

## Capturing the untapped benefits of deep energy renovation

*As new MEPs take their places and the European Green Deal takes shape, it bears repeating that the state of EU buildings holds potential to make or break whatever energy, emissions and environmental targets are set in the coming months. A growing body of research attaches financial figures to the value of benefits that energy efficiency measures deliver to public agencies, private entities, economies as a whole and to individual citizens. As detailed below, renovating private homes, for example, is shown to have a benefit-cost ratio of 4:1, reflecting reductions in healthcare expenditures, elimination of energy subsidy pay-outs, job creation and greater economic empowerment of citizens who are lifted out of energy poverty. Across diverse building types, very specific benefits are ripe for capture, sometimes delivering value of 2.5 times the initial cost of efficiency measures.*

### THE BUILDINGS ISSUE

At present, buildings account for 40% of EU energy demand and 36% of CO<sub>2</sub> emissions. Each year, the EU imports 55% of its energy needs at a cost of approximately €300bn. Most troubling is the reality that in 2050, 9 out of 10 existing buildings will still be in use.

Renovate Europe is pleased to see buildings recognised in early discussion of the European Green Deal. Yet to date, policy action in this area has failed to stimulate or support the level of deep energy renovation needed. That is not to say that our call for collective, strategic action that will slash by 80% energy waste in buildings by 2050, has fallen on deaf ears. Quite the contrary: there is growing consensus on what is needed and on the technologies that can deliver it. But many stakeholders are waiting for what they see as a fundamental question to be properly addressed: *Who should pay and how?*

In parallel with **Frans Timmerman's first 100 Days in office as Executive Vice-President of the European Commission**, we are probing these questions through fresh lenses via briefing notes and social media channels. This first briefing introduces multiple benefits of energy efficiency, going beyond energy and emissions reduction to other market, social and environmental benefits that deliver, in parallel, high economic returns. In early January, we will highlight deep energy renovation projects that are already demonstrating substantial returns on strategic investment. A third article, planned for February, will examine what's needed to create an ecosystem that stimulates deep energy renovation – i.e. finding the right mix of technology, policy, financing and incentives.

We start with a broader examination of the benefits of energy efficiency for a very specific reason: better identifying which benefits are delivered to whom can help shift the conversation from *'who should pay and how'* towards a more strategic examination of *'what are the most efficient and cost-effective ways for all stakeholders to participate in capturing available returns?'*

### BENEFITS OF BETTER AIR QUALITY, INDOORS AND OUTDOORS

Across the EU, people spend approximately 90% of their time indoors. Conditions in these environments – temperature, lighting, humidity, draughts and noise – play important roles in their physical and mental well-being. More efficient buildings improve thermal comfort for lower volumes of energy consumption, in turn

reducing emissions and leading to better air quality both indoors and outdoors. In different building contexts, a growing body of research attests to other benefits – and their values.

In 2013, long-term exposure to air pollution was responsible for about 436,000 premature deaths across the EU-28. Additionally, direct costs associated with air pollution, including lost working days and higher health costs – especially for the elderly and children – amounts to €23bln annually. In Poland, poor energy performance of homes and the combination of outdated home boilers (using wood, waste and coal) and polluting power plants (using coal) drives up release of particulate matter and carcinogens. The concentration of benzo(a)pyrene (BaP) is five times above the EU target level. In some regions of Poland, air pollution is worse than in New Delhi, one of the most polluted cities in the world.<sup>1</sup>

### IN HOMES, ERADICATING ENERGY POVERTY DELIVERS BETTER HEALTH AND PUBLIC BUDGET BENEFITS

It is well known in the EU that people with low incomes live in poorer quality dwellings which require high energy consumption to achieve thermal comfort – whether that means staying warm in winter or maintaining a healthy indoor temperature in summer. Often, the associated costs drive them into energy poverty. Recent estimates put the number of EU citizens affected at 41 million in winter and 98 million in summer.<sup>2</sup> Renovating such homes would obviously reduce demand and lower energy bills, thereby lifting people out of energy poverty.

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But public budgets could also realise substantial benefits, particularly through reduced healthcare costs. Multiple studies show that young children living in cold, damp homes are more than twice as likely to have problems with breathing, chest conditions and bronchitis,<sup>3</sup> and are 40% more likely to suffer asthma.<sup>4</sup> Adults in energy poverty suffer higher levels of stress associated with poor quality living conditions, rental instability, social deprivation and inability to pay energy bills, which can contribute to hypertension and other physical symptoms.<sup>5,6,7</sup> Among the elderly, inadequate housing is linked to a 40% increase in deaths

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<sup>1</sup> Environmental Agency (2015), *Air Quality in Europe*, available at: <https://www.eea.europa.eu/publications/air-quality-in-europe-2015>

<sup>2</sup> Open EXP (2019), *EU Energy Poverty Index*, available at: [www.openexp.eu/sites/default/files/publication/files/european\\_energy\\_poverty\\_index-eepep\\_en.pdf](http://www.openexp.eu/sites/default/files/publication/files/european_energy_poverty_index-eepep_en.pdf)

<sup>3</sup> Barnes, M et al. (2016), "The Dynamics of Bad Housing: The Impact of Bad Housing on the Living Standards of Children", NatCen. [www.eagacharitytrust.org/app/uploads/2016/03/natcendynamicsfullreport.pdf](http://www.eagacharitytrust.org/app/uploads/2016/03/natcendynamicsfullreport.pdf)

<sup>4</sup> VELUX (2017), *Healthy Homes Barometer (2017)*, Buildings and their impact on the health of Europeans, VELUX. [https://velcdn.azureedge.net/~media/com/health/healthy-home-barometer/507505-01\\_barometer\\_2017.pdf](https://velcdn.azureedge.net/~media/com/health/healthy-home-barometer/507505-01_barometer_2017.pdf)

<sup>5</sup> Gilbertson J, M Grimsley, and G Green (2012), "Psychosocial routes from housing investment to health: Evidence from England's home energy efficiency scheme". *Energy Policy*. 2012; 49:122–133. doi: 10.1016/j.enpol.2012.01.053.

<sup>6</sup> De Carlo Santiago, C, ME Wadsworth and J Stump (2009), "Socioeconomic status, neighborhood disadvantage, and poverty-related stress: Prospective effects on psychological syndromes among diverse low-income families", *J. Econ. Psychol.* 2011; 32:218–230. doi: 10.1016/j.joep.2009.10.008

<sup>7</sup> Right to Energy Coalition (2019), *Power to the People: Upholding the Right to Clean, Affordable Energy for all in the EU*, available at: <https://righttoenergy.files.wordpress.com/2019/02/ep-report-18.02.19.pdf>

during the winter season in Europe;<sup>8</sup> it is now recognised that more research is needed on excess deaths in summer.

Research from the UK shows that of all household risks that carry costs for the National Health Service, being cold at home is four times more costly than the next-highest risk of falls on stairs.<sup>9</sup> It is important to note as well that of the nine risks shown, eight are truly accidents. Being cold at home is a chronic condition that we know how to fix and thereby avoid the high healthcare costs arising from treatment of respiratory conditions, heart attack or early death. Across the EU, approximately 250,000 excess/early deaths are recorded each winter (as compared with summer mortality rates); about one-third of these – ~80,000 deaths – are associated with poor-quality housing and inability to keep adequately warm.<sup>10</sup>

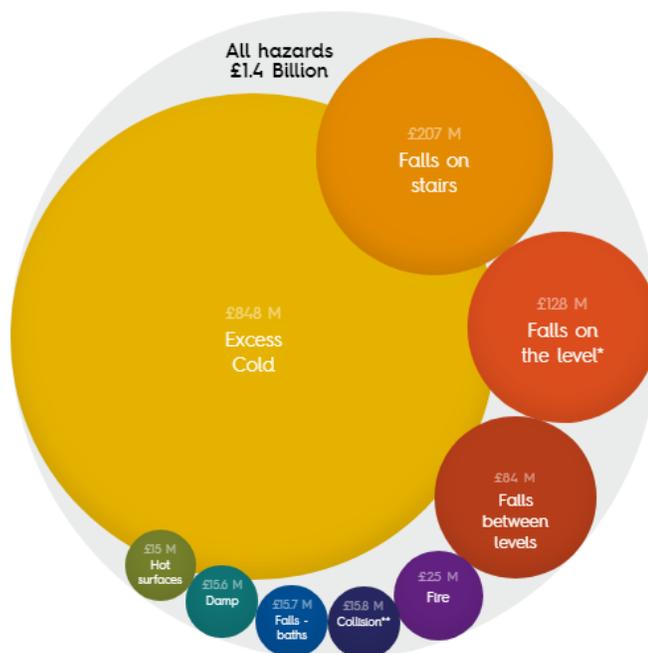
Figure 1 • Household risks that carry costs for the UK National Health Service

### Cold homes are costly!

In fact, at £848 million cold homes are 4 times more costly than the next risk category - falls on stairs (£207 million).

Being chronically cold stresses the body's respiratory, cardiac and immune systems, leading to more doctor visits and hospitalisations, and greater need for long-term treatment. In 2011, more than 1.3 million homes - 15% of all homes - in the UK put their residents at risk.

Learn more by exploring [Impacts of fuel poverty](#).



Source: [COLD@HOME](#), based on data from the Buildings Research Enterprise.

Energy efficiency measures are shown to deliver substantial health and well-being benefits: one study reports that installing insulation and improved heating systems delivered a benefit-cost ratio of 4:1.<sup>11</sup>

<sup>8</sup> Healy, JD, (2003), "Excess Winter Mortality in Europe: A Cross Country Analysis Identifying Key Risk Factors." Journal of Epidemiology & Community Health, BMJ Publishing Group Ltd, 1 Oct. 2003, [jech.bmj.com/content/57/10/78](http://jech.bmj.com/content/57/10/78)

<sup>9</sup> EnAct (2016), *What Do Cold Homes Cost a Country?* Available at: [www.coldathome.today/what-do-cold-homes-cost-a-country](http://www.coldathome.today/what-do-cold-homes-cost-a-country)

<sup>10</sup> IEA (2018), *Energy Efficiency Market Report 2018*, available at: <https://webstore.iea.org/market-report-series-energy-efficiency-2018>

<sup>11</sup> Grimes et al. (2011), *Cost-Benefit Analysis of the Warm Up New Zealand Heat Smart Program*, Report for the Ministry of Economic Development Department, Motu Economic and Public Policy Research, Wellington, (revised June 2012).

## IN WORKPLACES AND PUBLIC BUILDINGS, ENERGY EFFICIENCY BOOSTS PRODUCTIVITY AND PERFORMANCE

A recent study by the Buildings Performance Institute of Europe (BPIE) found that deep energy renovations deliver very specific benefits across different building types.<sup>12</sup> (Note: all data in this section reflect findings of this report.)

**In hospitals:** Directly related to the health costs associated with energy poverty in homes described above is the question of energy efficiency in hospitals, where a healthy interior can make the difference between life and death. Good ventilation reduces the risk of cross-infection while daylighting, thermal comfort and good soundproofing accelerate patient recovery times.

Startlingly, the BPIE study found that improved indoor environmental quality at a children's hospital would lower mortality rates by 10% and increase the time doctors can spend with patients by the same amount. More broadly, energy renovations could cut the average length of patient stays by 11% while also shaving medication costs and employee turnover by 20%. In the EU alone, the cost benefit was tallied at €114 billion per year.

**Public and private workspaces:** Around 36% of the EU workforce – i.e. 81m people — spend eight hours per day (or more) working in offices. In turn, about 90% of operating costs are linked to employees. Renovating for comfortable, healthy, well-lit and thoughtfully designed workspaces improves staff morale and reduces turnover. It can boost employee productivity by up to 12%.

Further analysis found that every 1°C reduction in temperature in the 22-32°C temperature range increased a worker's performance by up to 3.3%, while every 100ppm decrease in CO<sub>2</sub> concentration increases performance by 4.25%.

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Across the EU, every percentile improvement in building performance could add €40 billion to the bottom line of EU business. All things considered, healthier workplaces could save a staggering €500 billion annually.

**In schools:** Schools warrant special attention for two reasons: a) the occupancy density of classrooms is much higher than in homes or offices; and b) children are more vulnerable to the indoor air quality as they breathe more air relative to their body size than adults do. Student health, attendance, concentration and learning performance all suffer when school buildings are poorly designed or have outdated systems.

Modelling carried out by the BPIE estimates that school renovations could allow children to improve academic performance by 3%-8% – equivalent to ten fewer school days per year. Within the 20°C-32°C range, every 1°C reduction in temperature increases student learning performance by 2.3%. This could translate to additional time for teaching, extra-curricular activities or vacations, or reduce education costs

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<sup>12</sup> BPIE (2019), *Building 4 People: Valorising the Benefits of Energy Renovation Investments in Schools, Offices and Hospitals*, available at: <http://bpie.eu/publication/building-4-people-valorising-the-benefits-of-energy-renovation-investments-in-schools-offices-and-hospitals/>

through a shorter year. Additionally, every 100ppm decrease in indoor CO<sub>2</sub> concentrations is associated with a relative decline of 0.1%-1% of absences due to illness.

Good daylighting can also help boost attention spans, concentration and relaxation, increasing academic performance by up to 18%!

### ENERGY EFFICIENCY ENHANCES SOCIAL JUSTICE

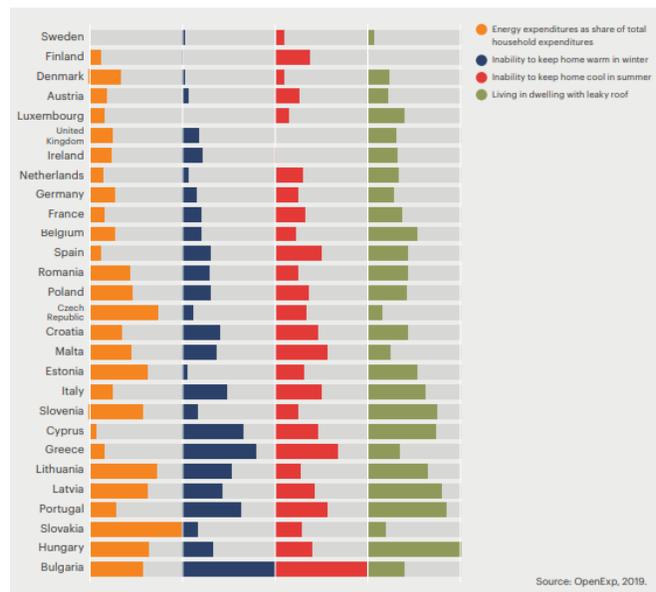
Article 20 of the European Pillar of Social Rights recognises energy as an essential service. In fact, access to affordable energy underpins access to other services stated in the Pillar including water, sanitation, financial services, digital communication and transportation.

In this regard, we echo The Right to Energy Coalition’s argument that people’s health and well-being is best protected by bringing affordable energy services into a comprehensive policy package that links strategies for energy efficiency, renewable energy, access to housing services, access to affordable transportation services and environmental sustainability.<sup>13</sup>

### SCALING UP RENOVATIONS CAN REDUCE HOUSEHOLD FINANCIAL PRESSURE, CREATE NEW JOBS, STIMULATE LOCAL ECONOMIES AND RELIEVE PUBLIC BUDGETS

The EU Domestic Energy Poverty Index (EDEPI), released in February 2019, shows the weighting of four factors that contribute to energy poverty in EU households: inability to maintain thermal comfort in winter and in summer, energy expenditures as share of total expenditures, and quality of dwellings.<sup>14</sup> In many countries, the latter carries the heaviest weight, as poor-quality housing requires more energy to achieve thermal comfort. There is a strong logic, then, in investing in energy renovations to alleviate the cost burden of energy and achieve greater thermal comfort.

Figure 2 • Weighting of factors that contribute to energy poverty



<sup>13</sup> Right to Energy Coalition (2019), *Power to the People: Upholding the Right to Clean, Affordable Energy for all in the EU*, available at: <https://righttoenergy.files.wordpress.com/2019/02/ep-report-18.02.19.pdf>

<sup>14</sup> Open EXP (2019), *EU Energy Poverty Index*, available at: [www.openexp.eu/sites/default/files/publication/files/european\\_energy\\_poverty\\_index-eepep\\_en.pdf](http://www.openexp.eu/sites/default/files/publication/files/european_energy_poverty_index-eepep_en.pdf)

Across all building types, scaling up renovation to the level needed to achieve the 80% reduction in energy waste is estimated to have the potential to create 2mIn local jobs. In many cases, this will require building skills capacity in low-income areas, with the added benefit of boosting local economies. In turn, net gains – both direct and indirect – are seen in local economies through higher employment and shifts in expenditures linked to higher disposable income (e.g. with lower energy bills, families can afford a comfortable indoor temperature while also covering the costs of other basic needs).

There are multiple ways in which job creation and energy efficiency more broadly deliver benefits for public budgets. In the first instance, job creation reduces public budget outlays for unemployment benefits. In turn, higher household incomes and more spending boosts tax revenues. In parallel, where governments provide subsidies for households in energy poverty, the one-time investment in renovation eliminates repeat pay-outs. At the macroeconomic level, countries that rely on energy imports benefit from lower overall consumption and increased energy security; energy exporting countries have more supply available for sale in international markets.

Taken together, such factors show that strong policy to stimulate deep energy renovation can boost EU GDP by 0,7% annually.<sup>15</sup>

### THE EUROPEAN GREEN DEAL NEEDS TO UNLOCK THESE BENEFITS

In 2014, the International Energy Agency (IEA) published seminal work on this challenge; *Capturing the Multiple Benefits of Energy Efficiency*, set out clear benefits at the macroeconomic level, for public budgets, for health and well-being of citizens, in industry and for energy delivery. Importantly, it also described methodologies for measuring and evaluating such benefits. In some cases, the positive impacts delivered by energy efficiency were valued at 2.5 times the cost of measures taken.<sup>16</sup> Broadly, the report highlighted how energy efficiency can “stimulate economic and social development, enhance energy system sustainability, contribute to environmental sustainability and increase prosperity.”

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At the global scale, the IEA estimated that uptake of economically viable energy efficiency measures would result in more efficient allocation of resources across the global economy, with a potential cumulative economic boost of USD 18 trillion by 2035. Their estimate of investment needed – at USD 11.8 trillion – was shown to be more than offset by a USD 17.5 trillion reduction in fuel expenditures and USD 5.9 trillion

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<sup>15</sup> Renovate Europe (2019), Infographic: *Reducing the Energy Demand of the EU Building Stock by 80% by 2050*, available at: [www.renovate-europe.eu/communications/infographics/](http://www.renovate-europe.eu/communications/infographics/)

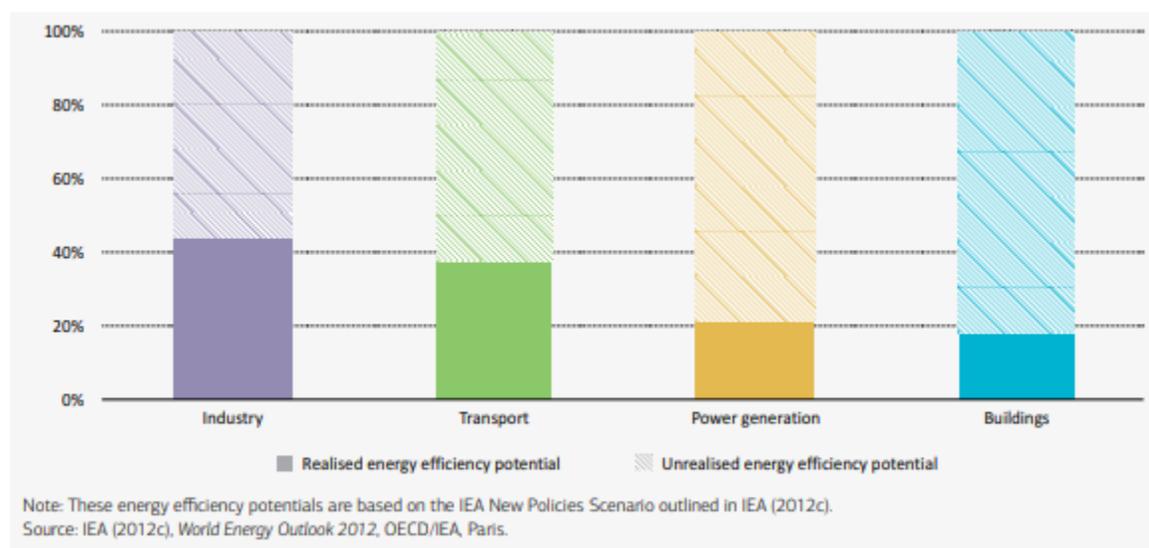
<sup>16</sup> IEA (2014), *Capturing the Multiple Benefits of Energy Efficiency*, available at: <https://webstore.iea.org/capturing-the-multiple-benefits-of-energy-efficiency>

“One study found that every €1mIn invested in energy efficiency in the residential sector resulted in the creation of 17 job years.”

reduction in supply-side investment.<sup>17</sup> In short, even without evaluating the full economic value of all benefits, savings in energy demand and supply deliver substantial returns. Considering that 97% of buildings in the EU are known to need a deep energy renovation to reach desired efficiency standards – and, as stated above, 9 out of 10 existing buildings will still be in use in 2050 – it is clear that *not* carrying out those renovations is not just a missed opportunity, it carries a very heavy price.

Under policies in place in 2014, the IEA estimated that two-thirds of the economically viable energy efficiency investments would be missed – with buildings showing the greatest lost potential, at 82%. It identified barriers to uptake as including information failures, split incentives, subsidised pricing of energy, inadequate pricing of externalities and a shortage of financing.

**Figure 3 • Long-term energy efficiency economic potential by sector**



Reaching the goals of reducing energy waste by 80% requires tripling the rate of renovation of existing buildings from 1% annually to 3%. As indicated above, we will examine the need for innovative financing and incentive solutions in a future article.

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While we have focused on benefits specific to the buildings sector, including increasing prosperity in terms of public budgets and of disposable income for families, the IEA highlighted others of high relevance to the European Green Deal. The report goes into detail about energy efficiency as a means to increase energy security, ensure more efficient delivery of energy (and the possibility of reduced energy pricing), stimulate macroeconomic development and boost industrial productivity.

<sup>17</sup> IEA (2014), *Capturing the Multiple Benefits of Energy Efficiency*, available at: <https://webstore.iea.org/capturing-the-multiple-benefits-of-energy-efficiency>

This supports the need for aggressive policy action, now. **We call on authors of the European Green Deal to unlock the substantial benefits of energy efficiency across all sectors in a strategic way.** To truly put people at the centre of policy, as per the European Pillar of Social Rights, prioritizing deep energy renovation is the most direct way to improve the health and well-being of EU citizens, while also advancing towards energy demand and emissions reduction goals.

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Renovate Europe is a political communications campaign with the ambition to reduce the energy demand of the building stock in the EU by 80% by 2050 compared to 2005 levels through legislation and ambitious renovation programmes. This will bring the energy performance of the entire building stock in the EU to a Nearly Zero Energy (NZEB) performance level.

Renovate Europe brings together 40 partners from across the building value chain (trade associations, companies, trade unions, city networks and 15 National Partners):

