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# Energy efficiency in green finance taxonomies

## Why energy efficiency investments fall short, and what can be done about it

May 2023

Energy efficiency refers to the ratio of output to energy input.[1] Simply stated, being energy efficient means using less energy to get the same job done.

Increasing the efficiency with which energy is transformed, distributed and used brings about multiple benefits – from energy savings, to greenhouse gas emission reductions, to job creation, to increased access to energy and reduced fuel poverty, to local air quality improvements, among others (IEA, 2014).

[1] Outputs can relate to performance (for example, thermal comfort in a building), service (for example, the transport of persons or the transmission of information), goods (for example, manufacturing smartphones), or energy (namely the process of changing energy from one form to another) (EP, 2015).

Yet, "the promise of such positive impacts has not generally been enough to spur more widespread improvements in energy efficiency" (Puig and Farrell, 2015).

Energy efficiency gains have been promoted through several types of policy inducements, including green finance taxonomies. The evidence presented in this policy brief explores why energy efficiency investment continues to lag compared to other types of investments, in spite of the emphasis that green finance taxonomies place on energy efficiency.

# INTRODUCTION

Energy efficiency is a widely available, cost-effective investment that increases competitiveness. Yet, investments in energy efficiency have fallen short of expectations (IEA, 2021a): the global annual energy intensity rate – a key measure of progress toward improving the efficiency with which energy is transformed, distributed and used – remains below the 2.6 percent target enshrined in the Sustainable Development Goals.

Indeed, despite the ostensibly strong business case for energy efficiency (Box 1), growth in private sector energy efficiency investments remain sluggish (IEA, 2021b). This observation contrasts with the rising volume of private-sector investments in sustainability more broadly (GSIA, 2021): a 15 percent increase over the period 2018-2020, to reach USD 35.3 trillion in five major markets in early 2020.

This policy brief provides answers to two questions. First, why energy efficiency investments continue to represent a marginal share of green investment volumes, even though energy efficiency improvements are among the most prominent investment categories in green finance taxonomies. Second, what corrective actions governments can take, especially with regard to developing-country supply chains.

The intended primary audiences of this document are investors and developers of green finance taxonomies. In line with the second question above, government officials working in energy-related agencies are the secondary audience of this document.

The document is organised around three additional sections. First, context on private sector investment in energy efficiency is provided. Then, the main green finance taxonomies are described, with a special emphasis on their coverage of energy efficiency. To conclude, recommendations for bolstering energy-efficiency investment are presented, with a focus on developing country supply chains.

## THE BUSINESS CASE FOR ENERGY EFFICIENCY

By investing in energy efficiency, businesses can create economic value through energy—related and non-energy—related benefits. The following sections describe these two sources of economic value.

### Energy-related benefits

Businesses consume energy to power (i) heating, ventilation and air conditioning; (ii) lighting; and (iii) information and communication technologies. In each of these three types of energy uses, the adoption of more energy-efficient technologies can help businesses cut energy bills. Table 1 below gives examples of the size of the energy and cost savings that the adoption of efficient energy technologies can bring about.

**Table 1** Potential energy and cost savings in a typical non-residential building

| Type of energy use | Energy use (percent of total) | Potential energy savings (examples) |
|---|---|---|
| Heating, ventilation and air conditioning | 20 | In the right circumstances low evaporative cooling systems can cut cooling energy consumption by up to three quarters |
| Lighting | 17 | Switching from non-efficient lighting to light-emitting diode (LED) units can reduce lighting energy costs by 80 percent a year |
| Information and communication technologies | 25 | Switching computers off during non-working hours reduces their energy consumption by 75 percent a year |

*Source: CT, 2017 and CT, 2018*

Businesses also consume energy to power production processes. In most sectors, production processes use significantly more energy in absolute terms, compared to the three types of energy uses listed in Table 1 above. The monetary savings associated with adopting more energy-efficient technologies in production processes have been shown to bolster both output and employment (Puig and Farrell, 2015). For a number of economic sectors, Table 2 gives estimates of the output and employment impacts associated with improvements in the efficiency with which energy is used in production processes.

**Table 2** Output and employment changes relative to no improvements in energy efficiency

| Type of impact | Agriculture | Manufacturing | Construction | Distribution and retail | Transport and warehousing | Consumer services | Communication and computing | Banking and liberal professions [2] | Real estate and other businesses |
|---|---|---|---|---|---|---|---|---|---|
| Output (percent change) | 0.0-0.1 | 0.1-0.5 | 0.2-0.7 | -0.5-0.3 | 0.0-0.2 | 0.2 | 0.2-0.5 | 0.3 | 0.1-0.2 |
| Employment (percent change) | 0.2 | 0.1-0.2 | 0.3-0.4 | -0.1-0.1 | 0.1-0.2 | 0.1-0.3 | 0.2 | 0.0-0.1 | 0.1 |

*Note: estimated change relative to a reference scenario (in 2030, for a price of USD 70 per tonne of carbon)*
*Source: adapted from Puig and Farrell, 2015*

To put in context the estimates in Table 2, related global-level economy-wide estimates of job creation associated with energy efficiency gains suggest the following:

- for one euro invested in energy efficiency, between 8 and 27 job-years are created (Wade, Wiltshire and Scrase, 2000);
- in 2050, and compared to current policies, stronger policy emphasis on energy efficiency would result in an additional 21.3 million jobs created (IRENA, 2020).

Energy utilities deserve separate comment. Worldwide, and compared to most other businesses, the power-generation sector is generally more energy efficient. To a great extent the reason for this difference lies in the regulatory framework that applies to energy utilities, which tends to be specific to them, and has promoted fuel switching and the improvement of both operational and equipment efficiency, among other measures. In addition, utilities are increasingly promoting energy efficiency through programmes aimed at reducing energy-use by consumers, both residential and industrial. To the extent that the structure of utility rates is aligned with the goals of these programmes, utilities derive economic value from them too.

### *Non-energy related benefits*

Although the non-energy related benefits of energy efficiency have long been recognised (Ryan and Campbell, 2012), assessing them – let alone quantifying them – is challenging (Puig and Farrell, 2015). Key non-energy benefits include the following (IEA, 2014): increased industrial productivity, poverty alleviation, reduced local air pollution and increased disposable income, among others.

Non-energy benefits are seldom reflected in payback models, partly because of lack of awareness, and partly because of the above-mentioned difficulty associated with assessing this type of benefits. Where assessments have been conducted, non-energy-related benefits appear to be between two and three times higher than energy-related benefits (Killip *et al.*, 2019).

## PRIVATE SECTOR INVESTMENT IN ENERGY EFFICIENCY

In 2021, investments in energy efficiency worldwide reached about USD 290 billion, which roughly represents a ten percent increase relative to the average for the period between 2015 and 2020 (IEA, 2021a). This growth is driven mainly by a surge in investments in the building sector, which offset a decrease in investments in the transport sector (Table 3).

**Table 3** Energy efficiency investments worldwide, by sector

| Sector | Estimated total investment in 2021 (in billion USD) | Change relative to the levels in 2019 (percent) |
|---|---|---|
| Buildings | 190 | 20 |
| Transport | 60 | – 9 |
| Industry | 40 | 0 |

*Source: IEA, 2021a*

[2] According to the Dictionary of the Royal Spanish Academy, liberal professions are activities that predominantly where the intellect is exercised, that have been recognized by the Government and whose exercise requires qualification through an academic degree.

In the period between 2021 and 2023, and further to the stimuli offered by COVID-19 recovery programmes, annual investment in energy efficiency is forecast to reach USD 260 billion (IEA, 2021a).[3] About 70 billion are expected to come from government budgets, with the remaining USD 190 billion coming from the private sector (IEA, 2021a).

Past and present volumes of private sector investments directed toward energy efficiency are not known, because data collection mechanisms are especially poor for energy efficiency, partly due to the disaggregated nature of the investment (CPI, 2021).[4] The limited data available suggests that private funds flowing to energy efficiency improvements are modest: for example, in 2021, corporate finance directed to technologies and business models aimed at increasing energy efficiency in buildings were negligible, compared to the same type of corporate funding that targeted renewable energy and hydrogen technologies or electric vehicle manufacturing (BNEF, 2022).

## ENERGY EFFICIENCY IN GREEN FINANCE TAXONOMIES

The case for green investments is powerful, with a financial element to it, as described in Box 1 above, and an ethical element, given the need to shift away from unsustainable technologies. However, investors need certainty regarding what constitutes a green investment. In response to this need, public authorities around the world are drawing up references in the form of green finance taxonomies, which provide a classification of the types of investments that can be considered sustainable, by sector or technology.

Although green finance taxonomies are similar in scope, the level of detail provided, and the actual types of investments included vary across taxonomies. Energy efficiency-related investments, which are a prominent element of all green finance taxonomies, are a case in point (Table 4).

**Table 4** Energy efficiency in green finance taxonomies

| Category | Core (included in most taxonomies) | Additional (included in some taxonomies only) | Questioned (excluded from most taxonomies) |
|---|---|---|---|
| Clean energy | | waste-to-energy, cogeneration | clean coal, other energy efficiency gains associated with fossil fuels |
| Transmission | storage systems, smart grids and mini grids | transmission systems for renewable energy | |
| Process efficiency | heat recovery from waste, industrial energy efficiency, co-generation | energy-efficiency products | energy efficiency in fossil-fuel use |
| Buildings | building retrofits, new green buildings, energy audits and services, equipment (for example, lighting) | | |
| Transport | urban mass transit, non-diesel powered rail | electric vehicles, hybrid vehicles, alternative fuel vehicles, bicycles, pedestrian lanes, waterways, logistics | diesel-powered rail, rail transport of fossil fuels |

*Source: adapted from UNEP (2016)*

The following sub-sections describe the main green finance taxonomies currently in operation, with a focus on their coverage of energy efficiency. A closing sub-section reports on upcoming taxonomies and related initiatives.

### The European Union's taxonomy for sustainable activities

The taxonomy is a classification system that helps determine whether, in the context of the European Union's single market, a project, product, business, or sector can be regarded as sustainable (EU-JRC, 2022). The taxonomy entered into in 2020, and financial and non-financial companies above the small- and medium-sized enterprise threshold need to disclose environmental performance of their assets and economic activities based on the detailed criteria of the EU Taxonomy.[5]

[3] To put these estimates in perspective, achieving the Paris Agreement's 1.5 °C target, global energy efficiency investments would "need to increase by up to USD 550 billion per year on average to 2050" (IIASA, 2021).

[4] Data shortcomings are especially acute in developing and transition countries. For example, in India (CPI, 2020), finance flowing to the power sector is tracked both across sources (domestic and international) and types of actors (public and private), whereas only public finance is tracked in the case of energy efficiency improvements.

[5] Small- and medium-sized enterprises are companies with less than 500 employees, a balance sheet of less than EUR 43 million, or a turnover less than EUR 50 million.

To achieve its objectives, the taxonomy provides sector-specific criteria, which will be updated as the need arises.[6] For inclusion in the taxonomy, the criteria must meet one or more among seven pre-established requirements.[7] Regarding energy efficiency, the criteria mainly relate to two such requirements:

- "best-in-class performance", which establishes performance levels above those of the top ten percent performers in the European Union;
- "practice-based criteria", which mandates compliance with European Union guidance on how an activity must be performed.

### China's green bond endorsed projects catalogue

In April 2021, the People's Bank of China, the National Development and Reform Commission, and the China Securities Regulatory Commission jointly released the Green Bond Endorsed Projects Catalogue (PBC, 2021). The catalogue, which builds on the original 2015 version and an update from 2019, entered into force in July 2021.

The catalogue, the use of which is mandatory, establishes requirements for the issuance of green bonds.[8] Targeting mainly domestic financial institutions and businesses, the catalogue primarily caters to investors active in Chinese onshore markets, across six sectors.[9] Energy efficiency standards are prominent in four out of the six sectors.

For several of these standards, the highest level of stringency (so-called level-I) is required. Stringency levels are defined relative to the guidance provided in technology-specific documents issued by China's standardisation administration. How this guidance compares with that of the corresponding documents by the International Organization for Standardization is unclear.

### Japan's green bond guidelines

Originally launched in 2017, the guidelines focused on removing administrative and cost constraints in the domestic green bonds market, while ensuring consistency with the International Capital Markets Association's Green Bond Principles. A 2020 revision of the guidelines expanded them to include loans in addition to bonds (JME, 2020). The guidelines are not mandatory.

In contrast with related initiatives providing a comprehensive list of investment options – namely, a taxonomy or a catalogue –, the guidelines include an indicative, non-exhaustive list of options. Regarding energy efficiency, energy storage, district heating, smart grids, electric appliances, and energy efficiency in buildings are among the options suggested. Similarly, the guidelines do not include eligibility thresholds. Instead, suggestions are given regarding potential metrics.

The guidelines encourage investors to "utilize an external review in case they need an objective assessment of the alignment of their approaches with the framework for green bond issuances" (JME, 2020 p. 29).[10] Whether or not an external review will draw on existing benchmarks, notably those in Japan's Top Runner Programme for energy efficiency, is left to the third party conducting the review.

### The Republic of Korea's green taxonomy guidelines

As per the country's "environmental technology and industry support" act, in December 2021 the government of the Republic of Korea launched the green taxonomy guidelines. These guidelines, which are often referred to as K-Taxonomy, establish the four sets of standards to which an activity has to live up to be deemed eligible for green finance. The first such sets relates to the types of activity concerned, which are broken down into two large groups: the green sector, which consists of 64 energy-sector-related activities, and the "transition sector".

[6] The sectors covered include: forestry; environmental protection and restoration activities; manufacturing; energy; water supply, sewerage, waste management, and remediation; transport; construction and real estate activities; information and communication; and professional, scientific and technical activities.

[7] The seven requirements are: impact, performance in relation to an environmental target, best-in-class performance, relative improvement, practice-based criteria, process, and nature of the activity. Further details on the requirements and the broader analytical framework are available online (EU-JRC, 2022).

[8] Specifically, the "catalogue" covers three types of green bonds, and a 'green debt financing instrument'.

[9] The sectors covered include: energy saving and environmental protection industries, clean production industries, clean energy industries, ecological and environmental industries, green upgrading of infrastructure facilities, and green services.

[10] The provision may be strengthened in future updates of the guidelines, to ensure consistency with the latest recommendations by the International Capital Markets Association (ICMA, 2021).

The guidelines, which are not mandatory, are currently being tested. It is expected that, upon completion of the test period, they will be revised and expanded.[11] At present, it is common for investors to forego due diligence procedures related to the environmental, social and governance aspects of a project. For this reason, the revised guidelines would benefit from increased guidance on, and stringency of, screening and eligibility criteria and procedures.

### Colombia's green taxonomy

In April 2022, Colombia's government launched its green taxonomy, which is built around two pillars: seven economic sectors for which green investment relates mainly to decarbonisation, and three sectors for which green investments includes, but goes beyond, decarbonisation.[12] Each sector is broken down in a number of sub-sectors, for which specific eligibility criteria are provided. At an aggregate level, these criteria are consistent with Colombia's climate change-mitigation targets for 2030.

In the taxonomy, energy efficiency metrics include (i) performance requirements adopted by law, (ii) standards and labels, (iii) best available technologies, and (iv) performance requirements listed in the taxonomy. At present, and given that the taxonomy is not mandatory, third-party verification procedures are not regulated. Nonetheless, Colombia's financial regulatory body (Superintendencia Financiera de Colombia) references the taxonomy in its norms, which is expected to encourage a race to the top regarding transparency in green investments.

### South Africa's green finance taxonomy

In April 2022, South Africa's Treasury launched the country's green finance taxonomy (NT and IFC, 2022). The document is intended as an official classification of the types of investments that are eligible to be defined as green. It serves the purpose of providing investors clarity with regard to what constitutes a green investment.

Individually for each of the nine sectors included, the taxonomy lists eligible investments. For example, under the sector "Energy", guidance on eligibility is provided separately for twelve subsectors, such as transmission and distribution of electricity or electric heat pumps. This guidance includes technical screening criteria at the sub-sector level.[13]

Energy efficiency features in the taxonomy through two main instruments: energy efficiency labels and, to a lesser extent, energy efficiency performance thresholds. For manufacturing processes, life-cycle greenhouse gas emissions are to be verified by an independent third party. Similar provisions apply to investments in the building sector.

### Forthcoming schemes and related initiatives

At the time of writing, most European Union member states had issued their own schemes, as had Malaysia, Mongolia and Russia. Schemes were being developed in Brazil, Canada, Chile, India, Kazakhstan and Thailand, whereas the United Kingdom was about to release its own.

By late 2022, the International Organization for Standardization is expected to release a standard focused on "green debt instruments". This standard, which will be labelled ISO 14030-3, will build on three existing standards – focused on, respectively, green bonds, green loans, and requirements for verification programmes.[14]

In 2013, the Climate Bonds Initiative unveiled a taxonomy focused on climate bonds (Box 2). Compared to the schemes outlined above, this taxonomy works at a higher level of aggregation, in that it focuses on whether or not a certain type of activity is compatible with ambitious climate change mitigation objectives. As such, the taxonomy provides guidance to investors at a strategic level, as opposed to guiding specific investments.

[11] Currently, both liquified natural gas and carbon-capture and storage are included in the guidelines, whereas nuclear power is excluded. Pressure on the government to include nuclear power is mounting, not least further to the European Commission's decision to take steps in that direction.

[12] The seven for which green investment relates mainly to decarbonisation are construction, energy, information and communication technologies, manufacturing, transport, waste management and carbon sequestration, and water management. The three sectors for which green investments includes, but goes beyond, decarbonisation are agriculture, forestry and livestock.

[13] For example, for electric heat pumps, eligibility thresholds include (i) a global warmin potential below 675 for the refrigerants used, and (ii) adherence to a "recognised" environmental management system.

[14] The standards are ISO 14030-1 on green bonds, which expands on the International Capital Market Association's Green Bond Principles; ISO 14030-2 on green loans, which expands on the Loan Market Association's Green Loan Principles; and ISO 14030-4, on requirements for verification programmes.

### Box 1. The Climate Bonds Initiative's taxonomy

**Established in 2010, the Climate Bonds Initiative is a not-for-profit organisation that promotes investment in low-carbon and climate-resilient projects and assets. It does so by providing neutral information on green bond and climate bond markets, and through the development and stewardship of the Climate Bonds Standard and Certification Scheme, a labelling scheme for bonds.**

**In 2013, the Climate Bonds Initiative launched a "climate bonds taxonomy", which has since been updated several times (CBI, 2021). For a number of assets under each of the eight sectors it covers, the "taxonomy" maps whether the asset in question can be certified as a climate bond (using the Climate Bonds Standard and Certification Scheme referred to above).**

**The "taxonomy" lacks explicit energy efficiency – or any other – standards, because it is built around eligibility criteria that focus on the degree to which a given asset is compatible with a 2°C decarbonation trajectory.[15] As such, assets related to energy efficiency in buildings are considered "certifiable" on the basis of aggregated indicators, whereas assets related to carbon-intensive industries are not considered "certifiable" and no indicators or criteria are provided.**

[15] Namely, a 2°C increase in global mean temperatures by 2100.

## EXPANDING THE UPTAKE OF ENERGY EFFICIENCY IN GREEN FINANCE INVESTMENTS

The limited evidence available suggests that energy efficiency accounts for a small share of green finance investments, especially in developing countries. For example, in the period 2008-2021, the World Bank's green bond programme committed US$ 18 billion across 32 countries, with only 37 percent of this amount allocated to the broad category labelled "renewable energy and energy efficiency" (WB, 2022).

Given the newness of the schemes introduced in the previous section, it is too soon to tell whether their use will catalyse a shift toward energy efficiency benefitting from a larger share of green finance investments. The lack of a basic set of principles and standards, endorsed by all countries, may become a first obstacle to the use of these schemes, as countries continue to develop their own individual sets.[16] For investors and governments with limited capacities, inability to follow developments in this dynamic field may represent a further obstacle.

Notwithstanding, the limited uptake of energy efficiency in green finance investments is also due to challenges that relate to the type of investment, more than the investment instrument. Two key challenges can be distinguished:

- Data on (i) realised fuel and cost savings, and (ii) payment default rates is largely lacking. As a result, financial institutions attach high risk premia to energy efficiency investments.
- Non-energy—related benefits such as increased local air quality are between two and three times higher than energy—related benefits such as savings associated with reduced fuel use (Box 1). Yet, the former are rarely reflected in investment decisions.

Compared to other energy-sector investments, such as those in the power sector, investments in energy efficiency are much smaller in scope. For this reason, local authorities are often the primary beneficiaries of energy efficiency investment projects – and, therefore, they are the main promoters of such projects. However, local authorities lack the funding required to cover transaction costs, such as due diligence expenditures, and their credit worthiness is limited, which prevents them from tapping financial markets. These constraints compound to the two challenges listed above, thus compromising energy efficiency investments by a key actor in this area (Box 3). Similar arguments could be made for small businesses.

Reversing these trends requires concerted actions on four fronts. First, developing targeted programmes for institutional investors such as pension funds and mutual funds, to help break down barriers to the expansion of their portfolios toward energy efficiency investments. Second, revising institutional investor portfolio management strategies, for example by redefining fiduciary responsibilities, to integrate energy efficiency into those strategies. Third, developing proxies that make it possible to reflect non-energy—related benefits in project screening methodologies, possibly focusing on urban planning. Fourth, creating a database of actual financial project performance, including both realised fuel and cost savings, and payment default rates.

[16] The International Platform on Sustainable Finance has sponsored the development of a "common ground taxonomy", exploring commonalities and differences between the European Union "taxonomy" and China's "catalogue" (IPSF, 2022). The result of this work does not constitute a taxonomy in itself, but rather a reference document for investors and countries wishing to develop their own taxonomy. For example, the "common ground taxonomy" concludes that the European Union "taxonomy" and China's "catalogue" are fully comparable regarding wind power, whereas the former includes comparatively more stringent and detailed criteria about hydropower, and covers landfills, which the latter excludes.

### Box 2. Energy efficiency investment in cities

Projects that seek to improve the efficiency with which energy is transformed, distributed, and used are especially relevant in an urban context. Yet, cities – and all the more so small- and medium-sized cities in developing countries – seldom have the technical and financial capacities to champion such projects, owing to a combination of factors: Financial ratings for cities are rare, the credit worthiness of cities is small, and financial institutions favour large cities. Understanding what development finance options cities can tap is challenging, not least because eligibility requirements vary across financial institutions.

Given debt rates and budgetary constraints, national governments are typically weary of guaranteeing a loan entered into by a city.

Cities seldom have the funds required to cover third-party review costs, which some financial institutions will require. On the upside, financial institutions are increasingly under pressure to support projects that are consistent with environmental, social and governance standards. Energy efficiency projects are most relevant in this context, which suggests that pro-active financial institutions will be receptive to considering them, also in the context of cities. More specifically, green bond- and green loan-financing may be relevant in the context of clustered energy efficiency projects, possibly across cities.

**AUTHORS:**

Daniel Puig and Xianli Zhu, UNEP Copenhagen Climate Centre

The authors are thankful to Ms Gabriela Prata Dias, Ms. Elisabeth Resch and Dr James Haselip who reviewed various draft versions of this working paper and provided fruitful insights.

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