



The Building Passport Alignment Project

Empowering Sustainability Reporting in the Built Environment

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EXECUTIVE SUMMARY

The rise of mandatory sustainable finance reporting schemes designed to combat greenwashing ('Sustainable Finance Taxonomies') marks a positive transformation towards sustainability in financial markets. These taxonomies provide criteria for assessing the sustainability and circularity of real-estate investments and portfolios.

However, significant hurdles impede portfolio managers' effective reporting of buildings' sustainability performance. These challenges result in an increased information burden at the building level and are worsened by the proliferation of reporting standards focused on real estate, at both national and international levels.

The digital capture and transfer of building-level information offers a potential solution to this reporting challenge. Digital building passports, or logbooks, are designed to capture building-level information for stakeholders. However, building passports are typically created bottom-up for specific purposes and often specific jurisdictions, which means there is no certainty that the information needs of all stakeholders in the real-estate value chain will be met.

Our work aims to fix this disconnect by identifying and aligning the primary data points needed to meet the requirements of four major sustainability reporting schemes. By developing a data dictionary, or ontology, using this top-down approach we can provide building passport developers with a comprehensive set of building-level data points that can be captured to meet multiple reporting requirements.

Of interest to the entire real-estate ESG information value chain, this report explores our approach to developing this ontology, our vision to deliver seamless global ESG reporting for the built environment, and our plans to overcome foreseeable challenges.



SOLUTION OVERVIEW

Smoothing the flows of ESG information for the built environment

If society is to deliver on the goals of the Paris agreement and achieve the UN's Sustainable Development Goals (SDGs), the built environment sector must change to be more sustainable. However, the sector is notoriously resistant to change, driven by a high degree of fragmentation and misaligned incentives.¹ This makes market coordination and change for more sustainable outcomes incredibly difficult. In this light, the slow pace of the transition of our built environment sector to a more sustainable footing can be seen as a significant market failure.

Countries across the world are beginning to introduce top-down interventions to address this market failure. One common approach is the use of 'sustainable finance taxonomies'.² These taxonomies define for each reporting jurisdiction what constitutes a 'sustainable' investment. Once defined, such investments can be the subject of policies designed to accelerate the financing of sustainable outcomes. Investing companies need to evidence their sustainable investments and compliance by gathering information on their portfolios of financial and real assets. While this is a positive development, a report by the usability and data subgroup of the EU's Platform on Sustainable Finance (European Commission, 2022) highlights a series of ongoing challenges to the effective implementation of taxonomies as far as buildings are concerned: building data is often absent, incomplete, or of poor quality; where data does exist, lending institutions may be unable to access it cost-effectively. Furthermore, because finance is global, there can also be a mismatch between the regulatory requirements of the environment governing the building and that governing loans on the asset.

Much of the information needed for reporting already exists at the building level. In fact, those involved in the production, management and disposal of buildings are awash with data, and are faced with an over-supply of reporting requirements. To address the growing cost of information management and reporting, some organisations are promoting the use of digital building passports (Box 1) with which to capture, store, process and share that information.

Passports, however, are typically developed bottom-up, and are often single-use and proprietary. As a result, each building passport has its own data structures and scope, addressing its own objectives. These development silos create yet another layer of data fragmentation, further inhibiting the information flow from the building level. Moreover, as these passports are developed at and for the building level, there is no certainty that the data stored will support the information requirements of the financial and other

¹ <https://globalabc.org/resources/publications/building-passport-tool-capturing-and-managing-whole-life-data-and>

² This is the common name for these types of regulations, but regional variations in naming exist.



external stakeholder communities in jurisdictions beyond those in which the passport has been developed.

Box 1: What are building passports?

A building passport (sometimes also referred to as a digital building logbook or electronic building file) is simply a repository of digital building information. Passports can hold the information relating to a building's whole life cycle, its plot and location, its technical and functional characteristics, and its environmental, social and financial performance.

Passports manifest in many different contexts: as stores of material or performance data, for example, or as sources of information for building refurbishments.

In its fully digital realisation, the Building Passport can act as a single point of input, access, and visualisation of all the information associated with a building. It is a living document, containing a mix of traceable static 'as built' information and continuous dynamic record-keeping of performance data and information (Global ABC, 2021).

This information blockage is restricting the operation of regulatory measures seeking to increase the availability of sustainable finance to fund the necessary transition to a low-carbon, circular built environment.

As a result, investing companies won't be able to classify their real-estate investments as sustainable if the information captured doesn't allow them to evidence that performance, irrespective of the asset's actual performance.³ Ultimately this means that the investors won't be incentivised to invest to improve the sustainability performance of their asset base.

In short, if the information doesn't flow, neither will the money to fund our transition.

Box 2: Summary – What is the problem?

Significant investment and international coordination are crucial to reach the global aspirations for a sustainable and circular built environment.

Although regulations exist to drive finance towards appropriate building projects and assets, their effectiveness is limited by siloed and missing information at the building level.

The problem is made worse by the volume of mandatory and voluntary reporting schemes working towards similar ends. Developing sustainable and circular buildings therefore creates a significant reporting burden, increasing the transaction costs of compliance. In turn, this reduces the motivation to achieve sustainable outcomes already considered to be more expensive than business as usual.

³ <https://www.wbcsd.org/Pathways/Built-Environment/Resources/Finance-and-built-environment-primer-Accelerating-the-decarbonization-of-the-built-environment-through-finance-sector-engagement>



Our solution: develop passport requirements top-down

Our project is helping to unblock these information flows by defining a comprehensive and coordinated data ask at the building level that addresses the reporting needs of stakeholders across the real-estate information value chain: building owners, investors, agents, managers, designers, builders and occupants.

We are doing this by turning the problem upside down. Rather than starting from the bottom, structuring digital building passports around a single use, we are taking stakeholder reporting requirements as our starting point: a top-down approach to developing a sustainable buildings ontology (Box 3).

Our work began with a bold idea: that we could identify and structure a complete set of highly granular data points to satisfy the ESG/sustainability reporting requirements for real estate, globally. Our hypothesis was that as these schemes are all trying to achieve similar ends – a more sustainable built environment – the information that they are asking for is likely to be quite similar, especially when you get down to the granular level of data points, even if they use the information in different ways.

With support from the Circular Buildings Coalition, we have reviewed the materials-related reporting requirements for buildings under development in four well-used reporting schemes: [LEED](#), [BREEAM](#), the [EU Taxonomy](#) and the [Sustainable Finance Disclosure Regulations](#). By breaking these reporting schemes down into their individual data requirements, we have been able to understand and structure the concepts that are important to buildings' reporting related to materials. The review has then allowed us to identify, map and align the data points (instances of concepts) needed to answer the questions posed by the different reporting schemes. This has led to the creation of a comprehensive and parsimonious data ask for buildings to comply with any or all of these four reporting regimes (Figure 1).

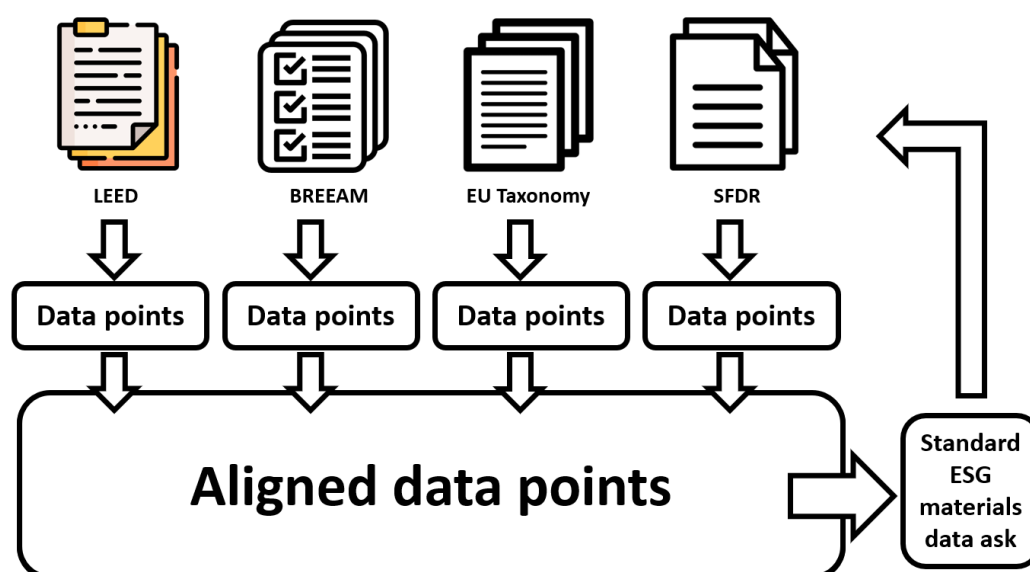


Figure 1 – Schematic of our approach to ontology/instance development



Box 3 – What’s an ontology?

In brief, an ontology is a model for describing a particular aspect of the world. Ontologies describe our knowledge of a field as a set of concepts and the relationships between them. For example, ‘type of asset’, ‘data point’ or ‘life-cycle stage’ are concepts relevant to reporting a building’s sustainable performance.

Once the concepts are defined, we can identify *instances* of each concept: the granular data points. For example, ‘office’, ‘hospital’ and ‘school’ represent instances or examples of the concept ‘type of asset’.

The development and use of ontologies in this way can help to create a common understanding of information, allowing different stakeholders to make better sense and use of their data. By structuring knowledge in this way, ontologies both create a sharable and reusable representation of that knowledge and support the discovery of new knowledge about the field.

Longer-term impact objectives

Our vision is to change the face of ESG reporting for the built environment globally, dramatically reducing the costs of reporting and delivering sustainable performance.

The development of a standardised and comprehensive data ontology/instances at the building level is the first step on the journey towards seamless ESG reporting for the built environment. The intended longer-term outcomes and impacts are explored below.

1. Visibility and consistency for building passport developers

The development of the ontology will provide a consistent and structured set of information requirements that are required from the building level to meet the sustainable reporting needs of the sector’s stakeholders. This provides developers of building passports with a converging development pathway, and a means to align their passports with a wider use case and, importantly, create interoperability at multiple reporting levels.

2. Reduced reporting costs for sustainable buildings

In achieving this, we aim to support the operationalisation of sustainable finance taxonomies around the world. Furthermore, by identifying and structuring the data points necessary to align with the existing reporting regimes, we can provide a framework for global policymakers to assess the usability of their sustainable finance taxonomy regulations. This has two outcomes:

- Policymakers can review the ontology and consider whether they are asking for new information beyond those of other reporting regimes. This will allow them to assess the relative costs and benefits of requiring those additional data points.
- The ontology provides an opportunity for each reporting jurisdiction to assess, data point by data point, whether there are any regulatory barriers to the



implementation of seamless ESG reporting for the built environment. For example, in Germany, Energy Performance Certificates (EPCs) are not available publicly, meaning that reporting requirements requiring EPCs are unlikely to be met. In the future, we expect the work of this programme to expand to cover this sort of country-level review.

By developing this ontology, we anticipate impact through a reduction in the information burden at the building level, freeing up resources for more value-added work, and reducing the costs of real-estate ESG reporting.

3. Improved coordination and alignment of sustainable finance policies

A meso-level comparison between sustainable finance taxonomies has already begun.⁴ This has highlighted significant differences between the taxonomies already published. However, our proposed focus on a micro or data-point level will permit a more granular comparison between sustainable finance taxonomies.

We anticipate that at this granular level of data points, these taxonomies will show a higher degree of coincidence than the meso-level category descriptions, highlighting similarities and differences between jurisdictions' reporting requirements. This is the power of ontological description. In turn, this enables a more fine-grained analysis of incremental reporting costs/benefits, and potentially the increased alignment of real-estate ESG policy.

Together these outcomes are expected to lead to impact through the simplification and standardisation of ESG reporting for the built environment, unblocking the information flows described above, and incentivising the flow of transition finance towards sustainable real estate.

Status of the solution

We began exploring the opportunity to develop a complete ontology for ESG reporting in the built environment in early 2023. This was followed by a trial review of the water reporting requirements for LEED, BREEAM, the EU Taxonomy and the Sustainable Finance Disclosure Regulations (Farghaly and Jones, 2023).

The funding from the Circular Buildings Coalition has given us the space to explore the material aspects of ESG and to develop a nascent community of practice.

The output from this phase of work is a structured and aligned set of data points for materials that could be used by building passport developers to shape the development of their solutions. This set of data points forms an input to the second stage of our work, testing and piloting, while providing a starting point for extending the coverage of our analysis (both planned for summer 2024) to other schemes. In time, we aim to extend the

⁴ https://finance.ec.europa.eu/system/files/2021-12/211104-ipsf-common-ground-taxonomy-instruction-report-2021_en.pdf



analysis to all reporting regimes and life-cycle stages, and each scheme's interpretation of sustainability.

FEASIBILITY ANALYSES

Conceptually this project is relatively straightforward: develop a standard materials-related ontology and ensure its adoption in the market by building-passport developers. This section outlines some of the feasibility challenges identified to achieving this goal, and how we have tried to address them in the development of our plans.

Methodology

To explore the feasibility of our project and aims, we hosted an inaugural workshop for our nascent community of practice in London on 17 November 2023. In convening the workshop, we were careful to involve the whole real-estate information value chain: from building passport developers through to investment managers, designers, insurers and standards setters. A complete list of the organisations represented at the workshop is included in Appendix 2.

The workshop was structured in a way that ensured that the participants had a common understanding of the problem, and the role that building passports could play in providing the solution. We then invited participants to explore the feasibility of our proposals under four headings: policy, economic, social and technical. The results of this review are presented in Appendix 3, and the key themes are discussed further below.

During the workshop we also gathered important data to guide the development of our work for the next stage of our project. This included questions to support:

- the development of the community of practice (who should be in the room?)
- the scope of our work (what key reporting requirements do they have?) and
- the strategic and policy responses they would like to see (do standards need to be harmonised?).

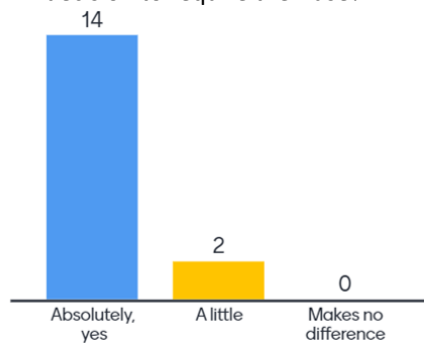
Results from these questions are reflected in our plans and proposals for the next stages of our work.

Findings

Overall, there was a broad consensus that the work we were proposing was a good idea, with interoperability and data transfer being highlighted as positive outcomes. Moreover, we saw that if building passports could address all users' reporting needs, there would be a significant take-up in their use (Figure 3). This provides an incentive for uptake of our project by building passport developers and a route to market for them. Interestingly, our attendees felt both that passports should be mapped to standards and that there should be a greater degree of harmonisation between reporting standards, confirming our impact objectives.



If a building passport could meet all of your ESG information needs, would this influence your decision to require their use?



How do we move forward?

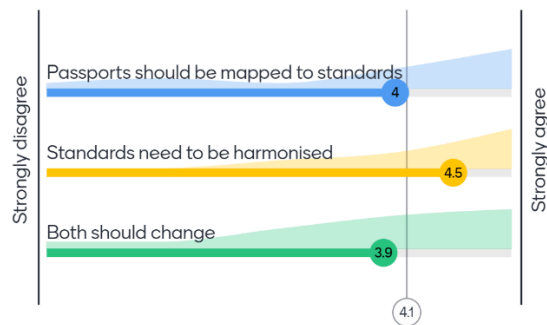


Figure 2 – Results from our workshop

The following feasibility themes emerged from the workshop relating to our proposals. We have included all the issues raised in the workshop discussion on feasibility in Appendix 3. Several of these issues were related to broader challenges to the delivery and promotion of a sustainable built environment and have therefore been excluded from the discussion below. We explain how we plan to mitigate these challenges in the next section.

Policy

The key policy challenge to feasibility in the policy context were:

- the variability in policies and reporting requirements around the world; and
- the emergent and highly dynamic nature of the ESG reporting context.

As ESG reporting is an emerging field, standards developers are developing reporting requirements (bottom-up) to meet their organisational, political, or aspirational needs, and undertaking analyses based on their local interpretation of the problem of sustainable building. Solutions in Singapore will differ from those in Sweden, for example. Additionally, as policies are implemented and interact with the real world, they can meet with unexpected usability challenges that limit reporting, requiring rapid clarification and change.⁵

These are key challenges for our project: data structures and specifications that don't have sufficient flexibility or coverage to adjust to local conditions will inevitably fail.

Social

From a social perspective, there were concerns that stakeholders may not wish to share data for commercial reasons. Furthermore, pre-existing challenges in accessing information from the supply chain could mean that information may not be available. While this is outside of the scope of this work, it represents a challenge for the longer-term

⁵ See, for example, the [EU Platform Report on Sustainable Finance Recommendations on Data and Usability](#).



delivery of our vision, and one with which we were already concerned. Addressing this challenge falls into the third phase of our programme, described below.

Economic

The key economic feasibility challenge lies in the scope of the ambition of our overarching programme of work. The task in front of us is significant and will require substantial funding. In the longer term, we hope to attract funding from research councils and/or the EU to advance our work. In the short term, however, we hope to attract second-phase funding from the Circular Buildings Coalition to enable us to increase the visibility of the project.

Technical

Much of the feedback focused on technical challenges. Discounting those comments that were beyond the scope of this work, we identified risks in three key areas:

- Definition and measurement: some of the information requests require similar-sounding information, but the boundaries of those requests may differ – for example, when discussing embodied carbon or other life-cycle impacts.
- Scope coverage: our work to date has focused on new commercial buildings. For full coverage, we need to ensure that the ontology covers the reporting needs of existing buildings and other building typologies.
- Qualitative and subjective information: the opportunity and ability to define clearly the scope and requirements of qualitative and subjective information is limited, restricting the comparability and portability of data.

Elsewhere, feasibility challenges relating to data availability and quality were highlighted. While these challenges are outside of the remit of our project, we believe that the definition of a detailed ontology for reporting will enable a closer focus on the data points that present a challenge. Questions around data quality are not being set aside; rather we are working closely with the British Standards Institution to identify opportunities to validate information.

Mitigation

The challenges related to measurement boundaries are addressed by our focus on the most granular levels of information.

One of the key drivers for this project was the observation that calculation boundaries are set by the reporting scheme and can have a significant influence on reporting outcomes. For example, different reporting schemes may allocate emissions against gross or net internal area, or the landlord-only part of the building. But ultimately, they are all trying to focus attention on the building's emissions. By identifying the most granular data points, our specification will support the reporting of all the various boundaries that the reporting schemes use (e.g. Gross Internal Area, Net Internal Area etc.). We can then be agnostic as to the calculations used in the reporting scheme.



We have a three-pronged approach to addressing many of the interlinking challenges and risks.

- We are developing the core ontology to accommodate data points from multiple sources. We achieve this by defining key concepts and instances thereof to satisfy the reporting requirements of four major reporting schemes. By beginning work using these well-used reporting schemes, we expect that this early ontology will cover a significant proportion of the data points needed to address the requirements of other reporting schemes.
- Our early work is directed towards creating a core ontology based on these four schemes. At the end of the next stage of our work (testing, piloting), we will publish a draft ontology and specification for comment. The draft specification will be made publicly available so that developers of other reporting schemes, standards or regulations can compare their data point requirements against the emergent standard.
- We plan for periodic updates to the standard specification to extend coverage to new reporting schemes and impact categories. To support this work, we are developing a global, engaged community of practice. We hope and expect that this community will see benefits in the project, and undertake these comparison exercises locally, supported by online tools. This will effectively lead to the crowdsourcing of the identification of unique or changing local reporting requirements, and the proposal of extensions to the standard specification to address them. Appropriate change control measures will be developed for the central specification.

We believe that our proposed use of expert crowdsourcing means that we can mitigate the key challenges around workload and scope. However, the testing and piloting of this work, and community engagement and development, still require funding. In the delivery of this first phase, we have identified several key organisations that have agreed to provide in-kind support to the project, but funding is still needed for a central burden of time, logistics and administration.

While the longer-term aspiration is to obtain funding from providers such as UK Research and Innovation (UKRI), the EU's Horizon Europe programme, the World Bank or the UN Environment Programme (UNEP), accessing such funding schemes will either take time, or will depend on the project having reached a reasonably advanced stage. We are therefore seeking additional funding through the Circular Buildings Coalition to deliver the second stage of our work. While the work may well proceed without this funding, our project timelines will need to be reviewed and probably extended.

Remaining challenges

The remaining unknowns relate to addressing the technical challenges of dealing with the differences in definitions and qualitative information.



Differences in definitions present the reporting community with challenges when information crosses country borders. Our approach to this project can address some of the definitional distinctions through increased granularity in the draft specification (what is included or excluded in net internal area, for example), but we cannot be certain that we can address all such differences in a meaningful way. Furthermore, accommodating these differences tends to increase the costs of gathering and reporting information at the building level. In the absence of an international agreement on definitions, we are limited in how much progress we can make in addressing the definitional challenges. However, one of the intended outcomes expected from this project is an increased focus on the differences between countries' reporting regimes for buildings and, in time, their harmonisation.

The challenges around qualitative information are not so much related to their capture – fields can readily be created to capture information – but to their intended uses. The process of data point alignment we are proposing is predicated on the information being requested being materially equivalent between reporting schemes. Our project will build on the work of EFRAG's collection of data points and their focus on primarily qualitative information to ensure that information is captured to address reporting needs across the value chain.⁶ However, the extent to which these can be aligned more generally is currently uncertain.

These feasibility challenges can be explored and resolved through the testing and piloting of our proposed ontologies. This is, therefore, the focus of technical work in the second stage of our project, which is discussed below.



⁶ <https://www.efrag.org/News/Public-471/Publication-of-the-3-Draft-EFRAG-ESRS-IG-documents-EFRAG-IG-1-to-3->



DIFFUSION

Ultimately this project is about developing a consensus around a standardised way of reporting ESG for the built environment. The two key enablers of diffusion are therefore:

- **The development and publication of a standard specification** around which building passport developers can develop their data structures to align with our selected reporting schemes.

To this end, our medium-term work plan involves the creation of a ‘Flex Standard’ for building passport data structures, with help and support from the British Standards Institution, which has agreed to work with us going forward. These standards provide a flexible way to develop consensus-based good practice that dynamically adapts to keep pace with fast-changing markets, such as ESG reporting (Castro and Jones, 2023) and digital twins.⁷ Although the specification is to be launched in the UK, it need not be country specific. Furthermore, the specification can act as a visible focal point and provide a route map for future international collaboration efforts towards the development of an ISO standard.

The publication of the draft specification of materials-related data points would be a key output from the second stage of our project.

- **The establishment of a global community of practice** through which to diffuse knowledge of our work.

Through this community of practice – coordinated in the first instance through a [LinkedIn group](#) – we aim to create a focal point for the building passport development community through which much of our work will be taken to market. However, this is not the limit of our proposed community: we hope to engage real-estate-focused standards developers, policy makers, information providers and users across the globe and the real-estate value chain to spread awareness of the opportunities that the standardisation of ESG reporting for real estate can bring. We hope that this community can act as a mediator between the worlds of buildings and finance to improve understanding of financial taxonomies and reporting. There will also be opportunities to foster the professional development of members, and the identification of networking and collaboration opportunities between members of the community who share similar interests and sustainable initiatives.

⁷ BSI Flex 260: v1.0 2022-01 Built environment – Digital twins overview and principles – Guide.



Timeline

To deliver on our vision of seamless reporting of buildings' ESG performance, we envisage a programme of work divided into three broad phases.

The first phase is the development of our first Flex Standard specification for materials reporting. This work has three stages:

- Stage A: Development of the baseline ontology, and the initiation of the community of practice. This has been the focus of this project.
- Stage B: Piloting and testing of that baseline materials ontology with interested information users and building-passport developers; extension of that data architecture to other reporting schemes; and the global extension of the community of practice. Stage B concludes with the publication of the draft ontology for materials. With funding in place, we anticipate that this will occur towards the end of Q3 2024.
- Stage C: During this stage, the team will continue to extend both the scope of the ontology and the community of practice, while working to develop the materials ontology for publication. This launch will mark the end of the first phase of the programme. With appropriate funding in place, we would hope that this could be launched in Q1 2025.

In the second phase of the programme, we intend to expand the scope of the specification to cover other aspects of sustainable buildings, including operational energy and indoor environmental quality, repeating the process undertaken for materials in the first phase. Each sub-stage within the second phase of the programme will culminate in the launch of a standard specification.

In the programme's third phase, we will begin to address issues around data transfer and availability. This work will involve our community of practice, policymakers and standard setters, as well as the open-data community.

Key actors

The key participants in the diffusion process are:

- Building-passport developers
- Standard setters
- Policy makers/influencers
- Information users

Project partners

Our emergent community of practice has representation from each of these groups, and we have received letters of support for Stage B of the first phase of our work from **Madaster** and **WSolve** (passport developers), the **British Standards Institution** (standards developers) and the **UN Environment Programme's Global Alliance for Buildings and**



Construction (GlobalABC), which has published a [report and guidelines](#) on building passports. **CBRE Investment Management** (information users) and **CAPSA** (passport developers) have also indicated that they wish to work with us on the second phase of the project.

Key actions for diffusion for Stage B of the first phase

- Launch the project website Q1 2024. This will supplement the LinkedIn group and facilitate community communication and information dissemination.
- Extend the community of practice geographically. To date, the work has been largely based in the UK and has some notable omissions. The second stage of this work would take our workshop to mainland Europe, the US and Australasia. We would identify and work with local connections to build consensus, develop interest in our work and extend the community of practice. We will engage with our current community and the CBC sponsors to identify suitable connections in these regions.
- Extend the scope of the ontology to include other reporting regimes, informed by our London workshop.
- Publish a draft materials ESG ontology for industry comment (end Q3, 2024).
- Define the pathway towards a Flex standard (Stage C).

Next steps

Having completed Stage A of the first phase, we are now ready – subject to funding – to embark on Stage B, in which the tasks will include:

- **piloting and testing the developed ontology** in collaboration with our community of practice and other interested parties, including building passport owners, information providers and information users, addressing the remaining feasibility challenges highlighted above.
- **extending the scope of our reporting regime coverage** to include the material requirements of GRESB, the EU Level(s) framework and the German Sustainable Building Council (DGNB). This will present an early test of the extent to which our four selected reporting schemes act as surrogates for the wider market.
- **developing and publishing a first draft of our core materials ontology** (specification) at the end of July alongside a document outlining our pathway to our first standardised ontology.
- **taking our message and project to a wider audience** over the coming months to engage other voices in the debate. We will also focus our attention on ensuring that those of the standards developers are included in future developments.

Naturally, the pace of programme development and execution is dependent on the resources available to us.

APPENDICES

1. Key background to the solution

Ontology development often happens within domains of knowledge in a bottom-up manner, with structures being inductively developed from the available data. In recent years, researchers have shown that there are up to five ways to develop ontologies (Holsapple and Joshi, 2002).

The process of ontology development adopted in our programme relies on each of these approaches, and as a result represents current best practice. We begin with a deductive (i.e. top-down) approach, followed by subsequent iterations of the ontology that use the inspirational, synthetic, collaborative and inductive approaches consecutively (illustrated in Figure 3 below).

The systematic use of each of the five approaches help to overcome the main challenges in the implementation of ontologies, such as missing concepts, expectation gaps, terminology conflicts and correspondences (Sileryte *et al.*, 2023).

In the first phase of our project, we are concentrating on the horizontal alignment between the standards and the certificates. Once that is complete, we will ensure the engagement of the passport developers to map/align their passports in accordance with the data points identified through our ontology.

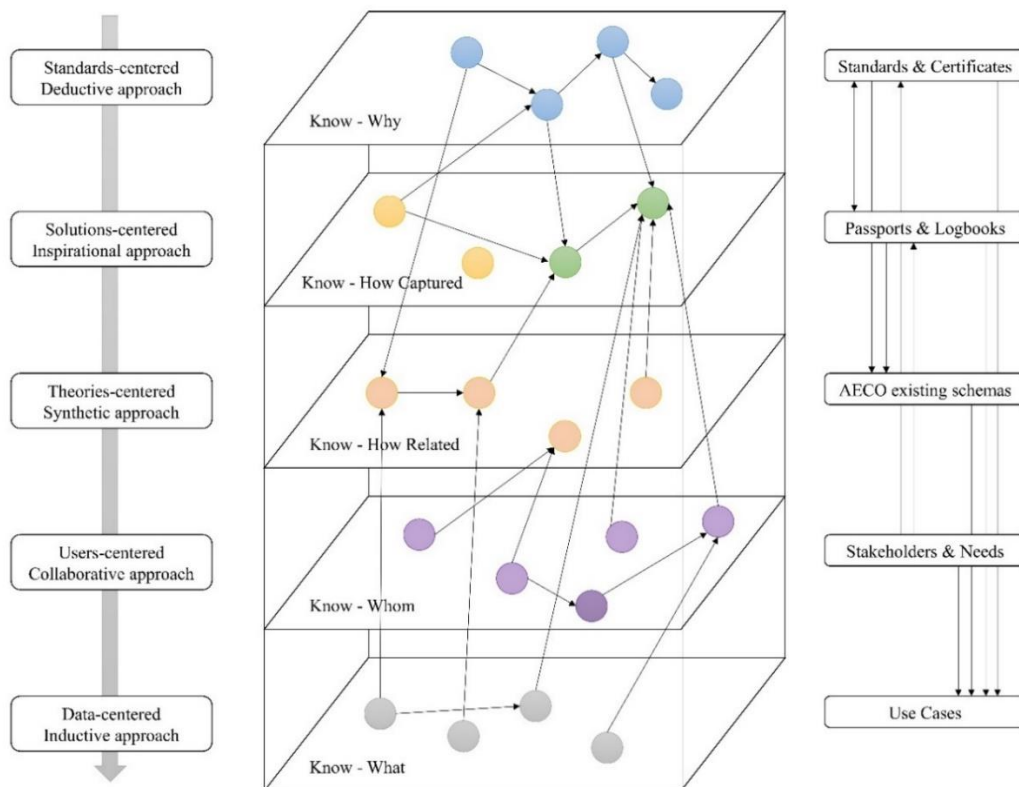


Figure 3: Conceptual model of ontology multi-approaches requirement-information connect (Farghaly and Jones, 2023).



For our solution, we have identified eight primary concepts: source, requirement, requirement description, building type, construction type, data point, information container and asset. We have also identified properties, which can be categorised into two primary types: object properties and datatype properties. Object properties serve the purpose of linking core ontology concepts, while datatype properties enrich these concepts with specific information. In the following tables, we present the entities and relationships of the developed ontology respectively.

Table 1: The eight main entities of the developed ontology

Entity	Description
Source	The entity describes the standard or certificate that includes the sustainability requirements
Requirement	The entity describes the requirement/clause in each source
Requirement Description	The entity identifies the different conditions in each requirement
Building Typology	The entity identifies the building type: residential, retail etc.
Building Status	The entity identifies the building status as existing building or new construction
Data point	The entity describes the required information to be provided to verify achieving the requirement
Information Container	The entity describes where the data point will be delivered
Asset	The entity describes the asset to which the identified data point relates. This could be a specific material, asset or the whole building

Table 2: The main object and data properties (relationships) of the developed ontology

Relationship	Property Type	Description
Referenced in	Object Property	Represents the relationship between different sources
Related to	Object Property	Represents the relationship between different requirements
Specifies	Object Property	Represents what each source and requirement is specifying
Applies to	Object Property	Represents what kind of building the requirement applies to
Defines	Object Property	Represents the relationship between the requirement description and the data point required to fulfil that requirement
Contains	Object Property	Represents the relationship between the information container and which data points it hosts
Required for	Object Property	Represents the asset for which the data points are required
Has name	Data Property	Shows the name of the entity
Has intent	Data Property	Shows the reason for the requirement
Has description	Data Property	Shows the description of the entity
Has unit	Data Property	Presents the unit of measurement for the data point



2. Organisations attending the BPAP workshop & nascent community of practice

We would like to thank our attendees from the following organisations for taking their time to contribute to our project.

Building Passport Alignment Project

17 November 2023, London

Attending organisations

Arup
BDO
British Standards Institution
CAPSA
CBRE Investment Management
Foster + Partners
Gallagher Insurance
Green Finance Institute
Mace
Madaster
Mott McDonald
Puma Property Finance
RICS
Climate Positive Europe Alliance
Troup Bywaters + Anders
UCL
UK Green Building Council
UNEP / GlobalABC





3. Feasibility challenges from our workshop

Table 3: Challenges in delivering the BPAP Project; responses from our workshop.

Economic challenges		Policy challenges	
Financing and investment	Lack of liquidity for sustainability. Private vs public investment and determining who bears the financial burden. Financial risks associated with sustainability initiatives. Lack of clear economic incentives for sustainable practices.	Short-term vs long-term focus	Balancing short-term needs and objectives with long-term sustainability benefits.
Data sharing and commercial considerations	Information retention cost across asset ownership changes and occupier transitions.	Policy vs strategy	Navigating the distinction between policy and strategy, and ensuring outcomes align with delivery.
Competitive advantage and valuation	Defining competitive advantage through sustainability initiatives. Valuation considerations, including cost of capital, rental uplift and regulatory/compliance risks.	Regulatory landscape	Managing the complexities of legislation, regulations, taxation and spending in sustainability policy.
Performance measurement and gap	Lack of actual performance data to assess the effectiveness of sustainability initiatives. Managing the performance gap in sustainability outcomes.	Policy consistency and updates	Dealing with changing policies, shifting regulations and evolving compliance requirements. Ensuring top-down regulations and mandatory reporting where needed.
Global variation in investment	Differences in sustainability investment between the UK and EU. Variations in the maturity of environmental aspects within the broader ESG framework.	Market variation Ambition and balance	Adapting to different markets with varying regulatory landscapes. Addressing regional differences in ESG policies, for example between the US, EU and UK. Striking the right balance between being too ambitious and not ambitious enough in sustainability goals.
Economic structure and integration	Addressing the current economic structure based on linear consumption and promoting circular economy principles. Integrating sustainability into commercial and financial aspects of business operations. Ensuring investment across the entire life cycle of assets, including a 'soft landing' approach.	Data management and clarity	Managing data security, ownership and sharing, especially in compliance with GDPR. Establishing clear standards, trust, measurement criteria and definitions in sustainability reporting. Ensuring comparability and common language in reporting.



Technical challenges		Social challenges	
Data management and standardisation	Required data for standard not being available. The data comes from many individuals. Different classification systems. No existing common framework related to the data structure and exchange. Data collection and quality. Access and collation of data. Inconsistency of calculations (EPC, SFDR, PED).	Stakeholder engagement	Engagement of stakeholders. Meeting diverse needs. Verification and agreement. Lack of awareness. Lack of collaboration. Stakeholders' reluctance to share data for commercial reasons.
Verification and certification	Continuous verification. Independent verification. Validation in relation to multiple life-cycle stages.	Supply-chain complexity	Supply-chain capability. Implementation challenges (including occupier vs supply chain).
Data ownership and sharing	Data loss, data access and data sharing – who owns that?	Qualitative vs quantitative data	Quantitative vs qualitative data. Qualitative focus.
Reporting guidelines and frameworks	Clear guideline for reporting. Clear standard guidelines and approaches to measure and report. Reporting templates/rule books/calculation methodology. Ensuring reported data and certifications are easy to understand.	Long-term impact and value	Social impact over time. ESG fatigue due to the volume of reporting requirements. Lack of value on the data. Holistic impact.
Data and requirement distinction	Clear distinction between existing buildings and new ones. Clear distinction between commercial vs social housing	Health, safety and wellbeing	Safety/health and wellbeing. Site-specific considerations (behaviours and users).
Professional training	Train professionals to use passports	Interpretation and bias	Interpretation of purpose and need. Bias (optimism, commercial and competence). Interpretation of guidance.
		Skills and capacity	Skills gap in implementing sustainable practices on the ground. Capability within companies, including SMEs, to adopt sustainability measures. Defining and developing skills and competencies for sustainable practices.
		Data sharing and commercial considerations	Information retention challenges across asset ownership changes and occupier transitions. Identifying who holds and manages critical sustainability information.



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