Deep Renovation: shifting from exception to standard practice in EU policy?

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Abstract

The Renovation Wave, the strategy published by the European Commission at the end of 2020, sets the objective to at least double the annual energy renovation rate by 2030 and to foster *deep* energy renovations. But what are these? While the concept is high on the EU political agenda, clarity has long been missing in the legal framework, where no definition of Deep Renovation was provided before the 2021–2022 revision of the Energy Performance of Buildings Directive (EPBD). The absence of common understanding and lack of consensus of what deep renovation is and what it should deliver, has led to a mushrooming of concepts at national level, and to an EU policy ecosystem which is not fit to deliver on it, missing on energy savings to multiple other benefits for individuals and society. The current annual deep renovation rate only stands at 0.2 % on average in the EU. But to achieve the EU 2030 and 2050 climate targets, it should increase to 3 % by 2030. A paradigm shift on deep renovation is therefore essential. This paper investigates existing conceptualisations of deep renovation, and deep dives on ways to define it, based on an overview of national examples, from which best practices and key parameters are extracted. While the concept is multidimensional, defining it should be guided by the overarching objective of achieving climate neutrality by 2050, setting a path for every building to be climate proof, while addressing affordability aspects. The paper suggests both a definition and delivery approach to deep renovation. At the same time, it considers the EPBD recast proposal from the European Commission, assesses the quality of the definition suggested and provides recommendations. But beyond giving an EU-wide legal definition to the concept, it is crucial to shift the deep renovation paradigm and practice from an exception to the default approach, and to recalibrate the EU renovation ecosystem of policies. The paper explains why this change is so important if the EU is to reach its climate targets and address energy poverty. It considers the ongoing revision of the EPBD and the extent to which this shift towards deep renovation is triggered.

Introduction

Increasing the building stock renovation ambition, both in terms of rate and depth, is crucial for the EU to achieve its 2030 climate target as well as climate neutrality by 2050. According to earlier research by BPIE, if the EU is to achieve its 2030 economy-wide target of reducing greenhouse gas emissions by at least 55 %, it must rapidly multiply its annual rate of deep renovations by a factor of fifteen, from an estimated 0.2 % today to roughly 3 %.The modelling in this earlier BPIE research defined deep renovations as achieving a reduction of primary energy consumption of 60 to 90 %.[1] Deep renovation is also a powerful tool in the fight against energy poverty and to improve the lives of vulnerable households. More widely, it has the potential to generate significant other benefits, besides energy savings, for individuals and society at large (lower energy bills, improved comfort, better health, increased resilience against disaster risks including seismic ones or fire safety).[2] Reduced vulnerability to price volatility of fossil fuels, a highly politi-

cal topic over the winter of 2021–2022, is also a key advantage of deep renovation.[3] But to reap all these benefits, and for the EU to reach its 2030 and 2050 climate targets in a socially just way, deep renovation rates need to drastically increase. This aspirational objective and the concept of deep renovation have been mentioned in many legislative and policy documents at EU level. For example, the Renovation Wave, a strategy from the European Commission, aims to foster deep renovation besides doubling the annual EU renovation rate.[4] Finally, the 2021 recast proposal for the Energy Performance of Buildings Directive (EPBD) introduced a welcomed legal definition at EU level for deep renovation. Until this EPBD recast proposal, the absence of an EU-wide definition led policymakers and construction professionals to develop a diverse range of national conceptualisations, certifications and labels indicating the depth of a renovation, which might be one of the explanations for the lack of progress and the low energy renovation activity, both in terms of rate and depth. This paper aims at suggesting a way forward for what concerns this EU wide definition of deep renovation, as well as a delivery approach to it. First, it outlines the state of deep renovation in the EU, both in EU level legislation and with some national examples, to check whether some best practices could be extracted there. Second, it provides a suggestion for a definition and analyses to what extent the one included in the EPBD recast proposal is clear and ambitious enough, compared to climate targets. Third, the paper outlines how to make deep renovation common practice in the EU policymaking and gives recommendations on how to improve the EPBD recast proposal so that deep renovation is mainstreamed into the design of all policy measures, and that in the end, deep renovation is shifting from exception to standard practice in EU policy and on the ground.

Deep renovation status in the EU

LEGAL CLARITY MISSING FOR A LONG TIME IN THE EXISTING EU FRAMEWORK

Although the term 'deep renovation' is often referred to in policy documents like the Renovation Wave, or in EU policy debates around building decarbonisation policies, it does not yet have a fully adopted legally binding definition at EU level. In existing legislation, several other related concepts like 'major renovation' (EPBD) and 'substantial refurbishment' (Energy Efficiency Directive) occur.[5] These two definitions are however not meant to describe the depth of a renovation. With 'major renovation', for example, the focus is rather on the size – share of a building that is renovated (in terms of surface affected) or the costs of the renovation (percentage of the total value of a property being renovated). There is no indication prescribing what kind of measures should be delivered, which energy performance level should be achieved, or how much energy demand should be reduced. However, Member States must ensure that when a building undergoes major renovation, then minimum energy performance requirements, set in accordance with cost-optimal levels, are applied – so 'major renovation' is a trigger to apply minimum requirements, but it does not define those requirements in its definition. An earlier Staff Working Document from the European Commission includes a concrete reference to this aspect (quantification of the reduction of energy demand), stating that a deep renovation should typically achieve more than 60 % energy savings.[6] While this has been used as a proxy to define deep renovation at EU level for many years, this document is not binding, thereby reducing the take up of this definition of deep renovation into policy measures.

A MULTITUDE OF NATIONAL EXAMPLES AND CONCEPTUALISATIONS

In absence of a clear and legally binding definition at EU level for deep renovation, Member States have started to define it at a national level. A BPIE report summarised how different Member States defined deep renovation in their 2020 long-term renovation strategies (LTRS).[7]

Other Member States (Austria,[19] Netherlands[20]) mention deep renovation several times in their LTRS, but without providing a definition for it, while other countries refer to major renovations or renovation up to nearly zero energy building level (Greece).[21] This shows the variety of interpretations at national level in absence of a clear definition and guidance from the EU level. Besides the definitions included in some of the LTRS, multiple public and private high-performance renovation standards have been developed. Examples of such standards are the efficiency house standard (Germany), Passive House Standard (EU), BBC Effinergie label (France), Zero on the Meter (NOM – Netherlands), Net-Zero Carbon or Zero Carbon Ready labels (International Energy Agency). In terms of metrics and other parameters used to develop those definitions, most standards focus on primary energy consumption (kWh/m²/year). Some standards like Passivhouse include indicators for renewable and non-renewable primary energy demand, while others like the French BBC only uses total primary energy demand. There is also some degree of variety in terms of whether staged renovations are eligible for consideration as deep renovations (Passive House) or not. Another divide exists about whether integration of renewables is required (BBC,

Table 1. Summary of deep renovation definitions in some 2020 national LTRS.

Belgium - Flanders[8]	EPC A (100 kWh/m²/year)
Belgium - Wallonia[9]	75-100% primary energy savings
Czechia[10]	EPC A or B (<79 kWh/m²/year)[11]
Denmark[12]	60% primary energy savings
Estonia[13]	EPC C (<150 kWh/m²/year)[14]
France[15]	BBC Effinergie Label (80 kWh/m²/year) and 'rénovation performante' (= stepwise BBC renovation)
Luxembourg[16]	EPC A/A to B/B and primary energy savings averaging 72%
Spain[17]	At least 60% primary energy savings
Sweden[18]	Third level or 'total renovation' = at least 50% improvement of energy efficiency

NOM) or whether the focus is rather on reducing the primary energy consumption to very low levels (Passive House). While the variety of initiatives illustrate the different possibilities to define deep renovation, it illustrates even more how important it is to get it right at EU level. The definition, especially if made legally binding, can influence how policies and financing programmes are designed nationally and ultimately whether EU climate targets are met.

ANALYSIS AND ASSESSMENT OF THE DEEP RENOVATION DEFINITION PROVIDED BY THE EPBD RECAST PROPOSAL AND OF ITS MAINSTREAMING INTO POLICY DESIGN

The 2021 EPBD recast proposal introduces in Article 2(19) an official definition to deep renovation in EU legislation.[22]

- To be considered 'deep', a renovation must, until 2030, bring the building up to the nearly zero energy building (NZEB) standard. From 2030 onwards, a deep renovation is a renovation transforming a building into a zero-emission building (ZEB).
- A ZEB, equal to a building with an Energy Performance Certificate (EPC) class A, is also a new concept, defined in Article 2(2) as "*a building with a very high energy performance, where the very low amount of energy still required is fully covered by renewable energy, generated on-site, from a renewable energy community or from a district heating and cooling system*".
- The text also introduces in Article 2(20) a definition for staged deep renovation, "a deep renovation carried out in several steps, following the steps set out in a renovation passport".

The proposed changes relating to deep renovation in the EPBD can be analysed in two steps (the definition itself, and then its use in other provisions).

First, while the EPBD recast proposal introduces one definition for the ZEB concept, there may be two different set of values to be used for maximum primary energy consumption levels - one for new built and one for an existing building being renovated. The thresholds applying to new built are already included in the proposal (Annex III). The ones applying to existing buildings being renovated should be based on those in Annex III but could be adjusted in the future by the Commission through a Delegated Act (Article 7§3), entailing a high risk of inconsistency. Another issue of the proposed definition is that it does not consider the starting point of the building in terms of energy performance. A renovation bringing a building from B to A class would be labelled "deep", just as would be the renovation bringing a building from E to A class, while in terms of reduction of energy demand expressed in percentage of energy savings, those two renovations are not equivalent at all. While the introduction of a legally binding definition at EU level for deep renovation is welcome, several issues or inconsistencies exist around the way the concept is understood and conceptualised, therefore making it unclear. The definition can therefore not be deemed entirely satisfactory. This paper further explores in the next section suggestions on how to define deep renovation, based on the review of national examples and the assessment of the EPBD recast proposal.

Second, beyond issues linked to the definition itself, the proposal misses the potential to mainstream deep renovation into the architecture of the whole Directive. It is not acting as guiding principle reflected in the design of all policy measures. Rather, the EPBD recast seems to make use of the deep renovation definition only in relation to financing programmes (Article 15), using it as a threshold setter in an in/out approach, requiring Member States to "incentivise deep renovation and sizeable programmes that address a high number of buildings and result in an overall reduction of at least 30 % of primary energy demand".[23] This approach could result in the use of financing programmes for the deep renovation of a small number of buildings instead of a set of comprehensive deep renovation programmes targeting the majority of buildings. By following the Commission's proposal, most programmes could fund renovations only achieving at least 30 % energy savings, a level which is used in the Taxonomy Delegated Act[24]. Overall, deep renovation is still presented as one (exceptional) 'category' of renovation amongst others.

Changing this approach in the EPBD recast holds the potential to massively increase the impact of the Directive and its contribution towards the 2030 climate target. The following part of this paper aims at suggesting improvements to the definition itself, providing clarity about what can be considered a deep renovation. The paper then outlines recommendations on how to mainstream deep renovation into the design of financing and policy measures, so that it becomes standard practice and delivers impact on the ground towards achieving climate targets.

Deep renovation definition: suggestions for maximal climate and social value

A COMMON APPROACH AT EU LEVEL

A uniform definition and common approach towards deep renovation at EU level will create clarity to the building sector within and between Member States, and thereby contribute to achieving maximum social and climate benefits of deep renovation. As outlined before, the lack of legally binding definition at EU level so far, has led to a mushrooming of national conceptualisations and implementations, resulting to a varying degree of ambition. There is no doubt that the definition of deep renovation shall be introduced at EU level rather than leaving the national level understand the concept in many ways.

With the 2021 EPBD recast proposal, a short definition for deep renovation is introduced into EU legislation. However, it can be questioned whether this definition is an entirely a common one. As a matter of fact, until 2030, a renovation can be considered deep when it brings the building in line with NZEB standards. Contrary to the ZEB, which is less ambiguous and has specifications set at EU level, 'nearly zero energy building' is a term whose ambition is ultimately defined at national level. Therefore, a definition of deep renovation which indirectly links to a nationally defined concept, cannot be considered as an EU wide definition. Taking NZEB as a reference has however the advantage that it already exists at the national level and that is gives national authorities the ability to define it, thereby respecting the subsidiarity principle.

Its strengths however are directly linked to its weaknesses. The 2010 EPBD required Member States to ensure all new

buildings from 2021 onwards would fulfil the NZEB requirements and required Member States to provide a detailed description of what the NZEB-definition in practice entailed.[25] BPIE reviewed the NZEB definitions of all EU Member States and found significant differences in the quality of the information published, and whether Member States fulfilled EPBD requirements. What is more, there were large discrepancies between the performance requirements values that were published, both for residential and non-residential buildings.[26] Similar great variance was observed regarding how renewable energy was integrated in the definition. The conclusion of the review is that differences exist from information availability to definitions and metrics, from calculation methodologies to renewable energy integration, and overall ambition level of what a NZEB is. The implications of these findings are that the deep renovation definition until 2030 in fact consists of 27 deep renovation definitions with varying ambition, of which some are not compliant with benchmarks for primary energy set by the European Commission in 2016 for NZEB.[27] Besides, the NZEB standard has been developed for new buildings, and there is a high risk of inconsistency when applying it now to existing buildings being renovated. It can therefore be concluded that a uniform, tailored and ambitious deep renovation definition with a common implementation approach is still missing from EU legislation until 2030 at least.

A MULTIDIMENSIONAL DEFINITION FOR DEEP RENOVATION

Defining deep renovation is a complex technical, legal and social process which requires multiple parameters to be used. This however can be achieved through a multidimensional definition. Based on the overview of national examples, summarised above, and own analysis, BPIE extracted the essential and additional parameters that were deemed to be included in a deep renovation definition.[28]

A strong deep renovation definition combines both essential parameters including metrics (to set ambition levels) and quality indicators (to tailor the definition to specific segments of the building stock and their owners). Additional parameters can be used as useful complement to essential parameters and are especially relevant to ensure environmental, health and energy poverty alleviation benefits are achieved. This leads to the following suggested definition and delivery approach for deep renovation, according to BPIE expert view:

> Deep renovation is a process capturing, in one or, when not possible, a few steps (maximum number to be defined), the full potential of a building to reduce its energy demand, based on its typology and climatic zone. It achieves the highest possible energy savings and leads to a very high energy performance, with the remaining minimal energy needs fully covered by renewable energy. Deep renovation also delivers an optimal level of Indoor Environmental Quality to the building occupants.

In terms of delivery, deep renovation ensures the building is, at each step of the process, contributing its full potential to the achievement of the collective climate targets, and is on track to be climate-proofed, in line with climate neutrality by 2050. Deep renovation considers key building elements to cover, and when it cannot be completed in one step, carefully plans renovation steps – for example by using Renovation Passports, which outline the selection of energy-saving measures and renewable energy installations to be executed, avoiding any lock-in, and can possibly be linked to progressive financial support. Deep renovation should lean towards a minimal carbon footprint for both operational and embodied emissions.

It appears that the definition(s) for deep renovation included in the EPBD recast proposal include some of these suggested parameters, but not all of them. The metrics related to thresholds for maximum level of energy needs as well as the share of renewable energy supply, are indirectly included in the definition, both the one applicable until 2030 (renovation to NZEB level) and the one applicable after 2030 (renovation to ZEB level). One essential parameter, the reduction of primary energy consumption expressed in percentage of energy savings compared to benchmark, is not included or considered. This is an important missing element, as a subtle calibration exercise between the three essential metrics, especially between energy savings requirement and requirement based on maximum level of energy consumption, while complicated, is needed. According to earlier BPIE research,[29] it appears that the best option is to combine these two metrics (percentage of energy savings and maximum level of primary energy consumption) and use them simultaneously. The advantage is to give a more comprehensive picture of what a deep renovation is, the drawback being complexity. Based on calculations done by BPIE, this paper suggests as a way forward for specifying the criteria of energy demand reduction within the deep renovation definition as

Table 2. Essential and additional parameters (metrics and quality indicators) for a deep renovation definition.

	Essential parameters	Additional parameters
Metrics	• Reduction in primary energy consumption (expressed in percentage of energy savings compared to benchmark, usually pre-renovation level) • Thresholds for maximum level of energy needs (maximum level of primary energy consumption expressed in kWh/m²/year) • Share of renewable energy supply, on-site or nearby (expressed in percentage of total supply)	• Link with EPC ratings • Whole-life carbon ceiling (expressed in maximum kgCO2e/m²/year) • Indoor Environmental Quality (IEQ) metrics
Quality indicators	• Differentiated thresholds per building type and climatic zone • Compliance/alignment with long-term climate targets • Defined number of renovation steps • Link to Renovation Passports, notably for consideration of key building elements to cover • Link with (progressive) financial support	• Requirement to achieve measured metrics (beyond calculated) – focus on actual delivered performance

achieving at least 75 % energy savings, with the possibility to do less if the building achieves 80 kWh/m²/year (and then tighten over time the second requirement on maximum energy level).

A SUBTLE CALIBRATION EXERCISE ALSO BENEFITTING FROM USEFUL ADDITIONAL PARAMETERS

Besides, the definition of deep renovation benefits from the inclusion of some other parameters than the essential ones. In the EPBD recast proposal, none of the additional ones are featured as such in the definition of deep renovation, but some are referenced in other provisions, which also entails the risk of inconsistencies. The specific definition of staged deep renovation for example, "a deep renovation carried out in several steps, following the steps set out in a renovation passport", positively links to the renovation passport tool, but does not indicate that there should be a maximum number of steps for the renovation to be considered 'deep'. Some other additional parameters are completely missing, such as the inclusion of whole life carbon or indoor environmental quality considerations. For those two aspects, the EPBD recast proposal only includes requirements for new buildings, but not for existing buildings being (deeply) renovated. An ambitious multidimensional definition of deep renovations should however include these additional parameters. To achieve a fully decarbonised building stock, it will be essential to take whole life carbon into account. Whereas embodied emissions from deep renovations typically represent less than half of embodied emissions from new buildings, they are still a key aspect to consider. Moreover, integrating indoor environmental quality considerations including a healthy indoor environment and thermal comfort, two main drivers for building renovation,[30] would communicate to building owners how they will benefit from the deep renovation besides cost savings.

A DEFINITION GUIDED BY CLIMATE NEUTRALITY BY 2050

All in all, the guiding principle when setting the ambition level of the different parameters of the deep renovation definition should of course be the alignment with the 2050 climate neutrality objective. More importantly, the potential of every building towards being climate proof should be fully tapped, also considering the building typology and the climatic zone. In this paper, it is argued that deep renovation should achieve the highest possible energy savings for each building renovated, expressed in percentage of energy savings (range could be 60 to 90 %), with the possibility to do less only if the building reaches (after renovation) a maximum level of primary energy consumption expressed in kWh/m²/year (range could be 60 to 80). This is based on the facts that technically it is often feasible to achieve primary energy saving rates of 75 % or more, compared to the pre-renovation state of buildings.[31] According to an expert survey held in 2013 among 23 experts active in China, the EU, the USA, India, Latin America and South-East Asia, 90 % of respondents indicated that a deep renovation should at least achieve a final energy consumption level of 80 kWh/m2/year and 60 % of those experts estimated that a value between 15–60kWh/m2/year would be feasible.[32] As a disclaimer, it is important to note that due to the variety between national calculation methodologies for energy performance, significant differences can exist between the actual performance of buildings in different Member States even though they claim the same theoretical performance. Despite these inconsistencies, this expert assessment suggests that significant relative performance improvements (75 % primary energy savings) and low final energy consumption (60–80 kWh/m2/year maximum final energy consumption) are feasible. EU-wide harmonised calculation methodologies would greatly contribute to the comparison and benchmarking of energy performance and deep renovations, and there are ongoing efforts in that direction. In any case, determining the ambition level at which these two metrics (energy savings and renovation target in terms of energy performance) are set is key. The following table analyses in more detail possible combinations of requirements on both metrics and their impact on the total useful energy of the building stock at EU level.

According to BPIE calculations, based on data from Hotmaps, requiring every building to achieve, for example, 75 % of energy savings with the possibility to do less, as soon as it achieves 80 kWh/m²/year in useful energy (energy needs for heating) would reduce the overall useful energy in the entire stock by 36 %. By contrast, requiring every building to achieve 60 % of energy savings with the possibility to do less as soon as it achieves 60 kWh/m²/year of useful energy would reduce the overall useful energy in the entire stock by 45 %. The highest reduction in useful energy consumption at building stock level (-49 %) takes place if every building is required to achieve between 75–90 % energy savings, with the possibility to do less as soon as it achieves 60 kWh/m²/year.[33] As a disclaimer, energy levels in kWh/m²/year in Table 3 are expressed in useful energy (energy needs for heating), not in primary energy consumption. Primary energy consumption levels would be higher than the ones in useful energy, referred to in Table 3.

When it comes to the EPBD recast proposal, one critical aspect is that for the definition in place until 2030 (renovation

Table 3. Examples of possible impacts on total useful energy of building stock (EU) of different options.

Relative change in useful energy consumption at EU level for all buildings		Minimum renovation target (kWh/m²/year)				
		60	65	70	75	80
Relative reduction (% of energy savings)	60%	**-45%**	-42%	-40%	-38%	-35%
	65%	-47%	-44%	-41%	-39%	-36%
	70%	-48%	-45%	-42%	-39%	-36%
	75%	**-49%**	-46%	-42%	-39%	**-36%**
	80%	**-49%**	-46%	-42%	-39%	-36%
	85%	**-49%**	-46%	-42%	-39%	-36%
	90%	**-49%**	-46%	-42%	-39%	-36%

to NZEB), it cannot be assumed to be compliant with long term climate targets due to the variety and often too high levels in primary energy consumption allowed between Member States. Regarding the definition in place as of 2030 (renovation to ZEB), the alignment with climate neutrality by 2050 is unclear. This is because the thresholds for maximum primary energy use to be applied are not finally set: it is yet to be seen whether there will be the ones in Annex III or different, but it also remains to be investigated whether thresholds proposed in Annex III can be considered aligned with climate neutrality by 2050. The ambition level currently suggested in Annex III, if applicable to buildings undergoing renovation, would fit with the level of ambition proposed in this paper, as the requirements for residential equates to around 65 kWh/m²/year (with the exception of the Nordic climate zone allowed to go until 75 kWh/m²/year).[34]

Deep renovation: suggestions for making it common practice for all in the EU

While this paper discussed so far how to define deep renovation, highlighting key considerations for a clear definition at EU level, this section will make some suggestions on how to mainstream deep renovation thinking into the design of policy measures, and explain why not only an improved definition is important, but also that deep renovation has to become the 'compass for ambition' used to leverage all policy measures upwards in terms of climate and social ambition.

MAINSTREAMING DEEP RENOVATION INTO EU POLICYMAKING IS NEEDED TO REACH CLIMATE TARGETS

Deep renovation is the key driver of building decarbonisation towards 2030 and 2050. Reaching carbon neutrality in 2050 economy wide is only possible when the building sector is completely decarbonised. Other sectors cannot compensate for the emissions from buildings, and buildings are closely linked to decarbonisation of other sectors like electricity and heat generation. To fully decarbonise buildings, their energy consumption must be reduced significantly. This is illustrated by the fact that overall, 90 % of buildings existing today will probably still be standing in 2050 and around 85 % of the EU building stock was constructed before 2001, thereby not complying with todays' efficiency requirements.[35] Even some buildings constructed now under NZEB standard cannot be considered aligned with the ambition of climate neutrality. All these elements stress the need for deep renovation of the existing building stock. The Renovation Wave initiative from the European Commission designed to tackle this challenge aims at increasing the average EU renovation rate (no matter the level of energy savings achieved) to 2 % annually and at fostering deep renovations. A BPIE study shows that a 2 % average renovation rate is insufficient to achieve full decarbonisation by 2050 and stipulates the need for a deep renovation rate from 3 % annually by 2030, presuming that 70 % of all renovations after this year achieve 60–90 % energy savings.[36] These objectives contrast sharply with the reality on the ground, where there is a mere 0.2 % deep renovation rate between 2012–2016.[37] In other words, if we want the EU to have any chance to achieve its 2030 and 2050 climate targets, deep renovation needs to become the default renovation practice in the EU.

There are also specific benefits of one-step deep renovations compared to multi-steps deep renovations, or compared to shallow renovations whether one-off or multi-stages. One-step deep renovations immediately result in higher energy savings and additional social or health benefits, compared to staged renovations.[38] Moreover, one-step deep renovations reduce the risk of *lock-in effects*, whereby low efficiency measures block the implementation of high efficiency measures,[39] and possibly lead to missing the full energy savings potential of the building. Another consequence of staged deep renovations is that the cumulative energy and emission savings over time are also lower, even when the full energy saving potential of a building is realised. During the first years in which lower performing measures are implemented, the building consumes more energy, resulting in higher emissions over time compared to a one-stage deep renovation. Deep renovations also contribute to a reduction of the peak load of energy demand and foster integration of renewable energy, thereby improving grid flexibility and energy system decarbonisation.[40] Finally, an increased demand for deep renovations would also boost innovation and investment in the entire construction value chain and transform the sector due to more demand for specialists in deep renovation, installers and building information modelling (BIM) managers.[41]

MAINSTREAMING DEEP RENOVATION INTO EU POLICYMAKING IS DESIRABLE TO UNLOCK THE FULL POTENTIAL OF OTHER BENEFITS, ESPECIALLY TO ALLEVIATE ENERGY POVERTY

Deep renovation is also key to unlock a multitude of other economic and social benefits, beyond mere emissions reduction. In particular, deep renovations of hospitals, schools and offices, by significantly improving the indoor environmental quality (IEQ), have the potential to reduce the time of patients, boost the productivity of workers and increase school attendance of children. Better IEQ could boost employee productivity up to 12 %, equal to €500bn annually.[42] It also has the potential to reduce the amount of missed schooldays of students, which due to respiratory diseases currently miss 1.7 million schooldays annually across the EU.[43] Moreover, for every million euros invested in building renovation, 18 direct and indirect jobs can be created in the EU.[44]

But deep renovation is also key to alleviate energy poverty amongst vulnerable or low-income households, by significantly decreasing their expenditures on energy and lowering their exposure to price volatility.[45] This is particularly relevant in the context of increasing energy prices and (possible) future carbon taxation on heating fuels.[46] Deeply renovating the worst performing buildings occupied by low-and middle-income household would reduce their vulnerability to the volatility of energy prices, and would make the EU as a whole less dependent on external energy suppliers. The topic of energy poverty receives growing attention from national and EU policymakers. However, as the Energy Poverty Advisory Hub has shown, based on an analysis of the national energy and climates plans, more than half of the Member States still lack a clear definition of energy poverty and sufficient policy measures to address it. There is thus an interesting parallel between deep renovation and energy poverty, two concepts that have been lacking clear legally binding definitions at EU level and are in the process of getting one, and where insufficient progress on the ground has been observed.

Energy poverty alleviation actions put forward by national and local authorities, even if they start being addressed through energy efficiency policies, still do not include deep renovation as the main solution measure.[47] The EU ComAct project found that many energy poverty alleviation measures can be categorised as palliative measures, rather than preventive measures (under which deep renovation would fall). Moreover, the accessibility of existing energy efficiency measures is hampered by the fact that vulnerable households often do not have the means to finance up-front investments or are more risk averse to sign up for financial commitments in the form of loans.[48] Because deep renovation measures are key among preventive measures for energy poverty on the long-term, they deserve more attention and support from policymaking. When it comes to EPBD recast proposal, it should give a much stronger impulse to tackle energy poverty through more deep renovations specifically targeted at vulnerable households. In this context, public financial support ringfenced for those most in need, is necessary. The swift policy response to energy affordability problems during the COVID crisis has shown that quick state-action and collective solidarity is possible to tackle these issues.[49]

SHIFTING TO DEEP RENOVATION AS THE DEFAULT APPROACH IN ALL POLICYMAKING: FOCUS ON FINANCING

Introducing a definition at EU level for deep renovation is a necessary addition to the current regulatory framework but it only constitutes the first step towards a more substantial change in how building renovation policies are considered. Introducing a definition without thinking about wider implications for the renovation policy ecosystem risks introducing wording which would only act as a 'threshold setter' in an 'in/out' approach. This would mean that some renovations would fall under the deep renovation definition, while others would be exempt. Thinking along those lines would imply that some sort of conditionality would be applied, creating instances when deep renovations should be carried out versus cases when other types of renovations should prevail. This approach, which simply mirrors what is currently in place with the 'major renovation' definition serving as condition to apply minimum energy performance requirements, is inappropriate and not up to the climate and social challenges of the buildings sector.

This unfortunately is what is at risk with the EPBD recast proposal provisions linked to financing (Article 15). Member States are required to provide appropriate financing to energy renovations, making best use of existing EU funding sources, such as the Recovery and Resilience Facility, the Social Climate Fund, cohesion policy funds, the InvestEU programme, or ETS2 revenues, with a view to transforming existing buildings into ZEB by 2050 (i.e., deeply renovating them). It is however regrettable that allocations under those funding sources are not (sufficiently) ringfenced for building renovation, let alone not directed towards prioritising deep renovations, especially targeted at vulnerable or low-to-middle-income households. All these programmes and funds would have a much greater impact if they were more clearly tied to stronger deep renovation requirements. Without clearly setting for the financing programmes the overall objective of deeply renovating and fully decarbonising the building stock, there is a risk of a sub-optimal use of financial and advisory resources, preventing the EU to meet its 2030 and 2050 targets. Another example is that the EPBD recast proposal requires Member States to link their financial measures for energy performance improvements to the targeted or achieved energy savings, but there is no explicit requirement to always have a proportional link between the two (therefore not specifically supporting deep renovation). More importantly, financing for deep renovation seems to be presented as an exception, while Member States shall incentivize, through higher support, "sizeable programmes addressing a high number of buildings and resulting in an overall reduction of at least 30 % of primary energy demand".[50] The figure of 30 % might be linked to the one used in the Taxonomy Delegated Act setting a technical screening criteria to determine what investments, notably in building renovation, can be deemed sustainable. For existing buildings, a renovation which is a major one, triggering application of minimum energy performance requirements, is considered sustainable. Alternatively, achieving 30 % savings in primary energy demand within three years, can also be considered sustainable. However, in the EPBD recast proposal, there is neither a condition linked to a limited timeframe in which these energy savings must be delivered, nor a specification that for example, these 30 % savings constitute the first step of a staged deep renovation completed in accordance with the stages outlined in a renovation passport.

The absence of stringent provisions making deep renovation the default guiding approach in financing programmes is even more worrying, if compared to current activity levels and investment needs. Deep renovation in the EU still represents a tiny proportion of the number of energy renovations taking place every year in Europe. For example, between 2012 and 2016, it is estimated that more than €184bn was spent annually on energy renovations (on average for all renovation levels), with 57.8 % of these investments going to light renovations (3–30 % savings), 35.4 % to medium renovations (30–60 % savings) and only 6.8 % to deep renovations (more than 60 % savings).[51]This trend in investments and activities must be reversed if the EU wants to achieve its 2030 and 2050 climate targets. Much more should be invested each year in building renovation activities throughout Europe, and specifically, much more should be invested in deep renovations. According to BPIE calculations, the total renovation investment opportunity in the EU is estimated at €243bn per year to bring the building stock in line with climate-neutrality by 2050. This €243bn per year should only fund medium and deep renovations.[52] If this is compared to the €77.6bn spent annually between 2012 and 2016 on medium and deep renovations, it means we have an investment gap of €165.4bn per year.

SHIFTING TO DEEP RENOVATION AS THE DEFAULT APPROACH IN ALL POLICYMAKING: POLICY RECOMMENDATIONS

To turn the definition into action, deep renovation should be considered the default approach, not only when designing financing programmes but also policies and measures, and any deviation from it should be duly justified. Deep renovation should evolve from a niche exception to mainstream excellence which everybody deserves. The following policy recommendations, focusing on the framework for Minimum Energy Performance Standards (MEPS), outline a pathway on how to make deep renovation available for all.

The EPBD recast proposal introduces MEPS by requiring Member States to ensure that buildings owned by public

bodies and non-residential buildings reach at least class F by 2027 and class E by 2030. For residential buildings, those requirements apply in 2030 and 2033. Member States may apply MEPS to the rest of the building stock but are not required to do so.[53] With the concurring reform of the EPC system, and in absence of complementary mandatory provisions applying to private buildings above class F[54] as well as no clear roadmap at EU level with milestones setting, higher performance levels to be attained beyond 2030/2033 up to 2050, this means there is a high risk that a certain part of the stock will be brought to class E by that date, but then locked-in at that level until 2050. By aiming for low EPC classes after renovation, there is the risk that building performance will remain low in those buildings, thereby not tapping into available energy cost (and thus energy poverty alleviation) and emission reduction potential. Overall, this means the vision of transforming existing buildings into ZEBs (equivalent to class A) by 2050, which is included as objective of the national Building Renovation Plans, is at high risk of not materialising.

The introduction of a MEPS framework in the EPBD to increase the renovation rate of worst performing buildings is a great addition to the Directive, but it should also be geared towards increasing the renovation depth. The MEPS framework should be strengthened and outline, in a trajectory approach compatible with the deep renovation ambition, how all buildings would be brought to the highest performance classes in a dynamic way up to 2050. The deep renovation ambition should apply to all buildings, including worst performing buildings, not only to a small fraction of the stock which would benefit from additional financial and technical support.

Conclusion

Deep renovation is not yet fully and clearly enshrined into EU legislation, and marginally delivered on the ground. However, it is crucial to make it standard practice, not only to achieve the EU climate targets, but also to seize its many benefits, in particular alleviation of energy poverty. Beyond determining the right definition for the concept, there is an absolute necessity to shift the thinking around it. Deep renovation should evolve from being an exception to the default approach, whether it is in EU legislation, national policies or delivery on the ground. The current revision of the EPBD provides a golden opportunity to trigger this shift by improving the introduced definition for deep renovation in the Directive and ensuring a consistent approach across the design of all policy measures and financing programmes.

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