X-tendo

GUIDANCE NOTE ON THE FRAMEWORK PRINCIPLES OF THE NEXT-GENERATION ENERGY PERFORMANCE ASSESSMENT AND CERTIFICATION SCHEME

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1 INTRODUCTION

This report is a guidance document outlining the common requirements for developing and assessing the next generation of energy performance certificate (EPC) features. It puts forward a set of cross-cutting criteria and an evaluation framework for each innovative feature.

Viability of the ten features will be determined against X-tendo's four cross-cutting criteria, which encapsulate the central success factors of EPC development: (i) **quality and reliability**, (ii) **user-friendliness**, (iii) **economic feasibility**, and (iv) **consistency with international standards**. In line with the four criteria, the analysis of existing EPC frameworks (deliverable 2.1) concluded, among other things, that:

- In all Member States, **EPCs must become more transparent and dependable** to build trust. Frontrunner countries (e.g. Denmark and Portugal) have proven that it is possible to build considerable trust around EPCs, yet no Member State is perfect in this regard. Without trust limited additional benefits can be reaped.
- The current EPCs have **not been tailored to the needs of the end-user**. Displaying only the energy performance of the building brings limited benefits to most people, especially when the content is conveyed in technical terms. New EPC indicators could enhance the usefulness and attractiveness of the instrument.
- A more **harmonised European calculation methodology**[1] for the EPC could increase comparability between regions, confidence, and market uptake. A new standard or guidance document would help Member States improve their EPC schemes.
- The features must be **economically feasible** to be attractive for the implementing body and the end-user. The additional benefits of a feature ought to be weighed against the cost, including the actual cost and indirect costs (e.g. administrative burden).

The X-tendo project is developing a framework of ten next-generation EPC features, aiming to improve compliance, usability and reliability of the EPC. The X-tendo partners cover ten European countries and regions: Austria, Belgium (Flanders), Denmark, Estonia, Greece, Italy, Poland, Portugal, Romania, and the United Kingdom (Scotland). The features that will be explored in the project fall into two broad categories:

1. **New technical features used within EPC assessment processes and enabling the inclusion of new indicators on EPCs**
2. **Innovative approaches to handle EPC data and maximise their value for building owners and other end-users.**

Figure 1 provides an overview of the ten features. The green features focus on innovative handling of EPC data while the pink features explore new EPC indicators. The figure is

[1] The Horizon 2020 project ALDREN is exploring the potential for a common European voluntary certification scheme for non-residential buildings.

encircled by the four cross-cutting criteria: quality and reliability, user-friendliness, economic feasibility, and compliance with international standards. The cross-cutting criteria will inform the overall work and the development of each feature throughout the X-tendo project. Each of the 10 features is briefly described below.

Figure 1: X-tendo features

Feature 1: Smart readiness - Smart technologies in buildings have the potential to contribute to increasing the energy efficiency of the building stock, to enhance the flexibility in smart energy grids, and to improve the comfort of building occupants. The introduction of a smart readiness indicator for buildings is included as an optional provision in the current amendments of the EPBD. This indicator would enable assessment of the building's level of adaptability to user needs and its ability to connect to the grid.

Feature 2: Comfort - Although ensuring adequate levels of indoor air quality, thermal comfort, lighting and acoustics within buildings are among the most potent drivers for renovation, they are rarely covered by EPCs. This indicator would enable assessment of the levels of comfort in terms of indoor environmental quality for a specific building through reliable and evidence-based inputs.

Feature 3: Outdoor air pollution - Approximately one in eight deaths in 2012 [1] were attributed to air pollution according to the World Health Organization, making it a crucial factor of health. A significant contributor to air pollution is the building sector, which in many

Member States still uses highly polluting fuels and technologies to cover heating, hot water and cooking needs.

Feature 4: Real energy consumption - The gap between real energy performance and EPC modelled performance is a source of confusion to EPC users. X-tendo investigates if, and to what extent, actual consumption data can complement energy performance assessments, and provide a more complete overview of building performance. The project also explores how this information can best be communicated to the end-users, including explanations for any discrepancy, such as user behaviour or climatic conditions.

Feature 5: District energy – The project is developing the capacity of EPCs to assess and report on the potential for the building to benefit from – or contribute to – future development of district heating (and if relevant also district cooling) networks. This concerns the future decarbonisation of heat generation as well as the required transformation towards next-generation (smart, lower temperature) district heating systems.

Feature 6: EPC databases – X-tendo explores the value of EPC databases as a tool for quality assurance and data mining to enable more effective retrofit policies and programmes, which has been demonstrated in several Member States. The project specifies how public authorities, with different EPC database systems, can take steps towards good practice examples.

Feature 7: Building logbooks - Logbooks have been recognised and developed in some countries to engage building owners and maximise the value of EPC data. The project will identify how EPC registers and systems at various stages of development can support the development of more dynamic logbooks.

Feature 8: Tailored recommendations - Cost and time constraints often result in EPCs containing generic, and not so useful, recommendations to the homeowner. The project is exploring cost-effective approaches to deliver tailored renovation recommendations that can enhance the instrument's impact on renovation activities.

Feature 9: Financing options – The project will identify which sources of information on financial support can be provided alongside, and integrated in, EPC recommendations. Financing options will focus on public support schemes like soft loans and subsidy schemes, as well as incentives provided by energy suppliers under their energy-saving obligations. EPC data could also bring benefits to private sector financing actors, enabling them to recognise/underwrite energy-efficient assets.

Feature 10: One-stop-shops - One-stop-shops are a key means to reduce barriers and transaction costs for finding information regarding support schemes, craftspeople and public authorities. Obviously, these functionalities of one-stop-shops could and should also be linked to EPCs as has already been done in a couple of cases.

2 PURPOSE AND SCOPE OF THIS DOCUMENT

This guidance note has been prepared as a complementary tool to support the development and testing of the next-generation EPC features in X-tendo. The ten features will be checked for how well they comply with the cross-cutting criteria. It is also an initial concept of the framework that will be finalised in Task 2.4[2] of the X-tendo project.

A list of indicators was identified under each cross-cutting criterion that has been defined in consultation and feedback with the involved project partners. However, since their scope and strength of application would differ based on the individual feature requirements, they are not binding on all features equally. The list of the indicators will be reviewed again to add or filter out some indicators as the work in the project progresses.

A recommendation of proposed application has been given for all the indicators in the description of each cross-cutting criterion shown by an (X) or (✓) in further sections. A few indicators may not be applicable/suitable for some features considering their scope and application. All the cross-cutting criteria cannot be applied equally, but some degree of compliance is required and necessary in the feature development. Each feature will be assessed, evaluated and validated against these indicators to ensure compliance with the cross-cutting criteria in the advanced stage of the project with the support of the implementing partners.

The indicators outlined in this guidance document are expected to come out clearly in the final feature description, with the ultimate purpose of ensuring that features take into account the context-specific needs. Moreover, this guidance note will provide support by removing barriers and making the features more meaningful for the EPC systems in the Member States.

[2] Embed cross-cutting criteria in the development and testing of innovative EPC indicators

3 FRAMEWORK OF THE CROSS-CUTTING CRITERIA

The framework of cross-cutting criteria in this guidance note presents a set of indicators with relevant examples that can be used to develop and assess the performance of various EPC features, within and beyond the scope of this project. The X-tendo cross-cutting criteria are, therefore, conceived as a set of external reference points to guide the development of all innovative EPC features. The four criteria are (1) quality and reliability, (2) user-friendliness, (3) economic feasibility and (4) consistency with international standards.

1. **Quality and reliability** are the foundation of the EPC framework and its features. They influence the impact of EPC frameworks, as well as the potential new and innovative features. They are the foundation to ensure user trust and data consistency and allow policymakers to develop policies based on the data from EPCs. Furthermore, quality control and reliability ensure that the EU-wide and national goals for the building stock can be monitored and can help them to be achieved.
2. **User-friendliness** emphasises that the EPC and its features must be easy to use and understand for various users. The end-user (often a building owner or resident) or target audience (e.g. public authorities) often has limited knowledge of the new features and technical aspects of buildings. Clear information is needed with easily understandable explanations and visuals. The degree of user-friendliness can be assessed regularly through feedback and checks. It is important to make sure that there is a balance between user-friendliness and accurate data and information that give a full and reliable picture. The level of user-friendliness needed for the feature (presentation/ documentation/explanation) can be obtained through user-testing.
3. **Economic feasibility**, in the context of EPCs, refers to how cost-benefit ratios are calculated when implementing specific features. Economic feasibility study is crucial during the early development of the indicators and forms a vital component in the feature development process. During the decision-making process, these cross-cutting criteria weigh much higher compared to others. It is important to include an analysis of the market, economic and technological conditions of a Member State before implementing the new features.
4. **Consistency with international standards** provides a basis for mutual understanding among individuals, businesses, public authorities and other kinds of organisations. Since features being developed are foreseen to be adopted and adapted by different Member States, this cross-cutting criterion will ensure that they are compatible and comparable across the EU by maintaining consistency with international standards such as CEN/ISO.

To enable the feature leads and implementing partners to assess the new features and how well they fulfil the cross-cutting criteria, several indicators are developed in this guidance note as shown in Figure 2. The indicators refined through discussions with the consortium partners and will be updated as the project advances.

Quality and reliability

- Transparency of methods, data and results
- Minimisation of existing gaps
- Applicability and adaptability to building stock
- Data quality
- Data protection and security
- Qualification level of experts
- Validated calculation tools

User-friendliness

- Avoid technical jargon
- User-friendly display of results
- Dynamic updates
- Guidance for application on different building types
- Indentification of potential benefits
- Customised solutions
- Simplified and transparent calculations
- Frequently Asked Questions
- Provision for feedback
- Material for educators and trainers

Economic feasibility

- Impact on EPC prices/cost
- Strategies to minimise additional costs
- Financial constraints
- Implementation options (at different price levels)
- Cost-benefit estimation
- Additional equipment/instruments required
- Cost breakdown structure

Consistency with international standards

- Quality management
- Relevant standards in feature development
- Common development process for all features
- Harmonisation of use of standards
- Interoperability
- User experience and goodwill
- Relevant national regulations

Figure 2: Indicators for four cross-cutting criteria

3.1 Quality and reliability

What is it?

Quality and reliability influence the impact of EPC frameworks, as well as the potential new and innovative features. Data quality and reliability are the keys to build and ensure user trust in EPCs. On a societal level, EPCs can provide valuable insights into the building stock, allowing policymakers to develop more effective decarbonisation policies and measures backed by evidence-based data. Furthermore, quality control and trustworthiness ensure that the EU-wide and national goals for the building stock can be monitored and can help them to be achieved.

The development of the new EPC features ought to consider and integrate quality and reliability indicators, which are presented below.

Indicators to assess quality and reliability

Transparency of methods, data and results

One central aspect of EPCs is energy performance calculations. The calculation ought to be comprehensible, consistent and based on correct data. This is an important aspect when trying to build trust around the instrument and to increase its usability.

For each feature, it must be clear which input data is being used, how impacts are being calculated, which methods are used for calculating the feature's impact and how the results have been realised. The default attributes of features should integrate into the process.

The following points could be followed to reach sufficient transparency:

- Mapping of data sources (government, private, public, own calculation)
- Application of calculation methods (standardised, individual)
- Continuous process assessment and refinement
- Outlining defaults and assumptions
- Easy accessibility of information to public

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Minimisation of existing gaps

The features should consider minimising the existing "gaps", for example knowledge gaps or communication gaps, for better uptake of the indicators by public authorities and end-users. The feature should either provide added information or build on the information that already exists in EPCs. The minimisation of existing gaps would increase the skills and awareness of energy auditors, end-users and/or authorities. Analysing which gaps exist in

EPCs and how the features can contribute to alleviate them is an important first step in this regard.

Key gaps that could be addressed by feature leads are:

- **Knowledge gaps:** not having enough reliable information to take decision
- **Skills gaps:** not being able to do something or to do it well enough
- **Motivation or attitude gaps:** knowledge is present but motivation to use it is lacking
- **Performance gaps:** something that blocks the performance (time, support, tools etc.)
- **Communication gaps:** instructions are not clear or are contradictory
- **Administrative or legal gaps:** lack of synergy in administration and implementers

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Applicability and adaptability to building stock

Building types vary according to their function and use, which can make it difficult for features to cover all types with a single methodology. The question of which building types can be covered and to what depth is significant for the application of features in EPCs.

This indicator also covers how to integrate the data on building types in features from existing databases. Therefore, it is important to use pre-defined categories in the EU such as single-family dwellings, multi-family dwellings, offices, educational buildings etc.

Some points that may be considered for increasing the adaptability of the feature to different building typologies are:

- **Responsiveness to regional policy instruments**
- **Responsiveness to environmental needs**
- **Occupant or user-behaviour**
- **Links with existing energy performance indicators**

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Data quality

Clearly defined features with methodologies for data collection and interpretation which are aligned with existing databases can increase the quality of the available data. Depending on the maturity of the feature's implementation, it can be useful to integrate a data quality assurance process from the beginning.

Some of the factors that can assure data quality monitoring are:

- Clear definitions of parameters and methodologies
- Data monitoring mechanisms or assessment criteria
- Indication and classification of sources
- Validation checks (format, structure, entries etc.)
- Structured assessments and on-site inspection

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Data protection and security

The issue of data protection and security is regulated EU-wide through the General Data Protection Regulation (GDPR)[3] but is implemented differently within the Member States. As some countries have very strict regulations on data protection for their citizens, features which collect personalised data need to have a clear outline on how data protection and security issues are dealt with. Most of these features imply capturing and managing additional sets of data compared to existing EPCs, so will need to be checked and safeguarded against relevant data protection and security requirements.[4]

Some aspects to consider are:

- Restrictions associated with privacy, confidentiality and security
- Description of data collection, storage and processing
- Measures to restrict data access
- Open data guidelines to protect the privacy of citizens, businesses and institutions
- Appropriate actions to address online security, risk of data loss, alteration of data or unauthorised access

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Qualification level of experts

In order to integrate new features into existing EPCs, it is necessary that the new methodology follows high quality standards and is monitored by qualified experts. Clear guidelines should be provided for features so that they are integrated well in the existing EPC systems. Nevertheless, depending on the feature, some more guidance, and often training, will be needed for assessors/energy advisors/professionals using the features.

[3] https://gdpr.eu
[4] "Users" of the X-tendo tool are public authorities responsible for EPCs.

Some key aspects to consider in determining qualification levels or the accreditation of experts are:

- Who will perform the work?
- Special training needs
- Continuous professional development
- Costs of the training
- Guidelines and documents
- Level of competence or educational degree requirements

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Validated calculation tools

The use of tools and software to validate calculations can be very useful during the development of some features. Software can eliminate errors and can be adapted for the specific needs of each feature. Moreover, there are tools which can be used to ensure quality and monitoring of data. Many of them can be easily implemented and used from the start and could be included in the X-tendo toolbox. Features should provide some guidance for their use and application for end-users.

Some examples of tools used during the feature development are:

- Manuals
- Checklists
- Spreadsheet tools
- Learning cycles
- Specially developed software

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✗	✓	✗	✗

3.2 User-friendliness

What is it?

Another key requirement for new features is user-friendliness. It is important to the end-user (e.g. building owner/property owner/tenant) or target audience (e.g. public authorities) who may have limited knowledge of new features and technical aspects of buildings. Clear information is needed with easily understandable explanations and visuals. The degree of user-friendliness can be assessed regularly through feedback and checks. It is important to

make sure that there is a balance between user-friendliness and accurate data and information that give a full and reliable picture. The level of user-friendliness needed for the feature (presentation/documentation/explanation) can be obtained through user-testing.

The development of the new EPC features ought to consider and integrate user-friendliness indicators, which are presented below.

Indicators to assess user-friendliness

Avoid technical jargon

One key element of reaching a high level of user-friendliness is to choose simple and clear language for the description of the features. It should be ensured that certain terms are used consistently across features, along with simple but accurate language. If necessary, a glossary can help explain words which are unfamiliar to most users.

Key points to consider are to:

- Develop a glossary for the features
- Avoid technical jargon for the details of methods
- Avoid legal language from standards or regulations

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

User-friendly display of results

This indicator is closely related to avoiding technical jargon. Wherever possible, the descriptions which need to be written for the end-user should be supported by useful and clear figures and pictures. A special focus should be put on not overburdening the displays with information but rather keeping them concise. Such representation registers easily in the mind of the user and makes an effective impact and would lead to a better understanding of the feature and its results.

Examples of user-friendly presentation include:

- Graphs
- Diagrams
- Flowcharts
- Clip art or graphics

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Dynamic updates

While considering data protection and privacy issues, automatic update of indicators that are relevant for the features (e.g. outdoor air pollution levels[5]) could bring added value. It could also enable features to be interconnected better and show how assessments are influenced when values are updated. The relevance for a feature will depend on whether it has indicators that change within certain timeframes, e.g. regular information updates. Such updates are important for the feature to be integrated well in dynamic EPC systems. Features should ensure that the development considers this aspect wherever relevant.

Some measures to ensure this include updates to:

- Input database
- Standardised values or inputs
- Input defaults or assumptions
- Standards and their application

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Guidance for application on different building types

Some features can be calculated for all buildings using the same methodology, others need to adapt the methodology to the building type. Wherever possible, features should provide clear guidance on how building types differ and how methodologies need to be adapted – ideally this can then be applied to building types by the experts and understood by the end-user.

The guidance for application on different building types may include details on:

- Building types and tenure
- Space and zone types
- Size and specifications
- Services and utilities
- Types of assessments

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✗	✗	✓	✓	✓

[5] www.eea.europa.eu/data-and-maps/dashboards/air-quality-statistics

Identification of potential benefits

Benefits can vary across features and stakeholders. While some benefits directly affect the end-user (homeowner/property owner/tenant) in the building, others are more relevant to the likes of building professionals, installers, public authorities or financial institutions. For each feature, the direct benefits should be clearly emphasised and placed at the forefront, while the broader, indirect benefits can take second place. Ideally, this should be done through plain language descriptions and visualisation.

The benefits could be outlined using categories such as:

- Health and well-being
- Monetary or financial benefits
- Environmental benefits
- Energy savings
- Social or community benefits

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Customised solutions

Buildings differ in type, location, use, occupancy and other factors. As a result, it could be useful to develop customised solutions, in order to support the public authorities to successfully integrate and implement the feature in their existing EPC systems. The details of the solutions can be used as an indicator of user-friendliness while developing the feature. Therefore, relevant features may give some indications of how public authorities should apply them.

Features could provide some advice in these directions:

- Design, calculation and procedure to be followed
- Impact on end-users
- Usefulness and quality of renovation measures
- Investment advice
- Data collection and management advice

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Simplified and transparent calculations

For end-users who are interested in more details, simplified and transparent calculations are important. These can be made available on dedicated websites, in guidelines or directly

within the feature description of the X-tendo toolbox. This indicator can be an output/part of calculation tools or software.

These simplified and transparent calculations can be provided in forms such as:

- Easy guides or manuals
- Training materials
- Interactive documentation

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✗	✓	✓	✗

Frequently Asked Questions (FAQs)

FAQs are an integral part of a new service or product. New features will prompt many queries when first implemented. A list of FAQs for end-users should be developed for each feature in the X-tendo toolbox and could be used initially by public authorities. FAQs should be precise and clear and can be systematically adapted when new questions arise. These can be integrated directly or made accessible through a website or guidelines.

Some aspects to be considered while formulating FAQs are to:

- Organise questions by category
- Write clear and concise descriptions
- Highlight the top questions

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Provision for feedback

All features need to be adapted over time in order to consider changes in regulations and user needs and to ensure they reach their respective goals. To ensure this is done in a coherent way to provide the best results a feedback loop should be part of each feature, where it is feasible. This feedback mechanism should be underlined in the description of the features for the X-tendo toolbox wherever applicable for the target group.

Some ways in which these provisions can be made are to:

- Outline specific performance pointers (KPIs/benchmarks/thresholds)
- Provide corrective guidance
- Provide details on implementing a feedback loop

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Material for educators and trainers

Materials for educators and trainers need to be put together for each new feature to make sure that all experts who have to calculate, prepare or explain the feature are trained accordingly or know where to get further information. A lot will already be available through the accompanying guidelines, but specially adapted manuals and education materials can be useful in most cases. The material would also become a part of the X-tendo toolbox.

The material could be in the form of:

- Guidelines and training manuals
- Self-study material
- Digital content
- Handouts

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

3.3 Economic feasibility

What is it?

Economic feasibility, in the context of EPCs, refers to how cost-benefit ratios are calculated when implementing specific features. Economic feasibility study is crucial during the early development and it forms a vital component in the feature development process. During the decision-making process, this cross-cutting criterion weigh much higher compared to others. It is important to include an analysis of the market, economic and technological conditions of a Member State before implementing the new features.

The development of the new EPC features ought to consider and integrate the economic feasibility indicators, which are presented below.

Indicators to assess the economic feasibility

Impact on EPC prices/cost

Introducing a new feature in the existing EPC regimes would affect the existing pricing/costing of certificates issued by SMEs or service providers. The impact on the existing pricing mechanisms in Member States' markets should be studied based on relevant

factors. Factors responsible should be outlined in the toolbox and used by the target group in assessing the fluctuation in price levels.

Some examples of the factors that could be considered are given below.

- Liveable area/size of a dwelling
- Type of property (e.g. residential, commercial etc.)
- Location or regional pricing (e.g. urban, suburban, rural)
- Separate assessment pricing in addition to EPCs
- As built/new construction
- Tailor-made recommendations

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Strategies to minimise additional costs

There are opportunities to use mechanisms from existing EPC systems in developing and delivering new features. This process would minimise added costs of integrating new features in EPCs. Details should be provided on the extent to which new features can utilise existing components of EPC systems.

Some examples of the components that may be included are:

- Input data collection/site visit protocols
- Software applications
- Data dictionaries
- Training and certification of experts
- Audit procedures

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Financial constraints

Often financial constraints limit the development of existing EPC systems by governments. To successfully integrate and implement a new feature, financial support is needed. The barriers to financing the feature in the EPC schemes of Member States should be identified. Certain recommendations may be provided on removing these barriers to promote the uptake of new features in the existing EPC schemes.

Some examples of the financial constraints and opportunities to overcome them are:

- Financial support from the building sector

- Political support to transform EPC system
- Financial subsidies and incentives by the government
- Grants from the public sector
- Lack of financially attractive plans

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Implementation options (at different price levels)

Considering the financial constraints, several implementation options would be needed for features with variable price levels to reduce upfront costs of EPCs for the end-users. Various implementation options should be considered in the development of the feature and included in the X-tendo toolbox to be used by the target group.

Some examples that could ease the acceptance of new assessments are:

- Instalment plans
- On-bill financing schemes and repayment programmes
- Validity/duration-based costing (e.g. 6, 9, 12 months)

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Cost-benefit estimation

During the development of the feature, several strengths and weaknesses of the methods or approaches should be determined. The choice of these approaches should be based on a cost-benefit analysis to determine the best way to achieve the greatest benefits while still preserving the savings. A systematic application of this approach should be outlined in the development of the features.

Cost-benefit analysis may include the following:

Costs

- Direct costs involved in developing an approach
- Indirect costs or overheads
- Intangible costs (e.g. delays)
- Regulatory risks (e.g. environmental impacts)

Benefits

- Sales/revenue increase due to the new feature
- Intangible benefits (e.g. health, safety, satisfaction etc.)

- Competitive advantage or market share gained due to the new feature

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Additional equipment/instruments required

Depending on the EPC system of a Member State, the standard EPC issuing procedure may or may not require the use of equipment/instruments during an audit or data collection. Based on the assessment requirement of each feature, additional equipment/instruments may be required. To assess the impact on EPC issuing costs, each feature should identify these requirements along with the latest market pricing. Other technical details of the equipment such as accuracy should also be provided.

Some examples of the details that should be provided are given below:

- Technical specifications
- Long-term stability
- Usability and flexibility
- Cost-efficiency
- Measurement and set-up times

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✗	✓	✗	✓	✓	✗	✗	✗	✗	✗

Cost breakdown structure

To assess the feasibility of implementation of the feature by the target group, a cost breakdown structure should be worked out. Several activities and services will form part of the application of the feature and these should be assessed in combination with the other indicators mentioned above. Providing a cost breakdown structure would assist in comparing the actual costs with the budget and integrating this into the cost control system.

Some examples of the key cost breakdown structure components are:

- Cost drivers: items, units, specific works, services, labour costs etc.
- Amounts: items, materials, work time
- Overheads or hidden costs: costs that do not bring any direct value but influence project work processes indirectly

Proposed application of the indicator									
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

3.4 Consistency with international standards

What is it?

Standards provide a basis for mutual understanding among individuals, businesses, public authorities and other kinds of organisations. Since features being developed are foreseen to be adopted and adapted by different Member States, this cross-cutting criterion will ensure that they are compatible and comparable across the EU by maintaining consistency with international standards such as CEN/ISO.

The development of the new EPC features ought to consider and integrate indicators for achieving consistency with international standards. These are presented below.

Indicators to assess consistency with international standards

Quality management

Quality management should be ensured through a formalised system that documents processes, procedures and responsibilities for achieving the quality objectives of each feature. Such a system will help coordinate and direct activities while developing the feature to meet the requirements of public authorities and end-users to improve its effectiveness and efficiency. Features should demonstrate the application of CEN/ISO standards throughout the process.

ISO 9001:2015 [2] is the international standard specifying requirements for quality management systems and is accepted as the most prominent approach. It uses a plan-do-check-act methodology and can be applied to any process regardless of size in any organisation. Individual processes to be followed can be determined and applied by the features based on individual requirements.

Some examples of quality management processes are to:

- Determine the inputs required, and outputs expected
- Set out the sequence and interactions
- Determine and apply the criteria and methods (including monitoring, measurements and related performance indicators)
- Define the resources needed for the activity
- Maintain documented information wherever necessary
- Address the risks and opportunities

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Relevant standards in feature development

Standards are followed to promote safety and interoperability and promote understanding of a service or product. They will bring transparency and authenticity to the approaches and methods being used in the development of the features. For maintaining consistency with international standards, each feature should ensure and demonstrate the application of CEN/ISO standards in the feature development process, wherever relevant. They should also ensure the flexibility of the methods when considering the different standards as they will be applied in the different Member States. Only the latest versions of the standards should be used.

Application of a standard can be ensured in several ways:

- Directly quoted within the text with identification number and title
- Multiple standards listed for potential use
- Scope and application area of the standard identified
- Use of standards with the same metric system
- Use of updated and latest standards
- Use of standards with high market and business acceptability

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✗	✗	✓	✗	✗

Common development process for all features

Each feature should clearly outline the steps/stages of the development process (e.g. from method to interface development and release for the X-tendo toolbox). This process will enable coordination between the features that will be used in different Member States by their target groups (e.g. public authorities).

This could be achieved through:

- Application of an EU framework for Member States
- Application of a global approach
- Identification of overlaps

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Harmonisation of use of standards

While developing the features there may be some overlaps in terms of data collection, assessment method or application. It should be ensured that the same standards are applied across the features that share these overlaps. This process will allow the harmonisation of standards in the development of the features.

The following processes may help in complying with this indicator:

- Preparation of common input datasheets
- Developing a common repository of standards based on titles or categories

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✗	✓	✓	✗	✗

Interoperability

Implementing interoperability requires the creation, management, acceptance and enforcement of realistic standards that are SMART (Specific, Measurable, Actionable, Realistic and Time-bound). Clear measures of interoperability are key to the successful integration of features in Member States' existing EPC systems. Interoperability can be defined at three levels: (i) information, (ii) business, and (iii) technical.

Interoperability measures that can help successfully develop the features are to:

- Determine the interoperability requirements
- Determine the level of information exchange between the features and existing EPC systems
- Define requirements for accessibility and sharing

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

User experience and goodwill

User experience refers to the user's perceptions and responses that result from the use and/or anticipated use of a system, product, or service. User experience focuses on the nature of these responses before, during and after use. This also links closely with user-friendliness.

Successful adaptation and use of the features by end-users is determined by their usability and satisfaction. Features may consider following the standard ISO 9241-11:2018 [3], which focuses on the effectiveness, efficiency and satisfaction of the user's interaction with the object of interest.

Three aspects that can be studied to improve user experience and goodwill are:

- **Effectiveness:** Effectiveness represents the extent to which the actual outcomes match intended outcomes in accuracy and completeness
- **Efficiency:** Efficiency is the resources (time, human effort, money and materials) used with the results achieved
- **Satisfaction:** Satisfaction is the extent to which the user's physical, cognitive and emotional responses that result from the use of a system, product or service meet their needs and expectations.

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Relevant national regulations

Often Member States impose relevant national regulations or regulatory frameworks to limit the imposition of higher prescriptive standards, enhance access, improve national consistency, and remove unnecessary overlaps in regulation. There is a risk of weak integration of the features in national EPC frameworks if the Member State regulations are not studied or considered in the development of the features.

Features may consider the following aspects of national regulations:

- National construction codes
- State/territory building regulations
- Process of rating or assessment of services
- Minimum requirements/audit procedures
- Qualification and training regulations
- Jurisdiction-specific provisions

Proposed application of the indicator

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

4 APPLICATION OF THE FRAMEWORK TO FEATURES

The framework of the four cross-cutting criteria will be used to develop the features more robustly over the course of the project duration. The feature leads, who are developing new and innovative EPC features, can check compliance with the four cross-cutting criteria using this guidance note. The framework varies in its level of application to the features depending on the individual indicators and requirements to be met. A guidance roadmap for application is provided in Figure 3. The application of the framework is divided into three steps.

1. Step 1 takes place in the initial phase of the project, from months 1-10. In this period, an initial assessment (i.e. "gauging mandatory indicators") will be conducted of each of the features against the applicable indicators of each cross-cutting criteria. The identification and definition of the specific indicators under each cross-cutting criterion will be finalised by BPIE, TU WIEN and NAPE corresponding to further work under Task 2.4.

2. Step 2 takes place in the following period from months 11-17, during which the feature leads will evaluate the criteria in detail (i.e. "degree of application required"), and outline the measures taken to address the applicable indicators of each cross-cutting criterion. The evaluation will allow the feature leads to advance the integration of the framework in their features.

3. Step 3 will validate (i.e. "check and confirm during the testing of the feature") the cross-cutting criteria, in months 18-33 of the project. The finalised indicators will be reported and included in the X-tendo toolbox.

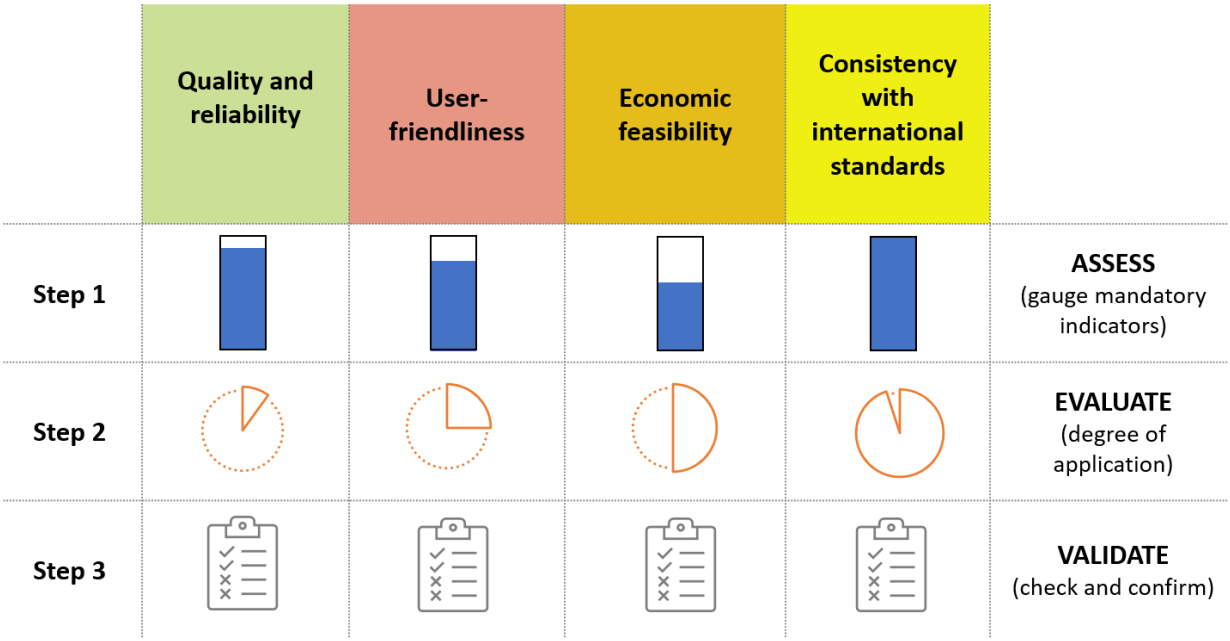

Figure 3: Guidance roadmap for the application of the framework

5 NEXT STEPS

The work in this guidance note will be used to develop a follow-up task (Task 2.4) in which the most relevant indicators will be prioritised under each cross-cutting criterion and guidelines to embed them will be outlined. It is intended to support the partners to assess, evaluate, validate and deliver each innovative feature by taking into account the four-key cross-cutting criteria of good quality and reliability, user-friendliness, economic feasibility and compliance with international standards. In the final X-tendo toolbox and implementation guidelines, each feature will provide details of compliance against every criterion to help the target audience (e.g. public authorities) to assess the potential for replication and development of that feature in their national/regional context.

The future work will focus on:

- Ensuring that all partners have a collective understanding of each criterion
- Ensuring that the criteria are considered in the development, testing and consultation process
- Reporting the development of the feature against each cross-cutting criterion for monitoring purposes in test projects
- Overall review of new features against each cross-cutting criterion in a format to be used in the toolbox and implementation guidelines

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[2] CEN, "Quality management systems- Requirements (ISO 9001:2015)," 2015.

[3] CEN, "Ergonomics of human-system interaction Part 11: Usability: Definitions and concepts (ISO 9241-11:2018)," 2018.

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