- risk associated with complexity and duration of the process,
- risk concerning uncertain return of investments from the use of Statements of Verification on EU and international markets.

In order to improve the value perception of ETV and minimise the identified risks the following three considerations need to be taken account of in the promotion and communication activities :

1. Amplifying the added value of ETV as favorable points-of-difference in innovation managing processes, public procurement, implementation of challenge led/performance based environment and climate policies and regulations addressing new environmental technologies in communication and promotion;
2. Facilitating the transparency of ETV in communication and promotion towards target groups (technology providers and buyers) and stakeholders
3. Promoting the compatibility of ETV with other environmental schemes for:
    - integrating technology performance data provided by ETV for the needs of improving environmental performance of products, organisations and supply chains
    - the opportunity for technology performance test data recognition offered by ETV as means to reduce the time, costs and duration of the process.

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The three considerations are further described in the following subsections.

3.1.1. Amplifying the added value of ETV

The amplification should be done in line with the needs and expectations concerning ETV demonstrated by the target groups as well as stakeholders such as national authorities. These needs mirror the areas where ETV provides a solution while other currently used practices/pathways do not. Our survey carried out in 6 countries showed (N=242 technology providers) that when bringing new technologies to the market, technology providers typically struggle with the following issues when trying to prove to their clients the benefits and significant improvements resulting from the application of their technology:

- How to demonstrate both environmental effects and innovation of a technology?
- How to ensure credibility, relevance and sufficiency of technology performance test data?
- How to satisfy the technology users' uncertainty if the technology is suitable to work in their operations?
- How to define the performance claim of a green innovation so that it meets the real needs of technology users?

At the same time technology buyers (N=203 respondents from 6 countries), when making purchase decisions on technologies rated the following challenges the highest:

- How to get confidence that the technology will perform as specified in the Statement of Verification?
- How to make the right choice of a technology in relation to the needs and conditions of its operation when more similar technologies are available?
- How to effectively prepare tendering procedures of environmental technologies including tender specification preparation and supplier selection?

Also, our survey carried out in 6 countries showed that technology providers (N=242) pointed out that the currently used methods to communicate the innovation and environmental effect of the technology towards buyers, like certificates, environmental labels, industry sector-specific awards and recognitions, environmental competition awards, innovation awards, allow them to distinguish a technology among competitors – most often, i.e. for 45% of technology providers across all 6 countries – only to some extent (Figure 5).

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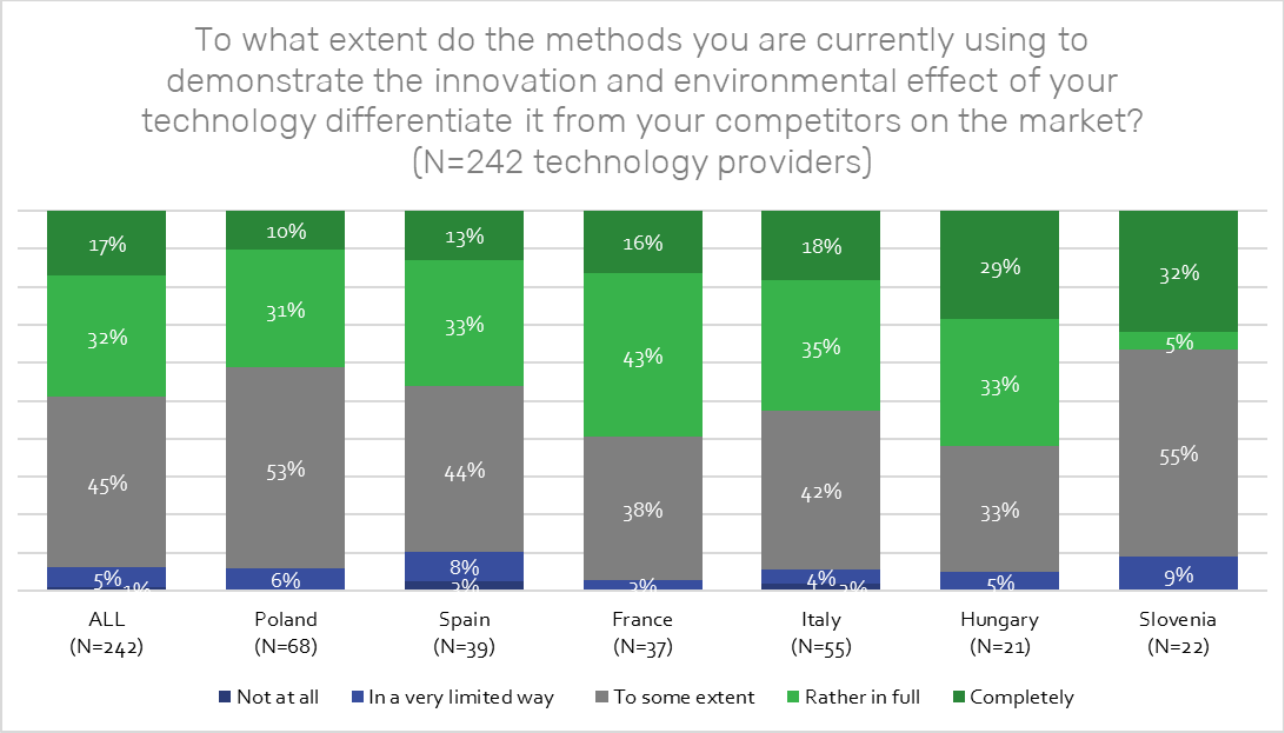

Figure 5 Effectiveness of methods currently used by technology providers in differentiating a new environmental technology on the market

The survey also showed (N=445, both technology providers and buyers) that the needs of technology buyers are not always compatible with the technology communication methods employed by technology providers (Figure 6). While 78% of buyers prefer certificates as a communication method, only 45% of providers use it. This incompatibility creates a space for communicating ETV as a "certificate-like" Statement of Verification that meets buyers' needs.

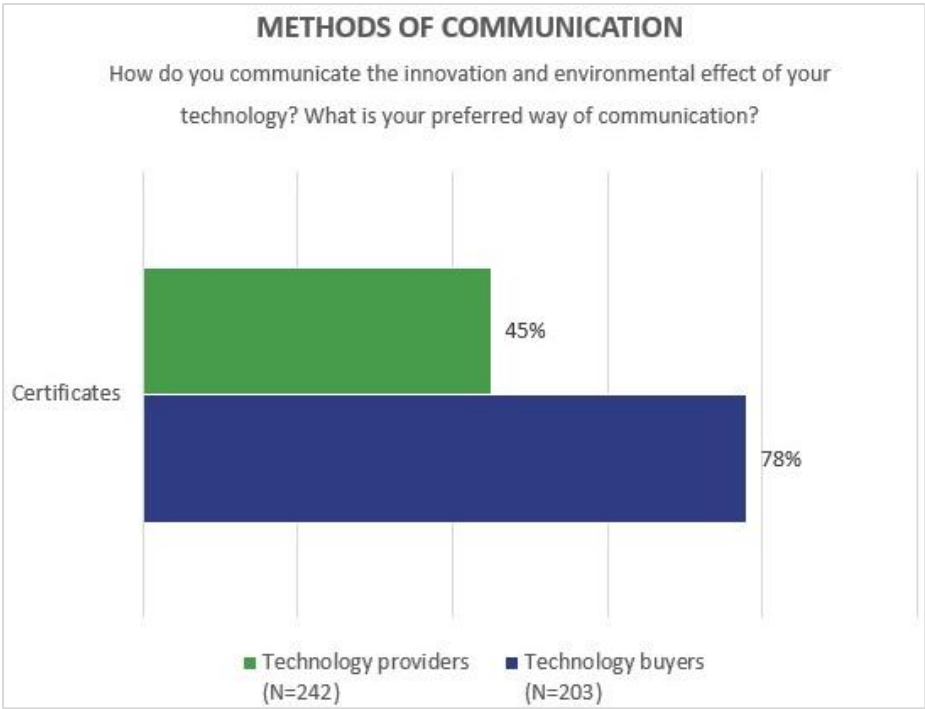

Figure 6 The incompatibility between the way technology providers communicate innovation and environmental effects of a technology and the preferred way of communication by technology buyers

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For amplifying the added value of ETV the following 4 key features should be stresses in ETV promotion and communication to stimulate value perception (Figure 7):

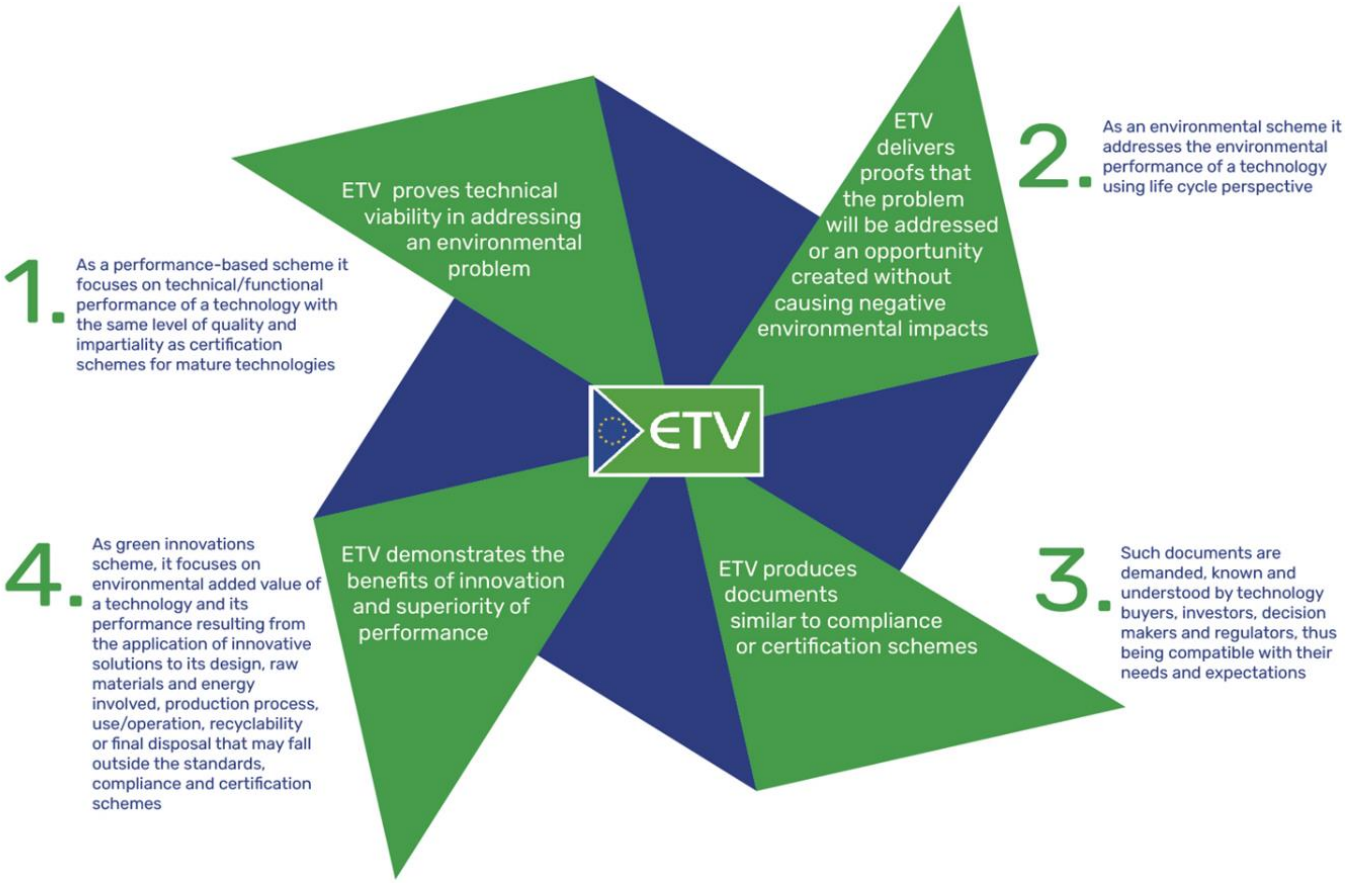

Figure 7 The favorable points-of-difference offered by ETV

The two tables below (Table 1 and Table 2) present some examples of advantages of ETV that go beyond/supplement the features and advantages of ETV already used in ETV communication and promotion and thus could amplify the attributes of ETV. They correspond to the key problems/needs of technology providers, when attempting to place a new solution on the market, and technology buyers, when purchasing innovations and their expectations identified in our survey. They also reflect the specific features of ETV that create its value for users.

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Table 1 Examples of key messages to amplify the ETV added value relevant for technology providers.

PROBLEM/CHALLENGE OF TECHNOLOGY PROVIDER	ETV ATTRIBUTE	KEY MESSAGE TO AMPLIFY THE ATTRIBUTE
The need to demonstrate both the environmental effects and innovation of a technology	COMPLETENESS Unlike any other scheme, ETV provides a combined assessment of the technology focusing firstly on its key environmental aspects from the life cycle perspective to check its compliance with the definition of an environmental technology, and secondly on its technical/functional performance claim resulting in environmental effects achieved through implementing a novelty in terms of technology design, raw materials and energy involved, production process, use/operation, recyclability or final disposal.	ETV provides a complete set of credible data on the technology presented in the form and way enabling to understand the users and other stakeholders (e.g. financial bodies, investors, regulatory bodies) the innovation and benefits of the solution while proving that: - the technology itself is an environmental technology i.e. has a less adverse or beneficial environmental impact compared to solutions with similar functionality (assessment of the environmental added value), - the technology solves an environmental problem of its user with better results than incumbents (verification of the technical/functional performance claim). Through offering a complete set of data relevant for the environmental and technical/functional performance of innovations, ETV helps tackle false green claims on technology performance.
The need to ensure credibility, relevance and sufficiency of technology performance test data of a green innovation towards the buyers/users	CREDIBILITY, QUALITY AND IMPARTIALITY & TRANSPARENCY Third party attestation of ETV and quality assured test data produced by a test system meeting the requirements of ISO 17025. Testing based on a design and test data requirements defined by an ISO 17020 accredited inspection body with the use of standardised testing methods corresponding to the performance parameters to be verified when available or validated test methods in the absence of these. Transparency and robustness of the verification process.	ETV helps reduce or even eliminate the need to perform costly tests and demonstrations for buyer's needs because it guarantees that the test data used to confirm the performance claim are credible, relevant and sufficient to confirm the verified performance. The information on the technology testing conditions is clearly explained in the verification report and summarised in the Statement of Verification.
The need to satisfy the technology users' uncertainty as to how suitable the technology is to their operations	CERTAINTY, TRANSPARENCY, COMPLETENESS Verification of the performance claim is carried out for a specific application of a technology defined by the technology provider as most representative for his technology from its marketing view point, under real defined operational conditions with known purpose of the technology, its intended application, characterised matrix (material) to which it applies, as well as all conditions of	ETV provides transparent, user relevant and complete information on the performance of the technology and conditions under which it is achieved so as to enable the users balance benefits, the requirements for change and adaptation against risks of adopting an innovative technology into their operating conditions.

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	operation, constraints, limitations and assumptions clearly specified.	
The challenge of defining performance claims that meet the real needs of technology users	FLEXIBILITY In ETV, the performance claim is proposed by the technology provider, however the verification body revises the claim from the viewpoint of its relevance and completeness in relation to the environmental impacts of a technology and/or results of its intended application focusing on the specific problems of users that the technology addresses as well as the specific opportunities that may arise from its use or addresses emerging regulations and may propose modifications to the parameters. Moreover, environmental certification and technology compliance schemes are typically locked down to making a technology assessment in the scope and with parameters resulting from or for the needs of existing legislative, labelling or standard frameworks that are typically set up for conventional technologies. They do not correspond to the dynamics of the market and the changing environmental conditions that decide about the competitiveness of the technology buyers/ users. With the flexibility in the choice of performance parameters to be verified, ETV offers a unique opportunity to focus the verification on these aspects of the innovation and environmental effects of the technology that are relevant for the competitiveness of the technology users to show its superiority.	ETV helps build a technology offer and increases its marketing effectiveness by satisfying the current as well as emerging needs of the technology users/buyers resulting from their demand to build their competitiveness through innovations that improve their environmental performance, help build new business models, address emerging regulations and meet stakeholder expectations.

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Table 2 Examples of key messages to amplify the ETV compelling attributes relevant for technology buyers/users.

THE NEED/CHALLENGE OF A TECHNOLOGY BUYER/USER	ETV ATTRIBUTE	KEY MESSAGE TO AMPLIFY THE ATTRIBUTE
Getting confidence that the technology will perform as specified in the verification certificate in the conditions for which it is intended	COMPLETENESS Completeness of data on technology performance and conditions under which it is achieved, transparent information on how the performance was tested including specification of test methods used and testing conditions applied.	ETV helps the buyer understand and evaluate new technologies and their potential outcomes corresponding to his operational environment and thus minimise the technical risk of implementing an innovation.
When more similar technologies are available, making the right technology selection in relation to technology performance, user/buyer needs and conditions of technology operation.	COMPLETENESS & CERTAINITY ETV provides information on technology performance in relation to its environmental impacts and/or results of its intended application	ETV enables benchmarking of different solutions taking into account their performance, operation conditions and the delivered environmental effects and thus enabling the buyers to make optimal choices according to their actual needs and priorities. ETV allows to differentiate between average and high performing technologies.
Preparation of tendering procedures including tender specification preparation and supplier selection	CREDIBILITY, QUALITY AND IMPARTIALITY ISO 17020 based quality and impartiality assurance framework that provides more credibility on the declared performance of a technology than self-declaration schemes. ETV Statements are equivalent to reports/ certificates issues by third party accredited test bodies that provide information on technology performance. Since they are publicly available, Statements of Verification offer a source of reference information on technology performance that may be used for specification of tendering criteria.	ETV provides evidence based information on technology performance and thus increases the certainty in buying decisions especially when addressing the environmental performance criteria under green procurement requirements. ETV increases the probability of making the technology choices with best environmental performance and lowest environmental impacts while reducing the innovation risks. ETV supports development of green innovation marketplace that promotes performance-based competition and the greening of public procurement.

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3.1.2. Facilitate the transparency of ETV benefits

The ETV promotion activities should be complemented with informational influence based on third party proofs, facts and figures that allow to take advantage of external validation of ETV and ETV users advocacy in order to influence the decision making processes related to both target groups, especially technology providers and buyers but also towards other stakeholders especially policy makers/ authorities who make decisions on the implementation of the scheme at national level and linking the scheme with national policies, national procurement strategies, large industries etc.

Examples of materials used as proofs that should be used to facilitate the transparency of ETV benefits and improve the ETV value perception include:

- testimonials/ examples of successful market entrance of a technology thanks to ETV
- use of ETV to improve sales performance
- concrete examples/cases of public tenders where ETV provided a competitive advantage proving the superiority of the technology statements from private/public technology buyers who bought a new technology because it was verified etc.,
- any concrete numbers other than the number of verified technologies that would demonstrate the utility of ETV, preferably coming from technology providers to illustrate that ETV is worth investing in,
- expressions of interest from professional associations/large industries in using ETV for their procurements.
- good practices on ETV implementation as a policy support tool borrowed from the best performing ETV schemes
- examples/ good practices for increasing accessibility of ETV through different ways of organising funding schemes reducing the cost burden of ETV to technology providers

At the same time, since the most of effective channel of ETV communication and promotion is internet as presented the LIFEproETV survey, these materials either as fact sheets, multimedia materials, advertorials, interviews etc. should be distributed via this channel.

3.1.3. Promoting the compatibility of ETV with other environmental schemes

Section 6.2 of Part I presents the competitive landscape of ETV involving a number of other environmental verification or certification schemes highlighting three contexts important for ETV compatibility, with contexts 2 and 3 based on the identification of synergies and opportunities for test data recognition between ETV and other environmental schemes.

These two compatibility contexts were focused on:

- role ETV as technology performance data provider to supplement the data of other schemes dedicated to environmental performance of organisations and products (context 2).
- opportunities for technology functional and environmental performance test data recognition between ETV and e.g., compliance schemes based schemes to align the efforts for proving technology performance necessary for its market uptake leading to potential savings in costs and time of this process (context 3).

Context 2 is based on synergies that contribute to the ETV business case and the ETV service while context 3 helps reduce the costs, duration and complexity of ETV.

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Both compatibility contexts are shortly presented below, whereas details are presented in a LIFEproETv brochure Map of the certification and voluntary environmental schemes landscape and the EU Environmental Technologies Verification. Competition, synergies and opportunities for performance test data recognition.

ETV as technology performance data provider to supplement the data needs of other environmental schemes

As our analysis of the ETV competitive landscape presented in Part I revealed, there is a significant number of other environmental schemes related either to demonstrating compliance of products and technologies or related to environmental performance of products, technologies relevant for building synergies with ETV and the technology areas covered by it. At the same time, there is an increasing interest among organisations to improve their environmental performance through implementing environmental management schemes such as EMAS, ISO 14001 or Organisations Environmental Footprint. In this sense, we have identified two options presented below on how the technology performance data verified under ETV could support or complement the information needs of other schemes:

- Option 1: ETV provides information on the performance and environmental benefit of a technology that may help companies find appropriate alternatives in order to achieve their environmental targets set up by themselves under different environmental management schemes such as Eco-Management and Audit Scheme (EMAS), ISO 14001 or Organisation Environmental Footprint (OEF). ETV Statements of Verification will contribute to perform technology-benchmarking based on sound scientific information and measured data to support purchase decisions.
- Option 2: Companies buying technologies of performance verified under ETV may use ETV related information as a proof of their environmental performance through the ETV statements of verification. This would facilitate compliance with environmental management schemes such as ISO 14001 or to make environmental claims in the EMAS statement facilitating the obtention of key performance information required by EMAS in terms of energy, material, water, waste and emissions and provide it in a clear and coherent manner.

In addition to environmental management schemes, there is a number of environmental schemes focused on environmental performance of products based on life cycle assessment approach. These schemes are aimed to deliver the final environmental impact of a product. The current and the upcoming legislation under the EU Green Deal related to sustainable products and circular economy may be expected as a strong market driver for producers to improve the environmental performance of products under these schemes. It will require determining and updating their key manufacturing process to reduce the environmental impact of a product through its life cycle. Here, similarly as in the case of environmental management of organisations, ETV could help companies select the most suitable technologies to reduce the environmental impact of key manufacturing processes and hence improve the product environmental impact so as to comply with the objectives of different environmental performance schemes for products such as Environmental Product Declaration (EPD), Ecolabel, Product Environmental Footprint (PEF) and Ecodesign. Furthermore, ETV may deliver useful information on technical / functional performance and environmental performance of input materials (e.g., secondary raw materials) that can be used to optimise the production process or environmental parameters of a product.

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Moreover, the technology performance test data provided by ETV could also be applied to other environmental schemes as a proof of innovation and environmental benefit. For instance, under the European Business Awards for the Environment (EBAE), the award refers to the use of instruments for the provision of reliable and comparable information such as EMAS, EU Environmental Technology Verification (ETV) and the European Ecolabel. Therefore, companies developing new products or services can benefit from their technology verification under ETV in order to demonstrate, in a reliable way, their product innovation and environmental benefit and utilise it in order to apply for the EBAE award. The data and information generated under ETV could also serve to continuously update and improve some of the other environmental schemes. In this sense, the increasing number of technologies verified under ETV, with a Statement of Verification proving their performance and environmental benefit could be used for the definition of the requirements of other schemes. For instance, under Ecolabel the performance parameters from the Statement of Verification of the newly verified innovative technologies (those that can be integrated in the manufacturing process of the product of the revised criteria) can be used by the Expert Panel of this scheme to define new requirements related to the manufacturing phase and their integration in the revised criteria.

Performance test data recognition between ETV and compliance schemes or LCA based schemes

There are two options or directions for test data recognition:

- Option 1: related to increasing the utility of data technical/functional performance test data produced for the needs of e.g. compliance testing as input data for ETV to avoid additional testing.
- Option 2: related the utilisation of environmental performance data of a product or technology generated under LCA based schemes to assess the environmental added value of the technology.

Option 1: Recognition of test data produced for e.g. compliance testing

One of the attributes and benefits of ETV is the opportunity of test data recognition that allows to use technology performance test data produced outside the ETV scheme for the needs of ETV. This performance test data could be produced e.g., on the occasion of testing a technology to demonstrate compliance with the requirements of other schemes or legal requirements for example at the final stage of a demonstration project, on condition that the test data meets the requirements of ETV and the technology is mature enough. It creates opportunities for combining the testing for the needs of e.g., compliance scheme with performance testing for ETV at one cost or covering the test data generation as eligible costs of a demonstration project. If a technology provider presents a set of quality assured data relevant to back up the performance claim of the technology to be verified, the testing part of ETV can be avoided reducing thus significantly the time and costs of the verification process that become limited to the activities of the verification body and thus become more foreseeable. It is also an obvious benefit for the different test bodies as they may get an opportunity to extend their testing offer with little extra effort by learning and incorporating into their routine procedures the testing requirements for ETV.

However, in order to be recognised for the ETV needs, the test data generated e.g., under compliance scheme or during a demonstration project must meet a set of ETV requirements including a clear reference to the technology to be verified, relevance to the performance claims to be verified, compliance to the quality requirements specified in the EU ETV General Verification Protocol and compliance to the verification-specific requirements defined in the Specific Verification Protocol developed for each verified technology. Details on the requirements for recognition of technology performance test data generated outside the ETV process are presented in a separate brochure developed under LIFEproETV project which is available on our web site.

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The test data recognition opportunity requires a clear communication and promotion technology providers, the testing centers/bodies as well as programme operators responsible for R&I programmes addressing development of technologies to ensure that testing costs for ETV by third party independent test bodies are eligible costs of the project. It also requires appropriate support and guidance to technology providers on the strategic approach to ETV as a part of innovation management process (see also Part I section 6.1 on ETV compatibility) so that they understand and plan the process properly in advance and contact the verification body if needed to jointly work on the testing requirements.

Option 2: Utilisation of environmental performance data delivered by other schemes for the needs of ETV

In the previous point it has been described how the data generated under ETV could be used for the purpose and objectives of other environmental schemes. However, this interaction can also be applied in the other direction, namely how ETV may benefit from the data generated by other schemes. This synergy mainly applies to LCA based schemes. Despite ETV does not perform an LCA analysis it uses a life-cycle perspective to determine the environmental added value of a technology. For instance, taking into account the main benefits and impacts during the life-cycle of the technology such as consumption of natural resources, water and energy consumption, emissions to air, water and soil, generation of waste (including hazardous waste), noise, etc., but with a simplified approach. Considering this, the LCA data generated from other environmental schemes such as, Life-Cycle Analysis (LCA), Environmental Product Declaration (EPD) or Product Environmental Footprint (PEF), may be used under the framework of ETV for different purposes, including:

- utilisation of the LCA data to help assess the environmental added value of the technology or its compliance with the definition of the environmental technology as specified in the ISO 14034 standard
- data provided by the environmental tools can also serve in the definition of potential environmental parameters for verification identified as major environmental issues related to e.g., manufacturing, operation or end of use life stages of the technology or as competitive advantage of the innovation.

3.2. Unleash the potential of green public procurement (GPP) and innovation procurement (IP) as ETV market drivers

In Section 4 of Part I we have defined the status quo concerning the use of GPP and IP as market relevant factors for ETV at EU level and in the 6 countries involved in the LIFEproETV project. The analysis of the situation in each country combined with the information collected from the interviews carried out with public and private procurers from these countries allowed us to identify a set of bottlenecks and opportunities as well as national experiences and good practices concerning the use of GPP and IP in relation to environmental technologies. Building on this gathered knowledge we have defined a proposal of areas and actions that need to be taken in order to demonstrate the potential and utility of ETV for the needs of GPP and IP and thus make these two tools market drivers for the scheme.

Our proposal is based on the following assumptions underlying the boost of ETV use in GPP and IP:

- Current as well as emerging policy developments supporting the implementation of the EU Green Deal relevant for improving the sustainability of products, industrial processes, and financing of economic activities, zero-pollution objectives, implementing circularity principles and improving energy efficiency will increase the importance of GPP and mainstream it with these policies by definition of the minimum mandatory GPP criteria and targets in sectoral legislation that will also

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be relevant for environmental technologies together with a compulsory reporting to monitor the uptake of GPP. It has already been announced by the Commission with the new Circular Action Plan.

- The definition of environmental technology according to the ETV standard ISO 14034 that allows technologies to fall under one or more subjects of green procurement (goods, services, construction works). The standard defines environmental technology as product, processes and services that either results in an environmental added value or measures parameters that indicate an environmental impact, where environmental added value is defined as more beneficial or less adverse environmental impact of a technology with respect to the relevant alternative i.e., technology applied currently in a similar situation;
- The current EU GPP criteria already now include opportunities for purchase of environmental technologies in most of the ETV technology areas with applications relevant for the purchase areas addressed in the EU GPP guidance documents, although a set of EU GPP criteria developed exclusively for environmental technologies addresses only wastewater infrastructures;
- ETV offers a combined assessment of a technology (completeness attribute) taking into account both its environmental as well as technical and functional performance. It involves first the assessment of the environmental added value of the technology taking into account major environmental aspects and impacts associated with the technology from the Life Cycle perspective, secondly assessment of performance that beside technical/functional performance may also include environmental parameters relevant for the technology either to demonstrate its benefits and/or resulting from the assessment of its environmental added value. These criteria correspond to the GPP criteria related to technical specification as well as award criteria including life cycle-costing (both core and comprehensive) in many cases. In that sense ETV may satisfy the tender requirements defined in its GPP criteria.
- IP shall include in particular the purchase of innovative or sustainable products and services, taking into account: standardisation aspects; life cycle costing; corporate social responsibility; dissemination of best practices and purchasing tools; social aspects[13]. Besides providing data relevant for the needs of determining life-cycle costing of the innovation, ETV may facilitate the standardisation aspects of innovation developed and purchased under IP benefiting from the standardised ETV procedures and quality assurance for example in the case of technologies with industrial applications that fall under the Industrial Emissions Directive to become identified as Emerging Techniques in BREFs or for upgrading or setting up new standards based on the performance of technologies.
- The EU ETV Statements of Verification meet the criteria of a document issued by an 'independent third-party certifier' or 'an independent third-party body' i.e., a body that performs conformity assessment activities accredited either in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council or an accreditation body signatory to the multilateral recognition arrangement (MLA) for product certification of the International Accreditation Forum (IAF). It is relevant in the case when the procurement enables provision of specific third-party certificates to demonstrate compliance with the tender documents or their equivalents.
- The scope of information provided in the ETV Statements of Verification, compared to Type I Ecolabel and in relation to subject matter of the contract demonstrates potential to apply them as

[13] Pożarowska, J, Olejarz M., (2020) Public procurement of innovation, Public Procurement Office, Warsaw,Poland

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proofs for meeting the technical specifications of the tenders as well as award criteria. In addition, when labels do not exist for the category of products services and process covered by the procurement, ETV can be a natural scheme to give a methodological framework for the assessment of the technical criteria and the environmental criteria defined in the specifications and award conditions (independent third party verification, Life-Cycle Approach, high quality data requirement, multicriteria analysis of the environmental added value, etc.).

- ETV seems to be especially well suited to stages of contract performance in innovation procurements. If the innovative technology is verified, ETV Statement of Verification can be a proof confirming the proper fulfilment of superior technical/functional performance. For non-verified technology, analysis of the existing data based on the ETV rules has to be performed in order to assess the veracity of the claims. For missing or non-reliable data, it is possible to implement a test plan for an existing full scale plant, or at least demonstration scale (TRL 7 or above), following the ETV rules by independent third party. ETV can therefore eliminate or considerably reduce the risk factor related to the non-achievement of performances in innovative procurements.
- ETV should be considered in GPP and IP in a way to provide a level playing field for green innovations however ensuring at the same time that other independent third party conformity assessment schemes are also recognised as equivalent means of proof.

3.2.1. The added value of integrating ETV to public procurement stages of GPP and IP

Under the EU Procurement Directives (2014/24/EU and 2014/25/EU), for acquiring environmental technology contracting authorities can choose between five types of procurement procedures:

- Open procedure;
- Restricted procedure;
- Competitive Procedure with Negotiation (2014/24/EU) / Negotiated Procedure with prior call for competition (2014/25/EU);
- Competitive Dialogue;
- Innovation Partnership.

In general, conducting of any of these types of public procurement can be divided into the following 5 stages (Figure 8):

1. **Identification of contracting authority's needs:** defining the subject matter of contract, analysing market - benchmarking of existing solutions, choosing of the procedure's type,
2. **Planning and preparation** - preparing of procurement documentation by the contracting authority, drafting technical specifications and award criteria, preparing procurement documents).
3. **Announcement of tender** (advertising, providing clarification, collection of tenders).
4. **Evaluation of tenders (choice of participants) and awarding of the contract**: applying exclusion grounds, selecting suitable tenders, awarding and signing of contract; in competitive dialogue and in competitive procedures with negotiation evaluation of tenders may take place in successive stages in order to reduce the number of solutions to be discussed during the dialogue stage by applying the award criteria laid down in the contract notice or in the descriptive document).

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Performance of an awarded contract : in case of innovation partnership a contract can be concluded with several competing partners and provide for different phases effecting in development of initially chosen ideas into outputs with ascending technology readiness level.

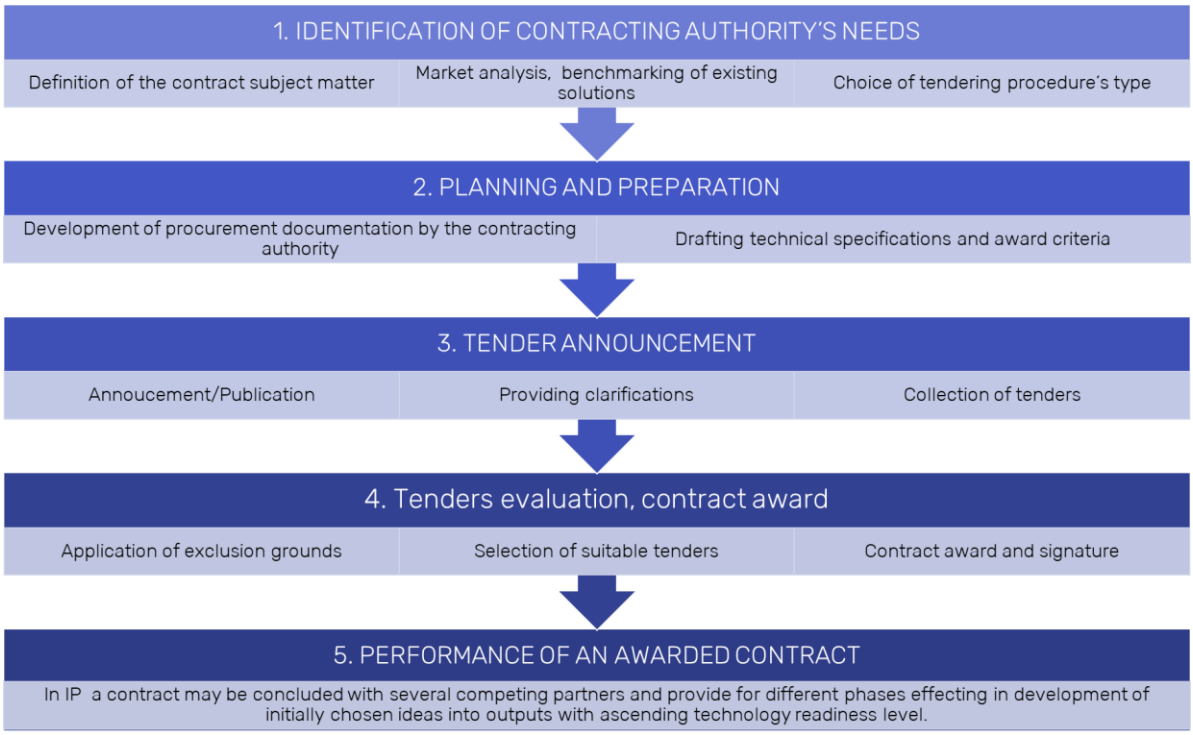

Figure 8 Procurement stages

ETV can be used to support the contracting authority either on planning and preparation stage, evaluation of tenders stage or performance of an awarded contract stage. Details are presented in the following subsections and summarised in Table 3.

Identification of contracting authority's needs,

In the course of identification of contracting authority's needs, existing ETV Statements of Verification may support the sourcing as:

- For GPP: reference to identify the current state of performance and environmental parameters of existing products and services and whether the performance of available technologies meets the needs of the contracting authority;
- For IP : source of information allowing to determine if there are products or services available on the market with a potential to satisfy the needs of the contracting authority as a basis for making decision on the need of concluding an Innovation Partnership if such offer does not exist on the market.

Planning and preparation

During the preparation of procurement documentation ETV can help the contracting authority:

- to define in the technical specifications the required minimum environmental and technical performance parameters of a purchased technology (based on existing ETV Statements of Verification).
    - For GPP, the ETV Statements of Verification may serve as a source of information relevant both for definition of the numerical values of the parameters as well as identification of

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parameters not referred to in the existing EU GPP guidance documents or procurement categories but relevant for specific needs related to ensuring for example the circularity aspects of the purchased goods, services or works. It may refer to the definition of core criteria related to key environmental impacts but in particular to comprehensive criteria aimed at selection of best environmentally performing products, services and works;

  - For IP, the EU ETV Statements of verification may be helpful to define technical and environmental performance criteria for the successive phases of the Innovation Partnership to set up intermediate targets and their ambition level to be attained by the partners/developed innovations; At the same time, the ETV procedure may be adopted in the tender documentation development including the draft contract providing an overall framework to be used for tender evaluation as well as verifying contract fulfilment against the targets at individual stages of the procurement. In particular it may be adopted to specify the method and requirements of the performance test data generation and their assessment as well as the evaluation of the declared performance of the innovation relevant for both tender evaluation stage to evaluate if and how well the offered innovation is likely to meet the targets defined in the technical specification tender as well as evaluate the fulfilment of the awarded contract.

- to define among others the award criteria including environmental criteria (based on existing ETV Statements of Verification) and their relative weighting chosen to determine the most economically advantageous tender, however with life-cycle costing included . (applies both to GPP and IP);
- to define the methods of proof of the fulfilment of the parameters declared in the tender by the offered technology. It applies especially to the definition of the requirements for the methods of proving e.g. requirements concerning the performance test data generation used as methods of proof. Beside impartiality, such requirements can include e.g. testing requirements defined in the EU ETV procedures. Such requirements can be also specified based on the existing Statements of Verification and Verification Reports as sources of information for the definition of such requirements for example concerning the testing duration, scope, testing conditions. It should be, however, stressed that the ETV Statements of Verification may be required by the procurement documentation as an option among other methods of proof that can satisfy the defined requirements;
- to define the methods of proof of a proper fulfilment of a contract (achievement by the purchased technology of the declared technical / functional performance and environmental parameters). in a draft contract included in procurement documentation
  - In GPP, the contract may include provisions where ETV can be declared as an option among other verification schemes considered as a method of proof requiring, however, at the same time that the body which performs such conformity assessment activities is accredited either in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council or an accreditation body signatory to the multilateral recognition arrangement (MLA) for product certification of the International Accreditation Forum (IAF). It will provide a level playing field for the evaluation of the offered technologies without limiting the verification method.
  - For IP, ETV may provide an overall framework for a proper verification of the contract fulfilment to be applied at the individual stages of the procurement based on which the contracting authority may decide after each phase to terminate the innovation partnership or, in the case of an innovation partnership with several partners, to reduce the number of

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partners by terminating individual contracts. This framework will need to be reflected in the contractual arrangements referring to the individual stages of the IP. For example a contract referring to the R&D phase (aimed at a TRL7 innovation) should include a specification of the requirements concerning the testing of the prototype demonstration in an operational environment corresponding to the targets for technical and environmental performance at the final stage of the phase. Here, the requirements related to the test plan and test report provided in the EU ETV General Verification Protocol could apply. Consequently, based on the testing requirements provided by the ETV procedure, the contractual arrangements referring to the final stage of the IP could include performing verification under ETV as means of proof of a proper fulfilment of a contract.

Evaluation of tenders and awarding of the contract

In the course of evaluation of tenders and awarding of the contract, ETV Statement of Verification may be used by an economic operator (tenderer) as a method of proof confirming the fulfilment of the declared parameters by the offered technology (analogically to Ecolabel type I, usually recommended in European GPP guidance documents).

Under GPP, to provide a level playing field at this stage, the contracting authority may apply an analysis of the existing test data related to the technical/functional performance and environmental performance using procedures and quality assurance requirements of ETV related to performance test data assessment in order to check the reliability, completeness, relevance and sufficiency of the data supporting the tenderer's claims when a technology has not been verified under ETV. Consequently however, such method of proof and its requirements must be indicated at the procurement documentation development stage as well as in the draft contract. For ETV verified technologies, the ETV Statement of Verification could be then used as satisfying these requirements.

Under IP: the ETV requirements concerning performance test data generation and their quality assurance may be adopted for the evaluation of tenders to evaluate the veracity of the claimed performance against the target defined in the tender for both solutions below TRL7 as well as above TRL7. At the same time for tenders offering innovations with TRL7 and above ETV Statements of Verification may be considered as a method of proof for demonstrating compliance to the test data requirements.

At the same time for missing or non-reliable data, it is possible to implement at this stage a test plan for generation of such data either for an existing full scale installation, or at least for a technology at a demonstration scale (TRL 7 or above), following the ETV procedures for performance test data generation with a requirement that the testing and the evaluation of the test data is done by a third party body with confirmed competences.

Moreover, offers can be compared on a multi-criteria analysis grid including ETV features. This methodology has been already implemented to accompany the already mentioned case of Principauté de Monaco in the tender for the renewal of its municipal waste treatment and recovery Centre.

The potential for using ETV in this phase of public procurement applies in particular to flexible procurement procedures, i.e. competitive procedure with negotiation, competitive dialogue, negotiated procedure with prior call for competition and innovation partnership. These types of procedures address purchase of technical solutions to help solve innovative, complex environmental problems, especially if it is difficult to write a detailed technical specification due to lack of market knowledge or lack of existing solutions. In the course of these types of procedures it is possible to negotiate aspects of environmental performance of products, services or works (above any minimum requirements which have been set)

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and the reporting arrangements which will apply. Here ETV may be used as a method of proving the compliance with the negotiated environmental performance levels, since ETV has a lot in common with Ecolabel type I (multi-criteria analysis, compliance checks by independent qualified certifiers, Life-Cycle Approach, reference to ISO standard).

Performance of an awarded contract

In the course of performance of an awarded contract, ETV Statement of Verification can serve the contracting authority as a proof confirming the proper fulfilment of a contract (achievement of declared parameters by the purchased technology) – provided that the contracting authority required beforehand, e.g. in a draft contract included in procurement documents, a test report or a certificate together with a specification of requirements concerning them as a means of proof of proper performance of a contract. It may apply both to GPP and IP. Especially in innovation partnership with several partners, on stages of performance of contract for innovation partnership resulting in TRL7 or higher, quality test data may be used for ETV verification in order to reduce the number of partners by terminating individual contracts that are not resulting in the delivery of innovation performance as defined in the targets.

Table 3 summarises the possible use of ETV (either ETV Statements of Verification or ETV procedures in the procurement stages

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Table 3 A summary of ETV use options in public procurement procedures of Green Public Procurement and Innovation Procurement

IDENTIFICATION OF CONTRACTING AUTHORITY'S NEEDS:		
Green Public Procurement and Innovation Procurement	Green Public Procurement	Innovation Procurement
ETV Statements of Verifications may serve as a reference for the sourcing purpose.	ETV Statements of Verification may serve to: - identify the current state of performance and environmental parameters of existing products and services, - to determine whether the performance of available technologies meets the needs of the contracting authority.	ETV Statements of Verification may help determine: - availability of products or services satisfying the needs of the contracting authority - facilitate decision making on the need for concluding an Innovation Partnership if such offer does not exist on the market.

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PLANNING AND PREPARATION		
Green Public Procurement and Innovation Procurement	Green Public Procurement	Innovation Procurement

. ETV Statements of Verification may serve as a reference for :
- definition of methods of proof and other requirements to be specified in tender documentation (incl. draft contract) relevant for:
  o demonstrating compliance with the technical specifications and award criteria at the evaluation stage
  o demonstrating a proper fulfilment of the contract (achieved performance) at the end of contract performance.
- development of technical specifications to define the required minimum environmental and technical performance parameters
- definition of award criteria including environmental criteria and their relative weighting.
	- ETV Statements of Verification may support the definition of the numerical values of the parameters in technical specifications (minimum requirements) as well as identification of other parameters relevant for technical specifications not referred to in the existing EU GPP guidance documents or procurement categories but relevant for specific needs of the contracting authority.
	- In the draft contract ETV Statements of verification may be indicated as an optional method of proof of the achieved performance together with a requirement that the performance data used as proof must be generated by an accredited third-party body .
		- EU ETV Statements of Verification may be helpful to define technical and environmental performance criteria for the successive phases of the Innovation Partnership to set up intermediate targets and their ambition level to be attained by the partners/developed innovations;
		- ETV procedure including the requirements of performance test data generation compliant to the requirements of ETV may provide an overall framework to be adopted in tender documentation (including a draft contract) for specifying a method to be applied for tender evaluation as well as verifying contract fulfilment at individual sages of the procurement.

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TENDER EVALUATION AND CONTRACT AWARD		
Green Public Procurement and Innovation Procurement	Green Public Procurement	Innovation Procurement
- ETV Statements of Verification may facilitate offer selection processes when considered as a method of proof with the tender requirements (requires consideration at the planning and documentation development stage) - Third-party testing according to ETV requirements may be adopted as a procedure in flexible procurement procedures including Innovation Partnership for generation of incomplete or non-reliable performance data for large scale installations/ technologies at min TRL7 to complement the tenderer selection and contract award processes (applies to) - ETV may provide basis for developing a multi-criteria analysis grid for tenders evaluation.	- ETV procedure concerning the analysis of exiting performance test data may be applied to check reliability, completeness, relevance and sufficiency of the data to confirm the veracity of the tenderer's claims for non-ETV verified technologies, for verified – ETV Statements apply as method of proof. - ETV Statement of Verification may serve as a method of proof with tender requirements similarly as Ecolabel type I.	- ETV requirements concerning quality performance test data generation may be adopted to the evaluation tenders which offer solutions both below TRL7 and above TRL7. It will allow to evaluate the veracity of the declared performance against the targets defined in the tender. - For innovations with TRL7 and above ETV Statements of verification may apply as means of proof to these requirements and confirm the trueness of the declared performance of the offer.

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PERFORMANCE OF AN AWARDED CONTRACT		
Green Public Procurement and Innovation Procurement	Green Public Procurement	Innovation Procurement
ETV Statement of Verification can serve the contracting authority as means of proof to confirm the proper fulfilment of a contract i.e. achievement of declared performance by the purchased technology (subject to consideration in the planning and documentation development stage)	ETV procedure may be implemented among other independent third party verification schemes as a requirement for the purchased environmental technology to prove a proper fulfilment of the contract, subject to inclusion of appropriate provisions in the tender documentation and draft contract at the tender planning and preparation phase. .	- For Innovation Partnership stages resulting in TRL7 or higher testing requirements based on ETV procedure may be applied to demonstrate fulfilment of the contract performance to e.g. to reduce the number of partners by terminating individual contracts that are not resulting in the delivery of innovation performance as defined in the targets. - Based on these requirements full ETV verification can be implemented as means of proof to demonstrate fulfilment of the contract requirements performance at the final stage of an IP.

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3.2.2. Recommendations details

Capitalising on the support and functions that ETV can provide in GPP and IP, the potential for use of ETV in public procurement could be unleashed by 8 actions gathered in the three following groups:

TECHNICAL:

1. ETV Statements of Verification get a similar level of recognition as other third party certificates currently used as a method of proof for compliance to technical specifications e.g. Ecolabel type I;
2. Mandatory requirement of performance assessment by independent third party in IP and GPP
3. Reference to environmental technologies in the GPP guide e.g. by providing a definition of environmental technology based on the ISO 14034 standardised definition;
4. Providing a clear guidance and showcasing the application of ETV in public procurement procedures and individual procurement stages taking into account the objectives and specificities of GPP and IP in terms of the subject matter of the tender, focus on environmental considerations, risk factors and innovation aspects;

FINANCIAL:

5. Linking ETV with sustainable financing tools e.g. the EU Green Taxonomy (green subsidies, tax exemptions) with a requirement of the technology green claims to be verified by third party bodies, preferably with competences confirmed by means of accreditation by national accreditation bodies;
6. Providing and promoting environmental criteria to tackle green claims/sustainability claims of technologies for capital providers (public or private) e.g. benefiting from the ETV methodology and criteria used for the assessment of the environmental added value in ETV as well as e.g. technical screening criteria provided in the EU Green Taxonomy.

ORGANISATIONAL:

7. Building ETV awareness and commitment on procuring green among public stakeholders including utilities and other large public buyers (e.g. state owned enterprises);
8. Demonstrating compatibility and mutual recognition pathways between existing environmental certifications, standards and labels (both relevant for products but also environmental management schemes of organisations) and ETV.

The actions are described below.

1. ETV Statements of Verification as a tool to prove performance in GPP and IP

ETV, as defined by the European Commission, according to the GVP and all its guides and constraints in terms of quality data insurance is of course intended to be in the long term the ideal reference for sustainable purchase of environmental technologies. Indeed, the Statement of Verification obtained at the end of the process of verification, could be used to prove the reality of achievement of technical specifications (e.g. waste treatment or new resources production) and the environmental performances of the products or technologies within GPP and IP.

In the case of IP, the following 3 key features demonstrate the compatibility and usefulness of ETV for consideration in innovation procurement:

- proof of innovation combined with the environmental benefits,
- a mechanism enabling choices of solutions that best fit the needs and expectations,
- trustful, third-party evidence on innovation performance allowing to derisk future investment.

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However, the actual level of awareness of ETV and the number of fully verified technologies (not even covering all the technology areas) at the European scale are too low for the time being. This could potentially lead to distortion of competition if ETV was a mandatory reference in GPP or IP. So, in order to support this scheme, it is important to propose some milestones and actions to reach these milestones. The first one is the development of the "culture" of verification by independent third party using the ETV scheme.

2. Mandatory requirement of performances assessment by independent third party in IP and GPP

The objective here is to develop the need and the methodological framework of performances assessment based on ETV scheme. For this we propose the following actions:

- **Adopting by the public buyers of a mandatory requirement of performances assessment by an independent third party in IP and GPP instead of an option.**

According to the interviews with technology buyers and sellers carried out under LIFEproETV, private entities in the SME sector mostly rely on their own assessment (carried out by their employees) of the parameters and effectiveness of the technology offered to public buyers.

Public buyers do not usually include the performance verification process they require in their tenders, as they do not have a methodological guide for this and fear that it will make their tender unsuccessful.

The ETV scheme can play a key role here in supporting public purchasers if the assessment of candidates' performance is made mandatory. This can be done through the implementation of GPP criteria in public tender documentation as well as by requiring proof of compliance with the technical and environmental specifications of the contract.

This requirement should not refer to the provision of the Statement of Verification according to ETV but to the requirement of a test report issued by a qualified conformity assessment body or a certificate issued by such a body as a means of proof of conformity according to the existing ETV data qualification rules. All or part of this conformity check can also be implemented within the contract (if the contract form is sufficiently flexible) on the basis of a test plan which will also have to comply with ETV rules.

A fortiori, in the case of innovative public procurement, there are even more risks concerning the actual achievement of the declared performance. Mandatory testing campaigns on demonstration facilities by independent and qualified bodies should therefore be included - either as a requirement of the tender documents or as evidence of the proper performance of the contract at the contract execution stage.

The practical recommendations for criteria to be integrated in GPP or IP by public buyers are listed below. In order to include and facilitate verification in the tendering, the GPP and IP criteria shall meet the following conditions:

- Technical specifications to be achieved shall be identified clearly and precisely (not in general terms but with quantitative targets to be compared with claims of technology), following the definition of claim in GVP);
- List of environmental criteria to be addressed shall not be generic, but precise, specific and measurable. We recommend to refer as far as possible to the environmental added-value criteria of ETV as described in the GVP;
- Technical environmental specifications shall refer to the requirement of verification by an independent body, considering the strategy for verification of the performances with regards to the claims and the environmental criteria. This verification procedure can take place before, during or after the tendering. This can include the requirement of a test campaign in a demonstration facility and the realisation by an independent qualified third party;

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- Technical environmental specifications shall consider the four steps of the life cycle of the equipment/process/service as in the GVP: resources/production/use/end of life. This is almost always absent from the tendering and most of the vendors (specially the SMEs) have only little information on this issue. At least the nature of the resources (to avoid raw material in depletion), and the feasibility of the recycling of the equipment for the end of life have to be addressed.

This approach was experimented by the Principality of Monaco for the renewal of its waste treatment and recovery plants[14].

- **Introducing a mandatory requirement of verification by independent (accredited) bodies at EU level**

It should be noted that in the current EU legislation on public procurement (art. 44 of the Directive 2014/24/EU, art. 62 of the Directive 2014/25/EU), contracting authorities have an option to require that economic operators provide a test report from a conformity assessment body or a certificate issued by such a body as means of proof of conformity with requirements or criteria set out in the technical specifications, the award criteria or the contract performance conditions (however contracting authorities shall accept other appropriate means of proof, such as a technical dossier of the manufacturer where the economic operator concerned had no access to the certificates or test reports, or no possibility of obtaining them within the relevant time limits, provided that the lack of access is not attributable to the economic operator concerned and provided that the economic operator concerned thereby proves that the works, supplies or services provided by it meet the requirements or criteria set out in the technical specifications, the award criteria or the contract performance conditions). According to art. 2 p. 21 of Regulation (EC) No 765/2008 'conformity assessment' shall mean the process demonstrating whether specified requirements relating to a product, process, service, system, person or body have been fulfilled. Under this legislation conformity assessment body shall be a body that performs conformity assessment activities including calibration, testing, certification and inspection accredited in accordance with Regulation (EC) No 765/2008. ETV verification bodies fulfil this definition and therefore can be regarded as conformity assessment body within the meaning of art. 44 of the Directive 2014/24/EU and art. 62 of the Directive 2014/25/EU.

The proposed mandatory requirement of test report issued by an accredited conformity assessment body in field of GPP and IP shall be implemented by amendment of existing EU legislation on public procurement. It is also justified to allow as a proof of conformity or performance test reports issued by conformity assessment bodies accredited by an accreditation body signatory to the multilateral recognition arrangement (MLA) for product certification of the International Accreditation Forum (IAF).

- **Introducing a mandatory requirement of verification by independent (accredited) bodies at Member States level**

Notwithstanding the proposed above-mentioned amendment of EU legislation, it is recommended to include in the Member State Purchasing Policies a requirement of certification in the field of GPP and IP by an accredited conformity assessment body, with an exception for other appropriate means of proof, based on art. 44 of Directive 2014/24/EU and art. 62 of Directive 2014/25/EU. This requirement can be related either to tendering stage as a proof of conformity or to the contract execution stage as a proof of proper performance.

[14] https://journaldemonaco.gouv.mc/Journaux/2019/Journal-8427/Appel-a-propositions-technologiques-conception-construction-et-exploitation-du-Centre-de-Traitement-et-de-Valorisation-des-Dechets

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It is also a justified adoption of requirement or of recommendation of conformance of purchased technology with technical screening criteria in delegated acts adopted according to the Regulation (EU) 2020/852.

3. Reference to environmental technologies in GPP

Most of the existing GPP criteria and IP in Europe concern products/goods/services: the reference to technologies does not exist and should be integrated. Because it is very likely that EU GPP criteria as well as the national GPP criteria will be adapted soon to the parameters set out in screening criteria implemented by delegated acts issued by European Commission according to the Regulation (EU) 2020/852, there is an opportunity to influence the process of revising of sets of GPP criteria, in order to uptake to GPP criteria the technologies referred to in the screening criteria and to introduce ETV as an optional method of verification of compliance with these GPP criteria. For this we recommend:

- the definition of environmental criteria with reference as far as possible to the environmental added-value criteria of ETV as described in the GVP with quantitative environmental targets to be achieved by the environmental technology,
- linking the environmental added-value criteria of ETV with six environmental objectives of Green Taxonomy Regulation,
- the definition of verification procedures/schemes related to the environmental performances of the technologies adopted for products/goods/services,
- the mandatory third-party verification of the environmental performances of the technology
- the monitoring plan of verification procedures/schemes

Since the analysis showed that the purchase areas covered currently by the EU GPP criteria may address purchase of environmental technologies, we have made an attempt to investigate how the environmental criteria relevant for GPP correlate with the criteria used to assess the environmental added value of a technology under ETV. The standard ISO 14034 defines the term "environmental added value" as more beneficial or less adverse environmental impact of a technology with respect to the relevant alternative i.e., technology applied currently in a similar situation. The environmental added value is considered from the life cycle perspective. ETV uses the following set of criteria reflecting the environmental impacts of a technology:

- Emission of pollutants to air (air pollutants including those listed under the green-house gas emissions)
- Emission of pollutants to water
- Emission of pollutants to soil
- Consumption of natural resources (consumption of natural resources, especially rare raw material required for the process Energy and water consumption will be addressed in the two following points)
- Energy consumption (Energy consumption and energy sources, use of non-renewable or renewable energy)
- Water consumption and related processes (Consumption or use of water, but also the quality of the water used and the necessary treatment before and after use, process water, water used in bulk such as cooling water)
- Soil consumption (land use, land and soil consumption)
- Production of non-hazardous waste
- Production of hazardous waste

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4. ETV as a benchmarking tool in GPP and IP

Issued ETV Statements of Verification can be also used as a benchmarking tool for revision and update of existing sets of EU GPP criteria published by European Commission as well as for adoption of new sets of GPP criteria, also on national level. Statements of verification can also be used as a reference tool by public buyers in process of preparing tender requirements referring to environmental performance of purchased technology.

Same thing concerning innovative public procurement. ETV could be used to define what is an innovative technology vs reference technology.

5. Green taxonomy linked with GPP and IP and conditioned by verification by independent (accredited) bodies

There is a strong link between GPP and IP conducted by public bodies or financed by EU funds or by financial institutions and the currently created framework to facilitate sustainable investment (green taxonomy) under the Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.

Delegated acts provide requirements for technical screening criteria and also tools for proving their fulfilment.

It is recommended to conduct activity to include in these regulations (on EU level) the requirement of certification of fulfilment of technical screening criteria by "independent third-party certifier", defined as a body that performs conformity assessment activities including calibration, testing, certification and inspection, accredited either in accordance with Regulation (EC) No 765/2008, or by an accreditation body signatory to the multilateral recognition arrangement (MLA) for product certification of the International Accreditation Forum (IAF)". On the other hand, ETV verification bodies should consider the compliance to the screening criteria stated under TR for assessing environmental sustainability in the process of assessing the environmental added value of the technology being verified.

It is very likely that EU GPP criteria (and also national GPP criteria) will be adapted soon to the parameters set out in screening criteria implemented by delegated acts issued by European Commission according to the Regulation (EU) 2020/852. e.g., in field of construction, extension and operation of waste water collection and treatment, draft of screening criteria provides that in order to substantially contribute to climate change mitigation, the net energy consumption of the waste water treatment plant shall be equal to or lower than: 35 kWh per population equivalent (p.e.) per annum for treatment plant capacity below 10 000 p.e., 25 kWh per population equivalent (p.e.) per annum for treatment plant capacity between 10 000 and 100 000 p.e., 20 kWh per population equivalent (p.e.) per annum for treatment plant capacity above 100 000 p.e. Published EU GPP criteria for waste water infrastructure refer to typical values for energy consumption for well-operated waste water treatment 20-40 kWh/PE/year independently of its capacity.

Therefore, it is an opportunity to influence the process of revising of sets of EU GPP criteria, to introduce ETV as an optional method of verification of compliance with these criteria.

6. Environmental criteria for business angels and other innovation funds (public or private)

More and more, private investors are considering the possibility to support the development of “green investment”. This is the case of Pension Funds for example or Bank to improve their public image.

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A part from GPP there is also Innovation Call for Projects where the assessment of the candidates are made by experts without the possibility to check the reality of the expected results.

We recommend to develop a set of criteria based on ETV process and rules to help investors (private of public) to select the good candidates for investment (in term of efficiency (do what they say), robustness, innovation (not already done), environmental added-value (no bad side-effects of hidden failure).

7. Improvement of awareness and commitment of environmental stakeholders

All the inquiries about ETV conclude that there is a crucial lack of awareness and recognition.

In order to contribute to improve this situation, we recommend:

- official engagement of the national competent Ministry(ies),
- official engagement of the national bodies responsible for environmental policies implementation (e.g., Regions, municipalities,…),
- official engagement of the business associations and clusters,
- development of communication/dissemination tools supported by national or regional bodies:
  - webinars,
  - presentation of successful case studies,
  - development of training courses for publics authorities (Including ETV in IP, competitive dialogue, variant…),
- promotion of ETV among the entities that organise procurement procedures on behalf of public sector entities. According to interviews with entities from public sector, there is a tendency to entrust the conduct of the entire procurement procedure (including the formulation of conditions of participation and bid evaluation criteria) to external entities (e.g., design and consulting offices). This leads to the conclusion that the addressees of the campaign promoting the use of ETV in public procurement should be, at least as much as the final purchasers, the entities that organise procurement procedures on behalf of public sector entities.
- Promotion of ETV among the owners of demonstration facilities. According to interviews with entities from private and public sector, it is essential that the technology purchased is proven on the market, i.e., that there already exist functioning plants or installations where the purchased technology has been implemented and which can be made available for inspection/testing by the potential technology purchaser. Therefore, ETV can be used by the owners of demonstration facilities not fully commercialised yet, as an additional tool for ensuring conformance with the declared parameters.
- Implementation of ETV through the GPP advisory group at European level and through organisations involved in National Action Plans for Sustainable Public Procurement at national level.

8. Harmonisation and mutual recognition between existing environmental certifications, standards and labels and ETV

The synergies between ETV and some certifications and labels have been described in section 3.2.3. These certification schemes and labels have already been used to identify green performing services or products such as EMAS, ECOLABEL, ISO 14001 in both, national and regional strategies and public procurement.

Public buyers are concerned about purchasing new technologies or technologies from not known providers. They often refer to existing schemes (labels, standards,…). At the same time technology

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providers, especially the SMEs are reluctant to start from scratch with ETV. The mutual recognition of testing and data and harmonisation of criteria will help the them improve their market recognition especially when making offerings to public procurers if they can integrate the existing data already validated in the existing labels and upgrade them to the ETV standard.

3.3. Link ETV with EU and LIFEproETV countries environmental and climate legislation and policies

In Part I section 5.1 we have presented policies at EU and national level relevant for climate and environment that currently include reference to ETV. Same of them have already been outdated. At the same time there are some new policyy developments resulting from the EU Green Deal policies and legislation as well as new financial perspective of the EU Funds and post COVID-19 recovery plans relevant for ETV.

The following subsections present policies, programmes and strategies at EU and national level of the 6 LIFEproETV focus countries with considerations for mainstreaming ETV into them with the aim to enhance making use of the scheme in addressing the market uptake of innovations for sustainable transitions.

3.3.1. EU level environmental and climate policies relevant for ETV

Below we present the EU level environmental and climate policies stemming from the EU Green Deal that we have identified as most relevant and impactful for including a reference to ETV. We have also made an attempt to define how ETV would support the objectives of these policies as well as which ETV scheme technology areas included in the extended technology scope of the full-scale EU ETV Programme are relevant for these policies.

Industrial Emissions Directive

ETV could add a value delivering innovations for large industrial applications to be considered as emerging techniques under reference documents BREFs.

It could facilitate a progressive upgrade of standards that must be met by industrial installations by providing a mechanism and a source of credible information on performance of innovative environmental technologies helping them to achieve an Emerging Technique status and thus potentially feed the development or upgrade of BREFs reference documents. ETV could in particular support implementation of IED (Art 15(5)) facilitating the development and testing of emerging techniques. It could also contribute to shortening the BREF cycles providing innovations with proven performance to set up a forward looking perspective based on Emerging Techniques Associated Emission Levels (ET-AELs).

Reciprocally, BREFs may also serve as source of information on the key environmental aspects relevant for a given industry to be considered as elements of performance claim to be verified under ETV for technologies with an intended application in a specific industry sector covered by BREFs.

Link to ETV technology areas: all areas, however with focus on technologies for industrial applications.

Zero Pollution Action Plan

ETV may contribute to provide adequate level of technical data on the performance of verified technologies to support the implementation of the Action Plan and the resulting regulations. ETV may contribute in particular to:

- creating thematic hubs such as a Clean Air Tech Hub and a Soil Pollution Hub offering a mechanism to support a transparent, robust, systemic and integrated benchmarking of technologies,

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- providing a complementary set of tools for creating a level playing field for new technologies, now the document mentions such tools only for organisations/enterprises based on Product Environmental Footprint and Organisation Environmental Footprint. It will ensure that the technologies placed on the EU market are sustainable, circular and minimise waste and pollution,
- supporting the link proposed in Zero Emission AP for accelerating innovation uptake in relation to IED and Innovation Observatory as mentioned above,
- improving compliance with EU pollution prevention laws and promotion of the use of cutting-edge technologies to boost national capacities for monitoring (monitoring and measurement technologies for water, air, soil emissions can be verified under ETV) as well as pollution control solutions,
- digitalisation as cross-cutting issue (possible option: verification of services under ETV based on digital solutions, ETV standard ISO 14034 defines technology as product, process service) that could also open new opportunities for ETV.

Link to ETV technology areas: all areas, however with particular focus on the new technology areas such as soil and groundwater remediation, cleaner production processes and air pollution abatement technologies.

Sustainable Products Initiative

A core aspect of the initiative includes revision of the Ecodesign Directive and extending its scope beyond energy-related products and make it deliver on circularity. ETV could contribute with providing technologies that are enablers for improving product durability, reusability, upgradability and reparability or confirming the performance of technologies and products in that respect, technologies enabling increasing of recycled content in products and facilitating remanufacturing in the context of the revised Ecodesign Directive and the Sustainable by Design Initiative.

Link to ETV technology areas: waste, materials and resources as well as cleaner industrial processes.

EU Green Taxonomy

EU Taxonomy is an important tool to direct funding towards sustainable innovation. ETV may support the implementation of Taxonomy by:

- providing a mechanism enabling the uptake and financing of innovative, emerging technologies that is currently somehow missing. For example, ETV could serve as a default mechanism for providing proofs on their significant contribution to sustainability objectives via verification of performance in order to make these innovations eligible for financing by default if they are ETV verified. This mechanism could be based on the link between the Technical Screening Criteria defined for the environmental objectives that often correspond to the performance parameters of technologies that may help achieving the required minimum values/thresholds.
- ETV can also support demonstration by the technology owner, especially in the case of SMEs, of the compliance of the verified technology to the technical screening criteria of Technical Report, for the purpose of assessing the environmental sustainability of the verified technology towards financial market actors offering 'green' financial products as well as other market actors.
- Reciprocally, when verifying the performance of green innovations under ETV, the Technical Screening Criteria may serve as a source for the definition of the performance claim and environmental parameters to be verified taking into account the environmental impacts associated with the intended application of the technology.
- ETV could contribute to creating a monitoring or revision mechanism based on the verified technologies enabling updates of the Technical Screening Criteria.
- For documenting taxonomy eligibility and alignment. ETV Statements of Verification, on the same principle as third party ecolabels may help auditors in such assessments providing information relevant to compliance to the technical screening criteria.

Link to ETV technology areas: all 7 ETV technology areas.

EU Plastic Strategy

ETV covers verification of technologies that can support the uptake of technologies contributing to an increase in the share of recycled materials in end products, the conversion of

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(difficult) waste plastics into raw materials as well as the development of new biodegradable or compostable polymers with a lower environmental impact than those used so far.

An ETV Statement, may also be potentially used to evaluate the suitability of this technology / polymer as a substitute for other plastics in a given application.

Link to ETV technology areas: waste, materials and resources.

EU Action Plan on Critical Raw Materials

Similarly as above, ETV may serve as a mechanism to address the innovation challenge related to the implementation of solutions that reduce the use of critical raw materials that can replace conventional technologies e.g. technologies that can separate critical raw materials from waste or by-products, leading to a significant reduction in imports from outside Europe.

Link to ETV technology areas: materials, waste and resources.

EU Bioeconomy Strategy

ETV can support the innovation challenge addressed in the strategy offering a mechanism relevant for modernisation of primary production systems through bio-based innovation supporting the market uptake of new green technologies especially:

- new technologies which can turn waste from farming, cities, food & forests into new added values products,
- develop best renewable alternatives to replace fossil material,
- develop substitutes to fossil-based materials that are bio-based, recyclable and marine biodegradable.

The strategy also seeks to promote standards, labels and market uptake of bio-based products. ETV could be one of them especially in B2B relations.

Link to ETV technology areas: waste, materials and resources, water technologies, cleaner production processes and environmental technologies in agriculture.

Farm to Fork Strategy

ETV could play an important role delivering innovations with proven performance for applications either in agriculture to make agricultural practices beneficial for the climate and the environment, for efficient and sustainable water use, along with water protection, improving the environmental performance of food production value chains and reducing waste. The strategy also mentions the need for investments, innovation and derisking investments which ETV could support either as derisking tool or providing a portfolio of innovations to invest. Support of ETV for the Field to Fork Strategy could be built on the existing programme VERA[15].

Link to ETV technology areas: water technologies, energy technologies (energy efficiency), cleaner production processes, environmental technologies in agriculture and waste, materials and resources.

8th Environment Action Plan

Priority (f) of the 8th EAP calls for promoting environmental sustainability and reducing key environmental and climate pressures related to production and consumption, in particular in the areas of energy, industrial development, buildings and infrastructure, mobility and the food system. ETV could clearly contribute to this priority, supporting also EMAS as well as other technical standards, complementary environmental schemes and labels relevant for demonstrating environmental performance of products and organisations.

An impactful option strengthening and streamlining ETV recognition at the EU level would also be through setting up a supportive EU legal framework for ETV, similar as the one established for the European Environmental Management and Audit Scheme (EMAS). With ETV remaining a voluntary environmental scheme. There is already a pool of knowledge, experiences and lessons learned from the development of the EMAS legal framework including the EMAS Regulation with later amendments 53 supported by an appropriate guidance on its

[15] VERA: https://www.vera-verification.eu/ The purpose of VERA is to enhance a well-functioning international market for environmental technologies to help solve the environmental challenges of agricultural production.

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implementation 54, rooted in the subsequent Environment Action Plans. The adoption of the 8th Environmental Action Plan could create an opportunity for a legislative proposal for ETV.

Link to ETV technology areas; all 7 areas

3.3.2. LIFEproETV focus countries environmental and climate policies relevant for ETV

Environmental and climate policies in EU Member States countries set goals to improve the quality of the environment as well as reduce greenhouse gas emissions and adapt to climate change in line with the requirements imposed by the EU level policies and regulations. However, each Member State determines how these goals will be achieved. These ways are mainly determined by the specific problems and challenges that each country has to face. Consequently, legislation and policies covering all environmental and climate areas have different focuses and environmental and climate ambitions. In the vast majority of cases, the implementation of legal environmental and climate requirements and policy objectives is directly related to the challenge of innovation and the use of innovative environmental technologies.

Bearing this in mind, we have analysed national environmental and climate policies and regulations in the 6 LIFEproETV focus countries taking into account the following areas addressed in these policies: Air, Climate, Water, Soils, Raw Material Efficiency, Energy Efficiency and Waste. At the same time, we have tried to identify the levers for ETV in these policies and regulations, seeking in particular those related to efficiency and achieving measurable results. A summary of our findings per analysed country is presented below.

Poland

Air protection policies	Air quality in Poland is very bad, and the standards for nitrogen oxides are notoriously exceeded in major agglomerations. Protection of air quality poses many challenges for Poland. This concerns not only national authorities, but also regional and local authorities and the economic sector. Wide implementation of ETV scheme could support many actions undertaken by local authorities to improve the situation. For example, ETV could form the basis for a certification system for sensors to monitor local air quality. Currently in Poland there are no clear quality guidelines for this type of equipment, while the demand for building local air quality monitoring systems is constantly growing. The creation of such networks is not regulated in any way, and devices of various manufacturers with different quality parameters are used, which affects the reliability of those systems and the data they provide. This is especially important when these data are the basis for local decision-making processes. The need for an evaluation system for air quality sensors that would provide reliable and clear information about the performance of these devices has been reported by both manufacturers and local government entities, including, for example, resort cities and metropolitan associations. In addition, ETV can help, for example, in the area of secondary street emissions - caused primarily by street cleaning - when verifying street cleaning equipment in connection with public procurement. According to the adopted Environmental Protection Law, individual local governments were given the right to introduce regulations prohibiting the operation of certain types of boilers and heating stoves and selected types of fuels. Basically, the anti-smog resolution indicates the following systems as preferred heating methods: district heating, gas heating, electric storage heating, renewable energy sources, installations burning biomass (low moisture). ETV Statements held by technology providers can assist local authorities in their decision making and thus accelerate the implementation of the anti-smog regulation. As far as industrial emitters are concerned, air pollutants include substances emitted into the atmosphere as a result of fuel combustion + VOCs, in which power generation plays a major role, as well as technological processes of chemical, metallurgical and refining industries, and mines and cement plants. In this case, ETV can play an important role in the permitting process (integrated permit or permit to introduce gases or dust into the air). A permit application requires information on the type of installation, the equipment and technologies used, and the technical characteristics of the emission sources. An ETV Statement obtained by a permit applicant would sufficiently facilitate streamline the permit decision-making process. ETV could also be used to demonstrate compliance with legally required emission levels for new technologies, again as part of the environmental assessment process. Funding for implementation of the ETV Programme is included in environmental funding, allowing ETV to be incorporated into technology projects across a broad environmental spectrum.

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Climate policies	The National Green Investment Scheme offers a wide range of funding opportunities for climate change mitigation and adaptation actions at local, regional and national levels. These actions cover many areas ranging from education, infrastructure, research and innovation, nature-based solutions, industrial transformation, etc. The Law on the system of managing emissions of greenhouse gases and other substances creates instruments for the implementation of the ETV scheme. The ETV scheme can be embedded in technology-related projects implemented with national or regional funds on a voluntary or mandatory basis. For example, all new technologies in the area of climate change adaptation or mitigation (energy, transportation, construction, water, nature-based solutions) could be subject to ETV verification. In addition, since most climate change adaptation activities are carried out by local authorities, the ETV scheme could be included in green public procurement or green innovative procurement systems. The ETV scheme can be embedded in technology-related projects implemented with national or regional funds on a voluntary or mandatory basis. For example, all new technologies in the area of climate change adaptation or mitigation (energy, transport, construction, water, nature-based solutions) could be subject to ETV verification. Furthermore, since most climate change adaptation activities are carried out by local authorities, the ETV scheme could be integrated into green public procurement or green innovative procurement schemes. The GHG Emissions Trading System Act has some options to incorporate ETV and improve the emissions management process: 1) the application forms for opening a registry account and for allocation of emission allowances include, among others, complete information about the installation, the ETV Statement could be an additional source of information/verification of the information provided by the installation owner 2) in the process of allocation of emission allowances for a new installation, ETV could be an additional condition/precondition.
Water policies	ETV Statements could serve as evidence of technology performance required in water permit application documents, such as for wastewater discharge developments to demonstrate the quality of discharged wastewater and its compliance with minimum requirements, or for water recycling developments and its use for various purposes to demonstrate the quality of recycled water. For utilities, ETVs can play a role as evidence of compliance with the revised Water Directive under the Green Deal's zero-pollution goal in adopting current processes used by wastewater treatment plants and water treatment plants to achieve stricter water quality standards that are more stringent than WHO recommendations, and in combating emerging contaminants such as endocrine disruptors and PFAs, as well as microplastics. These requirements will stimulate the need for utilities to adopt new technologies on the one hand and new monitoring solutions on the other. It may stimulate interest in ETV, provided, however, that utilities, consider ETV Statements as evidence in bidding procedures. ETV can also be linked to new business opportunities and models related to wastewater treatment and nutrient or chemical recovery and sludge management. ETV can facilitate such business opportunities by both: providing utilities and industry with information on the performance of technologies for the water sector that improve energy efficiency, enable substance recovery or produce secondary raw materials (recovery efficiency, quality of the resulting product vs its use, quality of recycled wastewater and their compliance with the requirements of Regulation (EU) 2020/741 of the European Parliament and of the Council of 25 May 2020 on minimum requirements for water reuse or other specific uses), as well as technology providers: with the ability to demonstrate to users in a credible way the performance of their offerings, so that they are able to identify the best performing solutions that meet their operational conditions and needs. Innovative solutions and technologies in the water and wastewater management are one of seventeen national smart specialisations (NSS). It covers 6 areas: improvement of water quality for consumption and economic purposes; increasing water resources for consumption and economic purposes; improving the quality of surface and groundwater; wastewater treatment; recovery of water and other raw materials from wastewater; use and recovery of energy in water and sewage management. The location of such targeted solutions among NSS creates additional opportunities, and entrepreneurs implementing projects that fit into smart specialisations can count on support from EU funds. By linking ETV with smart specialisation, a mechanism could be created that would combine development of such solutions with the post R&I business models development for them to support their market uptake, reduce the risk of market failure and provide a green guarantee of their performance to the technology users/investors.
Soil protection policies	Soil degradation in Poland is largely due to industrial activities (mainly steel mills, landfills, open-pit mines and waste dumps), agricultural activities and the activities of former Soviet military bases (contamination with petroleum compounds), which require remediation. In connection with these obligations, various types of studies are conducted to determine the location of contamination and to decide on remediation measures. The landowner is required to develop a remediation plan that includes the method of remediation. The ETV Statement of Verification could be considered as a tool to assist in the identification and selection of effective technologies, in particular in-situ soil and groundwater remediation methods, as an alternative

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	to ex-situ methods, contributing to the reduction of overall remediation costs and the generation of large amounts of waste that must then be managed or landfilled. The Strategy for Sustainable Rural, Agricultural and Fisheries Development 2030 defines strategic actions and projects to support rural, agricultural and fisheries development on a regional basis. ETV can be considered as a tool to support investments that foster sustainable farming in line with some of the strategy's assumptions including the protection of agricultural soils, support for investments that foster environmental protection on farms, dissemination of technologies that increase productivity with less use of crop inputs i.e., pesticides and mineral fertilisers.
Raw Materials policies	Introducing new Extended Producer Responsibility (EPR) regulations into national law should be one way to promote eco-design and manufacturing of products that take full account of and facilitate the efficient use of resources throughout their life cycle. With ETV it will be possible to verify whether natural resources are used efficiently in a given technology, whether materials are made according to customers' needs, so that they can reduce EPR charges.
Energy Efficiency policies	Public authorities may use the ETV Statement as a confirmation that verified materials used for construction and equipment having direct influence on the energy efficiency level of the building will meet the requirements imposed by the Act. If Polish verified technologies are used for construction/renovation, the administration will directly contribute to the promotion of these technologies and to the increase of innovation in Poland in this sector. This may especially apply to Polish innovative technologies developed under national R&D support programmes. Technology developers can take advantage of ETV with the required certifications for building materials that offer the potential for significant energy savings (especially those with energy efficiency parameters above standards). If Polish verified energy efficient technologies are promoted by governmental institutions (the law imposes the necessity of promotion of energy efficiency measures by central and local administration), the producers can reduce their marketing budget and reach the market that is contracted by public authorities. Improving energy efficiency in the energy sector, for example, improves the efficiency of energy distribution with the use of smart-grid solutions, increases the production from distributed sources of RES, the use of modern energy storage, including new technologies for the production and use of hydrogen, new batteries. Heat recovery from ventilation and the use of energy-efficient lighting will soon be a required standard in newly constructed residential buildings. ETV can very well serve as an enabler for the above strategic goals of rapid deployment of new energy efficiency technologies emerging on the European market. Strategic documents also indicate that the improvement of energy efficiency will be fostered by innovative solutions, therefore it is very important to conduct research and development work in this area. Utility parameters (expected effect) of the produced innovative technologies being the subject of R&D works may be independently confirmed within the EU ETV Programme.
Waste policies	ETV can help to reduce the administrative burden in particular in the following situations: when applying for a waste treatment permit, which can only be issued after an inspection of the installation for compliance with the requirements set out in the legislation. ETV can help to decide whether such requirements are met. If a new product is developed using a particular type of waste, the ETV Statement can help to ensure that the verified by-product meets the declared technical/functional parameters for further use as a raw material and to obtain a certificate of loss of waste status. ETV can help in the selection of technology in the process of obtaining the required waste permit the applicant needs to identify ways to prevent or reduce waste and its negative impact on the environment. ETV Statement can assist in the selection of technology that meets such requirements. According to the National Waste Management Plan 2022 in Poland, financial support will be given to SMEs carrying out activities related to changing technologies to innovative and low-waste technologies. ETV Statement can help prove that a technology is innovative and/or low-waste. Eco-design will also be promoted where ETV can be part of the scheme. According to the National Environmental Policy 2030 the target and priority sectors are: waste recycling, processing and utilisation of secondary raw materials. According to this policy, Polish environmental technologies should be promoted by government programmes at home and abroad. The ETV would help to identify the most innovative and environmentally added value technologies. Low innovative activity of Polish SMEs is one of the weaknesses of the Polish economy. Innovative solutions are connected with higher risk in comparison with commonly used solutions. In this case ETV supported by the state should increase the number of implementations of innovative technologies. A significant problem in Poland is the failure of the food industry to adjust to the EU requirements, e.g., in terms of waste generated in the processing of meat, potatoes or sugar. ETV Statement may help to find technologies which properly manage post-slaughter and post-production waste.

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Spain

Air protection policies	Monitoring and reporting of air pollution results is mandatory for some industries. Royal Decree 39/2017 states that technologies other than official methods can be used to monitor air pollution only if their accuracy is comparable to official methods as confirmed according to ISO 17025. ETV could be used to identify technologies that meet these requirements. Such solution would be beneficial for both the recipients of those technologies (e.g., industry) and their producers. The national programme of atmospheric pollution control aims to reduce between 50% and 80% of air pollutants such as SO2, NOx, PM2.5, among others, by 2030 compared to 2005. To achieve this, the programme indicates the need to acquire new technologies. ETV can be used to identify and verify such technologies that contribute to the achievement of the programme's objectives. One of the activities of the programme is the promotion of innovative technologies for air protection which are in the R&D phase. ETV can be used as a confirmation of meeting the requirements set out in the programme as properly spent public money.
Climate policies	The law on climate change and energy transition envisions a broad group of entities that will have to monitor and report their climate impacts and, if necessary, take certain measures to reduce those impacts. ETV could provide utilities and industry with information on the performance of technologies for different sectors in terms of potential GHG emission reductions. The national plan for the adaptation to climate change reinforces the importance of promoting the development of innovative environmentally friendly technologies in various economic services. Economic incentives for research and development can be demonstrated by verifying such technologies in ETV.
Water policies	The ETV can be used as a positive differentiator during the tendering process, helping to promote the acquisition of innovative green technologies for the water sector as it is able to demonstrate technology performance beyond regulatory parameters and polluted water quality limits. The ETV Statement of Verification can assist in the administrative procedure by providing clear information on the characteristics and performance of the technology, facilitating decision-making by the administration when issuing permits to industry. Environmental fees set by law depend on the quantity of water produced as well as its quality. ETV can be used by various industries to identify those technologies that contribute to reducing water discharge and improving water quality. The Royal Decree on Wastewater Reuse, establishes water quality requirements for various reuse purposes. The ETV Statement of Verification can identify those technologies that operate in accordance with water recycling requirements. The National Water Research and Innovation Strategy establishes criteria to determine how innovative a technology is, so ETV can be used as an instrument to identify these innovative technologies, facilitating their market uptake through acquisition by public water utilities. ETV can therefore be used to ensure that public funds are properly spent and as a way to stimulate innovative green technologies. Public water sector focused on traditional water treatment technologies, low innovation risk due to the nature of the sector. ETV as an instrument that guarantees both innovation and efficiency, lowers the risk of acquiring innovative technologies. The National Climate Change Adaptation Plan aims to reduce the use of water used for agricultural purposes to combat desertification. ETV can help identify such technologies. Economic incentives may be considered for those farms that acquire green water saving technologies.
Soil protection policies	The Environmental Responsibility Act establishes certain criteria for selecting technologies to decontaminate contaminated soils, which include environmental and performance criteria. ETV can be successfully used to select soil remediation technologies that meet the objectives of the regulation. The Basque National Plan aims to organise information at the regional level on new technologies for monitoring and cleaning up contaminated soil. The plan identifies technologies that have the greatest economic and environmental potential. ETV-verified technologies with proven environmental and performance parameters could be promoted by the Basque authorities in a revision of the plan. With this solution, companies developing these technologies would benefit from the promotion carried out in this way by the administration, while technology buyers will be able to easily identify the right technologies for their needs. The use of ETV in confirming the performance of new technologies reducing emissions to soil will have a positive impact on the quality of the environment as well as contribute to avoiding sanctions for non-compliance by potential emitters (industry).
Raw Materials policies	The newly introduced waste and circular economy law in Spain sets priorities for recycling and resource efficiency. The use of ETV-verified technologies could help companies or organisations to improve and demonstrate good resource efficiency, while helping to reduce the administrative burden for these companies and organisations. In addition, reputational incentives can be expected for those companies that go beyond the targets and limits required by legislation. ETV can demonstrate above average performance. The circular economy strategy aims to reduce the consumption of raw materials by 30% by 2030 compared

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	to 2010. In the same timeframe, the amount of generated waste should also be reduced by 15% compared to 2010. ETV can be used to identify and promote new technologies for both public and private entities, guaranteeing efficiency and reducing the risks arising from investment in innovation.
Energy Efficiency policies	The Sustainable Economy Act encourages public administrations to include energy efficiency in public procurement. ETV verified technologies and products can be used to demonstrate energy efficiency to help public administrations identify green technologies. Near-zero energy buildings for public administration are regulated by the Energy Efficient Buildings Law. The use of equipment or technologies that produce energy from green sources, tested and demonstrated under ETV, can be very helpful in proving a building's green performance. Energy efficiency is one of the priorities for the coming years included in Spain's Next Generation strategy. ETV as an instrument to support green technologies can be of great importance in the different sectors involved, such as public administration, construction and transport, to incorporate innovative technologies to achieve the objectives of the plan.
Waste policies	Catalan legislation aims to include on-site residue treatment for those companies that produce large amounts of waste. Therefore, ETV can help identify on-site treatment technologies, and then companies that purchase these proven technologies can benefit from a reduction in taxes related to waste disposal.

Italy

Air protection policies	The introduction of an air quality and emissions monitoring network throughout the Italian territory is a necessary action to obtain timely and accurate data. Monitoring activities provide the conditions under which local authorities implement measures required by European, national and regional legislation to protect human health and the environment. Air monitoring is also essential for quickly identifying hazardous situations and tracking changes in pollution levels over time to assess the effectiveness of corrective actions taken. ETV can provide performance proof of innovative air monitoring technologies to the local authorities responsible for monitoring networks building and maintaining the quantitative and qualitative enhancement of existing monitoring networks, in order to obtain more accurate, detailed and timely measurements.
Climate policies	To achieve the targets set by 2030 in the National Integrated Plan for Energy and Climate such as increasing the share of RES, reducing energy consumption and significantly reducing GHG emissions, a number of measures and policies are envisaged. These cover various thematic dimensions, including the decarbonisation and energy efficiency dimension in the reduction of CO_2 emissions in the agriculture, waste and land use sectors, among others; the conversion of renewable energy sources in the electricity, heat and transport sectors; energy efficiency in the main economic sectors. In this very broad panorama of issues, the measures adopted mainly concern the introduction of carbon pricing, the transition to circular models, the simplification of procedures and permits, and the acceleration of the search and dissemination of innovative solutions. In this context, the adoption of ETV as a requirement could play an important role, so that directly applicable technologies have access to incentives for technological innovation, also through recourse to specific European funds, including funds for research and innovation. Furthermore, the use of verified technologies could contribute to simplifying procedures and authorisations.
Water policies	A priority issue in Italy is to upgrade and increase the efficiency of water collection and distribution infrastructure. ETV could play an intermediary role in disseminating innovative technologies throughout the supply chain and, in particular, in solving "systemic problems" by developing technologies to monitor and repair network losses. Water utilities will thus receive confirmation of compliance requirements. ETV could provide assurance that wastewater treatment plants are operating and achieving high environmental performance and effluent quality, both in terms of mandatory national limits and the limits needed to guarantee quality objectives in different contexts at the local level. Compliance with effluent quality objectives, the limits of which are defined for water bodies in Regional Water Protection Plans, is overriding and in many cases more restrictive than general national limits. ETV Statement could encourage the use of technology for the benefit of businesses and lead to innovation networks between clusters and SMEs, towards broader common goals of protecting and improving water resources. As required by the Transition Plan 4.0, the adoption of water conservation and reuse technologies in the high-pump industry sector could provide economic benefits to businesses and tax incentives that would provide new economic stimulus to the industrial sector.

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Soil protection policies	In the remediation of contaminated sites, ETV could play a leading role in proposing verified technologies among those identified by the competent authorities as potentially applicable during the preparation phase of an in situ or ex situ remediation project. ETV could therefore provide local authorities and industrial operators with a technological platform that would allow them to select the technologies to be tested by choosing the most appropriate ones based on the environmental results to be achieved.
Raw Materials policies	The application of innovative technologies that support the circular economy are the basis for the creation of an industrial action that state policy intends to support through the implementation of a series of economic measures, such as bonuses and tax incentives, in order to accelerate the transformation process. ETV can be considered as a tool to support investment towards a circular economy. The ETV Statement can be a proof of performance for technologies to measure and monitor the use of inputs, in order to reduce the amount of materials / inputs used (e.g., raw materials and energy), and therefore to improve the internal efficiency of the company, as well as limited environmental impact.
Energy Efficiency policies	The energy saving objectives outlined in the National Energy Strategy concern different sectors: the residential sector; the transport sector; the services sector; the industrial sector. In each of these sectors, ETV can play a key role in ensuring that the requirements to access the incentives and tax credits available in the different sectors are met. Industry is encouraged to deploy energy efficient technologies using white certificates. Companies using verified technologies under ETV could be more confident that they will achieve the expected results associated with reduced energy consumption. ETV could also play a role in the area of business R&D investment supported by industrial policy through tax credits.
Waste policies	By confirming the environmental efficiency and performance of the technology, ETV will be the ideal solution to facilitate, from an administrative and political point of view, the construction of new waste recovery, treatment and disposal facilities in those areas of the country where there is a great shortage of infrastructure in relation to needs. Such implementation would help increase compliance with the hierarchy, self-sufficiency and proximity principles in waste management operations imposed by current legislation and create an integrated and innovative municipal waste management system. Verified technologies in the EU ETV Programme could therefore ensure compliance with the environmental requirements established in public procurement for the implementation of new plants using the best available technologies and ensure performance monitoring.

Slovenia

Air protection policies	When applying for an environmental permit for an installation that emits pollutants into the air, it is necessary to describe the technology used, the use of fuels and raw materials that may cause emission of gases. Technologies with an ETV Statement of Verification have a better chance of being granted a permit, as the emission reductions are independently verified and the technology must not have a negative impact on the environment in other respects. In addition, innovative ETV-verified technologies could be used to monitor air emissions because their performance is confirmed by accredited bodies. Less administrative burden would be required for companies or institutions that need to report their emissions and would likely speed up the process of applying for an environmental permit for their operations. On the basis of the NEC Directive, Slovenia has to significantly reduce emissions by 2030 compared to 2005, namely SO_2 by 92%, NOx by 65%, NMVOCs by 53%, NH3 by 15% and PM2.5 by 60%. The most significant source of SO_2 emissions is electricity generation. The Operational Programme for Low Emission Reduction is expected to fund the replacement of old heating equipment with new energy efficient and renewable energy sources. Technologies verified in the ETV Programme can be ideal to confirm their high efficiency for the programme operator.
Climate policies	According to the strategy until 2050 in the Integrated National Energy and Climate Plan, Slovenia is to become a climate-neutral country based on sustainable development, which means that it must manage energy and natural resources efficiently. To this end, national support has been created for pilot projects to develop and use sustainable technologies for the production of synthetic fuels from woody biomass and other lignocellulosic sources. This is a great opportunity for innovation in these technological areas and the incorporation of ETV as a tool to validate their performance and environmental impact and to accelerate the deployment of these technologies.

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Water policies	According to the regulation on the ecological tax for sewage pollution, homeowners must be connected to the sewerage system, but if there is no regulated public sewerage system, owners must have small municipal sewage treatment plants instead of septic tanks. Before installing a treatment plant, approval must be obtained from the public service provider, after which owners are eligible to apply for an environmental tax reduction. ETV verification can help small innovative biological wastewater treatment plants to enter the market that cannot obtain CE certification due to lack of standards. Moreover, the more environmentally friendly solutions that ETV represents are well accepted by public institutions, especially if they were additionally financially supported by the government. After 2030, only technologies that can recover phosphorus from sewage sludge are expected to be available to all larger municipal wastewater treatment plants. Currently, these are energy-intensive technologies. ETV-verified technologies in this area should be encouraged for use at the national level, as ETV is a qualitative proof of efficient energy use.
Soil protection policies	In some areas there is a need to clean up contaminated soils and remediate land, which is often technologically difficult and expensive to implement. Some remediation technologies can be difficult to certify due to the lack of standards, so ETV can be a good tool to validate the performance in a specific remediation area of a technology. Slovenian Soil Partnership is a voluntary association of organisations and individuals in Slovenia, which can be joined by anyone who wants to get information on content related to sustainable soil management and protection. One of its objectives is to exchange results and information in the field of soil protection and to promote, support and guide research and development in the field of sustainable soil management. ETV should be promoted in such partnerships and help them to select appropriate technology for its members.
Raw Materials policies	Subsidies, loans and later tax reductions are available for exploiting renewable resources and obtaining green energy. This could stimulate research and development of such technologies and give ETV the opportunity to identify them. ETV could support this vision by validating the quality and environmental performance of new technologies e.g., in the construction sector that use secondary materials instead of natural resources. An incubator, ADRIA Raw Materials, has been established to attract holders of innovative ideas to participate in programmes that support business development and help create new companies in the raw materials economy. ETV could be successfully used as part of an incubator operation, or a network of companies working together in the field of sustainable raw materials management.
Energy Efficiency policies	Eco Fund, the Slovenian public environmental fund established under the Environmental Protection Regulatory Act, prepares and implements energy efficiency improvement programmes where grants and loans are available for pro-environmental investments. ETV can be an excellent tool included in these programmes to identify technologies with high potential for efficient energy use or for reducing energy losses.
Waste policies	The Waste Regulation focuses on packaging waste management and implementation strategies for landfill reduction of biodegradable waste. ETV can help innovative technologies that reuse materials from waste (zero-waste technologies) to enter the market faster, as there is usually a lack of CEN standards to certify these technologies. According to the Waste Management Programme, Slovenia emphasises waste prevention, giving priority to preparation for reuse and recycling over energy recovery from waste, and waste recovery over disposal. Specific targets and measures apply to municipal and industrial waste. The use of ETV-verified technologies could help achieve the programme's objectives, by including ETV in tendering procedures. A major problem in Slovenia is sewage sludge and its management. Currently there is a great need for technologies that would help to reduce this type of waste. This will increase the innovation of wastewater treatment technologies that will be suitable for ETV verification.

France

Air protection policies	Some taxes are directly related to air pollution. These include the general tax on polluting activities (TGAP) that applies to industrial emissions, fuel tax, company car tax, etc. ETV can support the development and deployment of innovative air pollution sensors (e.g., <PM2.5 nanoparticle sensors), as well as the development of new technologies to clean up industrial gaseous emissions.
Climate policies	The project law on the fight against climate change stipulates that the introduction of clauses in public contracts on the environmental aspects of services, which are currently only an option offered to the public purchaser, will become mandatory, for example in the form of technical specifications or specific

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	performance conditions. The ETV can support the procurement process. The Energy and Climate Act encourages the development of a low-carbon or renewable hydrogen sector as a priority area for investment in France. The law sets out the prospect of achieving 20-40% of total industrial hydrogen consumption by 2030, and to implement systems to support and track hydrogen use. This will help achieve the 2030 target in the national low-carbon strategy for industry of more than 33% reduction in greenhouse gas emissions. The French government is providing support for research and development to develop more efficient technologies for all hydrogen applications. ETV can assess the technical feasibility of these technologies as well as their environmental impact in the context of achieving the climate goals.
Water policies	The presence of new contaminants in water (pharmaceuticals, pesticides, disinfection by-products, microplastics) requires the development of new effective treatment technologies as well as the development of sensors capable of detecting, identifying and quantifying these new contaminants and their transformation products in aquatic environments. With ETV, companies developing new treatment solutions or innovative sensors can prove their technology works. Local authorities, responsible for managing water and wastewater services, can select the most appropriate innovative solutions, reducing the risk of not achieving the required performance by selecting verified technologies or by considering the ETV framework when purchasing to assess the performance of innovative solutions.
Soil protection policies	The ETV standard provides a rigorous framework for local authorities and industrialists in charge of redeveloping brownfields and polluted sites to compare and select the technical and environmental performance of the innovative solutions proposed to them, while at the same time securing the risks of non-achievement of performance. ETV enables suppliers of soil monitoring and treatment technology to demonstrate the performance of their innovations.
Raw Materials policies	With the new law significantly expanding the scope of EPR for many materials and products for consumer and industrial use, there will be a marked increase in demand for technologies that will allow these end-of-life waste streams of these materials/products to be separated, characterised, treated (recycled) or recovered. ETV will allow developers of these technologies to demonstrate the technical and environmental capabilities of their innovations. The structures responsible for collecting and treating waste from these new EPR ranges will have to select the most appropriate technologies. These structures will also finance the development of some promising technologies. ETV can be a good tool to bring such innovative technologies to market. In addition, ETV provides a framework for comparing the performance of the different technologies that will be proposed to them and will facilitate the selection of the most suitable ones. The level of recycling that can be achieved by a technology, as well as the compliance of the recycled product with the input specifications of the recovery stream, are parameters that can be verified in the ETV scheme. These results will allow the recycling rate to be evaluated and compared to the targets set by public policy on the basis of reliable and credible data.
Energy Efficiency policies	The Innovation Acceleration Strategy "Advanced Technologies for Energy Systems" aims to promote the development of a French new energy technology industry that will mainly contribute to meet current and future global demand for the increasing development of renewable energies. Energy production from waste is also a growing sector in France, in terms of developing more efficient methanation technologies or pyro-gasification technologies for biomass or residual waste. The ETV Programme can support the achievement of strategy goals by assessing the environmental impact and proving the effect of efficient energy production technologies.
Waste policies	Achieving the objectives of the Anti-waste law for a circular economy means improving waste collection and sorting in order to increase recycling rates. Local authorities, responsible for the management of municipal waste, will therefore have to increase efficiency in the collection, sorting and treatment of waste. They will have to apply new, emerging technological solutions that may have few implementations. Adding performance verification criteria for their proposed technologies in public procurement procedures would reduce the risk of not achieving the performance of the selected technical solution. The introduction of performance ETV verification criteria in public procurement can be based on the independent and rigorous European ETV standard, which also fulfils the recent obligation to introduce environmental criteria in public procurement.

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Hungary

Air protection policies	The National Air Pollution Reduction Programme sets goals to reduce emissions from households, transport, agriculture and industry. New technologies that meet these targets, e.g., more efficient technologies for gas cleaning in industrial processes or heating technologies, and which have Statement of Verification, may have an advantage on the market due to the quality, reliability and independence of the ETV scheme.
Climate policies	According to the National Decarbonisation Roadmap, one of the directions for reducing greenhouse gas emissions is the use of CO_2 sequestration and storage technologies. Since this must be done with the least possible risk, it will be necessary to find and identify the best technological solutions. In this process, ETV can play an important role because of its unique characteristics. According to the NDR, low-energy and fertiliser-efficient technologies are to be used in agriculture, in the selection of which ETV can play a role. Vulnerable sectors, such as agriculture, will implement flexible and innovative adaptive technologies to minimise risks and increase productivity. To this end, research and innovation will be supported, where ETV can play a significant role because it is a reliable, credible way to verify the performance of an innovation.
Raw Materials policies	Multinational companies are already obliged to use environmentally friendly technologies for raw materials. In this case, ETV has great potential, as such companies can be more open to innovation, as well as having financial and administrative tools for new technologies.
Energy Efficiency policies	As stated in the National Energy Strategy, energy efficiency should be improved while increasing the share of renewable energy sources. The share of energy obtained from renewable sources should clearly increase, and technologies that are innovative and energy efficient could be targeted for ETV claims.
Waste policies	ETV Statement can help to prove that a given technology is either innovative and/or low waste technology. Technologies can benefit from the ETV Statement, which confirms through a third-party validation that their technology meets regulatory requirements, but also helps waste management companies identify technologies that meet their performance criteria. ETV technologies could also play a role in reducing and phasing out unsorted waste from landfills.

3.4. Build ETV in the framework of EU and national policies, programmes and tools supporting innovation and SMEs

Since the primary aim of ETV is to support the market uptake of green innovations, ETV should be mainstreamed to innovation support programmes at EU and national level and become an element of transformative innovation policies enabling sustainable transitions.

Similarly as in the case of environmental and climate policies, the innovation tools, policies and programmes constitute the external framework for ETV that should provide that there is a balance in the way that the scheme is supported on the supply side (support for technology providers) and demand side (technology users, buyers), which is currently not the case.

Taking the above into account ETV fits ideally as an option with an added value for example to:

- R&I programmes dedicated to development of close to-market innovations corresponding to the needs of the environmental and climate policies (or societal challenges) or particular technology lines (e.g. hydrogen)
- business development services for SMEs such as coaching, training, mentoring

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- innovation support mechanisms such us e.g. innovation vouchers or fiscal incentives to foster innovation in SMEs or mechanisms providing assistance in the establishment of innovative enterprises (e.g. tax reliefs both for investments in R&I to commercialise own innovations or for purchase of innovative technologies);
- public innovation under innovation procurement for purchase of green innovations (as already addressed in Part II section 3.2);
- existing as well as new financial and policy instruments in which there is an explicit need to mitigate the financial risk of breakthrough environmental technologies e.g. project development programs designed to help SMEs or start-ups attract private capital to demonstrate and/or scale up their green innovations,
- programs of support in the field of technology transfer for small- and medium-sized enterprises;

Below we are presenting a proposal of opportunities for linking ETV with different tools, policies and programmes at EU level and the level of the 6 LIFEproETV countries taking into account the specificity of their innovation ecosystems.

3.4.1. Potential for mainstreaming ETV into the EU level framework for innovation and SMEs support

Concerning the EU level framework for innovation and SMEs support, on the policy side ETV could and should be mentioned as a tool facilitating the implementation of the EU SME Strategy[16] adopted in 2020. It recognises the importance of SMEs as providers of innovative solutions to challenges like climate change, resource efficiency and social cohesion and actors in the spread this innovation throughout Europe's regions. The strategy also provides a set of actions some of which are related to green innovation including capacity-building and support for the transition to sustainability and digitalisation or improving market access. ETV may contribute to some of the proposed actions. For example, concerning the existing structures and organisation, information about ETV as a tool for market uptake of green innovations should be taken on board and further promoted by the Sustainability Advisors to be established within the Europe Enterprise Network. It could contribute to a better use of ETV among private sector supplementing the efforts for promotion of ETV in public tenders as well as through the KICs initiatives as described below.

ETV could also support actions dedicated to improve market access for SMEs focus on reducing of exporting barriers to the Single Market in Europe as well as to global markets where ETV could be promoted as a tool to help SMEs enter markets with innovative environmental technologies to reduce such barriers. Also in the area of improving access to finance for SMEs, the strategy proposes a package of measures. For some of them ETV could be promoted and used as a de-risking tool e.g. under the Green Technology Investment Initiative proposed in the strategy to pool funding from the EU, Member States and the private sector to increase access to equity finance for innovative SMEs and start-ups that develop and adopt green tech solutions.

Moreover, there is a number of initiatives ongoing at EU level towards which could and should be communicated and promoted as they support the uptake of innovations in the context of specific policies or on sectoral basis. These include for example:

- CircLean- European network of businesses and SMEs for Industrial Symbiosis

[16] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS An SME Strategy for a sustainable and digital Europe https://ec.europa.eu/growth/smes/sme-strategy_en

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- EREK – European Clusters Collaboration Platform
- Water Europe- dedicated water-related innovation and RTD in Europe
- Safe and Sustainable by design initiative – seeking to integrate safety, circularity, energy efficiency and functionality of chemicals throughout their lifecycle to minimise their environmental footprint
- European Assistance for Innovation Procurement (EAFIP) initiative - supports public procurers across Europe in developing and implementing innovation procurement.
- ERMA – European Raw Materials Alliance
- Process4Planet Partnership
- Hubs4Cirularity
- RMIS – Raw Materials Information System

However, in our studies, we have primarily concentrated on the innovation support programmes where ETV could be mentioned and included as eligible costs making the scheme combined with the pre-commercialisation phase for innovations achieving at a minimum TRL level of 7 while providing an EU level subsidising mechanism for ETV which contributes to ETV international recognition. The R&I programmes relevant for ETV are presented below.

Separately, we have considered other innovation supporting mechanisms available at EU level e.g. instruments offered by EIT/KICs.

ERA-NET Confund on Raw Materials (ERA-MIN)

ERA-MIN is a global, innovative and flexible pan-European network of 26 European and non-European research funding organisations, aiming to continue strengthening the mineral raw materials community through the coordination of research and innovation programmes on non-fuel and non-food raw materials (metallic, construction, and industrial minerals). ERA-MIN3 builds on the experience of the H2020 ERA-MIN 2 (2016-2022) and FP7 ERA-NET ERA-MIN (2011-2015).

The scope of this programme is needs-driven research addressing three segments of non-fuel, non-food raw materials: metallic materials; construction materials; industrial minerals.

The five main call topics are:

1. Supply of raw materials from exploration and mining
2. Circular Design
3. Processing, Production and Remanufacturing
4. Recycling and Re-use of End-of-Life Products Topic
5. 5: Cross-cutting topics.

The participating national and regional funding organisations are the following:

EU countries/regions and research funding organisations:

Belgium-Flanders (FWO and Hermesfonds/VLAIO); Belgium-Wallonia (SPW-Recherche); Bulgaria (BNSF); Czech Republic (TA CR); Estonia (ETAg); Finland (Business Finland); France (ADEME and ANR); Germany (BMBF/JÜLICH); Ireland (GSI), Italy (MUR); Poland (NCBR); Portugal (FCT); Romania (UEFISCDI); Slovakia (SAS); Slovenia (MIZS); Spain (AEI and CDTI); Spain – Navarra (CFNA); Sweden (Vinnova).

EU Associated country: Turkey (TUBITAK)

Non-EU countries: Canada-Québec (PRIMA-Québec); South Africa (DSI)and South-Africa (DST).

ETV could play a very relevant role supporting technological solutions developed within the framework of this relevant initiative to reach the market. A specific reference to ETV support in the call together with

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communication and dissemination activities during the call preparation could be of great interest for both ERAMIN and ETV.

ETV Technological areas: Water Treatment; Energy (Energy efficiency); Materials, waste and resources; Cleaner production and processes.

European Innovation Council – EIC

The EIC supports a European Green Deal, an economy that works for people and a Europe fit for the digital age.

Europe needs to capitalise on its science, innovative SMEs and start-ups to compete in global markets increasingly defined by new technologies. That is why the European Commission has introduced a European Innovation Council (EIC) to support high-risk, high-impact ideas, turning science into new business and accelerating the scale-up of 'game-changing' innovators shaping the future.

The EIC aims to support top-class innovators, entrepreneurs, small companies and researchers with bright ideas and the ambition to scale-up internationally.The EIC provides funding and opportunities for innovative researchers, innovators and entrepreneurs - often startups and companies that:

- are radically different from existing products, services or business models
- are highly risky
- have the potential to scale up internationally

The EIC supports ideas from any area of technology or business sector, including novel combinations of technologies and business models. Support is available from feasibility to development to scale-up stages.

The EIC includes two programmes relevant for ETV.

- *EIC Accelerator* (former SME instrument). The EIC Accelerator Pilot builds on the SME Instrument Phase II and provides grant-only support as well as support in the form of blended finance (combining grant and equity). The scheme supports high-risk, high-potential small and medium-sized innovative enterprises willing to develop and commercialise new products, services and business models that could drive economic growth and shape new markets or disrupt existing ones in Europe and worldwide.
- *Fast Track to Innovation (FTI)* a scheme for relatively mature ground-breaking technologies, concepts and business models which are close to market.

Considering the high TRL approach of this new European Initiative, ETV could be very relevant tool to support those environmental technologies to efficiently reach the market. EIC programmes could specifically include ETV support in their calls as other European Programs.

ETV Technological areas: All seven areas to be covered in this programme.

Innovation Fund

Innovation Fund provides strong support for the commercial demonstration of innovative low-carbon technologies, aiming to bring to the market industrial solutions to decarbonise Europe and support its transition to climate neutrality.

The goal is to help businesses invest in clean energy and industry to boost economic growth, create local future-proof jobs and reinforce European technological leadership on a global scale.

This is done through calls for large and small-scale projects focusing on:

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- innovative low-carbon technologies and processes in energy-intensive industries, including products substituting carbon-intensive ones
- carbon capture and utilisation (CCU)
- construction and operation of carbon capture and storage (CCS)
- innovative renewable energy generation
- energy storage

The Innovation Fund focuses on highly innovative technologies and big flagship projects within Europe that can bring on significant emission reductions. It is about sharing the risk with project promoters to help with the demonstration of first-of-a-kind highly innovative projects.

It aims to finance a varied project pipeline achieving an optimal balance of a wide range of innovative technologies in all eligible sectors and Member States, Norway and Iceland.

At the same time, the projects need to be sufficiently mature in terms of planning, business model as well as financial and legal structure.

The fund supports cross-cutting projects on innovative low-carbon solutions that lead to emission reductions in multiple sectors, for example, through industrial symbiosis.

The Fund is also open to small-scale projects with total capital costs under €7.5 million.

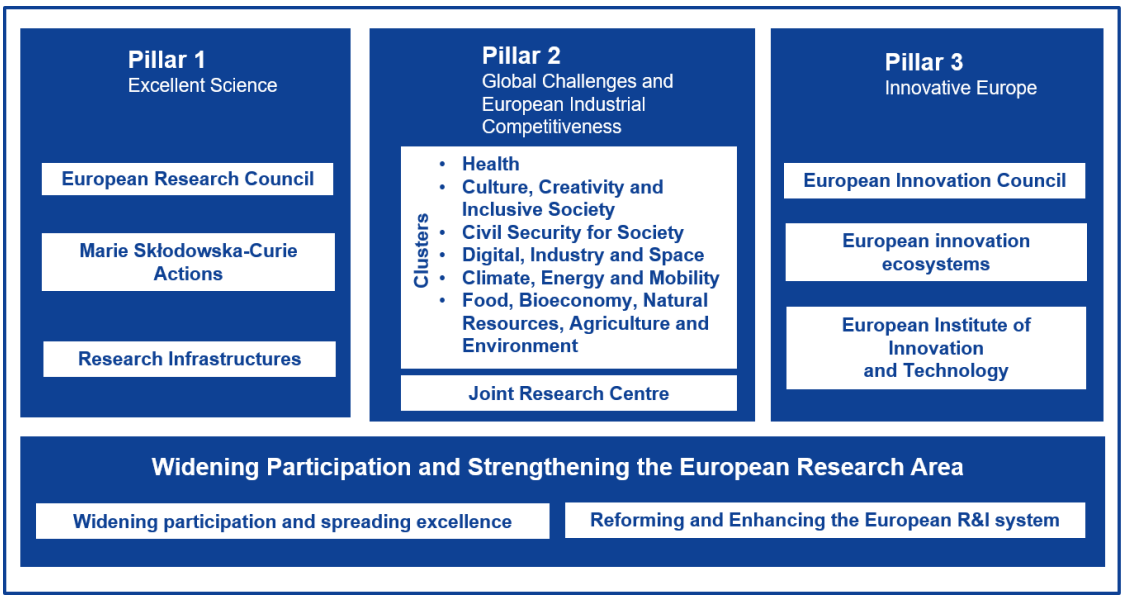
ETV Technological areas: Energy (Energy efficiency); Materials, waste and resources; Cleaner production and processes; Air pollution monitoring and abatement.

Horizon Europe

Following the political agreement, the Commission began a strategic planning process.

The result of the process will be set out in a multiannual Strategic Plan to prepare the content in the work programmes and calls for proposal for the first 4 years of Horizon Europe.

The strategic planning process will focus in particular on the Global Challenges and European Industrial Competitiveness pillar of Horizon Europe. It will also cover the Widening Participation and Strengthening the European Research Area part of the programme as well as relevant activities in other pillars.



Pillar 2 will be of specific relevance for ETV.

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ETV could play a relevant role supporting those solutions developed in Horizon Europe calls to reach the market, especially for SMEs. ETV was already specifically included in relevant topics in Horizon 2020, so it would not be difficult to keep this link also in Horizon Europe mainly regarding Clusters 4 (Digital, Industry and Space) and 6 (Food, Bioeconomy, Natural Resources, Agriculture and Environment) in innovation actions.

ETV Technological areas: All seven areas to be covered in this programme.

EIT/KICs

The EIT (European Institute for Innovation and Technology) is a unique EU initiative that drives innovation across Europe by integrating business, education and research to find solutions to pressing global challenges. EIT supports the development of dynamic, long-term European partnerships among leading companies, research labs and higher education. These partnerships are called Knowledge and Innovation Communities (KICs) and each is dedicated to finding solutions to a specific global challenge, from climate change and sustainable energy to healthy living and food. Currently there are 8 KICs established: EIT Climate-KIC, EIT Digital, EIT Innoenergy, EIT Health, EIT Raw Materials, EIT Food, EIT Manufacturing and EIT Urban Mobility.

The KICs also offer specific calls for innovation projects at high TRLs relevant for ETV. In addition the EIT Circular Economy Initiative includes a specific call for ETV support for any SME or start-up supported by any of the participating KICs (EIT Climate-KIC, EIT Digital, EIT Rawmaterials, EIT Food, EIT manufacturing and EIT Urban Mobility).

Beside these calls for proposals, ETV could be also better linked with the other innovation support mechanisms offered by EIT/KICs including education courses, trainings or mentoring activities to increase ETV accessibility to innovators by offering them support upstream the ETV process so that acquire knowledge and understanding on ETV allowing them to plan for ETV as an element of commercialisation strategy in their innovation marketing cycle.

ETV Technological areas: All seven ETV technology areas

3.4.2. Potential for mainstreaming ETV into national level frameworks for innovation and SMEs support

The national level framework for innovation and SMEs support plays an equally if not more important role for creating a favourable external framework for ETV. National innovation systems face different structure in each country providing different set of tools, while lacking a common framework and focus. It is clearly reflected in our analysis addressing the 6 LIFEproETV countries. Naturally, we considered as priority these policies and programmes both already in place or planned that would increase the accessibility of ETV to technology providers through e.g. providing financing for verification for example at the pre-commercial stage through publicly funded R&I programmes. Figure 9 presents the identified innovation support support programmes relevant for ETV in the 6 LIFEproETV countries. More detailed descriptions of these programmes are provided in Annex 1.

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Figure 9 Innovation support policies relevant for ETV in the 6LIFEproETV focus countries.

3.5. Make ETV more accessible to SMEs

As indicated I Part I, accessibility of the ETV service belongs to one of the key factors influencing the market acceptance of ETV. There are major 3 directions of improvements to increase the accessibility of ETV to SMEs, but also startups that are related to the full scale ETV programme implementation:

- improve availability of ETV service in terms of both proximity and technology areas, which is directly linked with the upgrade of the ETV infrastructure and extending the technology scope so that it matches the offering of a full scale ETV Programme;
- improve accessibility of ETV procedure through providing assistance to proposers (SMEs, startups) enabling strategic planning for ETV in the innovation management process and helping them get prepared for ETV application. It is directly linked with building ETV as an element of innovation framework, ensuring better access to ETV information by creating appropriate

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guidance materials and ETV information network together with development of dedicated ETV support services offered by business support organisations;

- **make ETV financially more attractive** which can be achieved in three ways**:** by building a strong ETV business case based on competitive advantage, by offering opportunities to compensate the verification costs and make them more foreseeable at the front end of the process and by promotion of ETV compatibility enabling recognition of performance test data generated outside the ETV process .

The three areas for accessibility improvements are summarised below

Improve availability of ETV service

As presented in section 8, Part I, currently there are seven verification bodies operational in Europe capable of handling up to several dozen verifications per year with accreditation scopes limited to the ETV pilot, except for Denmark. Geographically, they are fairly evenly distributed, although there is a gap in the south-eastern part of the European Union for countries such as Greece, Romania or Bulgaria, which have somewhat difficult access to ETV services.

The priority should be given to actions aimed at ensuring that the current verification capacity enables verification in all 7 technology areas of the full-scale ETV Programme. To investigate the potential in this area, we have carried out a short survey among the operational verification bodies to get an insight into their plans towards developing accessibility of their service for providers of innovations belonging to the new technology areas based on their observations of the interest in ETV. Since the verification bodies have already been approached with enquiries for verification of technologies that currently fall outside the limited scope of their accreditations and the EU ETV Programme, at least 4 of them declared interest to extend the accreditation scope to adjust the service offerings once the full-scale programme with all 7 technology areas is officially relaunched.

According to the verification bodies, the most attractive new technology area is air pollution monitoring and abatement followed by soil and groundwater monitoring and remediation and cleaner production and processes. It is also reflected in the analysis of the ETV competitive landscape (Part I, Section 6.2), where these technology areas have been identified as niche for ETV due to low number of other environmental schemes that may be a competitive alternative for technology providers.

The interest in establishing new verification bodies in Member States where such service is currently not available may be driven by such factors as high number of enquiries for verifications originating from these countries as it is for example in the case of Spain, however, on condition that appropriate organisations will recognise ETV as a business case and appropriate collaborative institutional framework together with external framework are created at national level to facilitate this case while national accreditation bodies establish appropriate accreditation schemes. The potential for these activities can be, on the one hand, fostered by capacity building actions dedicated to organisations potentially interested to become verification bodies and accreditation bodies interested to establish appropriate accreditation schemes benefiting from the experiences gathered so far from ETV implementation on operational level. On the other hand, ETV promotion and communication actions targeted to establish appropriate institutional and external frameworks on national level will be indispensable. As already mentioned, among factors diminishing the interest in establishing ETV capacities on national level strong national branding of innovative environmental technologies, limited credibility of ETV in terms of its current performance in Europe as well as perception of the scheme as additional burden for SMEs may be considered.

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Improve accessibility of ETV procedure

Facilitating access to the verification procedure is also related to make the process simpler and more understandable to technology providers to reduce the risks and uncertainties associated currently with the process trough:

- providing more guidance, support and clearer information about the process, its procedures, test data needs and requirements focusing on the preparatory stages before ETV application;
- promoting strategic planning of ETV in the innovation management process already at earlier stages of the innovation readiness level concerning the compatibility of ETV as presented in Part I section 6.1.

Guidance, support and ETV information

Although the General Verification Protocol of the EU ETV Programme (EU GVP) which is a publicly available, provides comprehensive information on the requirements and procedures of the ETV process, the document serves more as a guide to verification bodies than to ETV proposers. There is a guide for proposers available as well, however it does not provide sufficient information for the preparatory stage on ETV. It does not make it upfront clear for the proposer what are the ETV requirements concerning technology description and supporting data relevant for the assessment of technology eligibility for verification and ensuring that ETV will deliver value for the proposer as defined by its 4 key compelling attributes while satisfying the information completeness aspect of ETV as presented in section 1.

It refers in particular to:

- a clearer specification of the minimum requirements related to market readiness vs technology readiness level and means of proof of the claimed TRL,
- definition of the initial performance claim of a candidate technology in relation to the actual market needs, user challenges, created opportunities and information/data requirements about the technology based on which the claim proposal is based and the claimed environmental added value ,
- description of the innovation with the use of the revenant alternative,
- data (including the scope and use of LCA data if performed) and description of the environmental added value and the consequences of the assessment by the verification body in terms of identified risks that may add to the list of performance parameters to be verified,
- explanation of the relation between the regulatory compliance requirements and standards as well as other references (e.g. Best Available Techniques) relevant for technology performance in a specific application, their role and use in the ETV process and definition of performance as well as environmental parameters to be verified .

Delivering this information is the responsibility of the proposer at the application stage and has a critical impact on the whole process in terms of the effort and costs required both from the side of the applicant and a verification body. It also influences the value perception of ETV as high effort and duration of the application stage accompanied by the risks and uncertainties related to the end result of the application evaluation may be discouraging for many proposers.

The scope of the guidance and support needs prior to application should also take more account of the objectives of ETV, especially in their extended dimension as proposed in section 1 so that the verification adds business value to the proposers by satisfying both their the needs and purpose of applying for ETV as well as stakeholders needs by providing relevant information for example for.:

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- meeting the risk profile requirements of an investor (ETV as data provider for technical due diligence),
- reducing the administrative burdens related to technology implementation by its users,
- demonstrating compliance with the requirements of environmental regulatory bodies (although it should be highlighted that ETV is not a scheme for demonstrating compliance with regulatory requirements),
- use of ETV in public tendering,
- use of ETV as means to become recognised as an Emerging Technique under IED Directive.

The guidance should also highlight the opportunities for performance test data recognition as explained and supported with examples in a dedicated LIFEproETV brochure *Map of the certification and voluntary environmental schemes landscape and the EU Environmental Technologies Verification: Competition, synergies and opportunities for performance test data recognition.*

Some of the information concerning an initial quick check if a technology is a good candidate for ETV could be done by potential proposers even without contacting verification bodies with a verification request. It will require creation of an propriate, easy in use, preferably on-line self- assessment tool ending up with an individual report including a set of issues and recommendations concerning the readiness of a candidate technology for verification highlighting the information/data gaps to be addressed by the proposer when considering ETV application.

Beside the self-assessment tool and development of a new Guide for EU ETV Proposers, also other forms of assistance delivered by third parties like business support organisations under their offer of business development services seem indispensable to support SMEs in their preparation for ETV as addressing some of the challenges and information needs as mentioned at the beginning of this section requires competences and knowledge in areas that SMEs or startups may not necessarily have. It will, however, require building appropriate capacities and knowledge in these organisations. At the absence of verification bodies established in all Member States, creating a network of organisations with skills and knowledge to advise SMEs on the use of ETV is especially recommended to offer support to technology providers with an ambition to enter EU market. Moreover, increasing the accessibility of the ETV service through creating capacities to get assistance for getting prepared for ETV at national level is an effective way of reducing the language barrier which may be the case when contacting directly verification bodies for information on ETV.

Strategic planning for ETV

Commercialisation is the most critical and costly part of the innovation process. It is also heavy with a number of risks that result from earlier stages of innovation development, even going back to the front end phase of the innovation process when the innovation idea is developed with a lot of uncertainties[17]. In the case when innovation address a new environmental technology, ETV may help reducing some of the risks and uncertainties by facilitating the streamlining the front end decision making processes related to target market and customers, strategic alignments, and resources with the commercialisation efforts reducing the time, costs and market failure risk. By integrating ETV strategically into innovation management process, technology providers may gain support in addressing in particular the technology

[17] Luoma, T., Paasi, J. and Nordlund, H. (2008) Managing commercialisation risks in innovation development: Linking front end and commercialisation. In Proceedings of the XIX ISPIM Annual Conference https://www.researchgate.net/publication/267774698_Managing_Commercialisation_Risks_in_Innovation_Development_Linking_Front_End_and_Commercialisation

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and market needs challenges. Figure 10 presents the added value of a strategic positioning of ETV in the innovation management process from the early innovation stages corresponding to the innovation readiness levels[18] and technology readiness levels.

As presented in Figure 10 the most critical moment for the market uptake of an innovation is the so called "Chasm"[19]. For new environmental technologies the key challenge stays with proving its performance claims (technical viability with combined environmental effect) through performance testing to derisk the technology especially towards early adopters and show the commercial potential of the solution before its deployment as a mature product. That typically happens at the stage of an early product i.e. after IRL 3(TRL7-9)

The support for a strategic planning of ETV should be provided by business support organisations who assist SMEs and startups in developing innovation management pathways for their new offerings as the consultation with verification bodies actually happens shortly before application. As mentioned above, offering this kind of a special service requires a good understanding of the ETV process and its benefits by business support organizations and thus opens an area and a need for their education.

The strategic planning of ETV should be focused in particular on the two stages of technology development defined as IRL2 and IRL3 on aim at reducing the costs, time and duration of the ETV process by taking into consideration, among others, the following aspects:

at the technology prototyping phase (TRL 4-6, IRL2): development of test data allowing to formulate market relevant claim and looking into environmental aspects related to the prototype system components so as to get an understanding of their environmental impacts from their Life Cycle perspective that may influence the environmental added value of the innovation. At this stage modifications and improvements of the components are typically done to optimise prototype performance including environmental performance. For example in many R&D projects LCA is performed for the developed innovations. In view of a planned verification, this information may guide changes in the components to improve the environmental added value and thus the innovation aspect in the meaning of ETV. It can also help possibly eliminate risks and identify benefits related to environmental performance that should be taken account when developing the initial claim. Also definition of a proper scope of technology testing (e.g. definition of the most appropriate and representative matrix to demonstrate the performance of the technology, tests relevance in view of market/user needs and challenges, scale and method of testing etc. at the prototyping phase may contribute later on to a better formulation of the constraints, assumptions and limitations relevant for the performance claim and thus definition of the testing conditions for test data generation for the needs of verification. In consequence this may help better define the testing needs and requirements at the technology completion phase in order to be able to generate test data relevant and sufficient to the performance claim.

[18] Tao L, Probert D, Phaal R (2010) Towards an integrated framework for managing the process of innovation, R& D Management 40(1):19 – 30 https://www.researchgate.net/publication/227938049_Towards_an_integrated_framework_for_managing_the_process_of_innovation

[19] The original term has been introduced by Moore, G.A. (1999) Crossing the Chasm. New York:

Harper Business and defines as 'the chasm between the early adopters of high technology and the product (the enthusiasts and visionaries) and the early majority (the pragmatists)'.

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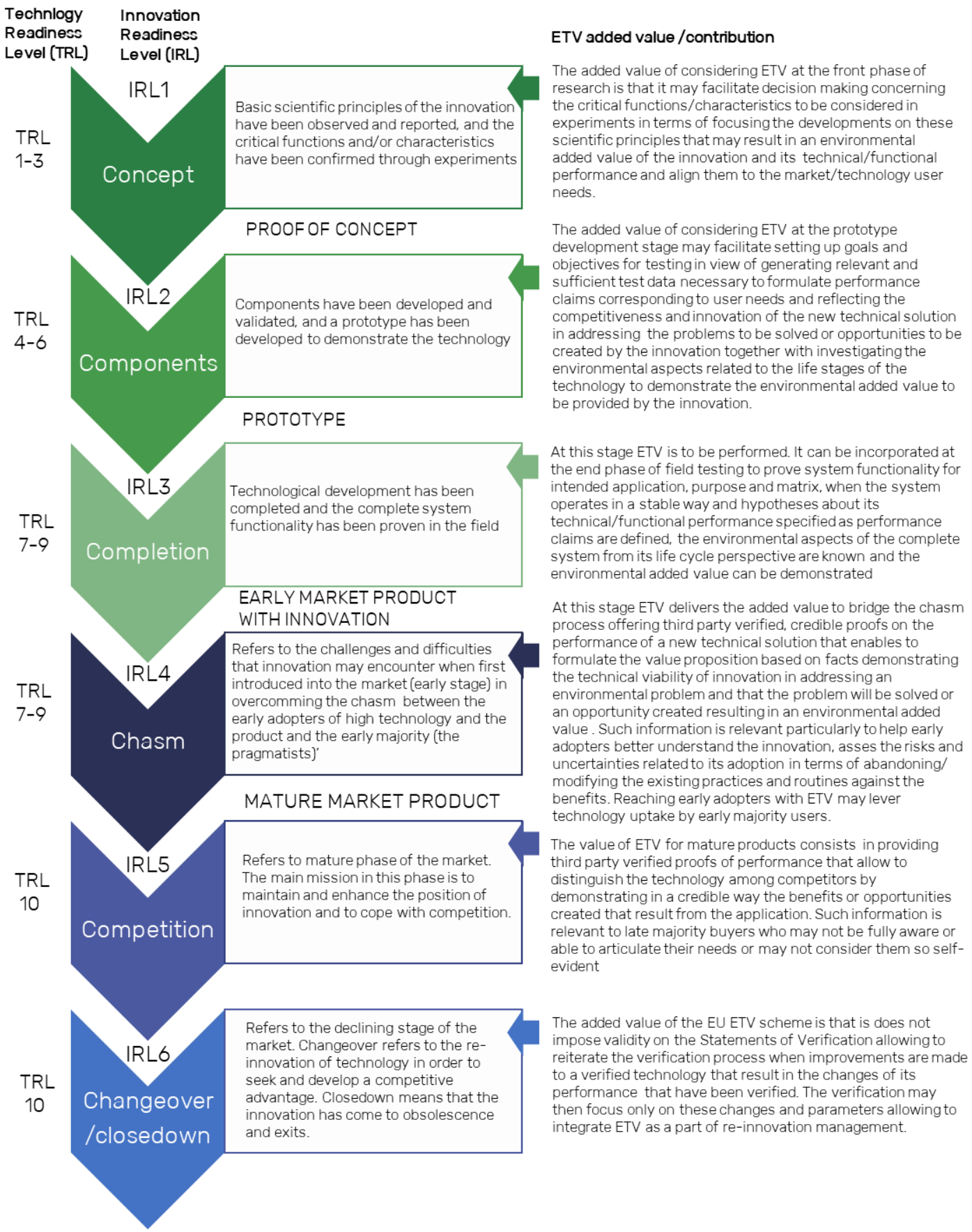

Figure 10 The added value of strategic planning of ETV in the innovation management process

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- **at the technology completion phase** (TRL7-9) IRL3 which is the optimal phase for ETV implementation e.g. performing the testing as a the final stage of a demonstration project. Based on the information gathered from IRL2 it is easier to define the optimal moment either to apply for ETV or to generate quality test data that may be potentially recognised for the needs of ETV – for example in combination with required compliance testing if a technology is mature enough to enter these processes. Although the performance test data produced for IRL2 may rather not be appliable directly to ETV, they may however provide a solid basis for the verification body to assess the stability/ variability of candidate technology's operation under different conditions and whether the initial performance claim is realistic. All these assessments are relevant to the costs and process duration. They also help the applicant understand the rationale of the ETV process for their technology. For example if a technology demonstrates high variability of performance under different ambient conditions then the proposer should count with an adequate, probably longer, duration of the verification process due to the need of testing the technology under appropriate conditions to demonstrate the veracity of the claim. Also by considering ETV earlier, it is much easier to collect and demonstrate data to support the environmental added value and/or consider them under the environmental parameters to be verified. If an LCA is performed for a TRL 7 stage technology, considering ETV may help better adjust the assessment with focus on key environmental parameters relevant for the technology and the choice of the appropriate data on the reference units applied.

These are just some examples of key benefits of a strategic planning of ETV. There also, however, some conditions that need to be considered to enable such planning. Beside the competences of the business support organisations already mentioned, ensuring a succession in data provision/transfer is also necessary. For example if an R&D consortium develops technology to TRL 4-6, or higher, it should be ensured that the successor of e.g. an SME or a startup who is to apply for ETV for a technology based on a commercially exploitable outcome of the project should also have access to the performance test data generated in such project as well as LCA data if produced in order to be able to provide this information as a part of the application package. For example, very often manufacturers have difficulties with providing data relevant to the environmental aspects of the technology related to the early stages of its life cycle, typically focusing only on the production and operation stage which is under their control. It often results in the fact that the data necessary to demonstrate the environmental added value at the application stage is limited, requires an in depth analysis by the verification body leading sometimes to identification of negative environmental aspects at earlier stages upstream the operation phase that may not necessarily balance the declared positive impacts delivered in other stages of the life cycle endangering the compliance of the candidate innovation to be verified under ETV with the definition of environmental technology.

Strategic planning of ETV depends also to certain extend on the external framework for ETV. It involves for example recognition of the eligibility of ETV costs, especially subcontracting of testing bodies to perform testing for the needs of ETV to ensure third party, quality test data generation under different EU/national funding schemes.

Another aspect is related to the duration of the ETV process. Knowing the test data, an idea of a claim and the constraints, limitations and assumptions concerning the performance of a technology from a project targeting TRL4-6 technology development stage allows better planning for ETV in a demonstration project which must consider on the one hand the time and resource constraints of such a project and the readiness of the technology to deliver performance data relevant for ETV.

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Make ETV financially more attractive

The financial factors relevant for the accessibility of the ETV service have already been presented in section 7, Part I as well as in section 3.4, Part II where we present the potential for cross-compliance with EU and national programs that could provide financing for verifications. Other options that could contribute to reduction of ETV costs include for example:

- hybrid funding schemes for ETV, where verification bodies are provided with a subsidy to cover part of their costs of performing their service from national authorities while the testing costs stay with the technology provider. Such solutions are applied in some national ETV schemes e.g. South Korean ETV, Japan ETV scheme. They require, however, a strong commitment, involvement and interest of the institutional partners (scheme owners) and appropriate external framework enabling such financing (i.e. establishing a dedicated funding scheme).
- promotion of combined testing under compliance certification with ETV. This may apply for technologies shortly before entering the market, especially where compliance testing related to technology performance is obligatory (e.g. for small scale domestic water treatment facilities or for some construction products) or includes additional, secondary criteria which go beyond the legal requirements but are relevant to address stakeholders needs and technology market uptake. In both cases, however, the compliance certification must involve third party testing. The combined testing is based on the opportunity of test data recognition offered by ETV and described together with case studies in the already mentioned LIFEproETV brochure *Map of the certification and voluntary environmental schemes landscape and the EU Environmental Technologies Verification: Competition, synergies and opportunities for performance test data recognition.*

4. How LIFEproETV is to trigger the market acceptance and recognition potential of ETV

The LIFEproETV project has an ambition of building strong market acceptance and recognition of ETV at Member State and EU level in scheme for accelerating the way of green innovations to the market and adding to the success chance of their commercialisation and diffusion. Our intention is to facilitate the EU wide uptake of the scheme based on showcasing the experiences gained from our efforts to instill in the 6 LIFEproETV focus countries the values and benefits of the scheme that hopefully they will retain through considering ETV a sustainable mechanism of the national/regional innovation ecosystems that deliver new technical solutions for bridging the policy objectives and targets with their implementation. Based on the analysis of opportunities and drivers for ETV resulting in strategic directions presented in this report, a Roadmap for EU-wide ETV market recognition and acceptance will be developed focusing on the actions and contributions to be made by the implementation of LIFEproETV project as presented in Table 4.

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Table 4 Actions to be undertaken by LIFEproETV in the roadmap

Strategic direction	Actions to be undertaken by LIFEproETV in the roadmap
1. Improve ETV value perception	• Amplify the added value of ETV in promotion and communication of the scheme • Facilitate transparency of ETV benefits • Promote compatibility of ETV with other environmental schemes
2. Unleash ETV potential for ETV use in GPP and IP	• Present and promote the use of ETV in Green Public Procurement (GPP) procedures • Present and promote ETV in Innovation Procurement (IP) procedures • Promote ETV Statements of Verification as credible method of proof in public purchases • Promote mandatory assessment of the performance of purchased goods and services by third party bodies in GPP and IP • Promote the status of ETV Statements of verifications as credible methods of proof in tenders • Propose reference to environmental technologies in the EU GPP guidance (definition of environmental technology, update of the criteria) • Propose linking of the environmental added value criteria and environmental performance with sustainable financing tools • Promote environmental criteria based on the assessment of the environmental added value to tackle green claims by capital providers • Build awareness about ETV among public procurers including utility service providers and large state owned industries • Demonstrate compatibility and mutual recognition pathways between ETV and other environmental certifications used in GPP
3. Make ETV a sustainable mechanism of transformative innovation ecosystem	▪ Include ETV into a broader portfolio of R&I programmes at EU and national/regional level dedicated to development of close to-market innovations corresponding to the needs of the environmental and climate policies (or societal challenges), ▪ Include ETV into the business development services for SMEs such as coaching, training, mentoring, ▪ Encourage policy makers to financially incentivize ETV including tax reliefs, fee reductions, subsidies (eligible costs in innovation support calls) or ETV dedicated funding schemes ▪ Promote the use of ETV as a tool for improving public sector innovation e.g. under public procuremen of innovation to address environmental problems or create new green business opportunities ▪ Promote ETV towards existing as well as new financial and policy instruments in which there is an explicit need to mitigate the financial risk of breakthrough environmental technologies e.g. project development programmes designed to help SMEs or start-ups attract private capital to demonstrate and/or scale up their green innovations.

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Strategic direction	Actions to be undertaken by LIFEproETV in the roadmap
4. Promote ETV as environmental policy tool for EU Green Deal	• At EU Level make ETV a tool to feed the development or upgrade of BREFs reference documents under the . ETV could in particular support implementation of IED (Art 15(5)) facilitating the development and testing of emerging techniques. It could also contribute to shortening the BREF cycles providing innovations with proven performance to set up a forward looking perspective based on Emerging Techniques Associated Emission Levels (ET-AELs). • Promote ETV Statements of Verifications as means of proving compliance with some environmental requirements e.g. to reduce the administrative burden in environmental permits when implementing green innovations or in relation to sustainable financing regulations • Include ETV into national public procurement laws • Encourage policy makers to refer to ETV in national/regional policies, strategies, programmes and plans implementing EU Green Deal as well as Post-Covid recovery plans • Promote ETV as a tool supporting upgrade of performance-based regulations aimed at achievement of specified results/targets rather than on adherence to particular technologies
5. Strengthen ETV compatibility	• Promote ETV towards other environmental schemes referring to environmental performance of products and environmental management of organisations as contributor of information on performance of technologies • Promote the performance test data recognition opportunity provided by ETV to reduce the time and costs of verification among technology providers (also in relation to testing for compliance purposes) • Present and educate testing bodies in the testing requirements for ETV to extend their testing offer towards new environmental technologies
6. Make ETV more accessible to SMEs	• Promote ETV towards new potential verification bodies and accreditation organisations • Provide knowledge facilitating establishing appropriate accreditation schemes and quality schemes for the needs of ETV • Provide Business Support Organisations with knowledge and schemes to promote ETV among SMEs, provide support in the preparation for ETV • Encourage operators of EU and national/regional operators of innovation supporting programmes to include ETV as eligible costs of e.g demonstration projects • Provide materials and tools making the ETV process more understandable to technology providers .

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5. ANNEX 1 INNOVATION SUPPORT POLICIES RELEVANT TO ETV IN THE 6 LIFEPROETV FOCUS COUNTRIES

Poland

GreenEvo - Green Technology Accelerator	GreenEvo is a programme of the Ministry of Climate and Environment, designed to promote Polish green technologies. The core of the programme is the support of Polish environmental technologies at home and abroad. Its main task is to help Polish small and medium-sized companies to establish international contacts, as well as to provide them with knowledge and tools enabling a dynamic development. Actions taken under the Programme comprehensively stimulate sustainable development and strengthen the position of innovative green technologies in the process of building a circular economy. Technologies that apply to the programme must undergo a detailed expert assessment evaluating the achieved performance and environmental parameters as well as the market potential of a given technology. ETV could replace the requirement of expert assessment and at the same time would give confidence to the programme operator that the confirmation of parameters is based on reliable and high quality data. The promotion of ETV-certified technologies outside Poland by GreenEvo would be more effective due to the EU and worldwide recognition of the system, especially of the ISO 14034 standard.
Research, Development and Innovation Programme, (FENG)	The FENG programme is established under the new EU Financial Perspective. FENG includes a component "Greening enterprises" to support transformations of enterprises towards sustainable development and the circular economy, including development of new business models. The implementation of the component is intended to change the thinking of companies about the whole business, take into account its environmental aspects and switch it to a circular model: from the selection of contractors and resources, through the design of products and services, to the sustainable production and management of waste and the life cycle of products. The component includes support for ecodesign, environmental and product lifecycle assessments (such as ETV, PEF or LCA) and implementation of the recommendations and investment support for greening companies, including the implementation of R&D results.
Sixteen regional programs managed by regional governments	The programmes will be financed by the ERDF and the ESF+. The scope of the intervention is based on the Regional Development Strategy and is developed within the framework of working groups appointed by the provincial board, representing different sectors and stakeholders. The aim of individual contract negotiations is to best match programme interventions to the diagnosed needs and potentials of the regions. Regional programmes are subject to intervention among others in the operation and implementation of business R&D activities, support for SMEs, clusters, RES development, energy efficiency, adaptation to climate change, protection of areas valuable for nature, water retention, water and waste water management, waste water.

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	Including ETV verifications costs into eligible costs for example in demonstration projects or in relation to green public procurement within this programme might significantly boost the ETV verifications market in various regions of Poland as well as the development of green technologies. Consultations of regional programmes will be carried out by Marshalls` Officies of particular regions, therefore implementing ETV scheme requires cooperation on regional level.
National Centre for Research and Development (NCBR) – innovation procurement programmes	Since 2020 National Centre for Research and Development (NCBR) is implementing a new way for financing R&D through a new portfolio of programmes based on innovative public procurement including three methods: Method 1: Pre-Commercial Order (PCP) NCBR determines the research challenge and orders technology. The results of the projects are developed technologies and built operating and implemented demonstrators on a 1:1 scale Method 2: Innovation Partnership (PI) NCBR together with the Partner determines the research challenge and orders the technology. The results of the projects are developed technologies and built operating and implemented demonstrators on a 1: 1 scale. The result of the project is also the first purchase of the technology / solution by the Partners. Method 3: Great Challenges NCBR determines the research challenge and orders technology. The result of the projects are prototypes of solutions ready for further development. The new way of financing R+I includes at present such areas relevant to ETV as: energy technologies, water and wastewater treatment, heating and cooling, energy efficiency in construction. NCBR is currently implementing various programmes within the innovative public procurement. Including ETV in the innovation procurement process would be highly beneficial for both sides: procurers and suppliers. It would be a solid confirmation of environmental sustainability of proposed technologies and solutions. It would also confirm their viability for green public procurement. In the longer perspective such system would contribute to boosting the development and wide implementation of innovative, green technologies in Poland as well as create a strong national offer of green innovations with a potential to compete on global markets.
National Just Transition Programme	The programme is to support the implementation of the European Funds for Just Transition Program. It includes a priority dedicated to pilot projects to test innovative solutions as an experimental approach to build systemic approaches to the identified problem areas related to the just transition process.

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Polish Hydrogen Strategy by 2030 with an outlook to 2040	The Strategy is a response to global changes taking place, which is witnessing a technological race towards innovative methods of production, transport and use of hydrogen The document addresses aspects of all parts of the value chain - production, transmission, storage and use of hydrogen. One of the policy objectives is to identify actions related to the deployment of hydrogen technologies in the power sector. The proposed action is to support research and development of co-generation and poly-generation systems to create demonstration plants followed by deployment of medium-sized plants. **In this respect ETV can serve as a confirmation of efficiency and environmental effect of the subsidised demonstration plants/projects before the process of their implementation on a larger scale.**

Spain

Eight Spanish policies and strategies related to innovation have been reviewed to identify its main characteristics, objectives and how ETV can contribute to these policies and programmes. Five out of the eight documents identified are at national level, whereas 3 of them correspond to regional governments.

Spanish strategy for Science, Technology and innovation 2021-2027	The Spanish strategy for Science, Technology and innovation (https://www.um.es/documents/1718090/18815392/EECTI-2021-2027.pdf/3d5a599b-49bb-444c-924d-bcdacffd250e) (applied during 2021-2027) is the main instrument to strengthen the science, technology and innovation system in the following years. It is managed by the Spanish ministry of Science and Innovation. The strategy is not restricted to any technical area, rather it is a horizontal strategy for the innovation in both, private companies and public administration. In the first step, the strategy will focus on the investment in ecological transition and digitalisation, boosting research and through specific programmes. The second step, is aimed to implement the research and development as one of the pillars of Spanish economy. One of the specific objectives of the strategy is to boost new technologies, promoting a framework that enables the detection innovative technologies and incentive their purchase by private companies or public administration. Specifically, the 8th objective of the strategy aims at promoting the innovation within companies mainly, SMEs. Within this framework, ETV could clearly be linked within the strategy as an instrument that allows, to identify innovative technologies, through the list of ETV verified technologies, belonging to different technology areas that at the same time provide an environmental added value. The ETV verification of technologies will also contribute to facilitating the acquisition of these technologies by potential buyers (including both, companies and public administration) as it will guarantee the technical performance of the technology, reducing the risks for the purchasing companies related to the acquisition of innovative technologies. Furthermore, the verification of technologies under ETV could serve as a promoting instrument of innovative technologies increasing its visibility and facilitating its market uptake.
Spanish Strategy on Bioeconomy. Horizon 2030.	The Bioeconomy strategy (https://www.mapa.gob.es/es/desarrollo-rural/temas/innovacion-medio-rural/estrategiaenbioeconomia23_12_15_tcm30-560119.pdf) implemented in 2015 aims at boosting economic activity and improving the competitiveness and sustainability of the productive sectors that are linked to the use of bio-based resources, promoting the generation of knowledge and its use for the development and application of technologies derived, through collaboration within the science and technology system and public and private Spanish entities. The strategy, managed by the Ministry of Economy and competitiveness, is focused on agricultural sector, energy (bioenergy) and the development of bioproducts. One of the expected result

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	is the use of scientific research for the development of technologies and their incorporation into companies; existing ones, to reinforce their competitiveness, and those that may arise, to promote new economic activities based on them. In order to boost the incorporation of innovative bioproducts related technologies or products into the market, the strategy encourages it through public procurement. In this scenario, ETV could be a tool facilitating the utilisation of public procurement for the promotion and acquisition of innovative technologies. For instance, the incorporation of ETV as a positive discriminatory factor under public procurement may help promote innovative technologies with an environmental added-value, facilitating the objective of the policy to use public procurement for the incorporation of innovative technologies under the framework of bioeconomy.
Strategy on sustainable, secure and connected mobility. 2030	The transport sector in Spain is under a big change era. The strategy on sustainable, secure and connected mobility 2030, (https://esmovilidad.mitma.es/), currently, June 2021, under development by the ministry of transport and mobility, is intended to cover three of the main challenges that mobility faces. • Introduction of technology within the mobility • Reduction of carbon emissions • Concentration of people in cities and hence the challenges for the mobility in these environments and the related health effects. The strategy reinforces the importance of a sustainable mobility, energetic efficiency and that contributes to the mitigation of climate change. Innovation and technologies will play a key role in contributing to these objectives. Specifically, the strategy highlights the need to enhance those technologies related to mobility that use green energy through boosting research and innovation activities. Furthermore, the strategy aims at the decarbonisation of the transport sector, by the incorporation of technologies that reduce emissions. In order to maximise the results of the research and innovation activities, ETV could be included within the eligible costs, that will help the market acquisition of the innovative technologies developed under research programs. Besides, ETV information on verified technologies could serve to identify those that use green energy and reduce their emissions contributing to the objective of decarbonisation of the transport sector.
Law of corporate Tax. Taxation and discounts for R & D & I activities	The law of corporate tax and discounts for R & D activities (https://www.boe.es/eli/es/l/2014/11/27/27/dof/spa/pdf) in force since 2014, which depends on the Ministry of presidency is one of the instruments that public administration has to promote the company's innovation including tax incentives and deductions. This tax deductions are based on the realisation of research projects or the development of innovative technologies. This is a horizontal instrument as its application is general and free (it is not a competitive concurrence). Tax deductions are intended to incentivise innovation in the private sector without being restricted to any specific technology area. The policy mentions fiscal deductions for those activities related to innovation technologies. In order to be able to apply for this tax deduction there is a definition of what is considered innovative technology under this law (article 35). In order to shed light on the innovations that can apply for this deduction, ETV could be incorporated in the law as an example of a way to demonstrate that a technology is innovative and that it can apply for these deductions.

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Spanish National Guide for public innovation procurement	The National Guide for public innovation procurement (https://www.ciencia.gob.es/stfls/MICINN/Innovacion/FICHEROS/Politicas_Fomento_Innv./Guia.CPI.pdf) is aimed to be the reference framework for political, social and economical public entities, to achieve the objectives to promote innovation in order to transform the Spanish economy in one based on knowledge. This guidance is promoted by the Spanish ministry of Innovation and Science to boost the innovation procurement in public administrations including both, PIP and PCP. The guidance provides recommendations related to the evaluation criteria, confidentiality, related to R + D and recommendations related to potential financiering of the innovation offered. The guidance mentions some criteria for the technologies or products to be incorporated under the innovation procurement and that also contribute positively to the environment, such as the acquisition of technologies or products with less energy or water consumption, decrease of emissions, reduce residues, etc. In order to demonstrate that a technology complies with these criteria, ETV Statement of Verification, could facilitate the demonstration of the environmental benefit of a given technology in a reliable manner. However, the document provides general recommendations, not mentioning specific criteria. But having ETV could facilitate accomplishment of the required criteria by technology providers.
Valencia plan for ecological production	The Valencia plan for ecological production (http://agroambient.gva.es/documents/163228750/163232590/I+PLA+VALENCI%C3%80%20DE+PRODUCCI%C3%93%20ECOL%C3%92GICA.pdf/96c71dcb-3b4a-4687-a039-81de15d1b6db) is developed by the regional government of Valencia to promote ecological production within the agricultural sector. The second plan is currently being developed (June, 2021). The plan defines the strategy to evolve the agricultural sector to practices that reduce the residues and contribute to mitigation of the climate change impact. It promotes the utilisation of agricultural practices that contribute to the reduction of water consumption and contamination and mitigate the desertification of the region. Besides, it is also aimed at reducing contaminants in water and soil such as pesticides or nitrates that will help to improve environment and environmental health. One of the key aspects to achieve these objectives is to promote the acquisition, by the agricultural sectors, of new environmentally friendly technologies to renew the old polluting ones as well as to boost research and development in this field. ETV could be used firstly under the research and development activities to demonstrate the development of innovative technologies for an eco-friendly agriculture production, that will demonstrate the environmental benefit of the developed technologies. Once verified under ETV, it would also contribute to the second aim of the plan intended to promote the acquisition of innovative technologies by the agricultural producers, as it will demonstrate both, the performance of the technology and its related environmental benefit.
Euskadi plan for the science, technology and innovation, 2020	The Euskadi plan for the science, technology and innovation (https://www.euskadi.eus/contenidos/enlace/pcti2020_resumen/es_def/adjuntos/pcti_resumen_es.pdf) developed for the period between 2020-2030 is managed by the regional government of the Basque country. It is intended to promote Euskadi economy based on knowledge. The plan will implement an innovation policy promoting the scientific and technological products demand. The plan

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	wants to incorporate new technologies in the production systems, in new products and process to incorporate added value to the products commercialised, overall, considering sustainable aspects contributing to improving the environmental quality. One of the main gaps identified in the plan is the transfer of the research results into market solutions applicable for public and private companies. To fill this gap, the strategy aims to enhance the resources provided to the research and development focused on the technological research (closer to the market solutions than the fundamental research). Here, ETV could be included as a tool to demonstrate the market readiness of a technology developed under a research activity. ETV costs may be financed under this plan facilitating its implementation and contributing to the objectives of technology transfer from research to applicable market solutions.
Madrid regional plan for the scientific research and technology innovation	The Regional plan for the scientific research and technology of Madrid (https://www.comunidad.madrid/sites/default/files/doc/educacion/v_pricit_para_web_v2_0_0.pdf) is promoted by the regional government of Madrid. The plan defines a strategy of scientific research and technological innovation that allows for "positioning the Community of Madrid as a leader in research and innovation at the national and international levels". The plan is structured around three areas: a) improving the capabilities of the R&D+i system, with a focus on the three aspects of strengthening research agencies and their scientific facilities, attracting and retaining both young and senior talent and promoting projects with exceptional prospects; b) promoting ways to more effectively take advantage of activity generated within the system through the realistic valuation of the results of R&D+I, the protection of these results and the creation of start-ups and spin-offs; and c) enhancing the coordination of R&D+ I efforts with European, national and regional funds through the articulation of the entire system and its critical mass. The plan focuses on boosting the innovation within the Madrid region. The programme highlights the need to promote the transfer of scientific results to the market and society. There, the plan describes actions to boost innovative technologies and results to increase their market uptake. In the action intended to help companies to introduce their products to the market, ETV verification of the developed technologies can contribute to increasing their market uptake providing a demonstration of their innovative, technological performance and environmental benefit. Besides, the inclusion of some innovative criterion to public procurement is mentioned in the plan, hence, ETV could be included as one of the positive discriminatory innovative criteria.

Italy

Innovation Policies and strategies in Italy are divided in three different levels such as: a) national; b) regional and c) inter-regional documents and agreements. They have been analysed in order to find out how ETV can be integrated and then contribute to boost innovation.

National policy: Strategy for technological innovation and digitalisation of the country 2025.	The strategy has its roots in sustainable development goals of the Agenda ONU 2030 and after an accurate analysis 3 challenges have been identified: • Digitalisation of the country • Innovation of the country

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- Sustainable and ethical development of the society as a whole.

Each challenge has 3 objectives that are reached through concrete actions. An action plan has been drafted and it will be updated every 4 months in order to strictly monitor achievements and possible delays.

In this framework ETV could be a helpful tool for actions approaching challenge 2 and 3, thus an eventual inclusion during the definition phase would guide decision makers in better allocations.

The action plan foresees a collaboration with the institutions at local level, where the priorities will be defined. It is in this process that inclusion of ETV is possible and useful because it can steer choices and solution in an informed manner.

ETV could help in increasing the number of innovative and green technologies available on the market and in creating a competitive industrial system.

Regional Policies: Smart Specialisation Strategy – S3	The Smart Specialisation Strategy (S3), as part of POR FESR, is a regional strategy that provides the areas to which the innovation choices of companies should be directed, in close connection with the society challenges identified by the European Horizon 2020 funding programme. With the new seven-year programming of structural funds (2021-2027), the Regions are called upon to align and update the S3. An integral part of the approval process is the consultation process which aims to collect comments and proposals for integration or revision of the document under discussion. This represents an opportunity for the integration of ETV in the revised and updated strategy. As an example, the Emilia Romagna Region opened a group on the EROI platform to inform about the thematic areas on which the new S3 is oriented (with documents, materials and general consideration) and to collect all possible ideas, feedback and any other observations considered of interest for the strategy. The document in consultation identifies 15 priority thematic areas, aggregated into five discussions, to which it was possible to contribute until 21st of January 2021. In particular, the 2nd thematic area of the document is about Sustainable Transition and it is divided into five sub-areas. The first three sub-areas concerning Clean, safe and accessible energy, Circular Economy and Climate and natural resources (air, water and land), were considered of interest for the potential integration of ETV. Taking advantage of the consultation process, we left a comment in the relevant discussion to suggest the inclusion of the ETV tool within the strategy in order to support the implementation of the strategy and to support the SMEs in innovating and greening. In order to support the SMEs the costs for the verification of technology through the ETV tool should be made eligible in research/innovation/demonstration projects carried out by companies. It is conceivable to follow the same pattern for all the other regions consultation processes: Veneto, Lazio, Puglia, Tuscany and the Autonomous Province of Trento still have to begin the new programming, so that the procedure described and adopted for Emilia Romagna will be easily implementable.

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Regional Policies: Regional Strategy for Sustainable Development	The Regional Strategy for Suistainable Development (SRSvS) aims to identify the main tools to contribute to the achievement of the objectives of the National Strategy for Sustainable Development (SNSvS) as well as the goals and targets contained in the "Agenda 2030 on Sustainable Development". The Veneto region has already approved its Regional Strategy on 20th of July 2020. A mention to ETV could be included in the 7th chapter of the strategy where the six strategical macro-areas are described. In particular in the 2nd and the 5th macro-area, respectively "For 360-degree innovation: making the economy and the production system leading actors in global competition" and "For a reproduction of natural capital: reduce the pollution of air, water and earth". The integration of ETV tool in these chapters will be beneficial for the promotion of innovative and green technologies. Moreover, ETV is able to confirm the environmental sustainability of the technologies, fostering the transition towards a more sustainable development model. The Toscana region has started the process to formulate the strategy and has set up the public forum which will be activated soon: this means that there is an opportunity to include ETV scheme into the strategy. Other regions have still not approved their regional strategy.
Inter-Regional Strategies and agreements: The Green City Network guidelines	The Green City Network involves different regions with more than 140 Italian cities all around the national territory. The most relevant document concerns the green cities guidelines, where the 4 general objectives of the network are described and subsequently articulated in 15 specific guidelines. The 4th objective "Promoting eco-innovation and the green economy and improving governance" is of interest for the integration of the ETV tool. In fact, ETV can provide significant help in selecting those technologies that, through an efficient use of resources or cutting emissions, could reduce the impact on the environment. This is true especially for measures following the objective related to eco-innovation. The introduction of ETV could be beneficial for both buyers (e.g., municipalities) and providers.
Inter-Regional Strategies and agreements: Creiamo PA	The CREIAMO PA (Competences and Networks for Environmental Integration and Improvement of the Public Administration Bodies) project is included in the strategy developed by the Italian Ministry of Environment, Land and Sea Protection to face the environmental issue in the implementation of public policies. The project, aspires to provide significant environmental and technical skills to PA and to create networks to increase synergy, participation and shared knowledge between members. With this aim, nine lines of intervention have been created and three of these are considered of interest for an eventual ETV inclusion: • The Circular Economy Models and tools for the transition towards a circular economy (L3) • Air Quality Procedures to limit atmospheric emissions from biomass burning for civil purposes. (L4) • Climate Change and Capacity Building for adaptation to climate change (L5) The L3 in particular is then articulated in three work packages: • Sustainable and effective use of resources

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	• Environmental and energy management models • Waste management and prevention As this project mainly works with workshops, seminars, on the job coaching modules, training activities, and similar it was difficult to find a single document where to insert a reference to the ETV tool. However, it is conceivable to create a seminar to explain the functioning of the tool and the opportunities deriving from its implementation and to invite cities and regions to use it to design their policies and strategies, for example in the public procurement system for the promotion and adoption of green and innovative technologies.
PAES: Action Plan for Sustainable Energy	The Action Plan for Sustainable Energy is a document that defines the energy policies that a Municipality should have adopted to achieve the European CO_2 emissions reduction target within 2020. For example, the Municipality of Bologna adopted its current PAES in 2012.. A mention of ETV can be hypothesised in section 6 of Volume 1 of the current PAES (page. 64), under the entry "Instruments and in progress projects". Also considering that other LIFE+ projects are already mentioned in the cited paragraph, the ETV can easily be added in the following way: "In order to limit the adverse effects of climate-altering emissions, the use of the ETV tool can help select those technologies that can actively contribute to the achievement of the 2030 targets and ultimately to carbon neutrality in 2050".

Slovenia

Smart specialisation	With the implementation of Slovenian smart specialisation strategy (S4), in force since 29.8.2014, Slovenia introduced a new model of development cooperation between key innovation stakeholders. The implementation of S4 represents one of the key tools for strengthening and upgrading the Slovenian innovation ecosystem. The implementation of S4 is based on a new model of development cooperation, which emphasises closer, institutionalised cooperation between the state, the economy, knowledge institutions and other relevant stakeholders in the field of research, development and innovation. In order to achieve high-productivity economy, nine priority domains with corresponding focus areas and technologies are defined and thus, 9 Strategic research and innovation partnerships (SRIP) were established in 2016. S4 remains one of the bases underpinning the implementation of Cohesion Policy in Slovenia in the period 2021-2027, where at least three SRIPs ("Circular economy SRIP", "SRIP Materials as end products" and "SRIP Food") are focused on developing green and innovative technologies in scope of ETV technology areas. **As a help to the co-creation of innovative solutions between public and private research, ETV could serve as a good tool for identification of innovative technologies that are at same time environmentally friendly in use and can help new innovative technologies get to the market.**
National Recovery and Resilience Plan (NRRP)	On 28th of April 2021, the Slovenian government adopted the National Recovery and Resilience Plan (NRRP), which will be the basis for using the available funds from the Recovery and Resilience Fund (RRF).

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	c. In its RRP Slovenia has identified development areas and the related reforms and investments that will help mitigate the negative economic and social impacts of the COVID-19 epidemic and prepare the country for the challenges related to green and digital transition. The overall vision is to position Slovenia as a green, creative and smart economy in the international arena. It is intended to achieve this through measures aimed at improving Slovenia's position in high value-added segments (in global value chains) by attracting and supporting quality investments. Under Green Transition business entities will be able to apply for the funding available under calls for proposals for energy efficiency and renewable energy (the potential of geothermal energy, hydro energy and solar energy), transition to circular economy models and adaptation to inevitable impacts of climate change. **ETV could serve as tool for quality check of such investments as well as possible co-financing of ETV by RRF would facilitate the innovation and technology transfer from research to market uptake.**
Ordinance on the Climate Change Funding Programme for the period 2021 – 2023	This document was published by the Ministry of the Environment and Spatial Planning and it is in force since 25th of June 2021. The document defines the co-financing of research, development and innovation projects (pilot and demonstration projects) in the fields of low-carbon technologies and services and adaptation to climate change. The funds are intended to support the introduction of the principles of the circular economy or the sustainable use of resources in all areas where this will contribute most to the decarbonisation of Slovenia. **This programme might boost the ETV verifications market as well as the development of green technologies in Slovenia.**
Programme "YOUNG ENTERPRISES"	**The programme "YOUNG ENTERPRISES"** was established by The Public Fund of Republic of Slovenia for Entrepreneurship or shortly The Slovene Enterprise Fund (SEF). Its purpose is to improve the development and business investments of SMEs and Start-ups in Slovenia. The programme "YOUNG ENTERPRISES" offers financial support provided for enterprises younger than 5 years, which due to the specifics of the development and no track record, have difficulties in obtaining the necessary financial resources on the market. For example, the scheme Start-up incentives is available to newly established enterprises and is currently being financed by European Cohesion Fund 2014-2020. One of the incentives is "**Incentive for innovative startups**" that supports start-up enterprises that develop innovative products, processes and services with high added value for a broader market. ETV verifications could be co-financed by SEF incentives and then can help green technologies reach the market uptake faster and enhance the market success of the start-ups. The Public Agency for Enterpreneurship, Internationalization, Foreign Investments and Technology, SPIRIT Slovenia was established in 2012. It provides support to the Slovenian economy by featuring Slovenia's key competitive advantages in niche areas of the green economy, innovative products, and environmental technologies. **SPIRIT agency is an important factor that improves the Slovenian ecosystem with their activities that are dedicated to promote "green" Slovenia and can enhance the usage of ETV verifications as a promoting tool for green technologies that are being developed in Slovenia.**

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France

Working for the Minister of the Economy, Finance and Recovery, the General Directorate for Enterprises (Direction Générale des Entreprises, DGE) implements French public policies to support innovative companies. For these missions, the DGE relies on State's operators (Bpifrance, INPI, ANR, Business France, France Brevets, etc.) and on various structures that it manages and leads:

- French Tech communities
- Competitiveness clusters
- Technology Transfer Accelerator Offices – (Sociétés d'Accélération du Transfert de Technologies SATT).
- Technological Research Institutes (Instituts de Recherche Technologique, IRT)

Through the Innovation Council, and in collaboration with the other ministries, the DGE draws up the overall strategy for supporting innovation, establishing the guidelines and major priorities for action, at both French and European level. It also prioritises emerging sectors of the future, and monitors the "Investissements for the Future Programme" (Programme d'Investissements d'Avenir, PIA) and European programmes in favour of research and innovation.

Investissements for the Future Programme" (Programme d'Investissements d'Avenir, PIA) and Acceleration strategies for innovation	The "Investments for the Future programme"), steered by the Secrétariat Général pour l'Investissement (SGPI) and operated by the French Environment Agency (ADEME), was set up by the French State to finance innovative and promising investments, in order to enable France to increase its growth and employment potential. The fourth PIA has been launched in January 2021, and a large part of the new priority innovation strategies will be dedicated to ecological transition (transforming agricultural systems and equipment, decarbonising industry or supporting the transformation of cities so that they are more adapted and more resilient to climate change). The "Innovation Competition i-Nov" is one of the funding tools from the PIA aiming at supporting innovative projects carried out by start-ups and SMEs in order to accelerate the emergence of leading companies in their field with the potential to become world class. It enables the co-financing of research, development and innovation projects and contributes to accelerating the development and marketing of innovative solutions and technologies. The call for projects in the sixth wave of the competition closed in October 2020, focused on the following themes: • Circular economy • Environmental performance of buildings • Adaptation to Climate Change • Hydrogen Since 2016, ETV-related costs (accompaniment during R&D stages + verification at the end of the demonstration phase) can be funded through the "Innovation Competition i-Nov" call. The objective is to take ETV's requirements into account right from the R&D

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phases in order to reduce the time and cost of verification, particularly in terms of requirements for experimental data to support future performance claims.

Acceleration strategies for innovation are at the heart of the fourth PIA. The objective is to define investment priorities and to drive real transformations in sectors or technologies of the future.

The "Decarbonised Hydrogen Strategy" has already been initiated by the government, and 12 acceleration strategies to accompany innovation are submitted for consultation with the main stakeholders, namely industrial sectors, higher education, research and innovation ecosystems and regional players. The strategies related to the ecological transition being developed are:

- Decarbonisation of industry
- Recycling and reincorporation of recycled materials
- Sustainable and healthy food
- Sustainable agricultural systems and equipment contributing to the ecological transition
- Sustainable city solutions and innovative buildings
- Digitalisation and decarbonisation of mobility
- Bio-based products and industrial biotechnologies - Sustainable fuels
- Advanced technologies for energy systems
- The environmental impact of digital technology

French recovery plan

In order to rapidly and sustainably revive the French economy, an exceptional €100 billion recovery plan is being deployed by the French government around three main areas: ecology, competitiveness and cohesion. The ecological transition is therefore a strategic objective of the French recovery plan.

As part of the "France Relance" recovery plan, the State has allocated €1.2 billion to ADEME, in collaboration with the Payment Services Agency, to support and accompany the reduction of greenhouse gas emissions from the industrial sector, by strengthening existing measures. The aid covers industrial investment in the fields of energy efficiency, electrification and process adaptation, which will reduce CO_2 emissions.

Among the actions of the French Recovery Plan, ADEME (French environment agency) has launched a call for projects to support the launch of innovative solutions ""with positive externalities for the environment". This call for projects is aimed at companies whose eco-innovations are in the commercial launch phase. ETV-related activities (accompaniment of upstream verification and verification) are eligible for this call.

Moreover, the importance of public procurement is highlighted for the success of the recovery plan and the ecological transition.

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Hungary

There are several policies and innovation programs where ETV can successfully support their implementation. This shows the necessity to implement the ETV scheme in Hungary as soon as possible.

New National Research-development and Innovation Strategy	The **New National Research-development and Innovation Strategy** is under approval by the government. It will organically connect to the previous one (2013-2020). It will be a horizontal strategy, and vertical / sectoral elements will appear in the Smart Specialisation Strategy. According to official information, in the horizontal goals the "Creating a modern regulatory framework and business environment supportive of RDI" and "Promoting technological and non-technological innovation" will appear, which could provide a basis for the implementation of the ETV scheme. Although the details are not revealed yet, this document is built on the basis of the former strategy, and no changes are expected in the main directions. The former National Research-development and Innovation Strategy 2013-2020[20] was aimed to build a new purposeful system according to three priority axes, from which the third one is *"companies that exploit intensively the results of modern science and technology"*. Although the strategy aimed to increase the performance of all actors in the innovation system through direct and indirect ways, it marked "key players" with the potential to have this spill-over effect. Among them we could find the "R&D intensive Hungarian medium-sized companies", "small companies (to use the jargon and David Birch's expression: the "gazelles)", "innovative supplier SMEs" and "innovative start-ups" but also the "public sector institutions performing R&D and exploiting innovation results". The Strategy also focused on introducing innovations. Therefore, these fundamental values could serve as a joining point for the ETV scheme, i.e., these organisations can benefit from the marketing factor of it, especially in the case of SMEs, where the Strategy aimed to stimulate the entering of foreign markets and becoming higher-level suppliers, and where the ETV verification could be a competitive advantage. Another important part of this document was where it is stated that the decision makers want to promote the innovative solutions by forming a "conscious public demand" with altering the public procurement system, which could urge the usage of ETV-like verifications. The development of this strategy is under the supervision of the Ministry for Innovation and Technology.
Act LXXVI on Scientific Research, Development and Innovation	This act describes the governmental tasks and the organisational background in order to develop and execute the referring Strategy. Among others, it requires the establishment of the **National Research, Development and Innovation Office** (NKFIH) and the **National Research, Development and Innovation Fund** (RDI Fund), handled by the NKFIH, as a national strategic and funding agency. It is also

[20] Governmental decision 1414/2013. (VII.4.)

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	an advisory body on RDI policies for the Hungarian Government. The Office and the Fund are also under the supervision of the Ministry for Innovation and Technology. The NKFIH, in the role of a funding agency, regularly publishes calls for proposals in order to subsidise RDI-related activities in specific areas (e.g., pilot projects on energy management-related innovations and on carbon-neutral, innovative storage of surplus electricity). As part of the validation of the results obtained from the pilot technologies and their subsequent marketisation, ETV could play a key role. Therefore, ETV verification should be included as an eligible cost within the scope of NKFIH funding. Thus, NKFIH could play a key role in subsidising the implementation of ETV for the SMEs and could play a catalytic role, as an advisory body, to introduce the ETV scheme to decision makers.
National Research, Development and Innovation Fund Programme Strategy for the year 2021[21]	The RDI Fund Programme Strategy is regularly revised by creation of one-year strategies. These strategies consist of an innovation part and a research part. The innovation part focuses on SMEs and RDI programme support besides, for example, international programmes and marketing. The biggest amount of subsidy is provided for market-driven corporate research, development and innovation. This part of the strategy clearly has a potential for ETV as a tool to support entry into markets of innovative technologies (and products and services) which are targeted here. Marketing is also supported here, *"The aim of the programme is to support the market take-up activities of companies that already have a prototype and the validation of innovative ideas and technologies"* as it is also a goal of the programme.
National Decarbonisation Roadmap	National Decarbonisation Roadmap (encompassed in the Second National Climate Change Strategy (2018-2030) with a perspective until 2050)[22] The Second National Climate Change Strategy (NCCS-2) includes, among others, the National Decarbonisation Roadmap. Among the set areas of intervention the "Support for research, development, innovation and demonstration projects, in particular in the fields of material and energy saving technologies, the dissemination of renewable energy sources, the increase of the use of biomass as a renewable industrial raw material, environmentally friendly transport and agro-technologies, sustainable architecture, heat and power generation and CCS[23]" the ETV can be used as a supportive instrument. There is an intersection between the areas marked for support in the roadmap and the seven ETV focus areas (e.g.: material and energy saving technologies, innovative environmental technologies, even in the field of the agricultural industry), especially in the case of the demonstration projects, in which the ETV can be successfully used to confirm achievement of project goals.

[21] approved by the 1077/2021 (II.27) Governmental Decree

[22] approved by the Parliamentary Decree 23/2018. (X. 31.)

[23] CCS: Carbon Capture and Storage technologies

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	The Roadmap is implemented by the Ministry for Innovation and Technology.
National Hydrogen Strategy 2030[24]	This strategy is for the introduction of low-carbon and clean hydrogen technologies and for establishing a background infrastructure for the hydrogen industry. Comprehensive projects are planned during the implementation, from industrial decarbonisation to the development of green transportation systems and to the establishment of seasonal storage facilities (for storing surplus energy). In case of every project, the subsidy of RDI activities and also the promotion and demonstration of the legitimacy of such technologies are considered a priority measures like "*monitoring the development of new production technologies, developing international collaborations in order to employ market-ready solutions domestically as soon as possible*", "*supporting the research and development of carbon-dioxide capture and utilisation solutions and testing within the framework of pilot programs in the petrochemical and chemical industry*" or *"examining the possibility of introducing hydrogen to the natural gas infrastructure, implementing a pilot project"*. The implementation of ETV scheme could support the achievement of the Strategy goals. The Ministry for Innovation and Technology is responsible for the implementation of the strategy.
The Economic Development and Innovation Operational Programme GINOP Plus	The successor of GINOP for the 2021-2027 period. The programme aims to stimulate the economies of the less developed regions in Hungary. One of its top priorities is to increase the competitiveness of SMEs by funding research and development of innovation and technology transfer. The most important area in GINOP Plus is *supporting the transfer to low-carbon emission economy, environment protection and resource efficiency. The* ETV scheme can support better performance of the GINOP programme by confirming the innovation features, environmental performance of the technologies and can increase market competitiveness of environmental technology developers.

[24] approved by the 1372/2021. (VI.10.) Governmental Decree

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