

How governments and non-government organisations can benefit from a new approach to construction data

A white paper by

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Introduction

What does it take to make greatness happen? To build something like the Pyramids of Egypt, to bring about the Industrial revolution, to enable Woman's suffrage, to put a man on the Moon and maybe one day on Mars? Some will say big ideas, others - bold leaders, but there's certainly one thing in common between all achievements of such grandeur – likeminded people joined together for common goals, through common beliefs. Throughout history, at least for the last 12000 years¹ whenever humans wanted to achieve something important, something great, something that affected all of them they would come together in tight organizations, working together sometimes for generations. Such groups of people have happened for many reasons resulting in many different configurations – guilds, clans, orders, societies, states. Some have disappeared, others have remained to this day. Some have focused on small or specific community problems, others have become huge, affecting multiple aspects of life. The huge ones that survive to this day concern every one of us, precisely because they affect us on an every-day basis, sometimes without even us realizing. Those organizations nowadays come in two major forms:

- 1) **Governments** – national, sub- or super-national legally recognized organizations that make and enforce laws;
- 2) **Non-government organizations** – national and international organizations of people with common humanitarian, professional or social goals.

Some modern corporations also affect many people, either as employee or by providing products and services, they also address societal challenges like climate change, or goals like colonizing Mars. However, we will intentionally exclude them from this paper, as they operate in a different environment – that of the free market. For them, not adapting, not adopting new technologies means decay, or at least others will take their place.

It is not the same for governments and non-government organizations, competition is not inherent to them so adaptation and adoption of technology is not as obvious or as easy to them, as for companies. At the same time, “decay” is not an option for them, often there is nothing to replace them besides chaos. That is why we focus on them – we would like to bring their attention to the tools they can use while navigating today's complex world.

While it was mentioned how wide the reach of governments and NGOs is, we will anyway focus on their involvement in the construction sector for two reasons: first, this is where our expertise lies, but second and most importantly, the construction industry is the backbone of our society. We live, work and play in and on products of that industry.

According to McKinsey Global Institute, construction related spending accounts for 13% of the global GDP, ranking it the second largest industry in the world after the financial services. It is estimated to employ 7% of the global population and is consistently ranked as one of the top industries in work-related fatalities. Buildings are estimated to represent

¹ https://en.wikipedia.org/wiki/G%C3%B6bekli_Tepe

45-50% of global energy consumption, 50% of global water consumption², 50% of climate change gas emissions, 40% of drinking water pollution.³

These numbers together show the significant social, environmental, and economic impact construction has, and hint that reducing those impacts will have far-reaching benefits for humanity. They also show the problems are huge and global, requiring the combined effort of many people, working towards a common goal. This is where governments and NGOs must step in, this is what they were meant to do – unite people and ideas and to unite people and ideas into a formidable force of change. Let us see what challenges do these entities recognise, how do they try to face them and finally, what can be done to help them.

Modern day challenges

We should start by looking at what governments and NGOs see as challenges. Sometimes this is straightforward, because they tend to tell us through mutual agreements, declarations and statements. Sometimes it's not that obvious, we need to look at specific events and the reactions governments and NGOs are forced to make.

While authorities communicate with regular people through official declarations and statements on all kinds of topics, we will focus on those, which have immediate effect on the construction industry.

UN 2030 Agenda for Sustainable Development



In September 2015, all 193 Member States of the United Nations adopted a plan for achieving a better future for all — laying out a path over the next 15 years to end extreme poverty, fight inequality and injustice, and protect our planet. At the heart of “Agenda 2030” are the 17 Sustainable Development Goals (SDGs) which clearly define the world we want — applying to all nations and leaving no one behind.⁴

The Sustainable Development Goals (SDGs), also known as the Global Goals, are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. Countries have committed to prioritize progress for those who're furthest

² Hawken, P., Lovins, E and Lovins, H, *Natural, Capitalism – Creating the next Industrial Revolution*, Little Brown and Co., 1999 369pp.)

³ Brown MT, Bardi E. *Handbook of energy evaluation. A compendium of data for energy computation issued in a series of folios. Folio #3: Energy of ecosystems.* Center for Environmental Policy, Environmental Engineering Sciences, University of Florida, Gainesville; 2001. Available at <http://www.emergysystems.org/folios.php>

⁴ <https://www.unglobalcompact.org/sdgs/about>

behind. The SDGs are designed to end poverty, hunger, AIDS, and discrimination against women and girls.⁵

Paris Climate Accord

One of the clearest statements was made back in 2016, by practically all governments on the planet – The Paris Climate Accord⁶, or the Paris agreement as it's more widely known. It is a legally binding international treaty, adopted by 196 national governments, with the long-term goal to keep the rise in mean global temperature to well below 2 °C above pre-industrial levels, and preferably limit the increase to 1.5 °C. Signing parties agree to develop a plan to reduce emissions, follow it through and report on it, all in order to reach net-zero global emissions in the second half of the 21st century. While there is still controversy, whether the Paris agreement is sufficiently binding, whether it is too ambitious or not enough. The key takeaway is one – all the world governments agree and state that climate change is a problem. A global problem that requires extensive and long-term effort. Over the 5 years the agreement has been in effect, we can see it being echoed and referenced by many governments and NGOs.



⁵ <https://www.undp.org/sustainable-development-goals>

⁶ <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

European Green Deal



One of the most notable recent examples is the actions taken by the European Commission, namely the European Green Deal.⁷ It recognizes the threat of climate change, pledges a tremendous financial support to combat it and spurs member states to take actions themselves. It additionally sets out actions split into 8 categories:

- Climate
- Environment and Oceans
- Energy
- Transport
- Agriculture
- Finance and Regional Development
- Industry
- Research and Innovation

The goal is to achieve no net emissions of greenhouse gases by 2050. As part of these actions numerous additional strategies and activities have branched out that affect different economic and social areas, one of these being the 2020 Circular Economy Action Plan⁸. The plan considers legislative and non-legislative measures along the entire life cycle of products and targets how they are designed, promotes circular economy processes, encourages sustainable consumption, aims to ensure that waste is prevented, and resources used are kept in the economy for as long as possible. Essentially, it should enable the Circular Economy across the EU, another key tool in the fight against climate change⁹.

⁷ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

⁸ https://ec.europa.eu/environment/strategy/circular-economy-action-plan_en

⁹ <https://unfccc.int/news/circular-economy-crucial-for-paris-climate-goals#:~:text=Circle%20Economy%20calculates%20that%2062,use%20of%20products%20and%20s%20ervices.>

Construction industry NGOs

European Construction Industry Federation



Construction industry NGOs have received the strong messages made by governments and have responded with statements on their own, signifying they agree on the issues of climate change. The European Construction Industry Federation (FIEC) – organization representing construction enterprises from 29 European countries – have taken a clear official position in support of fighting climate change by declaring focus on decarbonization of buildings, support of the ongoing EU legislation on the subject¹⁰, and of the 2020 Circular Economy Action Plan¹¹.

Construction Products Europe

We can see similar statements from Construction Products Europe. They are an international “super – association” with members from the national and European construction products associations, representing the interests of all European construction products



manufacturers, making them a key mediator between the EU institutions, societal stakeholders and the construction sector. The powerful entity that CPE represents published a position paper in 2016 on the Adaptation to climate change, where they state to promote the uptake of efficient construction solutions for buildings and infrastructures aimed at reducing emissions generated during the construction cycle in order to mitigate the climate threat¹². They highlight the need to consider current building and infrastructure design’s vulnerability to future changes in climate, the efficiency that can be brought through standardization, the need of proper risk assessment and strategy and the need for cooperation between construction, transport and energy sectors, all as tools in the actions to reduce climate change.

¹⁰ <https://www.fiec.eu/priorities/climate-change>

¹¹ https://www.fiec.eu/application/files/7415/9886/6187/2020-0701_FIEC_position_on_new_Circular_Economy_Action_Plan.pdf

¹² https://www.construction-products.eu/application/files/4415/2457/5443/20160518045726-Adaptation_climate_change_2016_03_15_Position_paper.pdf

Additionally, CPE has a declaration titled “Construction in the circular economy: Towards circular materials, products and buildings”¹³ where they highlight construction as one of the most important waste streams that needs to implement reusability of materials, hence transition towards circular economy. They go on to propose an expert platform be established within future construction initiatives like “Construction 2020”, on the guiding principles of:

- Multi-stakeholder participation by policy-makers, industry representatives and civil society organizations, to frame reflection and discussion within a wider circular economy setting
- Build upon existing activities and best-practices, e.g. focusing on circular economy and sustainable buildings, to strengthen and repeat what works well and to improve where it is needed
- Deepen policy objectives and mechanisms addressing sustainable building design including circularity aspects
- Continue to build a common sustainability approach for construction, identifying and addressing ‘sustainability focal points’ and elaborately taking into consideration that materials and buildings are diverse and thus need mechanisms adapted to their specificities
- Prioritize liability and performance related challenges as well as technical specifications of recycled materials and reused products
- Better understand how to support business opportunities and improve B2B communications so that there is stronger market uptake of recycled materials and reused products
- Develop a dissemination and exploitation strategy from the beginning to reach out to national, regional and local levels to better ensure changes on the ground

International Federation of Consulting Engineers

Another good example we can look at is FIDIC, the International Federation of Consulting Engineers. They are the global representative body for national associations of consulting engineers, also responsible for the FIDIC forms of contract for construction. They do not only show support for the Paris agreement but state their commitment to the cause¹⁴ by indicating the key role of the consulting engineers both as designers of buildings, infrastructure and industrial plants and as a role with the skills necessary to deliver sustainable solutions. According to FIDIC’s statement consulting engineers can provide the skills, expertise and services necessary for achieving sustainable buildings, plants and infrastructure. Simply put, they don’t just agree, they want to actively help.



International Federation of Consulting Engineers
The Global Voice of Consulting Engineers

¹³ https://www.construction-products.eu/application/files/3815/5894/2825/Declaration_Enabling_circular_Economy_2019.05.27.pdf

¹⁴ https://fidic.org/sites/default/files/FIDIC_Commitments_Achieving%20the%20Paris%20Agreement_2017_0.pdf

European Single Market

But the effects of climate change are not the only concern of authorities. Digitalization has been a talking point for a long time and in the last decade more governments have started to set this as a clear goal on a national or regional level. Take for example the European Commission's plan for a Digital Single Market¹⁵. The European Single Market has long been one of the hallmarks of EU, empowering the economies of all member states through free movement of goods, persons, and services. But digitalization should also enable individuals and businesses to seamlessly access and exercise online activities under conditions of fair competition. That will be accompanied by high level of consumer and personal data protection, irrespective of their nationality or place of residence. The Commission believes that the implementation of a Digital Single Market will provide European businesses with an immense competitive advantage and ensure Europe maintains its position as a world leader in the digital economy.

European Builders Confederation (EBC)

Given that 94.1% of the sector is made up by microenterprises, it is important to also look at the European Builders Confederation (EBC), representing national associations of construction SMEs and crafts. Digitalization, and BIM in particular, is widely recognized as a solution to the management of information during the whole life – cycle of a construction project, and for that, EBC makes sure that all their members get training and knowledge about all the latest trends and activities on the matter. EBC follows and contributes to the activities of CEN TC 442 on BIM since 2015. They also hold different webinars and workshops like “BIM-Speed National Training and Dissemination Workshops” in October 2021.

Construction craftsmen and SMEs take sustainability issues very seriously and continue their efforts to minimise and recycle waste at any stage. Therefore, EBC supports feasible initiatives on reused and recycled construction materials as well as initiatives of the European Union to improve waste management and demolition processes. EBC is also a strong advocate to further promote the social, economic and environmental benefits of sustainable buildings and to improve access and availability of public and private finances.

SMEunited

SMEunited is a recognised employers' organisation and European Social Partner and acts on behalf of crafts and SMEs in the European Social Dialogue and in discussions with the EU institutions. As a horizontal SME organisation, SMEunited deals with all policy areas relevant for a majority of crafts and SMEs by actively monitoring the EU legislative developments that have a direct or indirect impact on European small businesses.

SMEunited believes that digital transformation, which is a key enabling factor for SMEs to grow, needs to be coupled with sound digital principles. European digital principles should create the necessary confidence in businesses and citizens while navigating the digital environment. With that said, SMEunited does not just support the idea of digitizing the construction sector, but actively follows and comments all legislative developments on the matter.

SMEunited, in partnership with EBC, also tries to help their members to exchange and get a deep overview of the current opportunities and challenges SMEs are faced with when dealing with the sustainable construction and renovation of buildings. In a publication, they have provided some useful tips and recommendations for SMEs to embrace the green

¹⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0192&from=EN>

transition in three key sections: sustainable materials, end of life/waste management, and process/skills, alongside with a webinar on the matter.

Other EU initiatives

The EU's position on digitalization does not end with the single market. In February 2020 there was published another communication – “Shaping Europe's digital future”¹⁶ – that sets three objectives for the EU that ensure digital solutions work for the benefits of Europeans, respecting their values. Another clue to the high importance of digitalization can be seen in the Horizon Europe program – the EU's financial tool for boosting science and innovation. Of the total €53.5 bln. budget €15.35 bln. are allocated to the “Digital, Industry and Space” cluster, more than any other and comparable only to the “Climate, Energy and Mobility” cluster¹⁷.

National governments recognize the benefits of digitalization too, often connecting it to the ongoing effort for achieving “Industry 4.0” – the process of automating manufacturing and integrating it with the web through Internet of Things (IoT) technologies. Some good examples are the initiatives Industrie 4.0 in Germany¹⁸, Smart Industry in the Netherlands¹⁹, Industrie du Futur in France²⁰, with other nations following suit one by one.

As with the issue of climate change, non-governmental organisations also have their own positions in support of the wider digitalization and pursue of Industry 4.0. FIEC have gone to sign a manifesto²¹ stating that the wider digital transformation cannot be achieved without ensuring digitalization in the construction sector too. In this effort FIEC pledge the organization's full support, but also make three requests for help toward EU policymakers:

1. The EU to take the political lead on digital construction
2. An appropriate regulatory framework on data policy
3. EU budget focused on digital skills, R&D and deployment of IT infrastructure

The pledge also includes some other major construction associations that have also joined FIEC's manifesto:

1. Construction Products Europe
2. Royal Institution of Chartered Surveyors
3. European Insulation Manufacturers Association
4. International Facility Management Association
5. European Federation of Engineering Consultancy Associations (The European representative of FIDIC)
6. European Federation for Construction Chemicals
7. And other key European governmental and non-governmental organizations

¹⁶ https://ec.europa.eu/info/sites/default/files/communication-shaping-europes-digital-future-feb2020_en_4.pdf

¹⁷ https://ec.europa.eu/info/sites/default/files/research_and_innovation/strategy_on_research_and_innovation/presentations/horizon_europe/ec_rtd_he-investing-to-shape-our-future.pdf

¹⁸ <https://www.plattform-i40.de/PI40/Navigation/EN/Home/home.html>

¹⁹ <https://smartindustry.nl/>

²⁰ <http://www.industrie-dufutur.org/>

²¹ [https://www.fiec.eu/application/files/3515/7830/0780/2018-06-](https://www.fiec.eu/application/files/3515/7830/0780/2018-06-12https://www.fiec.eu/library/manifestos/joint-manifesto-digitalisation-construction-industry)

[12https://www.fiec.eu/library/manifestos/joint-manifesto-digitalisation-construction-industry](https://www.fiec.eu/library/manifestos/joint-manifesto-digitalisation-construction-industry)



This unified declaration shows a shared vision among the European construction industry, not only between businesses themselves (which the NGOs generally represent), but also between businesses and the public sector.

We can also understand governmental and NGO challenges by analysing their actions for the industry. We'll do that by examining two unfortunate events which lead to important follow-up reactions of the authorities.

The first one is the 2013 Zolitūde roof collapse in Riga, Latvia²², a disaster eventually ruled as a design flaw of a shopping center's roof support steel structure that resulted 54 fatalities and 41 non-fatal injuries. The accident, the deadliest one in Latvia for the past 70 years, triggered immediate technical, criminal and parliamentary investigations that gradually unveiled signature forgeries, work safety violations, gross negligence and disregard to design regulations, and finally lead to prison sentence of the structural engineer in early 2020. It also caused significant public outcry, protests and political fall-back that pushed then-prime minister Valdis Dombrovskis to resign. The previously mentioned parliamentary investigation declared the names of seven public servants, including the Prime Minister, that were considered morally and politically responsible for the accident. There was even some diplomatic tension between Latvia and Lithuania, two traditionally good neighbours, over official statements regarding the event.

Another unfortunate case is the 2017 fire of the Grenfell Tower residential block in London, England. Once again, the human tragedy was followed by immense public outcry due to both the causes and the authorities' response. As in Latvia, the Prime Minister Theresa May had to assume responsibility (although it didn't lead to her resignation) and multiple investigations and inquiries were launched. Second phase of those inquiries is still ongoing, but phase one indicated that while the immediate cause was an electrical failure, the contributing factor was the building cladding that cause the fire to spread rapidly through the exterior. The precise mechanism through which this occurred has convinced the UK government to commission an independent review of building regulations and fire safety, something that we'll talk about more in a bit, but across the country, local governments have started investigating other tower blocks for the same dangerous

²² https://en.wikipedia.org/wiki/Zolit%C5%ABde_shopping_centre_roof_collapse

claddings and considering their outright replacement. Two very recent cases – a fire in an apartment block July 2021 in Bergen, Norway²³ and another one in Milan, Italy²⁴ about a month later – show striking similarity to the Grenfell disaster showing that the problem is more widespread than thought. The public authorities in the two latter cases were also held up to scrutiny and were forced to react with decisive actions.

So what did we find out from these few examples of statements or reactions? We have outlined that the world governments are concerned that **climate change** is a complex challenge nobody can face alone. It was made clear that the problem can be solved through the implementation of sustainable development, reuse of resources, limitations of carbon emissions and only if we implement them globally. Governments also recognize the need to lift **digitalization** from the individual to a societal level. That this will make our businesses more efficient and competitive, our societies safer and that again, nobody can achieve this alone in isolation. We also saw that major **health & safety hazards** still are a threat even in advanced developed countries and that people rely on governments to prevent those. Failure to do so can have serious political consequence for the authorities. Finally, we saw that the construction industry, through the various NGOs representing it, agree on the need to act upon those challenges, are ready to support the efforts, but needs help from the public sector.

The usual approach...

Governments and NGOs are fairly limited in how they can react to challenges like the ones we described – they can develop regulations and implement them through policies. While not very direct or fast-moving, often considered inefficient, these tools can be very powerful. The goal usually is to set down restrictions and incentives that result in an environment in which businesses and individuals (or countries when regulations are international) produce the desired beneficial outcomes like safer buildings, decarbonisation or more sustainable processes.

Following up on the previous conclusion, we can observe several good examples of policies in place to resolve the problems of climate change, health & safety and digitalisation. We will do that without going in depth, just noting how are they important and what do they mean, especially for the construction sector. We'll also focus heavily on examples from the EU mainly because:

1. The EU's efforts are both wide-ranging and provide some good examples, focusing on the broader issues, not the specific national challenges
2. Information about them is easily accessible, available in all Member state languages
3. Its regulations and policies in practice become national ones, making them representatives for multiple countries

²³ <https://norwaytoday.info/news/photo-major-fire-engulfs-apartment-block-in-bergen-24-people-evacuated/>

²⁴ <https://www.theguardian.com/world/2021/aug/29/fire-rips-through-20-storey-residential-tower-block-in-milan>

European Climate Law

We will start with one of the more recent acts - Regulation (EU) 2021/1119²⁵, widely known as the European Climate Law. Where the EU Green Deal served as the announcement of the EU's priorities, the Climate Law is the action needed to be taken. The regulation takes the announced objective – net zero greenhouse gas emissions for EU countries by 2050 – and makes it a target, mandated by law. It provides measures for keeping track of Member States' (and overall) progress and adjusts their actions accordingly. All based on existing systems such as the governance process for national energy and climate plans, regular reports by the European Environment Agency and the latest scientific evidence on climate change and its impacts. National governments now mirror this effort too, whether they do it on their own initiative, under pressure from Regulation 2021/1119 to honour the Paris agreement or combinations of all three. France²⁶, Germany²⁷, Denmark²⁸ are several examples of the growing number of countries who have either adopted or amended their climate-related regulations over the last year.

Renovation Wave

The Renovation Wave²⁹ is another way to act upon the EU Green Deal. It is a policy also aimed at achieving the net zero emission by 2050 target by renovating Europe's buildings, claimed to contribute 40% of EU's energy consumption and 36% of greenhouse gas emissions. The Wave will ensure new energy performance standards, less legal barriers, more accessible funding for renovation projects, more green jobs and changed to adjacent regulations.

Health and Safety Regulations

The EU has a number of regulations devoted to safety to changes to related regulations. Some of the more relevant for the construction industry being **Regulations No. 305/2011**³⁰ and **No. 1907/2006**³¹, widely known respectively as the **Construction Products Regulation (CPR)** and the Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (**REACH Regulation**). REACH aims to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. That is achieved by mandating businesses to manage the risks from chemicals and to provide safety information on the substances for their clients. While its scope covers all practical applications, a building's and a construction product's lifecycles both involve significant use of chemicals and have a significant interface with humans. As result, REACH strongly affects the construction sector by pushing manufacturers, distributors and builders to manage dutifully safety information regarding chemical substances used in the process.

The **CPR** is an even more interesting example, "native" to the construction sector. It aims not just to ensure the safety of the end users, but also to provide a sustainable built

²⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1588581905912&uri=CELEX:52020PC0080>

²⁶ <https://www.vie-publique.fr/loi/278460-loi-22-aout-2021-climat-et-resilience-convention-citoyenne-climat>

²⁷ <https://www.gesetze-im-internet.de/ksg/BJNR251310019.html>

²⁸ <https://nyheder.tv2.dk/politik/2020-06-18-bredt-flertal-vedtager-at-mindske-udledning-med-70-procent>

²⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603122220757&uri=CELEX:52020DC0662>

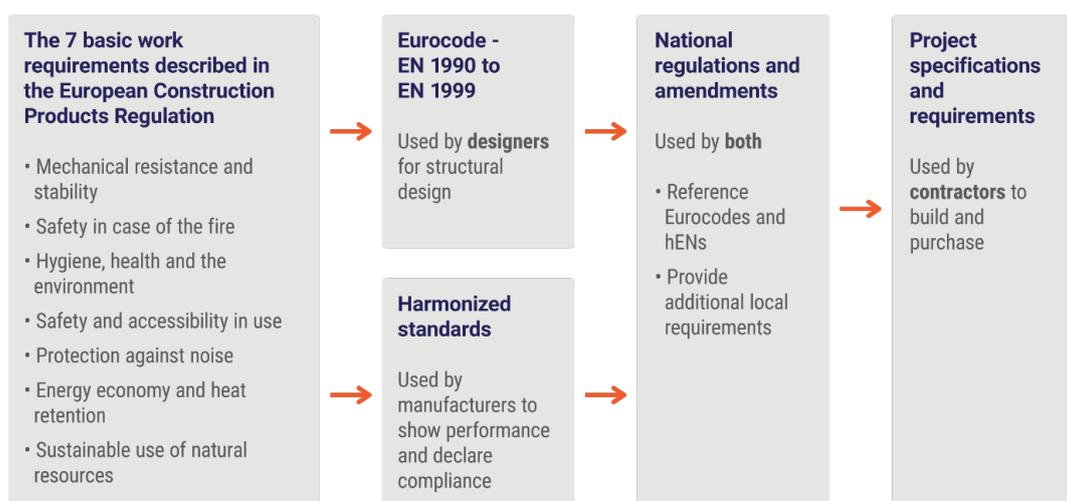
³⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R0305&from=EN>

³¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1907&from=EN>

environment and to protect the European Single Market. It does that by requiring construction products entering the Market to fulfil a set of basic work requirements, through standardized tests, and to declare the outcomes of those tests through a document called Declaration of performance. The standards describing the tests are developed by construction industry experts and are aimed to ensure the set of seven basic work requirements:

- Mechanical resistance and stability
- Safety in case of fire
- Hygiene, health and the environment
- Safety and accessibility in use
- Protection against noise
- Energy economy and heat retention
- Sustainable use of natural resources

The **CPR** and its work requirements are so deeply engrained in the legislations of Members states and the construction process, that many actors don't even realize how it affects every-day work on projects.



In essence, the **CPR** protects both the European consumers, providing them with safe and sustainable built environment, and the European manufacturers, ensuring they are not outcompeted through cheap low-quality products.

In a smooth transition toward the digitalization efforts its worth mentioning that all the regulations and policies we reviewed have to do with management of data and information – on product, on company on national level. It is no wonder then, that one of the more recent European mandates regarding digitalization is the **Data Governance act**³². The regulation is aimed at making more data available and enabling data sharing across sectors and EU countries in order to leverage the potential of data for the benefit

³² <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020PC0767&from=EN>

of European citizens and businesses, and is part of the Commission’s wider policy regarding data³³. The document provides four key areas of actions:

1. Mechanisms to facilitate the reuse of certain public sector data that cannot be made available as open data.
2. Measures to ensure that data intermediaries will function as trustworthy organisers of data sharing or pooling within the common European data spaces.
3. Measures to make it easier for citizens and businesses to make their data available for the benefit of society.
4. Measures to facilitate data sharing, in particular to make it possible for data to be used across sectors and borders.

The **Data governance act** itself provides a challenge for the construction industry. On one hand, both due to the regulations we mentioned above and its very nature, it is very information intensive sector. On the other, it is one of the least digitalized sectors³⁴, meaning this information (and its data) is trapped in traditional communication channels and information silos. And yet, as a sector it is stipulated to make the data available to citizens, businesses, and other sectors. The governmental and non-governmental authorities who will have to enforce the Act in practice will first face this problem, meaning they will have to look for new solutions.

Taking a step back, what we are seeing so far is **governments and NGOs identifying some complex societal challenges and trying to fight them the best way they know – through regulations and policies**. We also see that these challenges intersect and overlap. However, what is not evident is beneficial outcomes that are expected. Climate changes does not show signs of slowing down, accidents like the Grenfell tower fire keep happening, struggling digitalization is still a major talking point. This is not an argument



Extract of policies, initiatives and communications in the sphere of the EU Green Deal related to construction

³³ <https://digital-strategy.ec.europa.eu/en/policies/strategy-data>

³⁴ <https://www.mckinsey.com/business-functions/operations> Credit: Construction Products Europe, “Analysis of European initiatives related to the green, digital and resilient construction ecosystem”, 2021

against how good these regulations or policies are, but it is an acknowledgement that more can be done to help them, and the people behind them.

The issues with the usual approach

In order to figure out what would be the best way to help, we should examine what in principle are the difficulties policy and regulation makers face. A very useful material for that endeavour is "*Measuring Regulatory Performance: Evaluating the Impact of Regulation and Regulatory Policy*" by Cary Coglianese. There he claims that at its most basic level, a regulation or policy is designed to work according to three main steps:

1. *Regulation* is implemented, which leads to changes in
2. The *behaviour* of individuals or entities targeted or affected by regulation, which ultimately leads to changes in
3. *Outcomes*, such as amelioration in an underlying problem or other (hopefully positive) changes in conditions in the world.³⁵

What this means is that evaluating a regulation is actually evaluating the relationships between the three elements – regulation, behaviour, outcomes.

However, out in the field these relationships are extremely complex – multiple actors entitle exert different behaviours, desire different outcomes and even regard the same regulation differently. That complexity is additionally compounded by the existence of multiple regulations and policies that intersect, overlap or interfere each other.

Tracking the effects of a regulation or policy

This leads to the first issue - **tracking the effects of a regulation or policy**, both intended and unintended, particularly avoiding adverse ones. The Grenfell tower disaster once again provides an apt example. As previously noted, the investigations showed that the fire was greatly exacerbated by the external cladding, which enabled it to spread quickly through the building's exterior. However, deeper analyses³⁶ have shown that such dangerous cladding is actually present in thousands of buildings across the UK. This itself a result of changes in 2006 to building regulations intended to facilitate greater energy efficiency at lower cost, in effect making combustible cladding and insulation in buildings over 18m legal. After this became evident many building owners started removing the problematic claddings, resulting in huge public and private expenses. After all, a well-intended change of regulations resulted in human and financial losses a decade later, something that the policy makers definitely did not intend.

The cost of regulations is generally passed on to consumer in the form of higher prices.³⁷ Let's look at the European climate law and its objective – net zero greenhouse gas emissions for EU countries by 2050. Such an ambitious goal presses construction companies to quickly embrace new practices and processes to lower their carbon footprint impact. This requires them to put an extra effort gathering all the right and most accurate information to do so. However, practically such information is either missing or is too

³⁵ https://www.oecd.org/regreform/regulatory-policy/1_coglianese%20web.pdf

³⁶ https://en.wikipedia.org/wiki/United_Kingdom_cladding_crisis

³⁷ <https://www.americanactionforum.org/research/costs-benefits-using-regulation-achieve-climate-goals/#:~:text=Using%20regulation%20to%20achieve%2080,every%20person%20in%20the%20U.S.>

general and average, or is provided in a manner that requires further actions to refine and analyse it. While this objective will clearly benefit climate change and the better living environment for future generations, the cost burden that is imposed to companies that have to achieve it is too high.

Evaluating a regulation or policy

Some people may outline that these losses are acceptable, that climate change would ultimately result in much more losses, and that the 2006 changes were ultimately the right call. This connects to the second issue when – **evaluating a regulation or policy**. Does it work in alleviating the problem its addressing? Does it do it well enough? At what cost? Coglianesse, based on his three-step model, suggests evaluation can be done in three ways:

1. Regulatory administration or quantifying how much the regulation is enforced – how much inspections have the authorities made, how much penalties have been imposed. This shows only the effort spent in enforcing, not the overall effect
2. Behavior compliance or quantifying how much actors' behavior changed to be in line with the regulation. This shows the overall compliance to the regulation, but still not enough to determine the overall effect.
3. Outcome performance or quantifying actual results from the regulation. While Coglianesse sees merit in the other two methods, he considers outcome performance as the most thorough way to evaluate. The challenge with this one is to establish causality between the regulations and the actual outcomes.

Regardless of their advantages and disadvantages, the three approaches have one thing in common – they need the study of reliable data.

Overregulation – too many rules and requirements that do not complement each other beneficially

Moving away from Coglianesse's work, we can observe another issue with regulations and policies. It is hinted by one of the examples we already established – FIECs position paper on EC's Circular Economy Action Plan, more specifically the following: "*1. We welcome the commitment to ensure coherence between various relevant legislation. Our starting point here is that the Construction Products Regulation (CPR) should be the baseline in terms of relevant measures for products. Although we want to avoid duplicating legal requirements, we also recognise the CPR cannot include all regulatory measures. We therefore propose that, where this is the case, we need a streamlined legislative framework that minimises costs, confusion and the administrative burden on construction companies*". Reality is that enterprises, especially international ones are subjected to ever-growing number of regulations that attempt to "straighten out" their behaviour. This in turn reduces their efficiency and incurs further costs, all in attempt to keep up with all the different requirements. Very often this effect would "bleed" down to the end consumer, requiring of him to either pay higher prices so the supplier can overcome their compliance costs, or receive a lower quality service, because the supplier has stripped down their offering to avoid local regulations. We summarise this issue as **overregulation – too many rules and requirements that do not complement each other beneficially**. There are two main ways to overcome this:

1. Deregulation and relaxing requirements. This however has risks of unintended outcomes as we saw with the UK cladding case and the proper way to deregulate leads to the other two issues we established – determining and evaluating the effects of it. There is also the further issue that some governments simply cannot or will not dispense with certain mandates.
2. Harmonisation, i.e. making sure different regulations complement, or at least do not compound or interfere each other. While the effort in harmonizing regulations may be significant, EU and its Single Market represent great example of the benefits it can bring. Anyway, it must be noted that harmonization is also not immune to the effects of unintended outcomes.

Often regulations and policies experience other obstacles too – political gridlock, lack of understanding from the public, lack of expertise – but the remedies for these are as specific as the circumstance in which they arise, whereas the intent here is propose a common international approach. That is why we will conclude with the three issues we observed so far – **evaluating** regulations and policies, **tracking their effects**, and **overregulation**. We also must note that ultimately, the ones who are actually struck by these issues are government bodies and NGOs, as they are the actors responsible for their development and implementation.

Possible solutions for associations and governments

What is common between the regulation and policy issues? – the need of **data**. We would also add that it is confirmed by the actual regulations – they all rely heavily on **capturing data and making it available to whoever needs it for better decision making**. That is not a surprise, nowadays data is seen as the solution for everything, or as British mathematician Clive Humby put it “data is the new oil” – the world runs on it. Other people have further expanded his analogy nowadays to point out that just like oil, it needs to be refined, processed before it can be put to good use.. Let’s examine four concepts that can help governments and NGOs refine data and provide efficient and effective regulations.

Structuring data through data dictionaries

As mentioned above, data is not easy to make sense of straight away, it requires an underlying model that can make it understandable. Such model should classify the data in workable categories, it should show the logical relationships between them and should provide context for the relationships, as follows:

- A model has the categories *steel beams* and *structural elements*;
- The relationship between them states that a *steel beam* is a type of a *structural element*;
- The context is structural design according to the Eurocode design norms;
- This data model can help software assign data for real-world steel beam products to the virtual representations of structural elements in a building information model.

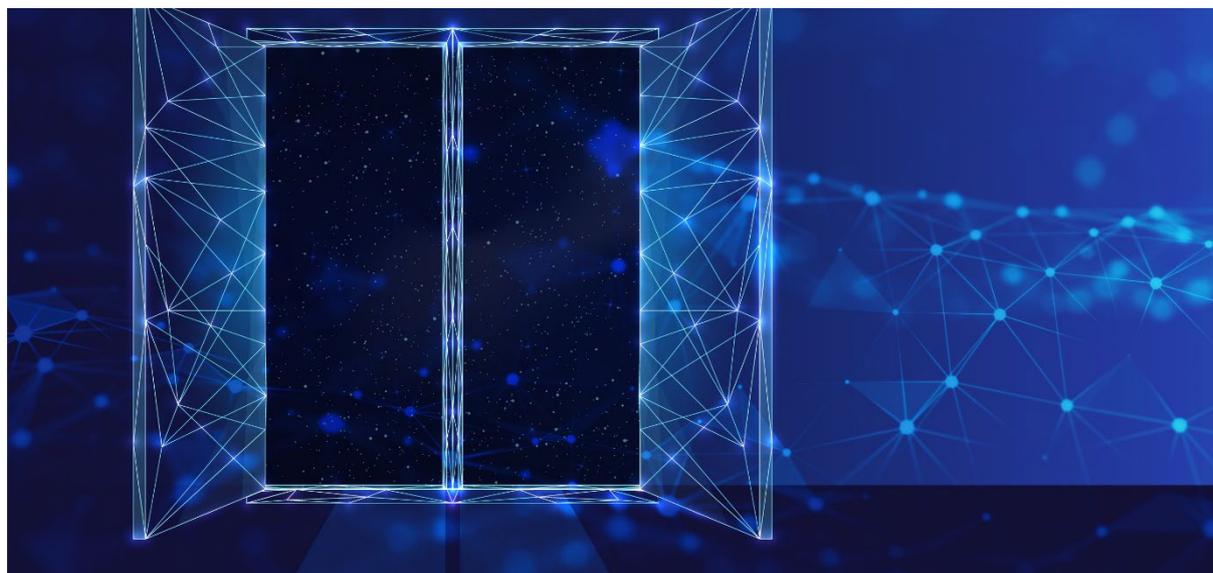
There can be many different categories, relationships and contexts, models can be very complex or quite simple. All of these are labelled in a human-understandable way in order to show how the datasets are interacting (e.g. steel beam, type of, structural element,

Eurocode). Solutions that enable such models are called **data dictionaries**. They are **repositories that enable differently built software to capture, validate and analyse the same raw data. Describing how data is structured through data dictionaries is the first step of refining it and extracting value of it.**

This is how we come to the issues we described before – determining and evaluating the effects of regulations and policies. As Coglianesi points out, both are managed through data-driven studies, simulations and research are key to their success is capturing and analysing the data properly, otherwise impossible without a good data model. Moreover, since regulations can cover many areas of human activity, many distinct categories, relationships, and contexts will be needed in practice. That is where data dictionaries with their structured, yet flexible data models come in play – describing what data needs to be captured, validated and analysed in order to determine and evaluate the outcomes of a regulation or policy.

Common data language

When talking about structured data models, we noted the need to label data categories with sensible human-understandable names – steel beam, window, radiator, fire rating, opening width, etc. However, that is not as straightforward as it seems. The point of having all those things in data dictionaries is to reuse them – between actors and between software products. That is both a more efficient way of working, but also provides for a consistent way to describe datasets throughout different scenarios. All this is achieved through very clear and concise names, complete with very clear and concise definitions:



Window - building element that is predominately used to provide natural light and fresh air

When a data dictionary is well maintained and widely used, another benefit for its users emerges – a **common data language**. That different people, regardless of their backgrounds, work processes or software tools, can describe data the same way. That on the other hand enables them to freely exchange this data without the risk of waste, errors, or misunderstandings. Essentially, they are talking in the same language in a digital environment. All this is key in achieving interoperability – if we can communicate efficiently, we can work together efficiently. That is why many industrial sectors looking to

achieve such an interoperability establish standards and mandates for the use of data dictionaries.

Advantages of a common data language

But let us return to our problem – **how can common data language support authorities and their regulatory efforts?** All three problems we explored – difficulty determining effects, difficulty determining efficiency and overregulation exist because of the complex interrelations between people, processes, businesses, and markets. Change of state in one of those result in changes in the others, which impart state on the first one, and so on. That can be observed in the smaller universe of the construction sector. Multiple actors with diverse backgrounds and goals work together on the same project. To simplify the world construction industry authorities (both governmental non-governmental) must start describing it through a common language, more precisely a common data language.

Establishing one as an industry-wide nomenclature for capturing and exchanging data will enable stakeholders to keep track of the information flows throughout the whole life cycle of a building and to notice the intricate dependencies between inputs and outputs. For example, we can track how data on material of the *thermal insulation* affects the data on *thermal transmittance* of the cladding, which in turn affects the data on *energy performance* of the building. Or we can track how the geometry of a concrete slab affects the carbon footprint of the building or its cost. All that is an enabler for better decision making, which on a project level results in better project management, and on a public level – in a better policy management. **The establishment of a common data language also works toward the issue of regulatory harmonization. Unifying the way computers and humans speak is the first step towards it and implementing it in the regulations themselves is the second.**

Data governance

The common data language however does not emerge purely by itself, well-coordinated effort is required to create, establish and maintain it. Credible experts must develop the content (terminology and relationships) in the data dictionary, and keep it up to date afterwards. Efficient caretakers must coordinate the multitude of users who will interpret the content and suggest changes to it, so to better reflect their needs. These conditions sum up to what is called data governance and ensure the common data language can provide the benefits we discussed above. A powerful authority must make sure to distribute the content and push the users to implement it. A disjointed community like the construction industry can hardly hope to fulfil these conditions so it falls to the centralized governments and NGOs to do so. They have necessary expertise, resources and authority to provide the efficient data governance required to establish an industry-wide way of describing data. Essentially, the practice of data governance does not provide benefits by itself, but it is a prerequisite to create a common data language and a common data structure.

Standardization

While we noted the unifying effect that structured data, common data language and data governance can bring to the construction industry, there is one more cog in this machine to make it all work. After all nothing is stopping every country or organization to set up their own data structures, nomenclatures, and governance processes, in fact it is actually happening. Some countries like Denmark are adopting existing structures like the IFC format, others like France or the UK are trying to create their own formats. If all those

structures, languages and processes don't have anything in common, all the benefits will go to waste. Yes, these governments and organizations will reap some benefits, but on the global stage they will remain separated islands, information silos. That will deprive us of a structured data management.

The means to avoid this already exists and has long been implemented – **standardization**. **That's the process of developing industry-approved documents i.e., standards, meant to provide rules, guidelines or characteristics for activities and their results. Standards are used in many fields to provide order, safety, compatibility, but most importantly interoperability - the capacity of a system to operate together with other systems, without any restrictions.** Interoperability is key so the examples above don't end up in isolated information silos, and the way it is achieved is through appropriate standards. Luckily for the construction sector, the experts in the European Committee for Standardization have foreseen the need of such documents and over the last few years have done excellent job in developing and publishing:

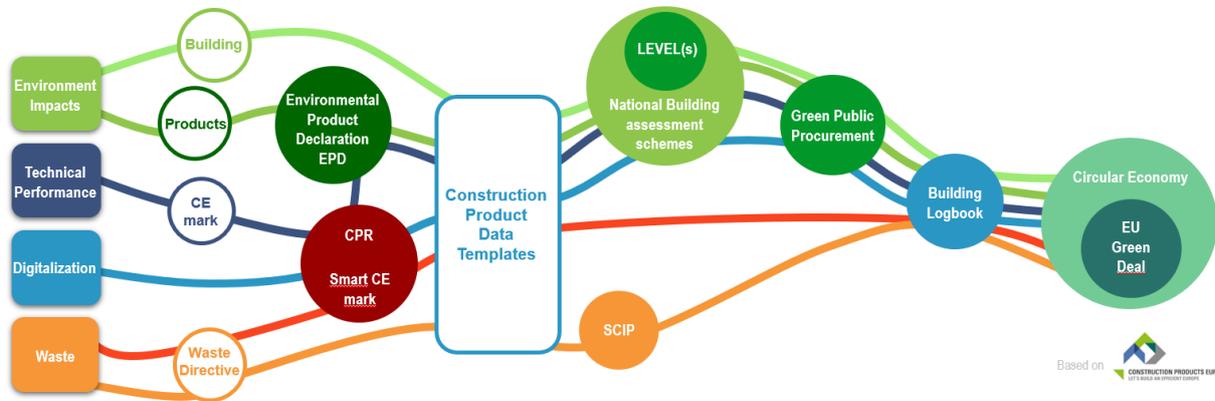
EN ISO 12006-3 Building construction — Organization of information about construction works — Part 3: Framework for object-oriented information - The standard specifies a language-independent information model which can be used for the development of data dictionaries used to provide information about construction works. It is an enabler of the common data language since it provides all users with common rules to “speak it.”

EN ISO 23386 Building information modelling and other digital processes used in construction — Methodology to describe, author and maintain properties in interconnected data dictionaries - This standard describes the rules for defining and a methodology for authoring and maintaining the content of a data dictionary. Practically, this adds up to a common governance process for all users, responsible for developing a common data language. Every new entry in a data dictionary is held up to the same scrutiny, all of them are equally well described. That happens by referencing actual relevant sources (ideally standards and *regulations*) and approval by domain experts, so that the content of the dictionary reflects the actual language used on projects.

EN ISO 23387 Building information modelling (BIM) — Data templates for construction objects used in the life cycle of built assets — Concepts and principles – This is the document that will enable the common structuring of data for construction sector through the so called data templates – structured representation of construction objects and their features. It leverages both above standards to provide data structures, based on the common language from a data dictionary, subjected to a rigorous governance process according to EN ISO 23386. That makes data templates digital human-understandable, machine-readable, interoperable representations of the very standards and regulations they were derived from.

EN ISO 22057 Sustainability in buildings and civil engineering works – Data templates for the use of environmental product declarations (EPDs) for construction products in building information modelling (BIM) – This standard practically enables EPD to be structured, governed, and digitally represented following all the three standards above. The ultimate goal of this document is to bring this type of data all along with any other like the technical characteristics of an object or its maintenance data. Thus, enabling the prediction of project's performance based on accurate manufacturer-specific environmental data which will set the basis for future benchmarks and policies.

CEN has developed other notable standards for BIM and digital construction that we urge readers to check out and learn about, but these three are what brings together the concept of describing everything through structured data.



Credit: Construction Products Europe, "Analysis of European initiatives related to the green, digital and resilient construction ecosystem", 2021

Growing Circle, Pedro Meda, Researcher at Construction Institute, Porto University, Faculty of Engineering

In conclusion

We are facing major global challenges, that we can only tackle together, through a common effort. This effort is channelled through both public and private organizations with ideal goals – governments and non-governmental organizations. Through them we have the power to establish regulations and policies that incentivize us to change for the better and overcome the challenges. These powerful tools have some limitations themselves, but luckily technology has provided us with means to support and improve them, we only must start using them. Structuring data will provide an unprecedented insight to the workings of the construction sector, that can be leveraged by researchers, analysis and policymakers for better processes, policies, and regulations. The common data language will ensure that all this data is commonly interpretable and will break down the silos between countries and disciplines. A robust data governance process will ensure that the structure and language always reflect the needs of the sector. And finally, the proper standards – EN ISO 12006-3, EN ISO 23386, EN ISO 23387 and EN ISO 22057 are the glue that sticks all this together into a unified digital representation of the who construction industry.

We firmly believe that structuring data for practical applications into data templates and establishing a common data language for a unified, transparent information flow is one of the best ways to support governments and NGOs in their policymaking efforts. This will lead us to better informed decisions and more efficient regulations that ensure a safer and sustainable life for everyone. My professional and academic experience, trying to digitize the construction process has convinced me this to be true for the construction sector, but I also believe that these means can be used in any field, in any industry.

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Stanislav works as a Digital Construction Researcher at Cobuilder International, where he deals with standardization, digital construction product data, and research of BIM trends and technologies. He's an expert at the Bulgarian Institute for Standardization, Bulgaria's standardization body and its representative in Technical Committee CEN / TC 442 "Building Information Modeling (BIM)". Stanislav is a graduated civil engineer and is currently pursuing a doctorate at the Department of "Organization and Economics of Construction" in UACEG Sofia. He is interested in innovative approaches for information management during design and construction.