



Integrated NBS-based Urban Planning Methodology
for Enhancing the Health and Well-being of Citizens

D9.12

Report on Standards and Liaison Activities with relevant organisations – Version 1

WP9 – Communication, Dissemination and Standardisation Activities





Task Leaders	Athanasia Kazantzi (RG)
Contributors* *In alphabetical order	Juliana Uribe Aguado (CEE); Alix Aliaga (AMPHI); Sandra Baki (NTUA); Ranko Bozovic (ENPL); Efthymios Chardavellas (PIRS); Elenia Drago (PAL); Konstantinos Fokeas (GSH); Paris Gallos (BioAssist); Agnes Gyuro (Biopolus); Stelios Kalogridis (PLEGMA LABS); Tassos Karatasakis (PIRS); Elsa Katsorida (SENTIO); Afroditi Mathioudaki (CDP Europe); Angeliki Paraskevopoulou (PIRS); Anja Randjelovic (FCEBG); Manolis Sardis (NTUA); Lija Stojkovic (MIKS); John Zeppos (RG)
Reviewers	Juan Pablo Rodríguez Sánchez (UNIANDES CEE); Juliana Uribe Aguado (UNIANDES CEE); Stanislava Boskovic (ICL), Cedo Maksimovic (ICL)
Due Date	31 st August 2022 (M24)
Delivery Date	25 th August 2022
Type	Report
Dissemination Level	Public
Keywords	Standards; Liaison Activities; pre-normative; pre-standardisation; developments; Horizon 2020; NBS

Document History

Version	Date	Description	Reason for Change	By
0.1	13 th Jan. 2021	Initial Draft	Draft	John Zeppos (RG), Athanasia Kazantzi (RG)
0.7	17 th June 2022	Second Draft	Updated Draft – Innovations identified by partners were added	Athanasia Kazantzi (RG)
0.9	12 th July 2022	Third Draft	Updated with input and comments provided by the partners	Athanasia Kazantzi (RG)
0.95	21 st July 2022	Fourth Draft	Final format corrections – Version send to internal reviewers	Athanasia Kazantzi (RG)
1.0	25 th Aug. 2022	Final Version	Updated on the basis of the comments received from the internal reviewers	Athanasia Kazantzi (RG)



Legal Disclaimer

This document reflects only the views of the author(s). Neither the Innovation and Networks Executive Agency (INEA) nor the European Commission (EC) is in any way responsible for any use that may be made of the information it contains. Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the information contained therein.

The information in this document is provided “as is”, and no guarantee or warranty is given that the information is fit for any particular purpose. The above-referenced consortium members shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials subject to any liability which is mandatory due to applicable law.

This document and the information contained within may not be copied, used, or disclosed, entirely or partially, outside of the euPOLIS consortium without prior permission of the project partners in written form.

Information may be quoted provided the source is stated accurately and clearly.

This publication is also available via <https://eupolis-project.eu/>.

© 2022 by euPOLIS Consortium.



Table of Contents

1	Introduction	11
1.1	Document Scope	11
1.2	Document Organisation	11
2	What is a standard?	12
2.1	Standard development principles	14
2.2	The value of standards for companies	15
3	Route to standardisation	16
4	The role of standardisation in euPOLIS	17
5	Technical Committees Overview	19
6	NBS urban planning standardisation potential	22
6.1	The euPOLIS GDPM methodology – an outline	23
6.2	The euPOLIS NBS preliminary selection framework – an outline	23
6.3	The euPOLIS indicator-based framework – an outline	24
7	Developments/Innovations identified by the euPOLIS partners	26
8	Standards and Technical Committees identified by the euPOLIS partners	38
8.1	Standards relevant to the in-situ sensors	41
9	Liaison activities with relevant organisations	43
10	Conclusions	46
11	References	47

Executive Summary

Deliverable 9.12, namely “Report on Standards and Liaison Activities with relevant organisations – Version 1”, summarises the outcomes of the ongoing Task 9.5 “Pre-normative and pre-standardisation activities - Contribution to European regulations and research”. In the context of the aforementioned task, the euPOLIS project developments up to month 24 are being identified and reviewed from the point of view of standards so as to: (a) specify the relevant regulatory framework and ensure compliance of the developments with the latest standards and methodologies, (b) identify potential gaps in the current standards and (c) provide a roadmap, where applicable, to the integration of the developments to future standard versions. This first version is mostly focused on,

- providing information for the standardisation process and the value of standards,
- the identification of the developments that are being formulated or exploited or further expanded within the euPOLIS framework (up to month 24),
- the novelty that is brought by those developments in the relevant scientific/technological field,
- the documentation of the pertinent to the identified developments standards and standardisation committees,
- the standardisation potential of the Nature Based Solutions (NBS), as well as of the NBS urban planning methodologies, such as those targeted by the euPOLIS project.

This document is an official project deliverable of the euPOLIS project. The dissemination level of this deliverable is “Public”.



List of Figures

Figure 1. Steps in the development process of a European Standard	16
Figure 2. The Green Bus Stop development provided by AMPHI.....	32
Figure 3. The Feel Emotion Sensor development provided by SENTIO.....	33
Figure 4. The euPOLIS by BioAssist mobile app development	33
Figure 5. The landing page of the under development euPOLIS NBS Preliminary selection tool	34
Figure 6. Overview of the data flow between the sensors and the euPOLIS gateway	34
Figure 7. Example UWOT schematisation of a scenario in an euPOLIS pilot application.....	35

List of Tables

Table 1. euPOLIS partner short names used in this deliverable	8
Table 2. Abbreviations	8
Table 3. Indicative list of European, National, Regional and International standardisation bodies.....	13
Table 4. European and International Committees relevant to the euPOLIS project.....	19
Table 5. Developments/innovations of the euPOLIS project	26
Table 6. Preliminary identification of the euPOLIS development/innovations to be considered in the city planning regulations.....	35
Table 7. Standards that are relevant to the euPOLIS development/innovations identified by the partners	38
Table 8. Indicative list of potentially clustering projects	43
Table 9. Participation of the euPOLIS partners in workshops/exhibitions/webinars/training events.....	44
Table 10. Conference and journal publications	45

List of Acronyms / Abbreviations

Table 1. euPOLIS partner short names used in this deliverable

Short name	Full name
AMPHI	Amphi International ApS
BioAssist	BioAssist S.A.
Biopolus	Biopolus Intézet Nonprofit Zrt.
CDP Europe	CDP Worldwide (Europe) GmbH
CEE	Civil and Environmental Engineering Department at Universidad de los Andes
ENPL	EnPlus d.o.o.
FCEBG	Faculty of Civil Engineering, University of Belgrade
GSH	Geosystems Hellas S.A.
ISS	Institute for Social Studies, University of Warsaw
MIKS	Mikser Association
NTUA	National Technical University of Athens
PAL	Municipality of Palermo
PIRS	City of Piraeus
PLEGMA LABS	Plegma Labs Technologikes Lyseis Anonymos Etairia
RG	Resilience Guard GmbH
RISA	RISA Sicherheitsanalysen GmbH
SENTIO	Sentio Labs Monoprosopi IKE
TREB	City of Trebinje

Table 2. Abbreviations

Acronym	Explanation
BRE	Building Research Establishment (https://en.wikipedia.org/wiki/Building_Research_Establishment)
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation

CI	Contextual Indicator
DMS	Data Management System
EC	European Commission
EI	Evaluation Indicator
ESS	Ecosystem Services
ETSI	European Telecommunications Standards Institute
EU	European Union
FL	Follower
FR	Front-Runner
GA	Grant Agreement
GDPM	Goals Driven Planning Matrix
GIS	Geographic Information System
IoT	Internet of Things
IUCN	International Union for the Conservation of Nature
MNR	Metabolic Network Reactor
NBS	Nature Based Solutions
PH	Public Health
RS	Remote Sensing
TC	Technical Committee



TBT	Technical Barriers to Trade
UHI	Urban Heat Island
UWC	Urban Water Cycle
WP	Work Package
WB	Well-Being
WTO	World Trade Organization

1 Introduction

1.1 Document Scope

Deliverable D9.12 (version 1), namely “Report on Standards and Liaison activities with relevant organisations” was produced in the context of the euPOLIS WP9 (Task 9.5 - Pre-normative and pre-standardisation activities - Contribution to European regulations and research). The main scope of D9.12 is to provide an overview of the standardisation process, identify the relevant to the euPOLIS project developments that are being delivered or further improved or developed within the euPOLIS context by the consortium partners, as well as to survey the published standards that are relevant to them. As the project deploys, the list of the project developments will be updated/further populated. These updates, will be integrated into the second version of this deliverable along with extending its scope towards identifying potential gaps in the existing standards that could be addressed by the euPOLIS project findings and hence accounted for in future standard versions.

1.2 Document Organisation

The present document, is organised into eleven Chapters to facilitate search, reference and further analysis as required.

Chapter 1 outlines the scope of this deliverable and describes the structure of the manuscript.

Chapter 2 introduces the reader to the development principles and value of standards.

Chapter 3 briefly outlines the route to standardisation.

Chapter 4 defines the role of standardisation in the euPOLIS project.

Chapter 5 summarises several European and International Technical Committees deemed relevant to the euPOLIS project.

Chapter 6 discusses the NBS standardisation potential and presents the main NBS-oriented urban planning tools developed in euPOLIS.

Chapter 7 outlines the main euPOLIS developments/innovations identified up until now by the consortium partners.

Chapter 8 summarises the pertinent to the euPOLIS identified developments Standards and Technical Committees.

Chapter 9 discusses the liaison activities with relevant organisations undertaken so far by the euPOLIS partners.

Chapter 10 outlines the main outcomes of the present deliverable and sets the roadmap for future work as well as for delivering its second version.

Chapter 11 provides the list of sources cited in this deliverable.

2 What is a standard?

Even though there is no single generally accepted definition for standards in the international literature, the one provided by ISO/IEC Guide 2 (ISO/IEC, 2004) is deemed to be a rather inclusive one. According to the aforementioned guide, standard is a “*Document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.*”

Overall, standards form a common baseline for quality. It is for this reason that standards are used since ancient times. For instance, Greeks and Roman used standards for their construction works to deliver safe structures. Another example is the introduction of the metric system, that may be considered being among the first international standards (Bøgh, 2015). However, the standard development process could raise questions that are often difficult to answer, such as for instance the question on what constitutes enough evidence for introducing a new standard or the acceptable level of risk in a process.

According to the CEN Compass (CEN, 2010) standards:

1. Enhance the safety of products;
2. Encourage economies to scale;
3. Enable manufacturers to comply with the European legislation;
4. Promote the interoperability of products and services;
5. Facilitate the uptake of innovation in the marketplace;
6. Encourage greater competition;
7. Facilitate trade by diminishing trade barriers;
8. Support environmental sustainability;
9. Reflect the outcome of research and development;
10. Promote common understanding.

Apart from the abovementioned benefits that are being brought through the adoption of standards, the latter are also known to contribute in managing/mitigating the risk related to the introduction of a new technology or development to the market. The International Organization for Standardization (ISO) characterises the standards as the “*distilled wisdom of people with expertise in their subject matter and who know the needs of the organizations they represent*”.

Standardisation bodies are non-profit organisations developing, coordinating, revising, amending, or producing standards. Standardisation bodies may operate at a National (e.g., BSI), Regional (e.g., CEN, CENELEC, ETSI), or International (e.g., ISO) level. The first National standardisation body in the world, formed in 1901, is the British Standards Institution (BSI). According to the membership rule set by several International standardisation bodies, such as ISO (Ping, 2011), each country is represented by one National standardisation body. Hence, to be represented in an International standardisation body each country has to designate one organisation as its National standardisation body.

A number of indicative European, National, Regional and International standardisation bodies are listed in Table 3 below. An updated full list of the recognised National standardisation bodies that are active across the EU members was published in March 2020 in the Official Journal of the European Union (2020/C 104/03).

Table 3. Indicative list of European, National, Regional and International standardisation bodies

Name of standardisation body	Acronym
American National Standards Institute	ANSI
British Standards Institution	BSI
Danish Standards	DS
French National Organization for Standardisation	AFNOR
German Institute for Standardisation	DIN
European Committee for Standardisation	CEN
Hellenic Organisation for Standardisation	ELOT
International Organization for Standardization	ISO
Institute for Standardisation of Serbia	ISS
Italian National Unification	UNI
National Institute of Standards and Technology	NIST
Polish Committee for Standardisation	PKN
Royal Netherlands Standardisation Institute	NEN
Spanish Association for Standardisation and Certification	AENOR

In general, standards are voluntary guidelines in respect to their application, essentially providing technical specifications for a vast range of products, services or processes. However, they often hold a strong position in the market as, in several circumstances, stakeholders require the compliance of a product, service or process with a particular standard. In the European Union (EU) various standards are pointed out in legislations, either as a preferred way or even a mandatory requirement for a product/service/process to comply with specific laws.

Further to the above, a European standard (EN) should be implemented at a national level. This essentially states that a European standard carries with it the obligation of being adopted as a national standard and at the same time the obligation to withdraw any conflicting national ones. In fact, the European Committee of Standardisation (CEN) is the association that brings together the National standardisation bodies of 34 European countries (including all members of the European Union and other countries that are members of the European Single Market). Hence, a single European standard, upon its issuance, currently replaces 34 national ones. In addition, there is an agreement between the European (e.g., CEN) and the International (e.g., ISO) standardisation bodies (Vienna Agreement, formally approved in 1991) to avoid duplication of efforts. This agreement allows the documents that are being developed within one body, to be notified for simultaneous approval by the other. National standards can also form the basis for new European and International standards.

2.1 Standard development principles

No matter whether a standard is intended to be national, regional or international, several key elements in its development should be accounted for. The World Trade Organization (WTO) Technical Barriers to Trade (TBT) Committee, listed six principles regarding the development of international standards, which however may be considered applicable, with only minor modifications, to any standard development activity, irrespectively of the considered scale. These principles are:

1. Transparency;
2. Openness;
3. Impartiality and consensus;
4. Effectiveness and relevance;
5. Coherence;
6. Development dimension.

The principle of “Transparency” essentially reflects the need that all required information related to the development of a standard to be made easily accessible in due time to all interested parties, to allow them to participate in the process if they are willing to do so. The second principle addressing “Openness” refers to the need of securing and expanding participation to include the wider possible relevant audience, directly or indirectly affected by the activity in question, at every stage of the standard development. The third principle, namely “Impartiality and consensus”, reflects the need to found the decisions on objective criteria, along with the need to consider any alternatives objectively as well as to account for the views of all concerned parties and build a consensus over any conflicting arguments. The principle of “Effectiveness and relevance” addresses the need for the standards to be relevant and effectively respond to regulatory and market needs as well as to the scientific and technological developments in various countries. The fifth principle, namely “Coherence”, pinpoints the need to avoid the development of conflicting and/or overlapping standards. Finally, the principle of “Development dimension” addresses the need to ensure that developing countries are not excluded from the standard development process. Regarding national/regional standards this criterion may refer to the actions taken for ensuring the participation of all stakeholder groups.

The process of developing a standard is long and often exceeds the lifespan of a typical research project. For instance, looking at the issuance history of ISO 37120: 2018 (ISO, 2018) on the “Sustainable development of communities – Indicators for city services and quality of life” one would find out that its origins date back to 2008, when Prof. McCarney established –along with the World Bank– the Global City Indicators Facility at the University of Toronto, to study nine pilot cities (Berman and Orttung, 2020). Following the completion of this work and having the indicators tested and verified, it took another two years to prepare and publish the first version of the aforementioned standard in 2014, and this was only after six international meetings and five drafts. In 2018, a revised version of this standard, which is currently in use, was issued. Concerning the European standards, in 2002 CEN implemented a system to deliver European standards (from proposal introduction to the standard publication) in three years (CEN, 2010), but this again requires the proposed developments to be at an already fully mature state.

It should be also pointed out that, standards are not forever. Standards are likely to become outdated due to several different reasons, with the most likely being the new technological advancements in the addressed field. In this case, new technologies and research are anticipated to fill the gap and contribute to the development of new/revised standards (Bøgh, 2015). It is important to consider that within the euPOLIS project objectives are to deliver new knowledge that will be developed within the project duration. This delivery will be done in a manner suitable for its potential inclusion in revised

pertinent standard versions and/or its integration into standard procedures that form the current state of practice in the industry. The aforementioned consideration, although more likely will be materialised following the project completion, is linked to the euPOLIS STO-8 which as per the Grant Agreement (GA) aims to *“widely and effectively communicate and disseminate project results to various audiences through targeted activities, clustering with related projects and initiatives, aiming to spread the euPOLIS concept”*.

2.2 The value of standards for companies

Although not always fully appreciated by the pertinent stakeholders, standards offer substantial advantages to the companies that adopt them, other than those stemming from the apparent need to comply with the customers/market requests or legislations. In particular, standards offer to companies a solid ground for developing new products/services and innovate but, at the same time, also ensure that those products/services remain compatible with existing dependent/connected ones (i.e., facilitating interoperability), a condition that is deemed to be necessary for the market catch up of any new development. According to survey studies that were conducted across Europe (e.g., CERB, 2015), it seems that there exists a two-way interaction between the companies and the standards, with the standards positively affecting the productivity of a company, but also the most productive companies using or contributing in the development of standards.

Overall, standards could generate benefits for companies in many different ways. For instance, standards could assist the companies in enhancing the quality of their products or harmonising the offered products to minimise production costs. Standards could also contribute to creating more efficient channels for technical information exchange between the companies. Regarding trade, standards could promote exports since they ensure compatibility of the product/services across a spectrum of regional or international markets, with this positive effect being further enhanced via the quality-signal that is being transmitted to the customers following the adoption of the standards.

Additional benefits to the companies can be also identified in relation to their participation in the development of standards. Among others, through this process, a company could closely follow the market emerging themes, contribute to the formulation of the future market rules, and also access, well in advance, state-of-the-art information that wouldn't be accessible otherwise before the standard's issuance. The main route for the companies to get involved in the development of the standards is through a National standardisation body. The latter can inform the companies about the standards that are currently under development and the different ways of participation in their development. One of the simplest, yet straightforward, ways of participation, is via submitting written comments during the public consultation of the draft standards.

3 Route to standardisation

In principle, any interested party is eligible to submit a proposal for a new standard in a standardisation body (e.g., CEN, CENELEC, ETSI, ISO). Nevertheless, the majority of the standardisation work is proposed through the National standardisation bodies, which however are receiving proposals on new topics by anyone who has a particular interest.

In the development of European standards (but a similar procedure is followed for the development of other regional or international standards, see Figure 1), following a proposal submission, the relevant Technical Committee decides whether the proposal is accepted or not. In case of a positive decision, the accepted standardisation proposal is allocated to one of the Working Groups of the relevant Technical Committee to prepare a draft of the standard. The standard draft is then prepared by a group of experts appointed to a working group of the Technical Committee. Once the draft of the standard is prepared, it is then released for public comments and vote (this process is called for the European Standards the “CEN Enquiry”). Anyone who has an interest in the addressed field (e.g., manufactures, public authorities) could comment on the draft. All comments are collected from the National standardisation bodies who then submit a national position by means of a weighted vote (based upon the population of the member states) which is subsequently analysed by the CEN Technical Committee. If the results of the Enquiry show approval for the standard, then the Technical Committee can proceed with publishing it. If the results show that the draft standard requires technical reworking, then the Technical Committee can decide to update the draft and resubmit the standard for another weighted vote that is called “Formal Vote”. In this stage, the national members have only three possibilities: approval, disapproval, or abstention. Following the approval of the standard either during the “Enquiry” or the “Formal Vote” the standard is published. Each European standard is identified by a unique reference code that begins with the prefix 'EN'.

Following publication, all member countries must publish the EN standards as national standards and withdraw any national conflicting ones. To ensure that an EN standard is still current, it is reviewed within five years of its publication. Following their publication, standards are open to all users and the payments for purchasing a standard are only meant to cover the preparation costs.

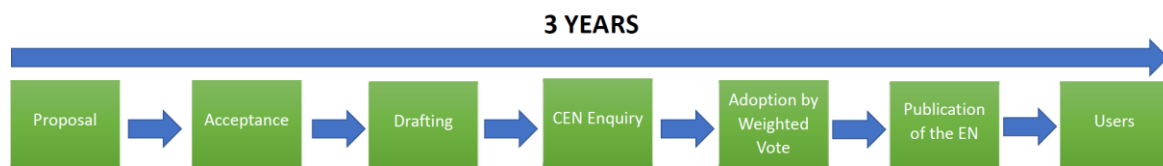


Figure 1. Steps in the development process of a European Standard

4 The role of standardisation in euPOLIS

Nature Based Solutions (NBS) have attracted considerable research interest in the past few decades, whereas substantial efforts have been invested towards their integration into governmental and non-governmental policies addressing climate change mitigation, environmental quality and urban planning. Nevertheless, to enable their full implementation and effective market entrance, penetration, and uptake, there is currently an emerging need for those novel ideas, concepts, and methodologies to be clearly defined and expressed in a more structured manner. This might be facilitated via a well-defined framework that is built upon a spectrum of transparent and coordinated principles that could be easily understood and adopted by the relevant practitioners and decision-makers. Overall, one of the key recommendations towards enhancing the NBS uptake, as was pointed out in the Nature-Based Solutions Handbook (Somarakis *et al*, 2019)–developed within the ThinkNature European funded project–is to harmonise the knowledge and evidence base of NBS so as to enable the formulation of global NBS standards, as for instance the only recently submitted “Global standard for nature-based solutions” by IUCN (2020).

Knowledge uniformity for promoting the NBS uptake could be well offered through standardisation activities, which, by definition, aim to express the developed methodologies/products or services in a clear and harmonised manner. This harmonisation essentially eliminates the technical barriers (CEN, 2010) and guarantees that the developed framework reflects the current-state-of-the-art and consequently prevents research work duplication. On the technical side, standardisation actions could contribute, (a) to easier and faster exploitation of the research findings, since the latter are distributed beyond the original network to be utilised and tested by a wider community of stakeholders (for instance a European standard, EN, automatically becomes a national standard in the 34 CEN countries) and consequently is replicated in different areas, conditions and scales, (b) to the long-term exploitation of the research achievements since those remain available following the project completion and (c) to improved economic growth, as was showcased in two pertinent studies that were undertaken in France (AFNOR, 2009) and Germany (DIN, 2000, 2011).

Owing to the above benefits of standardisation, the euPOLIS project targets a clear pre-standardisation plan, which, thanks to the presence of well-known experts in its consortium, is anticipated to benefit from and contribute to the relevant international forums and standardisation bodies. Standardisation can be addressed in a research project, either as a research input (e.g., via ensuring that measurements are carried out according to standards or the new developments are compliant with existing standards), or as a way to codify the new developments and knowledge that will be produced throughout the project, with the overall aim to suggest potential improvements to existing standards, propose new ones, or structure the new knowledge in such a manner that can be easily implemented in future standards. Regarding existing standards, the consortium partners will review any available standards in their pertinent scientific field. This review process, holds a central role among the targeted standardisation actions since it, reveals the applicability of existing standards and highlights any gaps/limitations that could be covered by the foreseen research activities and developments.

Existing standards could also serve as reference material to guide the targeted scientific work on a research project and provide a starting point for the intended project actions. Standards could assist in harmonising the intended work, by developing a common framework across the foreseen activities, adopting a common terminology, and ensuring common data and information exchange.

Overall, the euPOLIS results are expected to provide useful input to either formal (e.g., CEN) or more likely informal standardisation. Informal standardisation, which is anticipated to play a key role in the euPOLIS project, refers to the case where an influential organisation (e.g., 100Resilient Cities, BRE

Group, CDP, other national or international institutions) or even a local authority (e.g., municipality) adopts the project developments to present them as a best-practice guidance or include them in a certification scheme (e.g., BREEAM) or in an internal regulatory framework. Certification emitted by certification institutes or companies ensure that a product, service, or process complies with the requirements of a standard. The possible route of informal standardisation, that is likely to be very relevant to the euPOLIS, is the adoption of the proposed research developments by a national or international institution and consequently the request for compliance or inclusion of the proposed NBS recommendations in an existing or revised certification scheme. The euPOLIS consortium will also explore the possibility of combining certain elements of its novel indicator-based assessment framework with the new Cities Questionnaire (CDP, 2022) methodology that has been developed and used by the CDP consortium partner for measuring cities' actions and commitments across their environmental networks and consequently delivering tailor-made support and training, built upon their impact and capacity to act for enhancing their NBS and climate efforts. Further to the above, it is anticipated the Front-Runner (FR) and the Follower (FL) cities of the euPOLIS project to integrate several of the euPOLIS developments into their reformed internal regulatory frameworks for urban planning and services.

5 Technical Committees Overview

Table 4 below summarises some European and International Technical Committees (TCs) whose work is deemed to be relevant to the euPOLIS project, along with a short description of these TCs.

Table 4. European and International Committees relevant to the euPOLIS project

Technical Committee*	Description
CEN/TC 165: Waste water engineering	Drafting of functional standards, standards for performance and installation in the field of wastewater engineering for systems and components.
CEN/TC 230: Water analysis	Standardisation in water analysis including the definition of terms; sampling of water; measurement; reporting. Excluded are the limits of acceptability for water quality.
CEN/TC 264: Air quality	Development of standards as tools, which allow air quality to be measured and to obtain comparable results.
CEN/TC 318: Hydrometry	Standardisation of methods, procedures, instruments, and equipment related to techniques for hydrometric determinations of the water cycle.
CEN/TC 465: Sustainable Cities and Communities	Standardisation in the field of Sustainable Cities and Communities, covering the development of requirements, frameworks, guidance and supporting tools and techniques. The proposed standardisation plan was developed to assist cities and community decision making, and support their implementation of sustainability and sustainable development. Standardisation is focused on the development of a holistic and integrated approach in response to the needs of European Cities and Communities in both rural and urban areas.
CEN/TC 467: Climate Change	Addresses standardisation in the field of climate change, including related social and economic aspects, at the organization and product level. The goal is the development of frameworks, requirements and guidance to support the EU policies on climate change, also in the perspective of a full implementation of the EU Green Deal.
ISO/TC 113 Hydrometry	Standardisation of methods, procedures, instruments, and equipment relating to techniques for hydrometric determination of water level, velocity, discharge and sediment transport in open channels, precipitation and evapotranspiration, availability, and movement of ground water.
ISO/TC 146 Air quality	Standardisation of tools for air quality characterisation of emissions, workspace air, ambient air, indoor air, in particular measurement methods for air pollutants (particles, gases, odours, micro-organisms) and for meteorological parameters, measurement planning, procedures

Technical Committee*	Description
	for Quality Assurance/Quality Control (QA/QC) and methods for the evaluation of results including the determination of uncertainty.
ISO/TC 147 Water quality	Standardisation in the field of water quality, including definition of terms, sampling of waters, measurement, and reporting of water characteristics.
ISO/TC 176 Quality management and quality assurance	Standardisation in the field of quality management (generic quality management systems and supporting technologies), as well as quality management standardisation in specific sectors at the request of the affected sector and the ISO Technical Management Board.
ISO/TC 190 Soil quality	Standardisation in the field of soil quality.
ISO/TC 207 Environmental management	Standardisation in the field of environmental management to address environmental and climate impacts, including related social and economic aspects, in support of sustainable development.
ISO/TC 268 Sustainable cities and communities	Standardisation in the field of Sustainable Cities and Communities that includes the development of requirements, frameworks, guidance and supporting techniques and tools related to the achievement of sustainable development considering smartness and resilience, to help all Cities and Communities and their interested parties in both rural and urban areas become more sustainable.
ISO/TC 282 Water reuse	Standardisation of water reuse of any kind and for any purpose. It covers both centralised and decentralised or on-site water reclamation, and direct and indirect reuse applications, taking into consideration the potential for unintentional exposure or ingestion. It includes technical, economic, environmental and societal aspects of water reuse. Water reuse comprises a sequence of the stages and operations involved in collection, conveyance, processing, storage, distribution, consumption, drainage and other handling of wastewater, and treated effluent, including water that is reused in repeated, cascaded and recycled ways.
ISO/TC 323 Circular economy	Standardisation in the field of Circular Economy to develop frameworks, guidance, supporting tools and requirements for the implementation of activities of all involved organisations, to maximize the contribution to Sustainable Development.
CEN/TC 287 Geographic Information	Standardisation in the field of digital geographic information for Europe: The committee aims to produce a structured framework of standards and guidelines, which specify a methodology to define, describe and transfer geographic data and services.

Technical Committee*	Description
<p>CEN/SS S27</p> <p>Waste - Characterization, treatment and streams</p>	<p>Standardisation in the fields of Waste - Characterization, treatment, and streams.</p>
<p>IEC/TC 70</p> <p>Degrees of protection by enclosures</p>	<p>Prepares international standards and appropriate test methods for degrees of protection provided by enclosures against ingress of solid foreign objects and water and against access to dangerous parts.</p> <p>Prepares international standards and appropriate test methods for degrees of protection provided by enclosures for electrical equipment against external mechanical impacts.</p> <p>Has the Safety Pilot Function for “degrees of protection provided by enclosures against ingress of foreign solid bodies, water and access to live or moving parts and standardisation of accessibility probes. Such degrees should be expressed by the IP classification systems”.</p>

*Sources:

<https://standards.cen.eu/dyn/www/f?p=CENWEB:6:::NO>

<https://www.iso.org/technical-committees.html>

<https://www.iec.ch/>

6 NBS urban planning standardisation potential

With reference to NBS, there is currently an emerging need for developing new standards (also on account that many existing planning standards are obsolete and not in line with the ongoing climate emergency and the latest technological innovations), quantifiable targets, measurable standardised indicators, and technical protocols to serve as a reference and assist their wider application that will consequently result in more effective and sustainable urban designs. This effort is part of the growing recognition that investments in NBS could substantially contribute towards alleviating the consequences of major challenges that are faced by the societies, such as climate change and societal ones, as well as human health and disaster risks. Recently, the International Union for the Conservation of Nature (IUCN) issued the first version of a global standard for the NBS, namely “IUCN Global Standard for Nature-based Solutions” (IUCN, 2020). This is the first-ever standard for NBS and envisages cities and local governments to be its primary users. The objective of this standard is to *“Provide guidance and a global framework for the design, verification and scaling up of Nature-based Solutions. The Standard includes globally consistent Criteria and Indicators, which are supported by the Principles for Nature-based Solutions, to measure the strength of interventions.”*

The standard specifies eight (8) criteria that could be used (in the context of a self-assessment), along with 28 indicators, for setting a common basis on what constitutes an NBS intervention and contributing to transformational changes by improving the NBS practice. These eight criteria are:

1. NBS to effectively address societal challenges;
2. Design of NBS to be informed by scale;
3. NBS to result in a net gain to biodiversity and ecosystem integrity;
4. NBS to be economically viable;
5. NBS to be based on inclusive, transparent and empowering governance processes;
6. NBS to equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits;
7. NBS to be managed adaptively, based on evidence;
8. NBS to be sustainable and mainstreamed within an appropriate jurisdictional context.

As was pointed out by Seddon *et al* (2021), as NBS are increasingly finding their way in climate and biodiversity strategies, it becomes an emerging need to reach an agreement on what constitutes a sustainable and successful NBS implementation. This agreement will offer to policymakers and practitioners a clear and standardised framework for enabling their informed design, implementation, management, and long-term monitoring. Standardisation is considered to be a necessary ingredient of such a process, since poorly designed NBS could not only fail to deliver what is expected but could even have adverse consequences to the local communities (e.g., gentrification risk) or to the native biodiversity (e.g., potential exotic species used to become over-dominant).

Despite the aforementioned standard/methodologies development and their anticipated contribution towards promoting a common understanding and consensus on NBS design practices, there is still ample room for improvements since:

- (a) the contemporary urban planning methodologies fall behind the challenges set by the rapid growth of the cities and climate change,
- (b) the international literature currently lacks a transparent roadmap for identifying appropriate project goal-driven NBS interventions and implementing them into urban designs

in a manner that explicitly addresses multiple criteria such as PH&WB and other social aspects as well as resilience to climate change and sustainability,

(c) it is anticipated that soon the NBS non-binding recommendations will find their way into policies. This will create an urgent demand for robust frameworks, to be readily implemented into standards. These standards could be utilised by the urban planners and policymakers for designing and verifying the efficiency/impact of NBS urban interventions, not only on an individual basis but also on account of the entire network.

In this way, it is relevant to mention that euPOLIS introduces a novel NBS urban planning methodology that is capable of delivering solutions tailored to the particular context (climatic, cultural, social) of the considered urban area via explicitly accounting for the specificity of the local conditions. This methodology is not only capable of identifying a spectrum of NBS interventions (e.g., pocket parks, urban vertical farms, wastewater treatment plants, green corridors, etc.), but it also promotes a mutual understanding among the stakeholders on the NBS-based planning concept whereas it also offers a solid ground for quantifying their effectiveness, cost-efficiency and optimising their interaction with the people/end users considering their health and WB.

6.1 The euPOLIS GDPM methodology – an outline

In the euPOLIS project, the so-called Goal Driven Planning Matrix (GDPM) may be considered as one of the euPOLIS flagships. Hence, its potential inclusion in future NBS urban planning standards, design regulations, and certification schemes, is of particular interest to the euPOLIS consortium. This master planning mechanism was first introduced by Bozovic *et al* (2017) but was further refined, expanded, and will be verified in euPOLIS through its application in the FR city pilot sites.

The GDPM constitutes a systematic process for delivering an NBS urban design through the following steps:

- i. Identification of the developer's Goals at the site of interest,
- ii. Identification of a set of Targets for each Goal that are needed so as to attain the Goals,
- iii. Identification of a set of Contextual Indicators (CIs) for assessing the baseline status of the site of interest. Quantification of the CIs in order to specify the needs, trends and stressors at the site of interest (i.e. site diagnosis that integrates the concerns of all stakeholders),
- iv. Conversion of CIs into concerns to be added to the already specified Targets,
- v. Identification of the potential and theoretically possible NBS interventions to meet the Target requirements,
- vi. Identification of a list of Evaluation Indicators (EIs) for assessing the effectiveness of the proposed NBS interventions,
- vii. Design of the tailored to the site of interest NBS interventions and NBS implementation,
- viii. Quantification of the EIs for assessing the effectiveness of the implemented NBS interventions at the site of interest and their impact on PH&WB.

6.2 The euPOLIS NBS preliminary selection framework – an outline

The euPOLIS NBS preliminary selection framework is a methodology/tool (see Figure 5) that blends elements that have been already developed within the context of other euPOLIS research activities (i.e., the CIs, Baseline assessment methodology, and a spectrum of potential NBS interventions from the implementation of the GDPM at the site of interest) with new ones (e.g., consideration of the NBS impacts on certain problems, scoring system), to offer a multi-criteria

decision support system for assisting urban planners in the preliminary selection of the NBS interventions. In particular, the developed framework utilises a set of CIs (“main CIs”), that remains constant across all potential sites (i.e., persistent elements of the methodology). These CIs screen the site to identify the concerns across five different categories (urban, environmental, social, economic, and PH&WB) to figure out (a) whether a particular problem that is relevant to the site could be (fully or partially) solved by implementing an NBS (b) the severity of the problem/concern, following a rating of high, moderate, low, not a problem, and not a concern. The “not a problem” option refers to a site condition in which a particular problem could be an issue under certain circumstances. Yet, due to appropriate measures that have been taken in the past, it was resolved and is anticipated to remain resolved considering reasonable future projections and subject to appropriate maintenance of the relevant interventions at the site. By contrast, the “not a concern” option reflects a problem that is irrelevant to the site of interest under any realistic circumstances (e.g., water salinization for a demonstration site that is far from coastal areas). For each main CI that is linked to a particular concern, a set of suggested thresholds is specified (which could be further refined according to local conditions, other future technological advancements, or enhancement of the level of knowledge) to signify the transition from one state to another and provide an assessment for each concern. Hence, along with the measured values for each CI, the thresholds will provide the needed input for each site concern for accomplishing the baseline assessment.

Once the baseline assessment at the site of interest is fulfilled through the selected persistent set of CIs, the user/urban planner needs to identify in which way each site concern could be resolved by each potential NBS intervention identified during the urban planning process (GDPM in the case of euPOLIS). In fact, whether an NBS has an impact/effect on resolving a particular problem and the nature of this impact is assessed based on the following descriptive scale: direct, indirect, and no impact. This site problems-NBS impacts correlation matrix is founded on literature and expert opinion.

By convolving the severity of the problem with the ability/impact of an NBS in addressing/mitigating this particular problem, each NBS receives a score in each one of the five individual concern categories as well as an overall score. The overall score essentially reflects the efficiency of an NBS to address the entire spectrum of the site problems, explicitly accounting for the problem intensity along with the NBS ability to resolve/mitigate such problems. Hence, NBS that directly address severe site problems are assigned a higher score compared to those that address other problems of lower severity or the same problems but in an indirect manner. In fact, an NBS that addresses only problems that are not identified as concerns for the site of interest would receive a zero score. The latter does not mean that the NBS is not efficient at all, but rather that it is inappropriate/not useful for the site of interest. It should be pointed out that the methodology accounts only for the potential NBS benefits and disregards the possibility of an NBS adversely affecting any problems.

Within the context of the proposed methodology, the urban planner is given the option to identify some problems as “top priority” ones based on the preference of urban planners and stakeholders through participatory actions, as well as to reduce the scores assigned to each NBS if adverse factors are hampering the full implementation of a particular NBS at the site of interest (e.g., limited space, regulation restrictions, budget limitations).

6.3 The euPOLIS indicator-based framework – an outline

To facilitate the evaluation of implemented NBS, euPOLIS is proposing a multi-dimensional indicator-based methodology focused on PH&WB. In this context, two sets of indicators are identified: (1) Contextual indicators - CIs (see euPOLIS D3.2, D4.1, D8.1) used for NBS planning, and (2) Evaluation Indicators - EIs (see euPOLIS D4.1 and D4.2) used for monitoring during deployment and exploitation.

Both sets of indicators are developed in five (5) categories: (1) PH&WB, (2) social, (3) economic, (4) environmental, and (5) urban development and identified associated Challenges and Themes, which represent the main topics and processes relevant to NBS implementation.

CIIs are used during the planning phase to provide an initial site screening and site characterisation, by facilitating an initial baseline assessment that will assist in gaining a better understanding of the site and its needs. The evaluation of CIIs is based on readily available data and sources, including national and international databases, local agencies and authorities, existing reports, questionnaires, site visits, etc. The best available data is used at the temporal and spatial resolution most appropriate for each pilot site.

CIIs together with various euPOLIS urban planning tools and methodologies (e.g., GDPM) are used to identify, select and design appropriate NBS that will target specific issues, as these are represented by the Challenges and Themes of the location at which their implementation is planned. Specifically, by quantifying CIIs it is possible to identify the specific needs, trends, and pressures of each site. This identification in conjunction with the GDPM and the urban planning participatory processes (e.g., recording of stakeholders' concerns) allows for the identification of potential interventions/NBS to address these site needs according to the euPOLIS project aims and focus. These identified NBS interventions are evaluated through the NBS preliminary selection tool (see Section 6.2) and applicable simulation and assessment methods to eventually select and design the final NBS to be implemented at a site. Following the final selection of NBS, a list of EIs is produced based on the expected impacts of the implemented NBS.

The data needed to estimate the EIs will be collected either via monitoring (environmental sensors, questionnaires, wearables), modelling/simulations or targeted data collection, addressing in both cases the conditions prior to and after the implementation of the NBS at the site of interest. Consequently, by means of comparing the indicator values at these two stages one could undertake a multi-dimensional impact assessment of the implemented NBS. The proposed indicator-based assessment framework is innovative because it attempts to monitor multiple societal challenges that could be simultaneously addressed by the implemented NBS providing evidence for their multi-functional role. In addition, it offers guidance to the urban planners on how a tailor-made list of evaluation indicators could be prescribed on account of the implemented NBS along with a set of persistent evaluation indicators that should be monitored irrespectively of the implemented interventions.

7 Developments/Innovations identified by the euPOLIS partners

For the first version of this deliverable, the euPOLIS partners were requested to (a) identify the major developments/innovations that they bring to the euPOLIS project (these could be either new technologies or existing ones that could be further developed throughout the project duration) and (b) provide a short description to these developments. Consequently, the partners were also asked to identify the standardisation landscape that is relevant to the developments/innovations that they bring to the project. Table 5 summarises the initial feedback received from the euPOLIS partners with reference to the identification of the euPOLIS developments/innovations. Table 6 summarises the preliminary identification provided by the FR and the FL cities/supporting partners with regards to the developments that they are planning to consider in their city planning regulations/processes. Both Table 5 and Table 6 are expected to be revised and further populated as the project deploys and the ongoing developments are presented in more detail to the consortium.

Table 5. Developments/innovations of the euPOLIS project

euPOLIS partner	Development / Innovation	Short description
Biopolus	BioMakery powered by the Metabolic Network Reactor (MNR) water treatment technology	Using advanced biological engineering, Biopolus has created a modular, high-tech living system for complex circular urban water treatment and management. The technology can also be used to recover valuable products - energy, nutrients, and minerals from organic waste. These solutions, along with additional available space for community functions and urban food production, can all be integrated and housed in the Biopolus BioMakery, creating a true hub for nature-based urban circularity.
GSH	Designing, testing and developing GIS and RS activities for monitoring the environmental impact of the NBS implementation on time	GSH is contributing in the 4D WebGIS (time series) visualization, Remote Sensing tools using Copernicus and ESA TEP platforms downscaling to neighbourhood with sophisticated algorithms also using in-situ sensors and UAV monitoring.
MIKS	Innovative social / cultural hub Mikser House	Multidisciplinary cultural and community platform combining a physical venue in a revitalised industrial space and a strong digital presence (communication and engagement platform); Organising cultural events, lectures, exhibitions, conferences, debates, workshops, concerts, art performances, etc.; Facilitating multidisciplinary and multicultural dialogues between the sectors of design, industry, urban planning, government, media and general public (citizens); Raising awareness and standard of responsible sustainability-driven behaviour by professionals, industries, local authorities, and the society as a whole; Enhancing social responsibility

euPOLIS partner	Development / Innovation	Short description
		<p>through the participatory processes and inclusion of vulnerable groups, with the special focus on the gender issue; Development and promotion of new talents and education in the fields of social and technological innovation, urban design, architecture.</p>
AMPHI	Biowater Climapond	<p>Rainwater reservoir (pond) collecting rainwater runoff (e.g. from the roof), up to 10 years-rain event, providing new habitats for the local species and creating a recreational space. This NBS has also a cooling down potential, hence contributing to the reduction of the Urban Heat Island (UHI) effect. (Possibility for product upgrade: water cleaning pump could be a way to adapt the product to urban areas).</p>
AMPHI	Green Bus Stop	<p>Green Roof with underground water container, redistribute rainwater runoff to surrounding green spaces, acts as a stepping stone habitat for insects and birds, contribution to the reduction of UHI effect. (Possibility for product upgrade: Install a pumping system (i.e. solar pump) that can pump water up on the roof to water the plants). In its present form Green Bus Stop (see Figure 2) essentially uses Sedum plants which do not require much water and can tolerate dry seasons, but if this pump enables the watering of plants, other more water-demanding plants could be selected.</p>
ENPL	Pre-planning methodology for optimised urban solutions driven by GDPM	<p>Traditional urban planning of NBS is done predominantly on an ad-hoc basis where only a few technologies and solutions are ever considered, mostly in isolation and often without sufficient interaction between the different stakeholders involved. Up until now, the assessment of the proposed NBS effects is done mostly based on knowledge and experience without a systemic comparative analysis of the interactions and productive synergies between the new NBS and the existing legacy (grey) infrastructure.</p> <p>This euPOLIS development formulates an innovative, pre-planning process that comprises the identification of alternative potential urban solutions and a quantifiable comparative analysis between them to select the optimal ones.</p>

euPOLIS partner	Development / Innovation	Short description
		<p>Process: Mathematical models to simulate the performance of the applied NBS and related urban solutions and to quantify the PH&WB indicators as well as the benefits of the potential solutions. This enables a comparative analysis between alternative solutions and consequently the selection of the optimal interactive solutions. Optimised solutions are then converted into Detailed Design Brief used for the detailed design of urban facilities supporting the selected solutions with best PH&WB benefits.</p>
ENPL	“Blend-in” module	<p>New urban developments often disrupt the life of their neighbourhoods. euPOLIS proposes that new developments should systematically blend-in into a neighbourhood, in the sense that: (a) Should not have any negative impact on the life in the neighbourhood and (b) Should contribute to the neighbourhood life quality. To facilitate the blend-in criteria, euPOLIS will further develop a "blend-in" matrix, i.e. a mandatory set of sub-criteria for the planning and design of new developments and revitalisation of existing ones. euPOLIS proposes that the “blend-in” criteria become obligatory for all new developments or revitalised existing ones, and will cover both bio-physical aspects and societal issues. This development could become an active tool for supervising city developments.</p>
ENPL	Gender and different citizens groups related planning criteria	<p>Standard planning does not consider equality of all citizens groups as regular planning criteria. The social and functional equality of different citizens groups (women, seniors, kids, other ethnicity, refugees, technologically obsolete, disabled, etc.) cannot be achieved without it. euPOLIS will propose the introduction of citizens groups related planning criteria as a mandatory urban planning component.</p>
ENPL	Business Activation Module (BAM)	<p>This euPOLIS development offers a systemic demo site resources integration analysis, designed to activate business opportunities and introduce active business and operational models. The module identifies resources deriving from the NBS proposed interventions and resources already existing at the location of interest. The interaction / synergies between these two resources produces a new set of resources that are often suitable for utilising sound business models. This process is anticipated to create</p>

euPOLIS partner	Development / Innovation	Short description
		added value to each project and multiple the city benefits.
ENPL	Planning methodology to secure Urban Planners long term responsibility	<p>Most current planning/design methodologies do not take into account planner’s responsibility for the long-term performance of the planned urban components. To mitigate that, euPOLIS proposes a new approval system to be introduced at the master planning level to achieve a more controlled, target-related, planning process: Through modelling and simulations planners will have to prove that:</p> <p>a. they have used a pre-planning optimisation process; and b. they have simulated future functionality of critical city / project functions under projected extreme operational conditions. This should be the introduction of planner’s responsibility for future project functionality and resilience. When accepted, this innovation will represent a significant improvement of the planning standards.</p>
ENPL	euPOLIS methodology to preserve, enhance and exploit ESS	<p>The Nature Based city infrastructure and the resulting Ecosystem Services (ESS) with specific functions, are not considered in standard urban planning. euPOLIS proposes existing ESS to be mapped, evaluated and enhanced, as part of any urban development design process. This methodology should evolve into a mandatory planning criterion. Once introduced in the planning practice, these criteria will strongly support the systemic deployment of NBS for socially inclusive urban ecosystems revitalisation and will have an important impact on the Urban Planning Standards thus indirectly to PH&WB.</p>
SENTIO	MyFeel monitoring Platform	<p>MyFeel monitoring Platform (wearables, mobile app, algorithms) is a new platform customised and adapted to the Feel Program to cover the euPOLIS project needs, i.e. to monitor citizens’ mental health in the pilot demonstrations, which will be related to the assessment of PH&WB of the different NBS. Specifically, The Feel Emotion Sensor (wristband, see Figure 3) will collect and record the significant emotional events that affect the citizens’ mental health. The myFeel application, which connects to the Feel Emotion Sensor, provides an output with respect</p>

euPOLIS partner	Development / Innovation	Short description
		to the significant emotional events of the users and will be available for Android and iOS devices.
BioAssist	euPOLIS by BioAssist mobile app	The “euPOLIS by BioAssist” mobile app is a new deployment and adaptation of the BioAssist platform to cover the euPOLIS project needs, and particularly the requirement for monitoring citizens’ WB in areas where NBS have been applied. The mobile application is currently available for Android and iOS devices, and it is compatible with the most popular smart devices and wearables. The “euPOLIS by BioAssist” application can be used as a health and other data collection, analysis and visualization tool (e.g., by using custom questionnaires, forms and other communication instruments) to assess citizen’s WB improvement in areas with NBS (see Figure 4).
NTUA/RG	NBS preliminary selection tool	Development of a decision support tool to assist urban planners in the preliminary selection of the NBS on account of the concerns/problems identified by means of the baseline assessment/site screening process and the efficiency of each identified potential NBS to address/mitigate certain site concerns (see Figure 5).
PLEGMA	euPOLIS Gateway	PLEGMA is developing the euPOLIS gateway (see Figure 6) as a robust, scalable, interoperable networking solution for permanent sensors data automated collection, that is easy-to-deploy, extensible and customisable according to each city needs. The euPOLIS gateway will be able to perform data collection, processing, backup and transfer to the Data Management System. This IoT monitoring solution will collect data regarding the environmental parameters from permanent sensors that will be deployed on-site in order to better and more accurately assess the impact of the NBS on the various demonstration sites. This will allow a dense and smart monitoring, the breaking-down of results and will provide the required level of climatic, social, and other data, which will be used in a number of applications, including knowledge generation, model calibration, planning and design, as well as NBS performance.

euPOLIS partner	Development / Innovation	Short description
NTUA (UWMH Group)	Metabolism-based NBS Planning and Simulation Toolkit	<p>The NTUA UWMH Group is developing a NBS Planning and Simulation Toolkit to facilitate a metabolism-based design and assessment of NBS in urban areas. The technology is based on the group's Urban Water Optioneering Tool (UWOT) which simulates the entire Urban Water Cycle (UWC), from source to user, treatment and disposal or reuse, using a metabolic approach for all the main fluxes related to urban water (water, waste, energy, CO₂ emissions, etc.). Within euPOLIS UWOT is being customised to be able to simulate different types of NBS, with special emphasis in being able to cover the euPOLIS pilot site needs, but also wider project needs and requirements. The main objective is the development of a tool that enables the simulation and comparison of different conceptual NBS interventions through the prism of urban water, in order to identify resulting synergies and trade-offs.</p> <p>With this tool alternative water sources and decentralised water technologies for covering NBS water requirements can also be investigated to promote the environmental sustainability of potential NBS. The outputs of the tool have been linked with relevant euPOLIS Indicators (from WP4 and WP8) and related selected simulation outputs will be shown through a specially designed euPOLIS Results' Dashboard.</p>
FCEBG/ NTUA/ ISS/ ERCE/ RG/ ENPL/ ICL/ AMPHI/ CEE/GSH	euPOLIS Indicator-based Framework	<p>The euPOLIS indicator framework provides an integrated methodology and set of indicators for NBS Planning and Evaluation with a special focus on Health and WB. Specifically, it comprises two parts, a) the site screening and planning phase through the use of Contextual Indicators (CIs) and b) the exploitation phase during which the NBS performance is evaluated through the use of Evaluation Indicators (EIs). CIs are evaluated via readily available data sources at the best scale possible to provide a quick assessment of a site and identify the main Concerns together with stakeholder consultations. Based on this screening process potential appropriate NBS are identified through urban planning processes (GDPM) and stakeholders. These identified NBS</p>

euPOLIS partner	Development / Innovation	Short description
		<p>interventions are evaluated through the NBS preliminary selection tool and applicable simulation and assessment methods in order to select and design the final NBS to be implemented at a site. Following the final selection of NBS a list of EIs is produced based on the expected impacts of the implemented NBS. These EIs are estimated at a much finer scale (spatial and temporal) than the CIs, before and after NBS implementation, through monitoring (environmental sensors, questionnaires, wearables), modelling/simulations or targeted data collection. Both indicator groups, CIs and EIs, have been developed within five (5) euPolis Categories (PH&WB, Social, Environmental, Business, and Urban Development) and identified associated Challenges and Themes, which represent the main topics and processes relevant to NBS implementation.</p>



Figure 2. The Green Bus Stop development provided by AMPHI



Figure 3. The Feel Emotion Sensor development provided by SENTIO

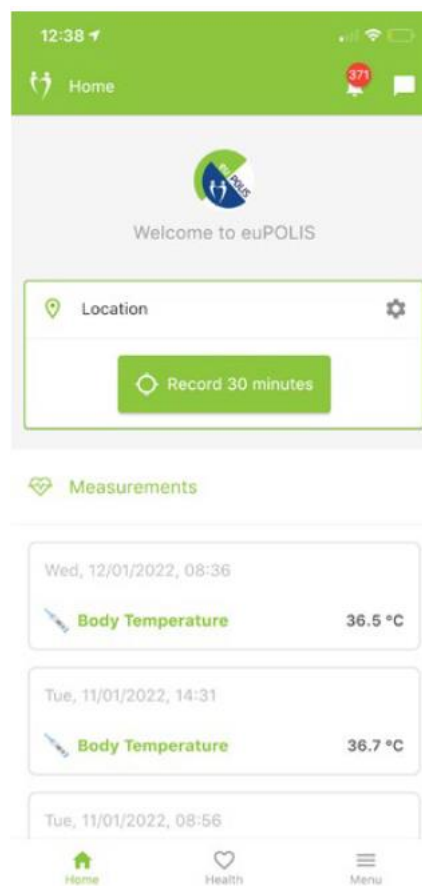


Figure 4. The euPOLIS by BioAssist mobile app development



Figure 5. The landing page of the under development euPOLIS NBS Preliminary selection tool

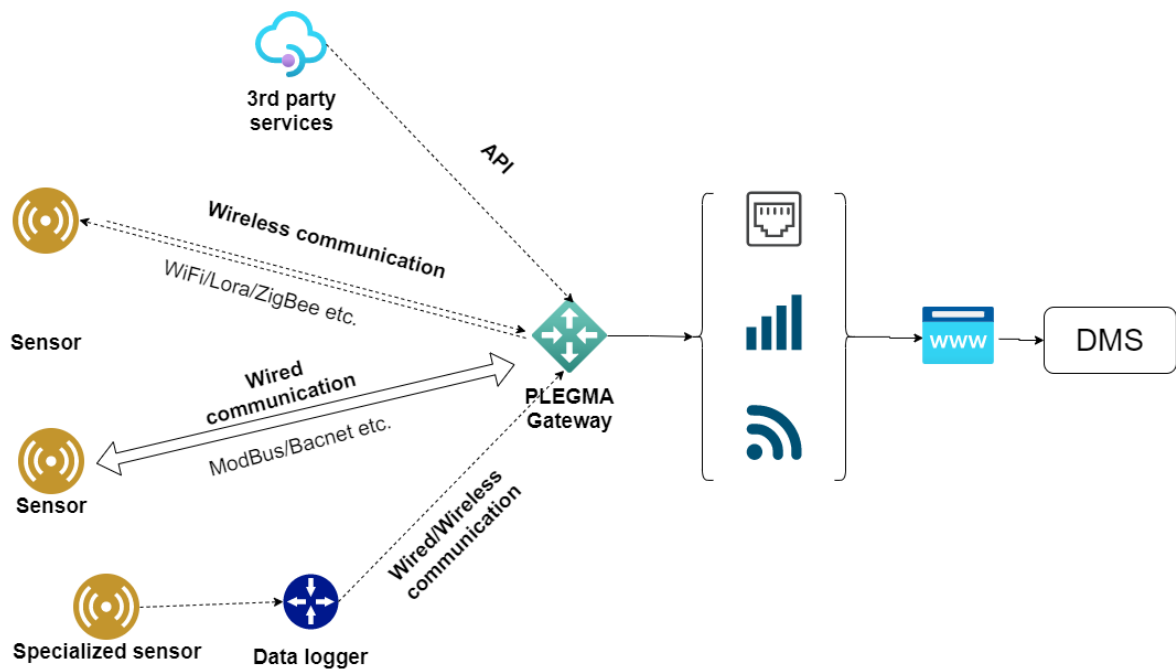


Figure 6. Overview of the data flow between the sensors and the euPOLIS gateway

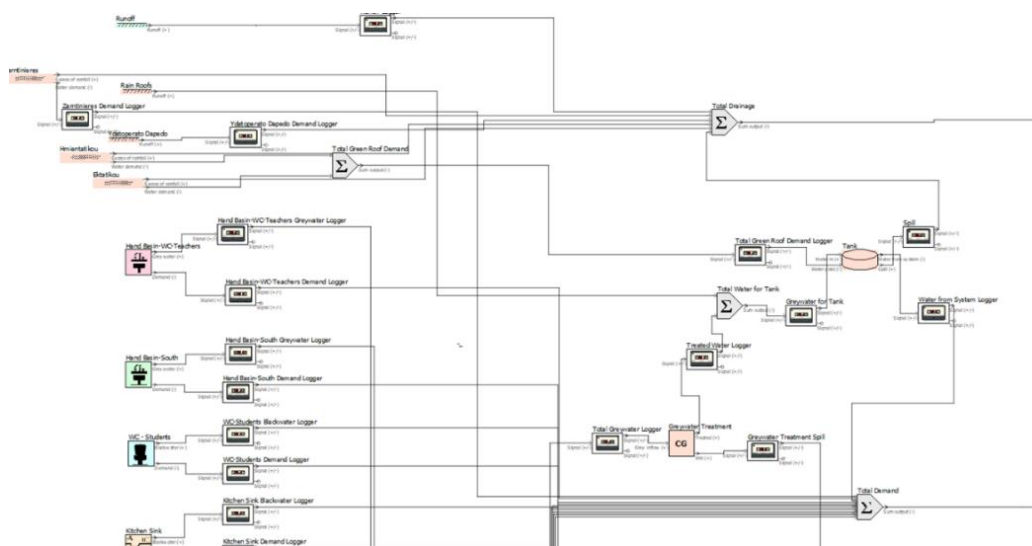


Figure 7. Example UWOT schematisation of a scenario in an euPOLIS pilot application

Table 6. Preliminary identification of the euPOLIS development/innovations to be considered in the city planning regulations

euPOLIS partner	Identify which of the euPOLIS development/innovations would you consider in the city planning regulations
<p style="text-align: center;">PIRS (for the front runner city of Piraeus)</p>	<p>The City of Piraeus is very positive to use innovative tools, particularly in terms of participatory planning, in order to record the citizens’ issues/concerns/views/propositions about their area or/and the specific public spaces which they are using for their daily activities, as well as decision support tools to assist urban planners in the selection of the potential NBS. Furthermore, the customised GDPM system could be an incentive and motivation for further research and project development at the neighbourhood/community/city level.</p> <p>During the euPOLIS implementation, the city planners who are dealing with the Akti Dilaveri renovation plan, were interested in consolidating some blue green growth NBS actions in this area based on the euPOLIS methodology. The euPOLIS technical team used this opportunity to propose a set of complementary NBS interventions for this particular area and most of these interventions are expected to be approved for implementation in the future.</p> <p>Furthermore, Ralleion School, will be used as a testbed for demonstrating that NBS could support the physical and mental WB, social skills, and learning performance of pupils through the development of spaces that can host various activities, such as offering opportunities for passive and active contact with the plants, with the latter supporting the biodiversity and improving the microclimate of the school playground, as well as learning opportunities on plants particularly native ones along with exotic species that are however adapted to the local climatic conditions, the principles of</p>



euPOLIS partner	Identify which of the euPOLIS development/innovations would you consider in the city planning regulations
	<p>sustainability and the NBS. This approach could serve as a means for providing interactive opportunities for education and awareness to the pupils on NBS as well as for formulating the future city regulations for designing and constructing education facilities, following the euPOLIS methodology/paradigm.</p>
<p>PAL (for the follower city of Palermo)</p>	<p>GDPM/Urban components' synergy & new planning criteria /Innovative NBS Planning and Simulation Toolkit: the preliminary analysis of the plan choices, for the research of the "environmental" and "adaptive" objectives and actions - is contained in the Strategic Environmental Assessment Report for the New Master Plan of Palermo. This "regulatory" approach and dimension are present in the New Master Plan which, however, still has to resolve fundamental issues to manage the climate challenge in progress, to prevent land consumption and to ensure the hydrogeological balance.</p> <p>Improvement of planning standards: many of them have already been introduced within the current 2030 Agenda.</p> <p>Innovative DMS (data management system)/Enhanced Monitoring Systems for PH & WB: to integrate / implement the tools and services of the Control Room and the SIAC (Municipal Environmental Information System) supported by REACT EU and to be activated by 2023.</p> <p>Novel planning criteria: the new criteria are identified and supported by the Strategic Environmental Assessment process / tool.</p> <p>Innovations in Mentoring/ Coaching: integrated into the education system of the City of Palermo.</p>
<p>UNIANDES (CEE) and ERU (for the follower city of Bogotá)</p>	<p>In the past years, the city of Bogotá has developed a technical standard for the Sustainable Urban Drainage Systems (SUDS) design and construction criteria (NS-166 EAAB-ESP 2018), the regulation for the maintenance of SUDS (Decreto 597 de 2018 Alcaldía Mayor de Bogotá), the guidelines and procedures for compensating the hardening of green zones due to the infrastructure development (Resolución Conjunta 001 de 2019 SDP & SDA), and a Climate Emergency Declaration (Acuerdo 790 de 2020 Concejo de Bogotá).</p> <p>In addition, vegetated infrastructure and the implementation of other NBS types have been standardised by the Technical Manual for Vertical Gardens and Green Roofs (Resolución 1305 de 2013 SDA), the water management plan (Decreto 485 de 2011), the action plan for wetlands (Resolución 02988 de 2015), the urban and peri-urban agriculture regulation (Resolución 361 de 2020), and the eco-urban planning and sustainable construction regulation (Decreto 566 de 2014).</p> <p>The main problem with regards to the aforementioned standards, guidelines and regulations in the city of Bogotá is the lack of articulation between theory and practice in several institutional, economic, and social aspects that</p>

euPOLIS partner	Identify which of the euPOLIS development/innovations would you consider in the city planning regulations
	<p>hampers their practical implementation. The city of Bogotá is expecting the euPOLIS methodology to enhance the state-of-the art in city planning in a practical manner via, among others, explicitly engaging the community and the main stakeholders during all planning phases.</p> <p>The main innovations identified in the euPOLIS methodology, which are of interest to the city of Bogotá for the time-being, are:</p> <ul style="list-style-type: none"> •The NBS selection guide that addresses the urban project needs during the planning phase. •The GDPM that complements the current urban planning methodology adding new types of analysis criteria (e.g., gender inclusion, environmental articulation, business activation). •The contextual and evaluation set of indicators for site screening and NBS assessment, accordingly. •The improvement of stakeholder’s engagement and communication strategies for enabling a co-creation process.
<p>TREB (for the follower city of Trebinje)</p>	<p>Several regulatory and urban plans are currently being prepared in the City of Trebinje. The intensive construction activity has begun to negatively affect the urban matrix of the city. During the development of the urban plan, we aim to take into account the direction of expansion of the city and the natural potentials of the new sites that can be used. The goal is to reduce the microclimate of the settlement and the problems caused mainly by the excessive use of concrete and asphalt. To this end, we will focus on the areas that lack green spaces the most with an aim to reduce the air temperature by more than 2° C. We plan to introduce the practice of elaborating a detailed horticulture plan during the development of urban plans, so as to enable the use of right trees with specific functions and positions; a combination of functionality and aesthetics. We also plan to arrange open public spaces and bring nature to the city with the addition of recreational facilities and urban gardening, in order to motivate citizens spending more time outdoors and consequently improving their WB. Also, an important element that is of interest to the city of Trebinje is to implement a watering system with recycled water since the latter is deemed to a reliable alternative source of irrigation water. The use of recycled irrigation water provides valuable nutrients for plant growth, reducing the need to use chemical fertilisers.</p>

8 Standards and Technical Committees identified by the euPOLIS partners

Further to the identification of the developments/innovations that they will bring to the project, it was requested from the consortium partners to identify the most relevant existing standards of the identified developments as well as those Technical Committees (TCs) that are relevant to their development/s. The identification of the TCs aims to reveal the potential links that could contribute during and following the completion of the project in integrating the euPOLIS innovations and technologies that might be further developed, in future standard versions and regulations.

Table 7. Standards that are relevant to the euPOLIS development/innovations identified by the partners

euPOLIS partner – development	Standard/s	Technical Committees
Biopolus – BioMakery	<ol style="list-style-type: none"> 1. CE certification for each equipment 2. 2030 Agenda for Sustainable Development 3. 17 Sustainable Development Goals (SDG 6: Ensure availability and sustainable management of water and sanitation for all) 4. Circular Economy Action Plan 5. 91/271/EEC Urban Wastewater Treatment Directive (UWWTD) 6. 2000/60/EC Water Framework Directive (WFD) 7. 2008/98/EC Waste Framework Directive (WaFD) 8. 86/278/EEC Sludge Directive (SD) 9. ISO/TC 323 Circular economy 	<ol style="list-style-type: none"> 1. GWP Technical Committee - Global Water Partnership (www.gwp.org) 2. European Technical & Scientific Committee (ETSC) (www.ewa-online.eu) 3. Ellen MacArthur Foundation CE100 Network 4. CEN/SS S27 Waste - Characterization, treatment and streams 5. CEN/TC 165 Waste water engineering
GSH – GIS/RS activities for assessing the impact of NBS	<ol style="list-style-type: none"> 1. ISO 9001:2015 	<ol style="list-style-type: none"> 1. CEN/TC 287 Geographic Information 2. ISO/ TC 211 Geographic Information - Geomatics
MIKS – Mikser House	<ol style="list-style-type: none"> 1. EU Green Deal 2. UN's 2030 Agenda for Sustainable Development 3. New European Bauhaus 4. Report of the OMC (Open method of coordination) Group of EU Member State Experts– 2021 "Towards a Shared Culture of Architecture" (EU Council Work Plan for Culture 2019-2022) 5. Citizen Science and Citizen Engagement - Achievements in Horizon 2020 and recommendations on the way forward 	

euPOLIS partner – development	Standard/s	Technical Committees
<p>ENPL</p> <ul style="list-style-type: none"> – Pre-planning methodology for optimized urban solutions – “Blend-in” module – Citizens groups related planning criteria – Business Activation Module – Planning methodology to secure Urban Planners long term responsibility – euPOLIS methodology to preserve, enhance and exploit ESS 	<p>1. Any City urban planning regulations</p>	
<p>BioAssist</p> <ul style="list-style-type: none"> – euPOLIS by BioAssist mobile app 	<p>1. Data Protection and Information Systems Security Policies and Procedures according to the ISO 27001, ISO 27005, and BS 25999 international standards.</p> <p>2. EN 62304 standard (medical device software – software life cycle processes)</p> <p>3. ISO 13485 for all the available products.</p> <p>4. BioAssist’s platform and services already include well defined APIs for data import/export and communication with third-party systems, which support several widely adopted standards and specifications such as ICD-10 and HL7-FHIR.</p>	
<p>SENTIO</p> <ul style="list-style-type: none"> – MyFeel monitoring Platform 	<p>1. EMC Tests EN55032, EN61000, EN55035, EN301489 for radio equipment</p> <p>2. Certificate EN62368 for Electrical Safety - Construction Review</p> <p>3. RF EN300328 Certificate for electromagnetic compatibility and radio spectrum matters, wideband transmission systems, data transmission equipment</p>	

euPOLIS partner – development	Standard/s	Technical Committees
	<p>operating in the 2.4 GHz ISM band and using wide band modulation techniques</p> <p>4. Health (SAR) Certificate EN62479 for the EUT operation that ensures the public is not exposed to radio frequency energy levels in excess of the relative provisions of EN62479</p> <p>5. Battery test (IEC62133) & 2012/19/EU WEEE Directive for charging, over-charging, forced discharge, external short-circuit, free fall</p> <p>6. RoHs 2.0 (Cd, Pb, Hg, CrVI, PBBs, PBDEs, DBP, BBP, DEHP, DIBP), referring to the restriction of the use of certain hazardous substances in electrical and electronic equipment</p> <p>7. FCC Part 15, Subpart C for Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz and digital transmission</p> <p>8. FCC Part 15, Subpart B for EMC tests for radio equipment</p> <p>9. CEC-400-2017-2010 Certificate for 24-hour charge energy/off mode/Battery discharge energy/Unit Energy Consumption</p> <p>10. US CA Prop 65 Certificate under Standard: US California Proposition 65 for specifications Pb, Pthalate</p> <p>11. UN38.3 Global Certificate for Li-Ion Battery Transportation Safety Testing Requirement</p> <p>12. MSDS Global Certificate for Material Safety Data Sheet (a document that contains information on the potential health effects of exposure and how to work safely with the material it is written about)</p> <p>13. Global Certificate for Identification and Classification Report for Air Transport of Goods (Standard: IATA DGR 61st, 2020) for Dangerous Goods or not restricted</p>	
<p>NTUA/RG – NBS preliminary selection tool</p>	<p>1. IUCN Global Standard for Nature-based Solutions</p>	<p>1. IUCN Nature-based Solutions Group; IUCN Commission on Ecosystem Management</p>
<p>PLEGMA – euPOLIS gateway</p>	<p>1. Recommendation ITU-T Y.4480 “Low power protocol for wide area wireless networks”</p> <p>2. CEPT Rec. 70-03</p> <p>3. EIA-232</p> <p>4. EIA-422/485</p> <p>5. RS-232</p> <p>6. RS-422/485</p>	<p>1. International Telecommunication Union (ITU)</p> <p>2. LoRa Alliance association</p> <p>3. IEEE Wireless Communications Technical Committee (WTC)</p> <p>4. Electronic Industries Association (EIA)</p>

euPOLIS partner – development	Standard/s	Technical Committees
<p>NTUA (UWMH Group) – Metabolism-based NBS Planning and Simulation Toolkit</p>	<ol style="list-style-type: none"> 1. European Commission (2012) Communication from the Commission to the European Parliament the Council the European Economic and Social Committee and the Committee of the Regions A Blueprint to Safeguard Europe’s Water Resources. COM (2012) 673 final, European Commission, Brussels, p 24 2. European Commission (2007) Communication from the Commission to the European Parliament and the Council on addressing the challenge of water scarcity and droughts in the European Union. COM (2007) 414 final, Brussels 3. ALCALDE SANZ, L. and GAWLIK, B., 2014. Water Reuse in Europe-Relevant guidelines, needs for and barriers to innovation, European Commission, Joint Research Centre 4. National legislations on Water Reuse 	<ol style="list-style-type: none"> 1. European Commission 2. Joint Research Centre (JRC) - EC
<p>FCEBG/ NTUA/ ISS/ ERCE/ RG/ ENPL/ ICL/ AMPHI/ CEE/GSH – euPOLIS Indicator-based Framework</p>	<ol style="list-style-type: none"> 1. EC Indicator Handbook: European Commission, Directorate-General for Research and Innovation, Evaluating the impact of nature-based solutions: a handbook for practitioners, Publications Office of the European Union, 2021 https://data.europa.eu/doi/10.2777/244577 2. The City Blueprint Approach (van Leeuwen <i>et al</i>, 2012) (https://www.watershare.eu/tool/city-blueprint/) 3. ISO 37120 - Sustainable development of communities, Indicators for city services and quality of life. International Organization for Standardization, 2014. Sustainable development of communities: Indicators for city services and quality of life. ISO. 	<ol style="list-style-type: none"> 1. European Commission 2. KWR 3. European Innovation Partnerships (EIP) 4. ISO/TC 268, Sustainable development of communities.

8.1 Standards relevant to the in-situ sensors

To assist the urban planning and design process as well as investigate the performance of NBS, in-situ sensor networks will be used to monitor the microclimate, air pollution, air temperature, humidity, water pollution, soil moisture and other indicators in the euPOLIS FR cities demonstration sites. A detailed description of the technical specifications of the euPOLIS customised gateway solution is provided in D5.1 “Technical Specifications of euPOLIS modules”, while the actual solution that is developed is described in D5.5 “Networking Solutions”.

The in-situ monitoring system utilises wireless and wired protocols to collect data, pre-processing, and transfer the processed data to the Data Management System (DMS). The euPOLIS gateway is designed to support a spectrum of network protocols, to accommodate the specific needs at each demonstration site. The supported network protocols include (a) wireless or wide-range protocols (such as LoRaWAN), and (b) wired protocols (such as Modbus).



Regarding the protection of monitoring system hardware against deterioration or malfunction due to water or dust, all equipment enclosures should comply with the International Standard IEC60529 (2013) and have a rating of at least IP54 if placed in outdoor locations without any other protection (e.g., shed).

9 Liaison activities with relevant organisations

As mentioned in the euPOLIS GA, the partners of the consortium have links with standardisation working groups related, among others, to the sensors, communication and monitoring fields. These connections will be exploited and strengthened throughout the project duration whereas the efforts will be further intensified in the final project year, when the euPOLIS outcomes will be at a more matured state.

euPOLIS also liaises with the consortia of other European Research funded projects, via exchanging ideas, sharing know-how and best practices as well as organising joint dissemination actions. Table 8 provides a list of indicative clustering projects along with more details about them. A more exhaustive list of potentially clustering projects is provided in deliverable D9.15 "Common Action Plan on Clustering Activities" along with the euPOLIS strategy on clustering activities. Up until now, the euPOLIS project coordinator and project manager have taken a series of actions (e.g., participation in online meetings, participation and presentation in project Kick-off meetings, participation in clustering events organized by the EC) to get in contact with the coordinators and the consortia of the VARCITIES, GoGREEN ROUTES and IN-HABIT cluster projects.

Participation in workshops/exhibitions/webinars/training events provides another liaison possibility. One such action was for instance the participation of the euPOLIS experts in the 12th edition of the Mikser Festival that was held in May 2021 in Serbia. In this event, the euPOLIS partners (from ICL, Biopolus and the Vertical Farm Institute) were clustered through their participation in two panels (namely "Blue Gold – the Revitalization of Urban Streams" and "Human Cities – Improving the Quality of Life in Urban Areas") with the partners of two sister Horizon 2020 projects, these being the HEART and the CLEVER Cities (see Table 8). The first panel ("Blue Gold - the Revitalization of Urban Streams") tackled the systems of urban streams and their interaction with urban green infrastructure. The second panel ("Human Cities - Improving the Quality of Life in Urban Areas") was focused on the perspectives in the public dialogue on planning more sustainable, healthier, and happier cities and achieve synergy of a people-centered approach with significant environmental and economic benefits for all citizens. Another example is the participation of two euPOLIS technical partners (i.e., BioAssist and GSH) in the 85th Thessaloniki International Fair (in September 2021) in which they presented among others, their latest euPOLIS developments as well as demonstrated their expertise in the field. Through this event, the aforementioned technical partners got in touch and promoted their technical solutions to a number of scientists, experts, and decision-makers (e.g., the Greek Secretary-General for Research and Innovation). Table 9 summarises some business-oriented events in which the euPOLIS partners participated to promote the euPOLIS developments, solutions, and concepts.

Table 8. Indicative list of potentially clustering projects

Project acronym	Full project title	Website
HEART	Healthier Cities through Blue-Green Regenerative Technologies	https://www.heart-project.eu/
CLEVER Cities	Co-designing Locally tailored Ecological solutions for Value added, socially inclusive Regeneration in Cities	https://clevercities.eu/
IN-HABIT	INclusive Health And wellBeing In small and medium size ciTies	https://www.inhabit-h2020.eu/
GoGREEN ROUTES	GO GREEN: Resilient Optimal Urban natural, Technological and Environmental Solutions	https://gogreenroutes.eu/



VARCITIES	Visionary Nature-based Actions for Health, Well-being and Resilience in Cities	https://www.varcities.eu/
INTERLACE	INTERLACE is a project to strengthen urban ecosystem restoration in the European Union and Latin America	https://interlace-project.eu/
CONEXUS	Nature-Based Solutions (NBS) for restoration and rehabilitation of urban ecosystems	https://www.conexusnbs.com/
INTERLACE	International Cooperation to Restore and Connect Urban Environments in Latin America and Europe	https://interlace-project.eu/
Urban GREEN UP	URBAN GreenUP	https://www.urbangreenup.eu/

The euPOLIS partners are also constantly promoting and communicating the euPOLIS concept and developments in the scientific community/experts, via publishing/presenting the project findings in several peer-reviewed conferences/journals under the FAIR principles and the need to establish mutual synergies. Table 10 summarises such efforts, up until the submission date of this deliverable.

Table 9. Participation of the euPOLIS partners in workshops/exhibitions/webinars/training events

Event	Date	Partner/s participated	Link to the event
RISK-IN 2020	11/2020	RG	N/A
12 th Mikser Festival, Serbia	05/2021	ICL, Biopolus, Mikser	https://eupolis-project.eu/2021/06/08/eupolis-and-heart-experts-at-the-mikser-festival-2021/
85 th TIF, Greece	10/2021	BioAssist and GSH	https://eupolis-project.eu/2021/09/15/bioassist-and-geosystems-hellas-at-85th-tif/
Business Integrity Forum (10 th Round Table)	12/2021	RG	N/A
EU Green Week	06/2022	CDP Europe, ICL, NTUA, FCEBG	https://vimeo.com/716003489
15 th International Conference of Urban Drainage	10/2021	UNIANDES (CEE)	https://iwa-network.org/events/15th-international-conference-on-urban-drainage/
Healthy cities Webinar session 1	10/2021	UNIANDES (CEE) and ERU	http://www.eru.gov.co/es/noticias/grandes-aprendizajes-dejo-el-primer-webinar-del-proyecto-eupolis-ciudades-saludables-los
Healthy cities Webinar session 2	11/2021	UNIANDES (CEE) and ERU	https://www.facebook.com/watch/live/?ref=search&v=4695813467162825
Healthy cities Webinar session 3	01/2022	UNIANDES (CEE) and ERU	http://www.eru.gov.co/es/noticias/tercer-webinar-de-eupolis-ciudades-saludables-un-derecho-de-todos
Global Sciences Exchange Series	05/2022	UNIANDES (CEE)	https://www.youtube.com/watch?v=Cb2UP2LTd4U
39 th IAHR World Congress Granada, Spain. From Snow to Sea	06/2022	UNIANDES (CEE)	https://iahrworldcongress.org/

Table 10. Conference and journal publications

Title / Journal	Year	Partner/s participated	DOI or Link
Strategies for urban water development as a part of integrated Blue Green Solutions (BGS) under climate changes uncertainties	2021	ICL	https://milutinmilankovic.rs/
Machine Learning Tools to Assess the Impact of COVID-19 Civil Measures in Atmospheric Pollution, PETRA 2021: The 14 th Pervasive Technologies Related to Assistive Environments Conference	2021	NTUA	https://dl.acm.org/doi/10.1145/3453892.3461327
An Introduction to the euPOLIS Project, In book: Novelties in Intelligent Digital Systems	2021	NTUA, ICL, EnPlus, MIKS	https://ebooks.iospress.nl/doi/10.3233/FAIA210094
Assessing the Lockdown Effects on AirQuality during COVID-19 Era	2021	NTUA	https://arxiv.org/abs/2106.13750
La questione urbana per euPOLIS. NBS e BGS: nuove regole e nuove pratiche urbane per la biocity, Reticula online magazine	2021	City of Palermo	https://www.isprambiente.gov.it/it/pubblicazioni/periodici-tecnici/reticula/reticula-n-28-2021-numero-monografico
A SUDS Planning Decision Support Tool to Maximize Ecosystem Services/ Sustainability	2022	UNIANDES (CEE)	https://www.mdpi.com/2071-1050/14/8/4560
Nature-based solutions for Foster Sustainable Urban Development Special Issue/ Sustainability	2023	UNIANDES (CEE), ICL and FCEBG	https://www.mdpi.com/journal/sustainability/special_issues/Solutions_for_Sustainable_Development

10 Conclusions

This deliverable summarises in its first version, the European and International standardisation context that is pertinent to euPOLIS as well as the liaison activities undertaken up to this point. Several TCs and existing standards have been identified by the partners as being relevant to the euPOLIS project and its developments. The identification of the standards that are relevant to the existing (but further developed within euPOLIS) and new developments that the partners bring to the project is anticipated to further assist the communication with the pertinent standardisation groups.

Even though no direct standardisation actions are targeted during the euPOLIS lifespan, it is expected this process to:

- (a) assist in the alignment (compatibility and interoperability wise) of the euPOLIS research with broadly accepted state-of-the-art concepts;
- (b) promote the deployment of the project and foster the adoption of the proposed urban planning methodologies that explicitly account for PH&WB concerns and other social aspects;
- (c) set the basis for recognising which results could potentially be eligible for contributing to the development/revision of standards following the end of the project and offer them in an easily exploitable format;
- (d) enhance the dissemination and take-up of the research findings by means of monitoring the work of the pertinent standardisation committees and consequently direct the dissemination actions in the fields where certain standards or regulations are either under development or revision.

In the second version of this deliverable, the consortium partner will be asked to identify any new developments, the progress made on the already identified ones, any needs for new standards that are not yet in the list of the European and International standardisation committees and any needs for revising specific existing standards and regulations that are relevant to the euPOLIS identified developments.

11 References

- AFNOR (Association Française de Normalisation). The Economic Impact of Standardization – Technological Change, Standards and Long-Term Growth in France. AFNOR, Paris, 2009.
- Bozovic, R. Maksimovic C., Mijic A., Smith K.M., Suter I., van Reeuwijk M. Blue Green Solutions: A Systems Approach to Sustainable, Resilient and Cost-Efficient Urban Development, Climate-KIC, 2017.
- Berman, M., Orttung, R.W. Measuring process toward urban sustainability: Do global measures work in Arctic cities?, *Sustainability*, 12, 3708, 2020.
- Bøgh, S.E. (editor). A World Built on Standards – A Textbook for Higher Education, Danish Standards Foundation, 2015.
- CEBR. The Economic Contribution of Standards to the UK Economy. Centre for Economics and Business Research Ltd. BSI. 2015.
- CEN. CEN Compass - The world of European Standards, 2010.
- CDP. Cities questionnaires. <https://www.cdp.net/en/guidance/guidance-for-cities>. (last accessed June 2022).
- DIN (Deutsches Institut für Normung). The Economic Benefits of Standardisation. DIN German Institute of Standardisation, Berlin, 2000.
- DIN (Deutsches Institut für Normung). The Economic Benefits of Standardisation: An update of the study carried out by DIN in 2000, DIN German Institute of Standardisation, Berlin, 2011.
- euPOLIS D4.1. Report on the multidimensional set of indicators for the assessment of NBS impacts on PH and WB as well as social sustainability aspects of the local communities (Version 1), 2022.
- euPOLIS D4.2. Report on cultural, social, economic and environmental impacts of NBS, 2022.
- IEC60529 (International Electrotechnical Commission). Degrees of protection provided by enclosures (IP code), 2013.
- ISO/IEC Guide 2: Standardization and related activities–General vocabulary, 2004.
- ISO, ISO 37120: 2018. Sustainable cities and communities — Indicators for city services and quality of life, 2018.
- IUCN. IUCN Global standard for nature-based solutions: A user-friendly framework for the verification, design and scaling up of NbS, International Union for Conservation of Nature, Gland, Switzerland, 2020.
- Ping, W. A Brief History of Standards and Standardization Organizations: A Chinese Perspective, East–West Center, 2011.
- Seddon, S., Smith, A., Smith, P., Key, I., Chausson, A., Girardin, C., House, J., Srivastava, S., Turner, B. Getting the message right on nature-based solutions climate change, *Global Change Biology*, 27(8): 1518-1546, 2021. <https://doi.org/10.1111/gcb.15513>
- Somarakis, G., Stagakis, S., Chrysoulakis, N. (Eds.). ThinkNature Nature-Based Solutions Handbook. ThinkNature project funded by the EU Horizon 2020 research and innovation programme under grant agreement No. 730338. doi:10.26225/jerv-w202, 2019.
- van Leeuwen, C.J., Frijns, J., van Wezel, A., van de Ven, F.H. City blueprints: 24 indicators to assess the sustainability of the urban water cycle, *Water resources management*, 26(8): 2177-2197, 2012.