Business Future under EU Green Taxonomy

Edited by
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and Francesco Cappelletti

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Introduction by

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Edited by Gian Marco Bovenzi and Francesco Cappelletti,
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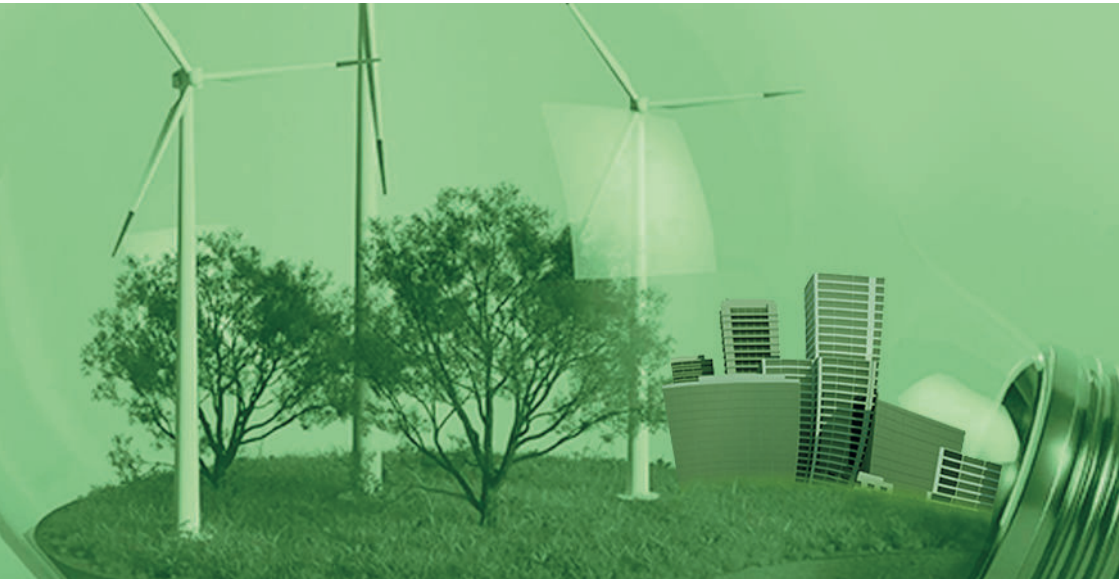
EU Taxonomy Regulation purpose, objective, and scope

Patrizia Feletig

Patrizia Feletig graduated in Economics at LUISS University of Rome. She had professional experiences in the finance sector (Morgan Guaranty Trust), in corporate communication (Shandwick Group) and in the energy business (Italian Nuclear Forum, Assoelettrica, Sharengo). From 2016-2019 she was appointed in the Board of Directors of state company Sogin. Freelance journalist she is a contributor of print and online media, radio and TV. As co-author she published books on nuclear, renewables and environment. She is an advisor of Guarini Institute for Public Affairs John Cabot University Rome and has been elected chairwoman of Copernicani Association for the second term



INTRODUCTION

Introduction

EU Taxonomy Regulation purpose, objective, and scope

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It is unobjectionable that climate change affects economy. Whereas the power of global capital markets plays a key role in the shifting to decarbonisation. Hence, the investment process impacts the speed and magnitude of the transition to a low-carbon economy. Since the access to capital market is – as Larry Fink, Chairman of BlackRock, put it – a privilege, not a right. The pattern of climate-finance proposed by the EU Green Taxonomy is to provide a handy green reference framework for investment, environment to steer resources towards low carbon technologies. Globally, according to The Economist estimates, demand channelled $35.3 trillion into sustainable invested assets under management.

Defining a shared set of criteria to categorise sustainable economic activities allows investors to gauge the environmental impact of the asset, underlying given financial products such as equity for equity fund, green bond for securities issuers, etc. The idea is that EU Taxonomy should replace the several existing classifications developed autonomously by

countries, corporations, and industries to measure how green an investment is. Thus, since this proliferation creates more puzzlement than guidance to investors, it is precisely what the common standard of the EU Taxonomy intends to fix. According to the Commission, only in Europe, 40 different ratings, 150 measure systems e 450 Esg index have been detected.

Although by the current year already 1.000 European firms (expected to expand gradually to 50,000) must disclose how much of their investment portfolio and capital expenditure fits into the Commission's classification, the Taxonomy is not mandatory. It doesn't prohibit investments in certain technologies, nor it restricts the Member State to finance them. It affects data reporting providing crystal-clear and science-based definitions of what can be consider sustainable. However, in specific local or national context some disputed technologies can result desirable as 'bridge technologies' to facilitate the emissions reduction, even though it means to invest in fossils: that is, replacing coal fuel powered electricity plants by more efficient gas plants. The environmental aim is clear: decarbonisation, to achieve 55% emissions reductions across the EU by 2030 and Net Zero objective by mid-century.

All this considered, the need for an accepted common ground reference framework arose not for a political decision to regulate business, but to address the growing scale of sustainable capital markets and the rising complexity of the financial ecosystem. The first idea of the Taxonomy emerged after the 2015 Paris climate

Taxonomy is not a dos and don'ts list that curtails investors freedom. It is an optional compass for financial actors and individual savers willing to achieve ethical investment decision making and to avoid transition washing

deal and went under work for years. The proposal shows that the EU Green Taxonomy is a project driven by investors – under the aegis of the Platform on Sustainable Finance – rather than by the regulators. Depending on the estimate of different organisations, if the word is to reach net-zero emission by 2050, investments will need to more than double to $3.2 trillion of dollar a year, and a large portion of it is funded by private capital: pension funds, insurance companies, investment companies. Setting clear, transparent, and accountable standards to sort out enabling activities for Net Zero – from heat pumps to depolymerisation process of plastics – constitutes a comprehensive guide for investment screening with two fundamental goals:

- to prevent greenwashing; and,
- to secure investors' trust in low carbon financial assets.

With over 550 pages mapping a wide array of economic areas, the EU Taxonomy is the cornerstone of the European Green Deal, although nuclear and gas were not initially part of the taxonomy at all. Their inclusion is the result of the pressure from industry advocate groups and state members in the second half of 2021. The originally strictly science-driven debate on Taxonomy was hit by a political battle between the state members with different positions on the classification of natural gas and nuclear power as sustainable investments. It ended up in a highly conflictual issue between sides: the pro-gas versus the pro-nuclear, above all not to mention the outcry against both gas and nuclear from environmental NGO. For instance, France was preoccupied that EU Taxonomy would restrain State aid to its plan for nuclear renaissance. Finland and Eastern European countries shared the French stance on nuclear. Whereas Germany and Italy, with energy mix dependent on gas, rallied as strong proponents of gas. The stiffening of the state members' positions has driven to the Commission's decision to regulate the controversial technical question about gas and nuclear via a separate so-called complementary delegate act. The latter establishes specific requirements and strict conditions to which certain nuclear and gas activities can be considered transitional investments and be included in the taxonomy. The act is submitted to the review from the Parliament and the Council for a period of four months, extendable by a period of other two months. If neither object, the supplementary delegate act will

apply as of 1 January, 2023.

When Fondazione Luigi Einaudi proposed a reflection on Taxonomy, the European Commission had just published an initial round of applicable rules for the technical criteria to be fulfilled by investors and client's partners to comply to sustainable financial Taxonomy of the EU.

By the time European Liberal Forum approved the editorial project, the second delegate act was presented, catching the media and public opinion attention. It has triggered a controversy biased by the misconception (and disinformation) that the exclusion from the EU green label would mean more expensive capital costs for these investments. This it is an unproven assumption: more favourable capital markets do not rely on the EU Taxonomy, but would result from the investor demand, which depends entirely on market forces. A proof that market forces empowerment outclasses policymakers' push, is evidenced by the paradoxical increase of coal consumption of US electricity under the 'green' Biden presidency. It is recalled as the first increase since 2013 whereas even under pro-coal Trump presidency consumption had fallen by 36%.

In the meantime, the war outbroke and painfully revealed that sustainability concept is not consistent over time. Energy safety objective took the lead, overtaking climate neutrality in the political agenda at least in the short term. The replacement of Russian fossil fuels constraints member states to quench their thirst for natural gas adopting moves that only a couple of months ago would appear unconceivable, such as switching on coal power plants, flying to Africa, Arabia, or Central Asia for fuel negotiations, pressing Oil&Gas industry to increase the production output. Putin weaponised fossil fuels, the energy transition represents the new geopolitical race. The 'month that changed a century', as Michael Hirsh calls it[1], brought the first big crisis of the energy transition era. Its outburst will eventually cast a revision of the Green Deal short term roadmap but will not affect EU Taxonomy Regulation.

1 M. Hirsch (2022), 'The Month that changed a century', Foreign Policy, 10 April, https://foreignpolicy.com/2022/04/10/russia-ukraine-war-postwar-global-order-civilization/

CHAPTER I

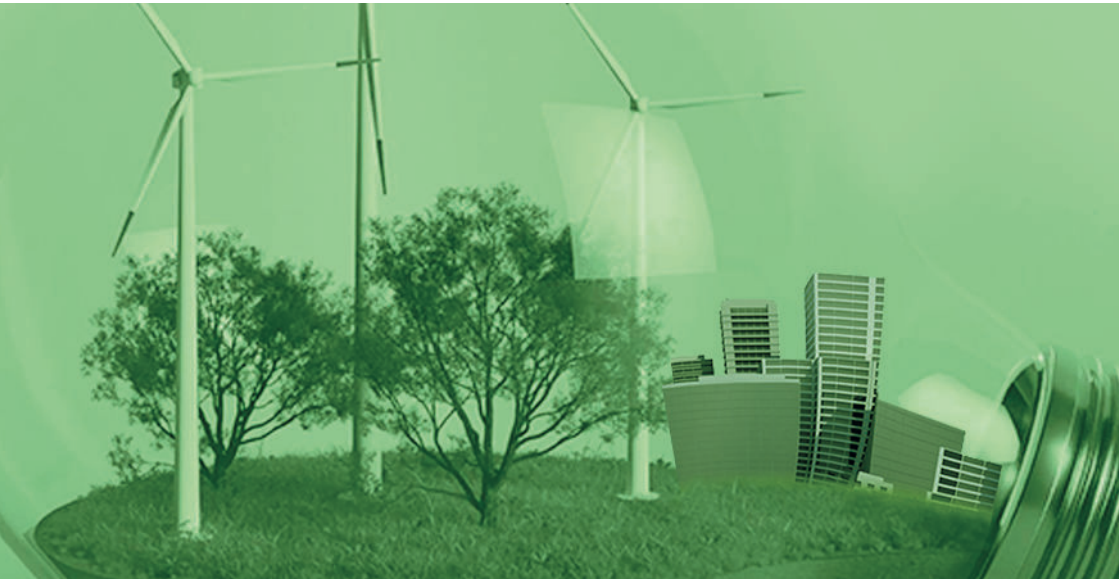
EU Green Taxonomy A difficult but clever tool. Linking science with economics, management, and finance

Sofia Santos

EU Green Taxonomy A difficult but clever tool. Linking science with economics, management, and finance

Sofia Santos

Sofia Santos is an economist specialised in sustainability and sustainable financing, with 24 years of professional experience among banks, companies, NGOs, and the public sector. She worked at Reuters, Bloomberg, Portuguese National Statistic Office, and at the Portuguese Paper Industry Association. In 2004, she created the consulting company Sustentare and worked with several companies on sustainability issues. In 2013, she founded another boutique consultancy company – SystemicSphere – working in Angola, Cape Verde, Guinea Bissau and Portugal, in the areas of sustainable finance, sustainable energy, circular economy, green bonds and others. She teaches sustainability classes at IDEFE-ISEG and NOVA SBE, both in Lisbon, being co-coordinator of an executive course on Sustainable Finance launched in 2020 by ISEG the University of Lisbon's School of Economics and Management



CHAPTER 1

EU Green Taxonomy A difficult but clever tool. Linking science with economics, management, and finance

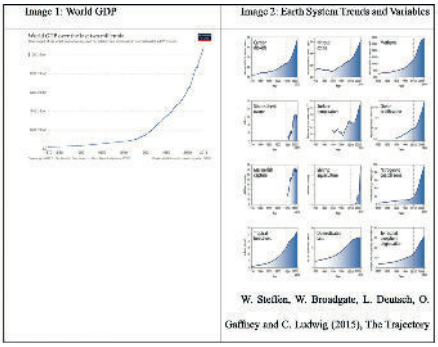
Sofia Santos

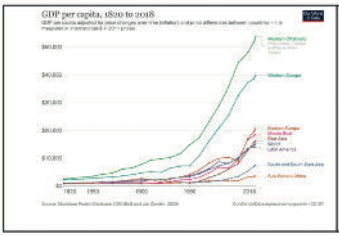
1. The environmental impacts of GDP growth

The global economic activity has increased significantly since the 1950, and this growth has led to a decrease of the global extreme poverty as well as to an increase in the general well-being of specific parts of the world population. In fact, since in 1981, about 44% of the world population was on extreme poverty compared with 10% in 2015[1]. Nevertheless, such economic growth has also led to an increase in inequalities – since in 2020 about 9 billionaires had the same wealth as 60% of the world's population – and to new levels of

1 Action Plan for circular economy in Portugal, Diário da República nº 236/2017, 2º Suplemento, Série I de 2017-12-11

poverty, since nearly half the world lives on less than $5.50 a day[2].





The significant growth of GDP we assisted at from 1950 onwards also lead to significant impacts on the earth system, which caused some of nature related imbalances we are living today. As we can see on Image 2, representing the earth system variables, there was a general increase in all variables after 1950, that has led to an imbalanced planet, which is today supported by scientific evidence from the IPPC – Intergovernmental Panel on Climate Change. In its last report, the IPPC[3] stated that 'each of the last four decades has been successively warmer than any previous decade since 1850 ... Human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability ... Across sectors and regions the most vulnerable people and systems are observed to be

2 World Bank Group, Poverty and Shared Prosperity 2018

3 IPPC (2022), Climate Change 2022: Impacts, Adaptation and Vulnerability

disproportionately affected. The rise in weather and climate extremes has led to some irreversible impacts as natural and human systems are pushed beyond their ability to adapt... Climate change has caused substantial damages, and increasingly irreversible losses, in terrestrial, freshwater and coastal and open ocean marine ecosystems ... The extent and magnitude of climate change impacts are larger than estimated in previous assessments ... Widespread deterioration of ecosystem structure and function, resilience and natural adaptive capacity, as well as shifts in seasonal timing have occurred due to climate change ... Approximately half of the species assessed globally have shifted poleward or, on land, also to higher elevations ... Some losses are already irreversible, such as the first species extinctions driven by climate change ... Other impacts are approaching irreversibility such as the impacts of hydrological changes resulting from the retreat of glaciers, or the changes in some mountain ... and Arctic ecosystems driven by permafrost thaw...'.

All of these imbalances have already led to a number of significant financial loses. According with Mark Carney, former Governor of the Bank of England, 'since the 1980s the number of registered weather-related loss events has tripled; and Inflation-adjusted insurance losses from these events have increased from an annual average of around $10bn in the 1980s to around $50bn over the past decade'.[4] The European Commission has also stated that, 'Between 2000 and 2016, annual weather-related disasters worldwide rose by 46%13 and between 2007 and 2016, economic losses from extreme weather worldwide rose by 86% (EUR 117 billion in 2016).This is a worrying trend, since close to 50% of the exposure of Euro area banks to risk is directly or indirectly linked to risks stemming from climate change. Other environmental issues are increasingly acknowledged to threaten current business models'[5].

4 M. Carney (2015), 'Breaking the tragedy of the horizon – climate change and financial stability' Speech by Mr Mark Carney, Governor of the Bank of England and Chairman of the Financial Stability Board, at Lloyd's of London, London, 29 September 2015, https://www.bis.org/review/r151009a.pdf

5 European Commission (2018), 'Action plan to finance a sustainable growth', https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0097&from=EN

The European Environmental Agency has also estimated that the EU Member States (EU-28), disasters caused by weather and climate-related extremes accounted for some 83 % of the monetary losses over the period 1980-2017, with weather and climate-related losses amounted to EUR 426 billion (at 2017 values); and that the most expensive climate extremes in the EU Member States include the 2002 flood in Central Europe (over EUR 21 billion), the 2003 drought and heat wave (almost EUR 15 billion), the 1999 winter storm Lothar, and October 2000 flood in Italy and France (both EUR 13 billion)[6].

IPPC also warns that if no change occurs in the economic business model, the average temperature of the planet could rise by 4.8 degrees centigrade by 2100, and the water level of the oceans could rise by 80 centimetres. However, 'a continuation of GHG emissions will cause even more severe term changes in all global system alterations, increasing the probability of occurrence of impacts over time and irreversible for people and ecosystems'[7]. An increase in the world temperature of this kind would be catastrophic for the people, planet, and prosperity.

2. The urgency to limit the increase in temperature to 1,5º C

There is a consensus amongst climate scientists that dramatic changes of the earth system would occur if the world temperature went above 2°C relative to pre-industrial levels (1870). Some of those dramatic changes could be large sea level rise, due to a melting of major ice sheets in the Greenland and Antarctic, more frequent occurrence of climate-related extreme events, and massive species extinctions[8]. But as said before, in 2005 the worldwide temperature had already increased 1ºC above pre-industrial levels, and the average temperatures in the Mediterranean have also risen by 1.5C and precipitation has fallen by

6 https://www.eea.europa.eu/data-and-maps/indicators/direct-losses-from-weather-disasters-3/assessment-2

7 IPPC (2014), 'Climate Change 2014 Synthesis Report Summary for Policymakers', p. 8

8 Z. Wang, L. Lin, X. Zhang, H. Zhang, L. Liu, & Y. Xu (2017), 'Scenario dependence of future changes in climate extremes under 1.5 C and 2 C global warming', Scientific Reports, 7, 46432.

2.5%[9].

As such, the scientists' concerns became focused in avoiding the world temperature to increase above 1.5ºC relative to pre-industrial levels by the end of this century. According to the IPCC[10], staying at or below 1.5°C would see at least 420 million fewer people being frequently exposed to extreme heatwaves, and at least 10.4 million fewer people exposed to the impacts of sea level rise. It would also make it markedly easier trying to achieve the sustainable development goals.

Bearing all this scientific information in mind, countries have agreed on the need to do whatever it takes to make sure the average worldwide temperature does not increase above 2ºC, ideally 1.5ºC, by signing the Paris Agreement. In order to reach a 1.5ºC temperature increase, countries will need to become carbon neutral by 2050. Achieving carbon neutrality implies: to promote activities of mitigation in order to decrease CO2 emissions; to promote activities of adaptation, since as temperature will rise, businesses will need to adapt and promote sustainable finance – i.e., investments and loans should be aligned with the decarbonisation goal, so that temperature does not goes above 1,5ºC.

3. EU Green Taxonomy as a tool to reach 1,5ºC and carbon neutrality

Since Europe and its Member States are committed to the Paris agreement and with achieving decarbonisation by 2050, it became clear that we don't have that much time to do so, and that we need to align the capital flows with economic activities that can lead us to carbon neutrality in 2050. In order to understand what are those economic activities that can lead economy towards carbon neutrality in 2050, the European Commission, together with several stakeholders and based

9 'Worrying effects of accelerating climate change on the Mediterranean Basin', October 2018, European Commission

10 IPCC SR15 2018

on scientific criteria, elaborated the EU Taxonomy that expresses what sustainable environmental activities are, and defines a list of technical screening criteria that specific activities should comply in order to be catalogued as environmentally sustainable.

Therefore, the EU Taxonomy should be seen as a list of activities that can contribute to carbon neutrality, and as such should be endorsed by the financial sector.

According with the taxonomy, an environmentally sustainable activity is an activity which:

1. Must substantially contribute to one or more of the environmental objectives, such as:

- Mitigation of climate change;
- Adaptation to climate change;
- Use and protection of marine resources;
- Transition to circular economy, waste prevention, and recycling;
- Pollution prevention and control;
- Protecting healthy sustainable ecosystems.

2. Cannot cause significant harm to any of the other objectives;

3. Must comply with social minimum criteria (e.g., OECD Guidelines on Multinational Enterprises and the UN Guiding Principles on Business and Human Rights);

4. Must comply with the technical criteria

Climate related extremes such as drought, floods, wind storms, accounted for some 83% of the weather related disasters monetary losses suffered by EU-28 over the period 1980-2017

defined in the taxonomy.

The technical criteria are published via the EU Delegated Acts, and they identify for each significant activity the scientific minimum criteria that can make an activity be identified as taxonomy aligned.

4. Alignment of organisations with the Taxonomy

Since the goal of the taxonomy is to identify the activities that are aligned with the decarbonisation path by 2050, organisations are obliged to disclose how aligned they are with such taxonomy. In 2022 large corporations (financial and non-financial) must report the eligibility of their activities under the taxonomy regarding the mitigation and adaptation goal, and in 2023 for the remaining four goals. In 2024 they will be obliged to report – under the Directive for Corporate Sustainability Reporting – their alignment with the six environmental goals. The calculation for such alignment is well defined in the Article 8 delegated act, for companies, asset managers, credit institutions, investment firms and Insurance and reinsurance undertakings.

For non-financial organisations such alignment will be provided by the % of Turnover, % Capex, and % Opex that is aligned with the taxonomy, and for the credit institutions that alignment will be given by the Green Asset Ratio, that aims to measure the % of loans that are aligned with the taxonomy.

Funds will also have to report their alignment with the taxonomy that is deeper defined in the Sustainable Finance Disclose Regulation (SFDR). This regulation obliges funds to report the % of their investments that are aligned with the taxonomy, and to state if the fund has, or not, any sort of environmental, social and governance criteria or specific sustainability goals.

So far, the literature does not provide us with the expected minimum level of alignment from companies, funds or banks, but one should expect a lower alignment, otherwise we would not have the unbalanced

planet that we have.

5. Practical implications of the Taxonomy and conclusions

The practical implementation of the taxonomy brings lots of challenges:

The reporting obligation is only for large companies, even though more than 90% of companies in Europe are SMEs. It is expected that SMEs will do it in a voluntary way. Since large majority of the loans from banks are also to SMEs, and since banks will need to comply with other Directives, such as those related with the integration of ESG issues in the capital requirement, it becomes important for banks to have access to the taxonomy alignment of the SMEs, otherwise they might be facing a significant and substantive lack of information;

If the capital requirements will be related with how sustainable and aligned with the taxonomy the project is, banks might be facing an incentive to avoid lending money to companies in transition, and to companies that are not in the taxonomy list. It is therefore extremely important that it becomes clear that investments from polluting companies that can decrease their environmental footprint are also considered as environmentally aligned;

- The fact that funds can declare to have ESG characteristics or to have specific sustainability goals, but that percentage can be 1% and the fund can still invest in

Taxonomy sets up reporting obligations to identify corporate activities aligned with the decarbonisation path by 2050: however, it is limited to large companies despite that more than 90% of European companies are SMEs

fossil fuel companies for instances, can increase the risk of greenwashing which was exactly what the SFDR wanted to avoid;

- The difficulties associated with the practical application of the scientific technical criteria, with country's realities and availability of data, can lead to an inappropriate use of the taxonomy, allowing for greater alignment that what should be;
- The identification of taxonomy aligned activities might induce economic agents to believe that only those activities can have a positive impact in society and in the environment, which can bring a risk of investment biased.

The EU Green Taxonomy is a difficult but clever tool. Nevertheless, since it is science-based tool, to be applicable by companies and financial institutions that are not science based – and do not possess a science-based knowledge, the same way the scientists to not have the business practitioner knowledge – there is a particular concern in relation to the effective implementation of the spirit of the taxonomy by the financial sector.

If in 2024 the alignment of companies and financial institutions (that will start to be disclosed) is above two digits, one should become really concerned with the level of freedom given by the unknown application methods that taxonomy allows. A possible way to avoid this would be to demand that all SMEs and micro companies also disclosed their turnover, Capex and Opex alignment with the taxonomy. If all companies incorporate these three variables in their annual reports, banks and funds would have the primary data needed. Companies would understand their specific technical criteria, and they would be able to realise that access to capital is also dependent on how aligned with good sustainability and environmental practices the company is.

Demanding SME and micro companies to disclose this information is not a popular measure and can have political implications. But if we want to reach carbon neutrality by 2050, governments must be clever enough to demand this, and provide co-financing measures to help the small and micro companies to develop the process innovation needed,

in order to be able to disclose annually the taxonomy alignment and the CO2 emissions.

Are polluting companies willing to decrease their environmental footprint, also considered as environmentally aligned, or are they denied access to capital in order to invest in transition projects?

CHAPTER 2

Business Future Under EU Green Taxonomy

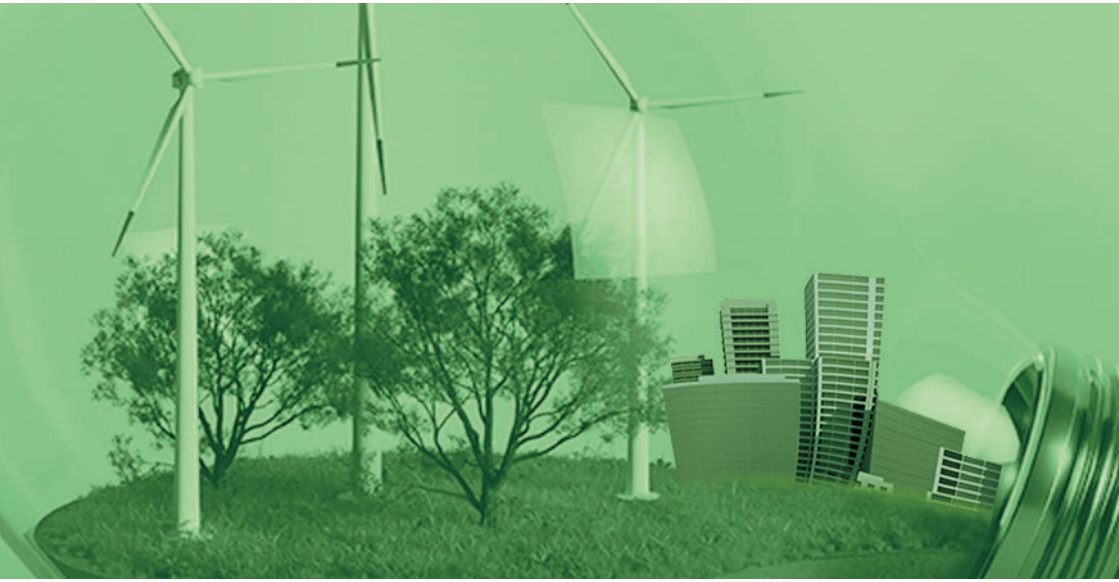
Šárka Shoup & Christopher Strong

Business Future Under EU Green Taxonomy

Šárka Shoup & Christopher Strong

Šárka Shoup is the director of the Institute for Politics and Society. In this position, she is responsible for managing a team and the implementation of projects to ensure the continued development of the think- tank. She pursues the communication between the think-tank, the political party, and the ministries, covering transatlantic, economic, and migration issues. Prior to joining the Institute for Politics and Society, Šárka worked as a project manager on analysing the potential trade relations between Latin America and Visegrád Group. She has studied at the University of Juaréz del Estado de Durango (Mexico) and IDRAC (France). She holds a doctoral degree (Ph.D.), engineer degree (Ing.) and master degree (MBA) from the University of Economics in Prague. She holds a master degree (MA) from the Université Jean Moulin Lyon 3. In 2020, Šárka Shoup was elected as a member of the Board of Directors of the European Liberal Forum, think tank of the ALDE Party.

Christopher Strong is a Geopolitical Analyst. He holds a Master's degree in Geopolitical Studies from Charles University and a Bachelor's degree in Political Science from Auburn University.



CHAPTER 2

Chapter 2

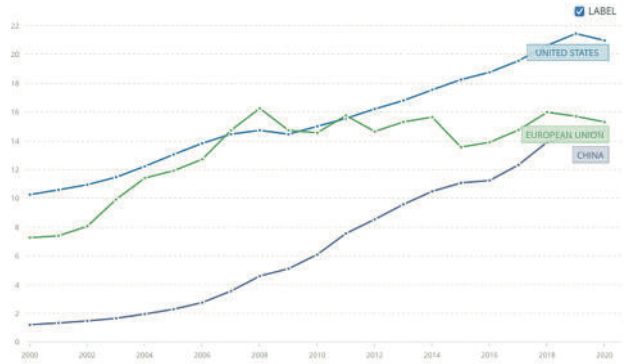
Business Future Under EU Green Taxonomy

Šárka Shoup & Christopher Strong

1. Introduction

The ongoing Russian war in Ukraine and the associated and resulting refugee, energy, and food problems, are not improving the current economic forecast – which is already worrying due to the COVID-19 pandemic. The rising inflation in the EU and globally, countries already impacted by the economic downturn from COVID-19, refugees from the global south that will likely increase with global food shortages, and more. The graph on GDP below shows how the economy of the EU has been stagnating and then slowing down in recent years. The continuation of this trend threatens to weaken the power and influence of the EU. The EU remaining competitive on a global scale is essential to a prosperous and relevant European Union. One influential new policy that could impact this competitiveness is the new European Union Green Taxonomy.

Figure 1: GDP growth 2000 to present for the EU, US, and China



Source: The World Bank[1]

This paper will address some of the initial concerns being raised regarding the taxonomy. Then it will seek to investigate some of the impacts the EU Green Taxonomy will have on the EU business and its competitiveness by working to provide a broad overview of some of the impacts on various industries, and the human and societal impacts involved.

The taxonomy is a new policy, and in the early stages of its implementation (thus, without a crystal ball) it is impossible to say how exactly this will impact our lives in the EU and presumably around the world, in case other nations choose to adopt a similar policy as well. Furthermore, one could write lengthy reports on each economic activity and how it will be potentially impacted by the taxonomy. This is beyond the scope of the paper, which will focus on giving a broad overview of a new and complicated policy while simultaneously trying to illustrate some of the ways this taxonomy

1 The World Bank, 'GDP (Current US$) - United States, European Union, China | Data' (data.worldbank.org2020) <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=US-EU-CN> accessed 24 May 2022.

will impact the competitiveness of a European Union that is already facing a significant economic slowdown and multiple crises.

The EU Green Taxonomy has been created as a tool to help companies to achieve climate neutrality and to make the EU a sustainable economy[2]. Taxonomy '... will create a frame of reference for investors and companies. It will support companies in their efforts to plan and finance their transition, help mitigate market fragmentation, protect against greenwashing, and accelerate financing of those projects that are already sustainable and those in transition, to deliver on the objectives of the European Green Deal'[3]. The taxonomy is supposed to be an important tool to help the EU finance the transition to a sustainable economy[4], and it is part of the idea of promoting sustainable finance in the EU. Sustainable finance is the process of taking environmental, social, and governance (ESG) considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects[5].

The taxonomy will do this by creating transparency among some companies and investors, as they will be required to disclose their share of Taxonomy-aligned activities: this will allow for the comparison of how closely aligned they are with the EU Green Taxonomy[6]. The taxonomy says it will help companies plan their transition to a more sustainable future and be able to raise finance for that, and that financial companies will be able to 'design credible green financial products'[7].

2 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p.2.

3 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf

4 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf

5 European Commission, 'Overview of Sustainable Finance' (European Commission - European Commission2021), https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en, accessed 23 May 2022.

6 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p.2.

7 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf

The taxonomy will not be set in stone, and instead will be set up in such a way that other economic activities can be added in the future[8]. Companies and investors are also not required to make decisions based on the taxonomy, but just to report their alignment.[9] This reporting will try to prevent companies and investors from greenwashing, as companies will have a hard time lying about how sustainable their activities are. Let us remember that greenwashing 'is the process of conveying a false impression or providing misleading information about how a company's products are more environmentally sound. Greenwashing is considered an unsubstantiated claim to deceive consumers into believing that a company's products are environmentally friendly'[10].

2. Objectives and conditions

The EU Green Taxonomy has six environmental objectives: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, and protection and restoration of biodiversity and ecosystems[11]. Moreover, there are four conditions for a given economic activity to be considered taxonomy-aligned: make a substantial contribution to at least one environmental objective, do no significant harm to any other environmental objective, comply with minimum social safeguards, and comply with the technical screening criteria[12].

8 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf

9 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p. 10

10 W. Kenton (2021), 'What You Should Know about Greenwashing', Investopedia, 23 January, https://www.investopedia.com/terms/g/greenwashing.asp

11 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p.4

12 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p. 4

The EU Green Taxonomy covers economic sectors that contribute to around 80% of the EU's greenhouse gas emissions: agriculture, manufacturing, electricity, gas, steam, and air conditioning supply, water, sewage, waste, and remediation, transport, information and communication technologies, and buildings[13]. The Taxonomy has some mandatory rules and can also be used voluntarily – 'Large financial and non-financial companies that fall under the scope of the Non-Financial Reporting Directive will have to disclose to what extent the activities that they carry out meet the criteria set out in the EU Taxonomy. Likewise, financial market participants (such as asset managers) will have to disclose to what extent the activities that their financial products fund meet the EU Taxonomy criteria'[14]. Companies will not be required to ensure their economic activities meet the criteria in the taxonomy, but it is the goal of the taxonomy to motivate companies to transition to activities that are classified as green so they can receive more financing to become sustainable[15].

3. What can be considered green

The EU Green Taxonomy has run into issues regarding what can be considered green, as debates are raging throughout the EU to try to come to a consensus on what exactly can be classified as green in the taxonomy. The EU Green Taxonomy includes all the usual green energy products, but it gets complicated because the taxonomy has included nuclear energy and gas[16]. France and some other countries believe nuclear power is a 'low-carbon, stable and independent energy source that can make up for the shortcomings of renewable systems,

13 'A Guide to the EU's "Green" Taxonomy - and Nuclear's Place in It : Energy & Environment - World Nuclear News', World Nuclear News, 10 February, https://www.world-nuclear-news.org/Articles/A-guide-to-the-EUs-green-taxonomy-and-nuclears-pla

14 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p.8.

15 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p. 10-11

16 C. Brooks (2022), 'EU Taxonomy Adds Gas, Nuclear despite Veto from EC's Own Experts', IHS Markit, 4 February, https://cleanenergynews.ihsmarkit.com/research-analysis/eu-taxonomy-adds-gas-nuclear-despite-thumbsdown-from-ecs-own-e.html

guarantee constant supplies, and reduce price volatility'[17]. Germany and several other countries on the other hand are concerned about nuclear waste, believing that waste – which can have half-lives of thousands of years – implies that nuclear energy clearly should not be labelled as green in the Taxonomy[18]. Germany, along with many other EU countries, also relies heavily on natural gas, and despite the fact it does less harm to the environment than coal it is still not a source of green energy[19]. Both nuclear and natural gas have been added to the taxonomy as a way to help move the EU towards a future that will be based on renewable energy.

The inclusion of nuclear and natural gas in the green taxonomy has been met with fierce critique. Many investors, NGOs, countries, and the expert group created by the European Commission have all been angered by this. They believe this would be institutional greenwashing, while the whole point of the taxonomy was to get rid of companies' abilities to greenwash[20]. Regardless of this, the European Union feels that these must be

Taxonomy supports companies in their transition plans, backs issuers designing credible sustainable financial products, and helps investors to navigate in resource efficient economy

17 J. Liboreiro (2022), 'How a Technical Rulebook Is Sparking a Storm over EU Green Energy', Euronews, 25 January, https://www.euronews.com/my-europe/2022/01/25/how-a-technical-rulebook-unleashed-a-political-storm-over-eu-green-energy

18 J. Liboreiro (2022), 'How a Technical Rulebook Is Sparking a Storm over EU Green Energy', Euronews, 25 January, https://www.euronews.com/my-europe/2022/01/25/how-a-technical-rulebook-unleashed-a-political-storm-over-eu-green-energy

19 J. Liboreiro (2022), 'How a Technical Rulebook Is Sparking a Storm over EU Green Energy', Euronews, 25 January, https://www.euronews.com/my-europe/2022/01/25/how-a-technical-rulebook-unleashed-a-political-storm-over-eu-green-energy

20 C. Brooks (2022), 'EU Taxonomy Adds Gas, Nuclear despite Veto from EC's Own Experts', IHS Markit, 4 February, https://cleanenergynews.ihsmarkit.com/research-analysis/eu-taxonomy-adds-gas-nuclear-despite-thumbsdown-from-ecs-own-e.html

allowed in a restricted capacity because they are needed to move Europe away from coal, which is much more harmful to the environment[21]. In fact, 'Natural gas emits 50 to 60 percent less carbon dioxide (CO2) when combusted in a new, efficient natural gas-power plant compared with emissions from a typical new coal plant'[22]. The impact of the Green Taxonomy was supposed to be in part to create a gold standard for sustainable finance, but many experts worry that with the addition of natural gas and energy, the goal has not only fallen by the wayside, but now the taxonomy will lose all of its credibility[23]. In addition, experts believe that if gas had not been included, it would not have hurt the ability for the gas industry to obtain financing, and that including gas in the taxonomy will hurt investment into renewable energy.

The EU Green Taxonomy has included nuclear and gas under a transitional classification. Article 10(2) of the Taxonomy Regulation says, 'transitional activities are those which cannot yet be replaced by technologically and economically feasible low-carbon alternatives, but do contribute to climate change mitigation and may play a role in the transition to a climate-neutral economy'[24]. According to the taxonomy, nuclear energy and natural gas fit into this classification. To fit in, nuclear must fulfil certain environmental and safety requirements, such as power plants using Generation III + technology (which is the most advanced will be recognised till 2045). Modifications and upgrades on existing nuclear power plants for the purpose of lifetime extension will be recognised up until 2040.

Gas fits in by being able to contribute to the transition of renewables from the much more harmful source, that is, coal. Economic activities

21 J. Liboreiro (2022), 'How a Technical Rulebook Is Sparking a Storm over EU Green Energy', Euronews, 25 January, https://www.euronews.com/my-europe/2022/01/25/how-a-technical-rulebook-unleashed-a-political-storm-over-eu-green-energy

22 GAS vessel (2018), 'Natural Gas vs. Coal – a Positive Impact on the Environment', GASVESSEL, 24 September, https://www.gasvessel.eu/news/natural-gas-vs-coal-impact-on-the-environment/#:~:text=Natural%20gas%20is%20a%20fossil

23 E. Sanchez Nicolas (2022), '[Magazine] Nuclear and Gas in EU Taxonomy Slammed as "Greenwashing"', Euobserver, 13 May, https://euobserver.com/war-peace-green-economy/154585

24 S. Spinaci (2022), 'EU Taxonomy: Delegated Acts on Climate, and Nuclear and Gas', European Parliament Think Tank,https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)698935#:~:text=The%20first%20climate%20delegated%20act,Commission%20on%202%20February%202022.

using gas must have life-cycle emissions below 100 g CO2e/kWh, or they have until 2030 to get a construction permit which will count as green if certain other criteria are met and there is not enough renewable energy to replace the gas[25]. While the EU Green Taxonomy has received criticism for including nuclear and natural gas in the mix, the taxonomy makes clear that these are transitional technologies needed to eliminate dependence on other high polluting fossil fuels such as coal. The inclusion of natural gas and nuclear energy will most likely influence countries around the world who are working to come up with their own sustainable finance systems[26].

The energy market will most likely be the most impacted by the taxonomy. The hope is that the taxonomy will pump the renewable energy market full of funding as to move Europe to a sustainable economy – but this might not be the case. While the inclusion of gas in the taxonomy is transitory, it does mean that funds that might have gone to sustainable energy could end up going to fund way more natural gas projects. This could end up with the EU being even more reliant on gas than it was before. This is a problem for the goal of creating a sustainable Europe, and a problem for the energy security of Europe as well, since Europe is heavily reliant on Russia for its gas. The Russian invasion of Ukraine has in fact caused natural gas prices to jump to record highs, due to Europe being heavily reliant on imports from Russia[27]. This inclusion of gas could not only be a mistake from the perspective of a green future, but also a strategic mistake for the EU[28]. The taxonomy will most probably slowly phase out the use of coal as it is intended to do, but it is not clear if it will usher in a new era of sustainable energy for the EU. The energy markets will change over time, but the transition to green energy for the EU will most likely be a

25 S. Spinaci (2022), 'EU Taxonomy: Delegated Acts on Climate, and Nuclear and Gas', European Parliament Think Tank,https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)698935#:~:text=The%20first%20climate%20delegated%20act,Commission%20on%202%20February%202022.

26 'A Guide to the EU's "Green" Taxonomy - and Nuclear's Place in It : Energy & Environment - World Nuclear News', World Nuclear News, 10 February, https://www.world-nuclear-news.org/Articles/A-guide-to-the-EUs-green-taxonomy-and-nuclears-pla

27 P. Inman (2022), 'Soaring Gas Prices Are a Cost of Russia's War – and Britain Can't Avoid Them', The Guardian, 7 March, https://www.theguardian.com/money/2022/mar/06/soaring-gas-prices-are-a-cost-of-this-war-and-britain-cant-avoid-them

28 W. Todts (2022), 'EU Taxonomy: Labelling Gas "Green" Is a Gift to Putin', Energy Post, 8 February, https://energypost.eu/eu-taxonomy-labelling-gas-green-is-a-gift-to-putin/

lot slower than previously hoped, and involve a considerable amount of gas.

4. Issues with the EU Green Taxonomy

There are arguments to be made that a free market without regulations pushes quality products to the top, while eliminating products that are not in demand. There is some worrying among economists that tampering with the free market will make products that are not viable and would have otherwise died, pushed into the market. As a result, there will not be as much of an incentive for companies to innovate and come up with better solutions to combat climate change[29]. Furthermore, companies that need investments, but are not considered green enough, might not be able to find them. These are legitimate concerns policymakers might have to deal with in the future. In addition, there is concern that this complicated taxonomy will burden companies with more expenses, and therefore push companies to look for loopholes to meet the criteria[30]. The latter situation adds to the argument that the free market leads to more innovation and stifling, that innovation could actually be detrimental not only to the economy, but to the push to reduce emissions. However, investment firms have a fiduciary responsibility to make money for their clients unless they are specifically heading a fund focused on sustainability: thus, it appears that regardless of the taxonomy-alignment, the market will push products that are worthy of investment to the top.[31]

Another issue that worries companies is if they will be able to collect standardised data and analytics to demonstrate their support for sustainable use and protection of water and marine resources. Starting in January 2022, companies had to report on whether their economic activities from 2021 fit into the taxonomy. One of the problems has

29 D. Schoenmaker (2018), 'Sustainable Investing: How to Do It | Bruegel', Bruegel, 28 November, https://www.bruegel.org/2018/11/sustainable-investing-how-to-do-it/

30 D. Schoenmaker (2018), 'Sustainable Investing: How to Do It | Bruegel', Bruegel, 28 November, https://www.bruegel.org/2018/11/sustainable-investing-how-to-do-it/

31 Politico Europe and Tariq Fancy (2021), 'Spotlight Discussion - EU Taxonomy: Green Stall or Start? | SFS', www.youtube.com, 1 December, https://www.youtube.com/watch?v=6euck6ENH4o

been that companies are not sure what exactly constitutes an economic activity, as the nature of an economic activity has not been explicitly defined. For the year 2021 companies just have to report whether their economic activity is eligible to be in the taxonomy, while for the next year they will have to report whether the activity is aligned[32]. This will be even more difficult seeing, as – again – it is unclear what counts as economic activity. Consequently, there are currently companies which are not signing off on their reports because the terms used in the green taxonomy are too vague; as a consequence, they feel they cannot accurately report on their economic activities[33].

Furthermore, companies are unsure of what counts as a substantial contribution to the goals laid out by the taxonomy. There does not seem to be a clear system to measure the impacts yet, so companies are unsure of what has to be reported[34]. These issues will need to be addressed in the future so that companies can try to adhere to the EU Green Taxonomy.

Funds are going to have difficulty assessing green bond funds against the do no significant harm principle, and the technical screening

Greenwashing is N.1 enemy of financial markets; the whole point of the taxonomy is to get rid of companies' abilities to greenwash

32 J. Thostrup Jagd (2022), 'EU Green Taxonomy: Good Idea, Bad Implementation', We Mean Business Coalition, 9 May, https://www.wemeanbusinesscoalition.org/blog/eu-green-taxonomy-implementation/

33 J. Thostrup Jagd (2022), 'EU Green Taxonomy: Good Idea, Bad Implementation', We Mean Business Coalition, 9 May, https://www.wemeanbusinesscoalition.org/blog/eu-green-taxonomy-implementation/

34 J. Thostrup Jagd (2022), 'EU Green Taxonomy: Good Idea, Bad Implementation', We Mean Business Coalition, 9 May, https://www.wemeanbusinesscoalition.org/blog/eu-green-taxonomy-implementation/

criteria. A study done by PRI (2020) found that it was hard to assess all the studied bonds, because there was a lack of granular data to come to any conclusions[35]. Another study done by the UNEP FI & EBF (2021) looked at 26 cases from banking products and found that none of them were strictly aligned with the taxonomy[36]. Financial institutions do not have access to all the same data, this meaning that some financial institutions might not be able to fully access all the data required to report to the taxonomy[37]. One study carried out by building councils from Austria, Spain, Denmark, and Germany looked at 62 buildings, and only found one fitting with the taxonomy[38]. These studies highlight all the issues that companies will have in trying to fit within the EU Green Taxonomy – and it appears that for many companies it is almost impossible to comply, perhaps negatively impacting them.

Another issue with the EU Green Taxonomy is that it does not fit the entire world. Companies and financial institutions will have trouble reporting on activities outside the EU, since the latter are dealing with different climates and, therefore, different realities when it comes to becoming a more sustainable company[39]. Furthermore, the companies outside the EU may not be able to report aligned economic activities to investors in the EU, which would put them at a disadvantage over firms from the EU[40]. Companies inside and outside of the EU will have to use significant manpower to try to report things correctly according to the taxonomy: nevertheless, this may not be enough, in light of the

35 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.11.

36 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.11.

37 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.15.

38 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.11.

39 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.14.

40 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.14

complexity of the reporting obligations.

In addition, the EU Green Taxonomy has the potential to negatively impact smaller companies and financial firms, because the classification is a one-size-fits-all instead of proportional to the size of an entity[41]. This also embeds the possibility to raise the costs for smaller sustainable energy products, and make investment less attractive[42]. Furthermore, taxonomy implies that several updated activities that were once seen as green, might not be seen as so sustainable anymore; this could cause investors to pull out of green bonds that are not viewed as sustainable as they once were[43].

The above-mentioned are just some of the problems associated with the EU Green Taxonomy, probably indicating that even more problems are likely to arise in the future.

5. EU Green Taxonomy impact on important industries

Having introduced some of the current and potential problems surrounding the EU Green Taxonomy, let us discuss the impact of the taxonomy. First, the impacts on high emitter industries like energy, steel, cement, construction, and manufacturing.

5.1. Steel

The EU Green Taxonomy could impact the steel industry in various ways. As it was stated, 'The European steel industry has more than 500 production sites operating across 23 EU Member States. The industry directly employs 330,000 people, and when including indirect and

41 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.15

42 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.15

43 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.16.

induced jobs in other sectors, creates 2.6 million jobs throughout the EU'[44]. It is essential to recall that the EU is only second to China in steel production[45]. We need steel for almost everything, and an increase in steel prices means an increase in the prices of many other things. The steel industry is one of the leading industries in world CO2 emissions (responsible for 8% of CO2 emissions worldwide and 5.7% of total EU emissions), so it will be quite difficult for the industry to transition to a sustainable model[46]. Difficult but not impossible, since Slovenian and Swedish companies have significantly improved upon green steel technology in recent years – with hopes to improve its efficiency[47].

One of the obstacles beyond the complexity and costs of refitting steel plants to produce green steel is the fact that it also costs about 25% more to make than regular steel[48]. Furthermore, the process requires high-quality iron-ore which many companies do not use[49]. The hope of the EU Green Taxonomy is that it will help incentivising financial backing to scale up the production of green steel, as well as research to make the process cheaper and effective. A Swedish start-up focused on green steel raised 100 million SEK in green investments in 2021, so this shows that such an approach is possible[50], possibly resulting in a quicker transition to green steel. This, combined with the fact that steel is a circular product (with plans to make it even more circular), meaning that the industry could reduce its emissions[51].

44 European Commission, 'Towards Competitive and Clean European Steel' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/swd-competitive-clean-european-steel_en.pdf, p.3.

45 European Commission, 'Towards Competitive and Clean European Steel' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/swd-competitive-clean-european-steel_en.pdf, p.3.

46 V. Bennett (2022), 'EBRD Supports Steel Industry Decarbonisation in Slovenia', www.ebrd.com, 14 February, https://www.ebrd.com/news/2022/ebrd-supports-steel-industry-decarbonisation-in-slovenia.html; See also: A. De La Garza (2022), 'This Swedish Company Wants to Fix Steel's Steep Climate Cost', Time, 28 May, https://time.com/6171369/ssab-sweden-green-steel/; European Commission, 'Towards Competitive and Clean European Steel' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/swd-competitive-clean-european-steel_en.pdf, p.7.

47 V. Bennett (2022), 'EBRD Supports Steel Industry Decarbonisation in Slovenia', www.ebrd.com, 14 February, https://www.ebrd.com/news/2022/ebrd-supports-steel-industry-decarbonisation-in-slovenia.html; see also 'Sweden Could Take Global Lead in Green Steel Production – Report', MINING.COM, 22 December 2021, https://www.mining.com/sweden-could-take-global-lead-in-green-steel-production-report/#:~:text=Sweden

48 A. De La Garza (2022), 'This Swedish Company Wants to Fix Steel's Steep Climate Cost', Time, 28 May, https://time.com/6171369/ssab-sweden-green-steel/

49 A. De La Garza (2022), 'This Swedish Company Wants to Fix Steel's Steep Climate Cost', Time, 28 May, https://time.com/6171369/ssab-sweden-green-steel/

50 EIT Raw Materials (2021), 'Investing in Green Steel: Swedish Start-up GreenIron Raises SEK 100 million - EIT RawMaterials', EIT RawMaterials, 20 December, https://eitrawmaterials.eu/investing-in-green-steel-swedish-start-up-greeniron-raises-sek-100-million/

The taxonomy might also drive some funds away from an industry that is huge and vastly important in Europe such as steel (but unable to become more sustainable), to different industries. This drive for a cleaner industry might make European steel less competitive compared to steel from other countries, as it could drive up the costs of production in Europe. The EU steel industry exports declined by around a quarter from 2017 to 2020[52]. Furthermore, disadvantaging the EU steel industry could be a problem in the future. The taxonomy may add to costs due to reporting, and so forth. However, if the industry works to remain competitive not just in the sustainability aspect, then it will still be able to attract investments from firms unconcerned with the Green Taxonomy.

Taxonomy as a one-size-fits-all classification is a relatively new idea, its success will greatly depend whether it makes the EU more competitive or not

5.2. Cement

The cement industry is an equally important industry to the world and also makes up around 8% of the C02 emissions in the world[53]: 'The cost of a new cement plant is equivalent to around 30 years of turnover, which ranks the cement industry among the most capital-intensive industries'[54]. Furthermore, it costs a significant amount of money to change a

51 European Commission, 'Towards Competitive and Clean European Steel' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/swd-competitive-clean-european-steel_en.pdf, p.2

52 European Commission, 'Towards Competitive and Clean European Steel' (European Commission 2021) https://ec.europa.eu/info/sites/default/files/swd-competitive-clean-european-steel_en.pdf, p. 23.

53 L. Rodgers (2018), 'Climate Change: The Massive CO2 Emitter You May Not Know About', BBC News, 17 December, https://www.bbc.com/news/science-environment-46455844

54 'Key Facts & Figures', Cembureau.eu, 2019, https://cembureau.eu/about-our-industry/key-facts-figures/

cement plant[55]. This means that the cement industry would require a large amount of financial backing to become carbon neutral. In addition, even more complications arise when considering the lack of adequate technologies capable of actually changing the situation[56]. The cement industry is working on ways to lower its emissions including resorting to carbon capture, but it is a difficult task[57] – plus, carbon capture is not economical.[58] Cement is a key component of building cities and as not only Europe, but the entire world become more urbanised, we will need increasing amounts of cement. The hope of the taxonomy is that it will drive much-needed funds into the cement industry. This could be hindered by the fact that it will be incredibly difficult to change, as well as incredibly expensive. The taxonomy could cause the cement industry to lose its free emissions allowances that help keep the EU cement industry competitive[59]. The bottom line is that the cement industry will have a very hard time meeting climate goals, and as a result it may not be able to attract finance from the sustainable aligned finance.

5.3. Construction

The EU Green Taxonomy is also likely to impact the construction industry. Let us consider that the two major components needed for construction, steel and cement, might increase in price, and such a situation is expected to cause construction costs to increase. Most buildings will most likely be up to the standards of the taxonomy, so if companies are looking to capitalise on the funding for green financing by renovating buildings to meet the standards, this has the potential to create projects and jobs in the construction industry[60]. It will also be

55 'Key Facts & Figures', Cembureau.eu, 2019, https://cembureau.eu/about-our-industry/key-facts-figures/

56 A. Nilsson et al. (2020), 'Decarbonisation Pathways for the EU Cement Sector Technology Routes and Potential Ways Forward', NewClimate, https://newclimate.org/wp-content/uploads/2020/12/SGCCC-EU-Cement-paper-NewClimate_Nov2020.pdf, p. 4.

57 'Innovation', Cembureau.eu, 2020, https://cembureau.eu/about-our-industry/innovation/

58 Financial Times (2022), 'Carbon Capture: The Hopes, Challenges and Controversies | FT Film', www.youtube.com, 6 May, https://www.youtube.com/watch?v=laGtd-b0vMY

59 F. Voetmann (2022), 'Foresight | EU Taxonomy Will Heavily Impact the Cement Industry', Foresight, 19 January, https://foresightdk.com/eu-taxonomy-will-heavily-impact-the-cement-industry/#:~:text=New%20targets%20from%20the%20European

60 N. Pfaff, O. Alton (2022), 'Ensuring the Usability of the EU Taxonomy', International Capital Market Association, https://www.icmagroup.org/assets/GreenSocialSustainabilityDb/Ensuring-the-Usability-of-the-EU-Taxonomy-and-Ensuring-the-Usability-of-the-EU-Taxonomy-February-2022.pdf, p.11.

incredibly difficult for construction companies to meet the taxonomy criteria completely as so many different economic activities go into constructing a building[61]. It is also more costly to find building materials that would be taxonomy-aligned, and not too expensive at the same time[62]. Furthermore, it will most likely be labour-intensive and costly to gather data from all the various aspects of constructing a building to report to the taxonomy. This is something that not only building companies all required to do, but also other companies supplying building companies[63]. The process of finding out how to do this correctly and efficiently, will most likely take construction companies some time. Presumably, companies making the most efforts towards logging this information, as well as constructing buildings in alignment with the taxonomy, will be able to offset the costs with investors looking to invest in companies who are taxonomy-aligned. Investors will most likely need to be patient with the construction industry as it navigates the best way to handle the EU Green Taxonomy. Buildings always need to be built, so these construction companies will probably have some time to adapt – without facing the risk of losing investment from not being taxonomy aligned right away.

5.4. Manufacturing

The manufacturing industry is another emission-heavy industry that must adapt to meet the climate objectives of the EU, and as a result it will encounter negative, but also some positive effects. The manufacturing industry is a major component of the EU. In 2020, it accounted for over 32 million jobs and added around 15% of value to the GDP of the EU[64]. Manufacturing encompasses a wide range of items being produced, and this results in a lot of emissions[65]. The top

61 H. Naser, C. Hageneder and A. Zinecker (2021), 'The EU Taxonomy -What Does It Mean for Buildings?', Global Alliance for Building and Construction, https://www.peeb.build/imglib/downloads/PEEB_EU_Taxonomy.pdf p. 1-2.

62 European Bank for Reconstruction and Development and World Green Building Council, 'Green Building Investments', World Green Building Council, https://www.worldgbc.org/news-media/green-building-investments

63 DGNB, DK-GBC, GBCe, ÖGNI (2021), 'EU TAXONOMY STUDY. Evaluating the Market readiness of the EU Taxonomy Criteria for Buildings', https://www.cpea.eu/wp-content/uploads/2021/04/210325_EU_Taxonomy-Study.pdf, p.4.

64 European Center for the Development of Vocational Training (2020), 'Employed Population by Occupation and Sector', CEDEFOP, 16 October, https://www.cedefop.europa.eu/en/tools/skills-intelligence/employed-population-occupation-and-sector?year=2020&country=EU&occupation=#1; see also 'Sweden Could Take Global Lead in Green Steel Production – Report', MINING.COM, 22 December 2021, https://www.mining.com/sweden-could-take-global-lead-in-green-steel-production-report/#:~:text=Sweden

65 L. Burton (2020), 'What Contributes to Carbon Footprint in Manufacturing?', resource.temarry.com, 30 March, https://resource.te-

manufacturing industries in the EU are food products, chemicals and chemical products, fabricated metal products, machinery and equipment, and motor vehicles and transport equipment[66].

The food and beverage industry in the EU alone accounts for 30% of EU emissions with the manufacturing involved being around 3% of those emissions[67]. This is just one of the many manufacturing industries that the EU has. Analysing the entire industry at the micro-level is beyond the scope of this paper, but similar to the previous industries discussed in this paper the manufacturing industry will most likely move slowly to get itself aligned with the taxonomy. Similar to all industries, but especially in relation to manufacturing (where we have seen this happen before) the taxonomy increases the risk of companies wanting to relocate to countries that do not have the taxonomy[68]. This could lead to the loss of jobs in an industry that employs a lot of people. Furthermore, if jobs are relocated then emissions might go down in the EU, but they would still be entering the atmosphere from another country – and, since we all live on the same planet, it would still negatively impact the environment.

This speaks to the delicate balance the taxonomy must do to reduce emissions, a balance that must motivate companies and investors without crippling industries. Additionally, just like the other industries previously discussed, the taxonomy will fuel more investment for companies becoming more taxonomy-aligned.

5.5. Potential consequences of the impact of taxonomy on industries

In all the previously discussed industries it is important to note that regardless of their alignment with the EU Green Taxonomy, the taxonomy is not binding[69]. As previously mentioned, the taxonomy is a

marry.com/blog/what-contributes-to-carbon-footprint-in-manufacturing#:~:text=The%20manufacturing%20industry%20is%20one

66 Eurostat (2021), 'Industrial Production Statistics', ec.europa.eu, July, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Industrial_production_statistics#Overview

67 D. Keating (2021), 'Challenge of Greening Agri-Food System Is "Absolutely Massive", Industry Says', www.euractiv.com, 10 November, https://www.euractiv.com/section/climate-environment/news/challenge-of-greening-agri-food-system-is-absolutely-massive-industry-says/

68 T. Suljada, C. Wagner and J. Wickman (2022), 'SEI Experts Dissect the New EU Taxonomy', SEI, 24 January, https://www.sei.org/featured/sei-experts-dissect-the-eu-taxonomy/

guide for investors who are interested in investing sustainably. Also, as previously stated, investors have a fiduciary responsibility to make money, and will attempt to do so regardless of taxonomy alignment[70]. These industries may incur extra costs, but it seems unlikely that they will not be able to attract investment from traditional investors because of the EU Green Taxonomy.

The previously mentioned industries have a direct impact on capital costs. Capital costs are a cost incurred on the purchase of land, buildings, construction, and equipment to be used in the production of goods or the rendering of services[71]. In other words, it is the total cost needed to bring a project to a commercially operable status. If we look at the industries that were just analysed such as steel, cement, and construction we see that most likely all of these will encounter some raised costs to become taxonomy-aligned, and to report whether they taxonomy-aligned or not. Additionally, all will have a difficult time doing it, meaning that in the future it is possible that industries will have a harder time attracting certain funding because they will not be taxonomy-aligned for a while (as described in detail above). To become operational, these one-time costs will most likely become slightly more expensive, which means that the capital costs to start a project will most likely increase. However, industries are starting new projects bearing the taxonomy in mind, and, as a result, all those companies about to start taxonomy-aligned new projects might attract more investments to realise their projects – at the meantime increasing their competitiveness. Moreover, if this results to be a good investment regardless of alignment, investors will most likely invest no matter what. When companies are starting new projects from here on out, they will need to study how to make it as taxonomy-aligned as possible to attract more investment.

69 European Commission, 'FAQ: What Is the EU Taxonomy and How Will It Work in Practice?' (European Commission 2021) <https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/sustainable-finance-taxonomy-faq_en.pdf>. p.10.

70 https://www.youtube.com/watch?v=Politico Europe and Tariq Fancy, 'Spotlight Discussion - EU Taxonomy: Green Stall or Start? | SFS' (www.youtube.com1 December 2021) <https://www.youtube.com/watch?v=6euck6ENH4o> accessed 3 June 2022.6euck6ENH4o Tariq Fancy 31:30.

71 Collins Dictionary, 'Capital Cost Definition and Meaning | Collins English Dictionary', www.collinsdictionary.com, https://www.collinsdictionary.com/dictionary/english/capital-cost

6. Human and societal impacts of the EU Green Taxonomy in relation to business

The human and societal impacts of the EU Green Taxonomy could be far-reaching. First, if the taxonomy works like it is presented then Europeans will be well on their way to a carbon-neutral EU, and will be dealing with much less pollution. If this were to be successful in financing sustainable solutions (particularly in industries that at present time seem unlikely to be able to) the EU could become a leader not only in sustainable finance, but European industries could also attract more attention and be consulted for their expertise. This kind of positive attention and leading the way on important issues is beneficial for European soft power. Soft power is defined by Joseph Nye as 'the ability to get what you want through attraction rather than coercion or payments. It arises from the attractiveness of a country's culture, political ideals, and policies'[72]. This kind of positive perception can already be seen in how much of the world views the Nordic countries as leading the way on sustainability[73]. In short, a positive image will attract more people and businesses[74].

The EU Green Taxonomy surely has issues, and can't do this all on its own. Nevertheless, if Europe is able to lead the way successfully on this important issue that the entire planet is facing, then it will most certainly positively impact the perception and the soft power of the EU.

The flip side of the coin is that if taxonomy doesn't work as well as planned, it might hurt companies who are not taxonomy-aligned, and subsequently, it might cause harm to the whole image of the EU. If these companies are unable to attract investment because they are incapable of making their products sustainable, there could be a problem. However, investment firms have a fiduciary duty to their clients to make money for them. There will be growing green bonds,

72 J. S. Nye (2012), 'Soft Power: The Means to Success in World Politics, Knowledge World, p. X.

73 'Nordic Countries Global Sustainability Leaders | Brand Finance', Brand Finance, 25 January 2021, https://brandfinance.com/insights/nordic-nations-global-leaders-sustainability

74 D. Buxton and A. Minc (2022), 'Why Is a Positive Reputation Important in Business? - Minc Law', www.minclaw.com, 16 March, https://www.minclaw.com/why-positive-reputation-important-business/#:~:text=Put%20simply%2C%20a%20positive%20reputation

funds, private investors, and firms that continue to grow with the push for a sustainable future so they will do their best to invest in taxonomy-aligned activities. Moreover, there will be more and more firms whose primary function is to make money, and have a fiduciary responsibility to do so. This fiduciary responsibility will keep them investing in industries that make them money regardless of whether they are green or not[75]. It seems that companies will be able to attract specific green investments by being taxonomy-aligned, and therefore create more jobs and a cleaner environment; despite this, companies that are not as aligned will still be able to attract investment, due to the desire to make a return on investments.

Companies and possibly some investors could face social pressure as a result of the EU Green Taxonomy. Citizens and NGOs could use the information in the taxonomy in several ways, for instance, to protest against certain companies because they are not taxonomy aligned. Social pressure from not being taxonomy-aligned could negatively impact a company. Protesting a company can hurt their image and then their business. An example of this would be Ringling Bros. and Barnum & Bailey Circus getting rid of elephants from their acts, and moving them to better homes in recent years[76]. These companies faced pressures from society to change their business practices as people became more aware of what they were doing. Whether companies like it or not, they are subject to societal pressure, and the taxonomy will open them up to further scrutiny and consequences for their actions. From the perspective of climate activists, this would be empowering. These practices being laid bare open EU companies up to more scrutiny, but companies can adjust and, in the process, rehabilitate their image in the eyes of the public.

75 https://www.youtube.com/watch?v=6euckPolitico Europe and Tariq Fancy, 'Spotlight Discussion - EU Taxonomy: Green Stall or Start? | SFS' (www.youtube.com1 December 2021) <https://www.youtube.com/watch?v=6euck6ENH4o> accessed 3 June 2022.6ENH4o Tariq Fancy 31:30.

76 C. Kane (2015), 'By Popular Demand: Companies That Changed Their Ways', CNBC, 28 April, https://www.cnbc.com/2015/04/27/by-popular-demand-companies-that-changed-their-ways.html; see also O. Whang (2020), 'Circus Elephants from Ringling Bros. Moving to Conservation Center', National Geographic, 23 September, https://www.nationalgeographic.com/animals/article/ringling-bros-circus-elephants-get-new-home#:~:text=The%20retired%20elephants%20of%20Ringling

The EU Green Taxonomy will also be an important tool when it comes to attracting and hiring talents. Many young people care deeply whether their activities and professions positively impact the planet[77]. People entering the workforce will be able to assess how closely a company is taxonomy-aligned and what they are doing to contribute to lowering emissions. This could motivate them to try and work for a company or, on the other side, if the company is not taxonomy-aligned it might push them away. Companies will have to keep in mind that their alignment with taxonomy can be exploited to help attract new hires. The EU in general could attract a lot of talent from around the world by having more and more businesses that are taxonomy-aligned.

7. Conclusion

The EU Green Taxonomy is a classification system more than anything else. It will help companies and investors make informed decisions about whether their business practices or money, or contributing or not to the EU becoming more sustainable. The taxonomy does not force companies to change practices or investors to change where they put their money. The taxonomy is a relatively new idea, and like all new policies, it has issues that will take time to recognise and fix. It is subject to much debate and scrutiny, including the involvement of natural gas and nuclear energy, even as transitory as it could lead to more dependence on Russian gas among other issues. The taxonomy is just one policy of the many that will have to be implemented if the EU is to reach its climate goals.

The EU Green Taxonomy will most likely impact business in several ways including increasing costs on things like reporting to the taxonomy, but also it is not enough to change companies who cannot or will not align. Companies will be able to attract more investment and

77 Governance & Accountability Institute, INC. (2019), 'Millennials Really Do Want to Work for Environmentally-Sustainable Companies, according to a New Survey of Large Company Employees', www.ga-institute.com, 23 February, https://www.ga-institute.com/news/newsletter/press-release/article/millennials-really-do-want-to-work-for-environmentally-sustainable-companies-according-to-a-new-su.html

more talent by being taxonomy aligned. There are also many investment firms who have a fiduciary duty to make money for their clients and, therefore, cannot just invest in a project because it will be more sustainable unless that is what their clients want. Big industries like cement that are unable to attract sustainable finance will still have plenty of opportunities to attract investment in the future. The taxonomy both provides opportunities for companies and opens them up to scrutiny that could hurt their business. With that in mind, the EU can most likely expect to become more competitive in some industries that are leading the way on being taxonomy-aligned, and other companies might take some penalties. The success and perception of the EU taxonomy will greatly impact whether it makes the EU more competitive or not. If the taxonomy is successful and does indeed become a model for other nations to adopt then all nations will be facing similar challenges to their competitiveness.

The taxonomy will provide society with a window into the operations of a business, and therefore these companies will have to be wary of how they are perceived and could face backlash for not being taxonomy aligned. This is something that companies in the EU will have to deal with, and could hurt their competitiveness or it could force them to adapt and innovate. It is yet to be seen how much this taxonomy can really change the EU. The Green Taxonomy is a new concept and will provide both opportunities and disadvantages to companies in the EU, this meaning that it will most likely not make or break the international competitiveness of the EU.

CHAPTER 3

EU Green Taxonomy in Czech Republic

Ryan Jacobsen

EU Green Taxonomy in Czech Republic

Ryan Jacobsen

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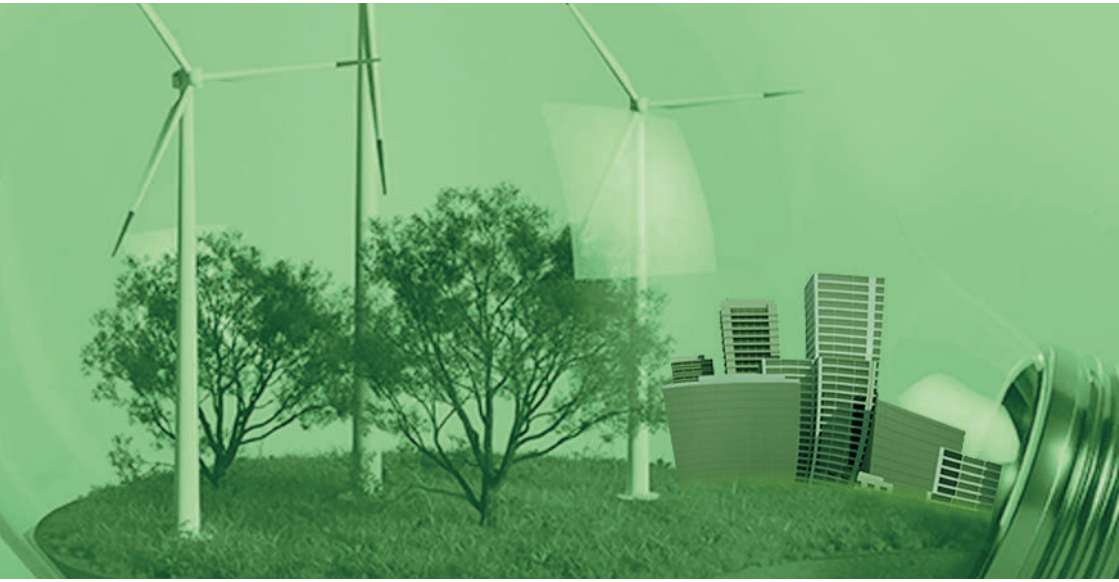

CHAPTER 3

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EU Green Taxonomy in Czech Republic

Ryan Jacobsen

1. Introduction

In June of 2020, the Taxonomy Regulation came into force and became what would be the base of the Green Taxonomy by establishing, among other things, 6 environmental objectives[1]:

- Climate change mitigation;
- Climate change adaption;
- Sustainable use and protection of water and marine resources;
- Transition to a circular economy;
- Pollution prevention and control;
- Protection and restoration of biodiversity and ecosystems.

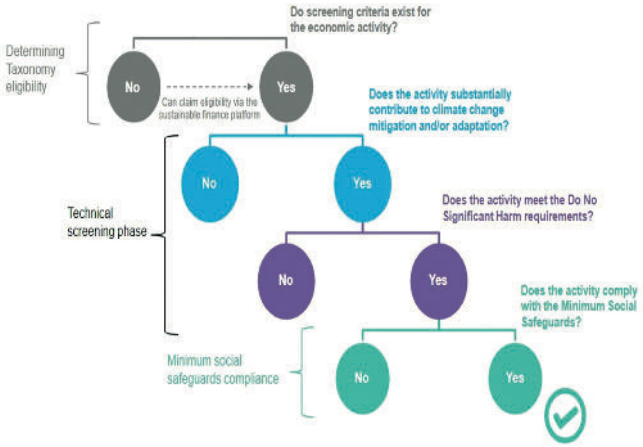
The European Commission then worked to develop a list of economically sustainable activities that meet one or more of the above objectives by coming up with objective criteria, the first act of which was published in

1 European Commission, EU Taxonomy for sustainable activities, Brussels: European Commission

December of 2021 and came into effect in January 2022[2].

The EU Green Taxonomy is a 'green classification system that translates the EU's climate and environmental objectives into criteria for specific economic activities for investment purposes'[3]. It establishes clear and objective criteria, that businesses can use to demonstrate how sustainable they are, and investors can use it to make investment decisions based on a business's alignment with the taxonomy. It covers an estimated 40% of companies across 13 sectors that produce 80% of greenhouse gas emissions[4]. In order to be eligible under the taxonomy, a business must meet the following 4 conditions: makes a substantial contribution to at least one of the 6 environmental objectives, does no significant harm to any of the objectives, and complies with both the technical screening and social safeguards[5].

Figure 1: How to determine if an activity is taxonomy aligned



Source: Bloomberg Professional Services[6]

2 European Commission, EU Taxonomy for sustainable activities, Brussels: European Commission

3 European Commission, FAQ: What is the EU Taxonomy and how will it work in practice, Brussels: European Commission

4 European Commission, FAQ: What is the EU Taxonomy and how will it work in practice, Brussels: European Commission

5 European Commission, FAQ: What is the EU Taxonomy and how will it work in practice, Brussels: European Commission

6 N. Humphreys (2021), 'Applying the EU Taxonomy to your investments, how to start?' New York: Bloomberg L.P.

The taxonomy is essentially an attempt to create a system that determines what is and what is not green. Opting into the taxonomy is optional, but for those companies in these sectors that do opt in, it supplies an excellent opportunity to attract environment, social and governance (ESG) investments. For those companies that decide not to take part, it can raise questions with investors, and with the public, about why they would not want to show their alignment with the taxonomy.

The 13 sectors covered under the taxonomy are: forestry, environmental protection and restoration, manufacturing, energy, water supply (including sewage, waste management and remediation), transport, construction and real estate, information and communication, professional, scientific and technical activities, financial and insurance activities, education, human health and social work, and arts, entertainment and recreation.[7]

2. Implications of taxonomy for Czech businesses

What does this mean for businesses in the Czech Republic? Czech businesses and people take sustainable development quite seriously. In the 2021 Sustainable Development Report, the Czech Republic ranked 12th out of 165 countries[8]. While the Sustainable Development Report is a ranking of overall sustainable development, and is not specifically about sustainable green business development, the spill over into the green business sphere is noticeable. A 2020 survey of businesses in the Czech Republic asked about their motivations when it comes to sustainable development and how they balance the environmental, social, and economic sustainability aspects in their business decisions. The majority of respondents, 73.2%, said they place emphasis to some degree on environmental sustainability when making business

7 European Commission (2022), EU Taxonomy Compass, Brussels: European Commission

8 J.D. Sachs, C. Kroll, G. Lafortune, G. Fuller, and F. Woelm (2021), 'The Decade of Action for the Sustainable Development Goals: Sustainable Development Report 2021', Cambridge UK: Cambridge University Press

decisions, with just 26.8% saying they only follow the minimum that is required by environmental protection laws.[9]

What this survey demonstrates, is that even without the potential investment incentives that the taxonomy provides almost three quarters of Czech businesses are already inclined to be conscious of environmental sustainability and their environmental impact. It should be noted that this study was not exclusive to sectors covered by the taxonomy and may have included businesses in sectors not eligible under the taxonomy.

Worldwide ESG investments are rapidly growing, and the taxonomy gives businesses a chance to standout and attract investors: 'more than $ 649 billion flowing into ESG-focused funds worldwide in 2021, up from the $ 542 billion and $ 285 billion in 2020 and 2019, respectively. ESG investment will be funneled into organizations that can show alignment to the taxonomy'[10]. Inside the Czech Republic, approximately 117 billion crowns (EUR 4.7 billion) are planned to be invested into ESG by 2025.[11] With the Czech Republic aiming to reduce greenhouse gas emissions by 55% of their 1990 levels by 2030 – which is estimated to require at least EUR 18 billion in

Almost three quarters of Czech businesses are inclined to be conscious of environmental sustainability and impact, even without the potential financial incentives provided by taxonomy

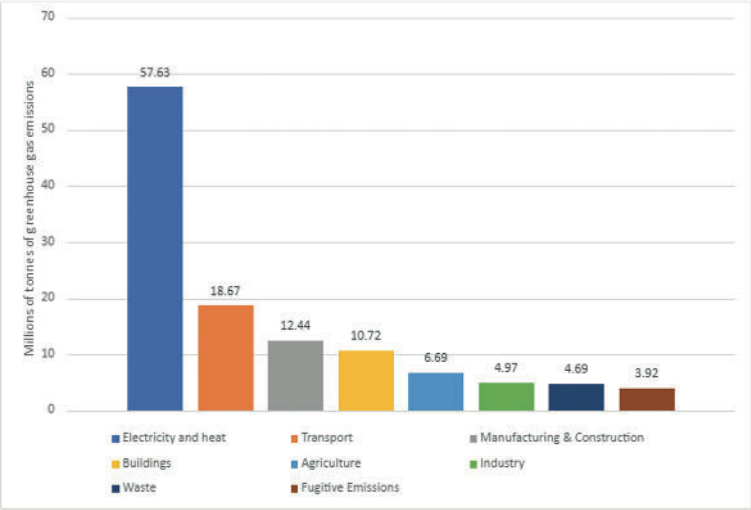
9 P. Vrabcova and Hana Urbancove (2021), 'Approaches of selected organisations in the Czech Republic to promoting the concept of sustainable development and corporate social responsibility', Prague: Agricultural Economics

10 H. Pettingale, J. Kuenzer, P. Reilly, and S. de Maupeou (2022), 'EU Taxonomy and the Future of Reporting', Cambridge MA: Harvard Law School Forum

11 W. Malcolm (2021), 'Czech Companies to Spend 117 billion Crowns on ESG by 2025', Prague: Prague Business Journal

investments over the decade and net-zero by 2050 which will require an estimated EUR 150 billion or more[12] – is vital for Czech companies to attract as much ESG investment as they possibly can to meet these goals.

Of the 13 sectors under the taxonomy, the energy sector in the Czech Republic produces the most greenhouse gases, largely due to the Czech Republic's current reliance on coal, but manufacturing (specifically vehicle and vehicle parts manufacturing which combined make up 17.55% of exports from the Czech Republic)[13] construction, and transport make up roughly 30% of greenhouse gas emissions combined[14].



Source: Hannah Ritchie, Max Roser and Pablo Rosado[15].

12 V. Hanzlik, V. Javurek, B. Smeets, and D. Svobod (2020), 'Pathways to decarbonize the Czech Republic', New York: McKinsey & Company

13 Observatory of Economic Complexity (2021), Czechia, Cambridge MA: MIT Media Lab, OEC

14 R. Hannah, M. Roser and P. Rosado (2020), 'CO and Greenhouse Gas Emissions', Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions'

15 R. Hannah, M. Roser and P. Rosado (2020), 'CO and Greenhouse Gas Emissions', Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions'

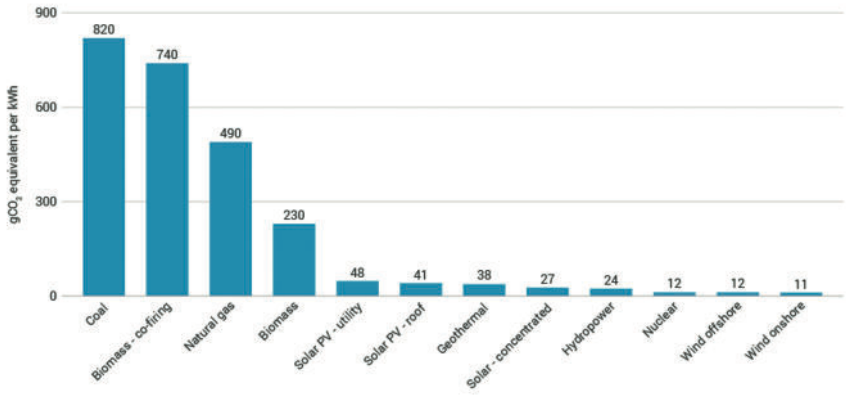
Although many of the coal plants have shut down, or are scheduled to be shut down, it is unlikely to be enough to meet the 2030 goal. Reduction in coal alone will only get the Czech Republic to around 75% of its 2030 goal[16], if the Czech Republic wants to get to 55% of its 1990 level it is going to have to address the transport, manufacturing, and construction industries as well.

Let us examine two large industries in the Czech Republic that could greatly benefit from the EU Green Taxonomy: vehicle manufacturing and nuclear energy. Manufacturing of vehicles and vehicle parts are two of the largest industries in the Czech Republic, and logically contribute to the greenhouse gas emissions. However, Skoda, the largest vehicle manufacturer in the Czech Republic, is working hard to reduce its carbon footprint through processes like producing more electric vehicles and equipping its centers with solar panels both of which, while expensive, could attract investors by demonstrating a high alignment with the taxonomy.

Nuclear energy is incredibly expensive to start up but relatively inexpensive to maintain once a plant is up and running, not to mention it is one of the cleaner energies (figure 3 demonstrates the CO2 lifetime emissions of various energy sources). With the Czech Republic looking to reduce its reliance on coal by building new nuclear reactors at its two nuclear power plants, CEZ, the company that runs the nuclear power plants, will likely need some assistance from investors. However, nuclear energy is a controversial topic and its place in the EU Green Taxonomy is no exception.

16 V. Hanzlik, V. Javurek, B. Smeets, and D. Svobod (2020), 'Pathways to decarbonize the Czech Republic', New York: McKinsey & Company

Figure 3: Average lifecycle CO2 equivalent emissions



Source: World Nuclear Association[17]

Vehicle manufacturing and nuclear energy are two industries in the Czech Republic that could greatly benefit from ESG investments gained from alignment under the Green Taxonomy. These investments will in turn help not just the two industries themselves become greener, but the entire Czech Republic as well by reducing the country's reliance on coal and potentially increasing the number of electric cars being driven on Czech streets.

3. Vehicle manufacturing

Skoda, as one of the largest and most well-known companies in the Czech Republic in one of the largest industries in the Czech Republic, plays a large role. As a vehicle manufacturer, many of its activities would fall under 'manufacturing of low carbon technologies for transport' in the manufacturing sector of the EU Taxonomy. Since most company details that would be relevant to taxonomy alignment are not public

17 World Nuclear Association, Carbon Dioxide Emissions From Electricity, London: World Nuclear Association

knowledge, or extremely convoluted, below will look only at Skoda's passenger vehicle production as these statistics are published in Skoda's annual report.

Looking at just passenger vehicle production alone, we can see how Skoda would have aligned with the taxonomy in 2021 in this regard. In 2021, Skoda produced 49.811 of their electric vehicles, the Enyaq iV, and a total of 692.894 passenger vehicles in the EU.[18] Meaning that in 2021, roughly 7% of the cars Skoda produced were electric. This may not seem like a lot, but it is a large increase over 2020 where electric vehicles made up less than 2% of total vehicles and less than 1000 Enyaq iVs were produced[19]. If the taxonomy had been in effect the past couple of years, and Skoda had opted to participate, companies or people interested in investing into electric vehicle production would have been able to see that Skoda's passenger vehicle production, in line with the taxonomy, more than tripled in a single year, and the production of the Enyaq iV increased by more than 5000%, to go along with their other green activities and goals.

The above along with their 2030 goal of achieving a 50% reduction in CO2 production from 2020 levels, 2050 goal of becoming completely carbon neutral, and working with CEZ to construct solar panels on the parts center and main logistics building of Skoda headquarters in Mlada Boleslav[20], Skoda would likely have reasonably high alignment under the taxonomy. This in turn would attract investors, which would assist them in producing more electric vehicles, install more solar panels, and help them to align even more with the taxonomy and attract even more ESG investments.

Skoda producing more electric vehicles also helps to address the issue of greenhouse gases produced by transport. The Czech Republic is far from a leader in the electric car front, although they are becoming more popular with Skoda being the most popular brand of electric

18 Skoda Auto (2022), 2021 Skoda Auto Annual Report, Mlada Boleslav: Skoda Auto
19 Skoda Auto (2022), 2021 Skoda Auto Annual Report, Mlada Boleslav: Skoda Auto
20 Skoda Auto (2022), 2021 Skoda Auto Annual Report, Mlada Boleslav: Skoda Auto

vehicle. Currently only 3.17% of vehicles in the Czech Republic are battery or plug-in hybrid electric vehicles with a total of 15,872 in 2021[21]. This represents an almost 50% increase over 2020. The number of electric charging stations also doubled in 2021[22].

If Skoda, or even Hyundai, officially Hyundai Motor Manufacturing Czech, (the only Hyundai manufacturing plant in the EU is located in Nosovice Czech Republic), are able to align themselves under the taxonomy and procure investments, they can use these investments to develop more affordable technology for electric vehicles and charging stations, and ideally increase the usage of electric vehicles in the Czech Republic even further. One of the biggest issues when purchasing an electric car is the price, as they tend to be significantly more expensive than traditional gas cars. A Czech survey of people planning to buy a new car within 3 years showed that a price reduction of 100.000 CZK (EUR 4.000) increased the overall percent of people interested in buying an electric vehicle by 0.5%, and in those already interested it made them up to 6.2% more likely to purchase an electric vehicle[23].

Using ESG investments gained from taxonomy alignment would go a long way in not just making Skoda and other manufacturers more environmentally friendly in the manufacturing itself, but it could also allow for new technologies to be developed that make it more affordable to produce an electric vehicle, and therefore more affordable to purchase one. As 2030 and 2050 get closer, the Czech Republic needs its vehicle manufacturing and transport industries to ramp up their greenification, as the replacement of coal with nuclear power on its own is not going to be enough.

21 European Alternative Fuel Observatory (2022), Czech Republic, Brussels: European Commission

22 European Alternative Fuel Observatory (2022), Czech Republic, Brussels: European Commission

23 M. Scasny, I. Zverinova, Z. Rajchlova, and E. Kysel (2019), 'Electric car reaches space, but only makes it into the Czech Republic after a discount', Prague: Cerge EI

4. Nuclear

Within the taxonomy there has been debate and controversy over where nuclear energy fits in. The Czech Republic was one of 12 countries in support of having nuclear energy covered by the taxonomy and supported adding gas energy, which is widely used in heating around the country, to the taxonomy as well[24]. Opponents of nuclear energy as a sustainable energy are concerned with nuclear waste and repeats of disasters like Chernobyl or Three Mile Island, as such nuclear and gas were added to the taxonomy as a transitory energy with some strict requirements and deadlines[25]. These restrictions include but are not limited to[26]:

Accident tolerant fuel must be used in all currently existing plants and new Gen III plants by 2025;

The Commission must be notified of new projects and makes the final decision on whether the criteria is met;

By 2050 a high-level waste repositor must be opened;

New projects will be recognised until 2045 and upgrades to existing plants until 2040.

EUR 18 billion is the estimated investment cost of greenhouse gas emissions reduction by 55% of their 1990 levels by 2030 in of Czech Republic and over EUR 150 billion to reach net-zero by 2050

24 R. Muller (2022), 'Czechs want to scrap deadline for nuclear energy in EU plan – report', London: Reuters

25 R. Muller (2022), 'Czechs want to scrap deadline for nuclear energy in EU plan – report', London: Reuters

26 World Nuclear News (2022), 'A guide to the EUs 'green' taxonomy – and nuclear's place in it', London: World Nuclear News

In response, the Czech government stated that 'The Czech Republic requests to leave out the statutes which suggest a transitory nature of nuclear energy, namely the 2045 deadline for new plants operating permits, and 2040 for the existing plants'[27]. Nuclear energy plays a big role in the Czech Republic with approximately 37% of energy in the Czech Republic being from nuclear power plants[28]. The 2015 state energy policy planned on phasing out coal, which currently supplies 40% of energy in the country[29], and replacing it largely with nuclear energy to the point where eventually nuclear energy would make up nearly half of all energy in the Czech Republic with renewables making up another 22%[30].

The Czech Republic currently has two nuclear power plants, Dukovany and Temelin. Dukovany has four Soviet/Russian made VVER 440/213 reactors and Temelin has two VVER 1000/320 reactors[31]. The 2015 Czech energy policy also foresaw one new nuclear reactor at the Dukovany nuclear power plant, with the possibility of an additional three at Dukovany and Temelin nuclear power plants[32]. Building nuclear reactors is neither cheap nor quick, and with the current plan for a new reactor at Dukovany not expected to become operational until 2036[33], any plans for more upgrades to Dukovany and Temelin need to be agreed on and settled in a relatively short period of time to meet the 2045 deadline.

The Czech government under former Prime Minister Andrej Babis initiated the plans to build a new reactor at the Dukovany nuclear power plant[34]. The current government has continued with the Dukovany plan and hopes to have the contract finalised by 2024 with the project costing an estimated EUR 6 billion[35].

27 R. Muller (2022), 'Czechs want to scrap deadline for nuclear energy in EU plan – report', London: Reuters
28 World Nuclear Association (2022), 'Nuclear Power in Czech Republic', London: World Nuclear Association
29 World Nuclear Association (2022), 'Nuclear Power in Czech Republic', London: World Nuclear Association
30 T. McEnchroe (2022), 'CEZ Director warns EU taxonomy plan could complicate Czechia's energy transformation', Prague: Czech Radio
31 CEZ Group, 'Nuclear Power Plants', Prague: CEZ Group
32 World Nuclear News, 2019
33 K. Janicek (2022), 'Czech Republic opens tender for new nuclear reactor', New York: Associated Press
34 World Nuclear News (2019), 'Czechs to commission Dukovany unit by 2036 says PM', London: World Nuclear News

Building a nuclear reactor is not a cheap endeavour, and being able to attract investors via alignment with the taxonomy could be vital to securing the funding the Czech Republic needs to build the potential 4 new reactors. The requirement for accident tolerant fuel in all currently existing and new Gen III reactors by 2025 is perhaps going to be the toughest requirement to meet if the Czech Republic wants its reactor projects to be aligned under the taxonomy. Accident tolerant fuel is a new technology still being tested and is not expected to be available commercially until 2025[36], meaning there will not be a lot of time for the Czech Republic to change its currently existing reactors to accident tolerant fuel if this requirement stays as it currently is.

Moreover, a single new reactor at Dukovany is not nearly enough to fully transition away from coal, especially when the current reactors at Dukovany are scheduled to be shut down in 2040[37]. More than likely, the Czech Republic will need to build at minimum the 4 reactors mentioned in their 2015 energy policy if the transition from coal to nuclear is to be fulfilled. This does not leave a lot of time especially when considering that the current reactors used, VVER, are Russian made, and with the recent invasion of Ukraine the Czech government will have to look at getting completely new types of reactors and hope to have them built before 2040.

If nuclear energy is viewed as transitory in nature under the taxonomy, this could cause problems for the Czech Republic (as well as other countries) which plans to extensively use nuclear power on the path to become carbon neutral. Daniel Benes the CEO of CEZ, the majority state owned company who runs the nuclear power plants in the Czech Republic, said of nuclear energy's transitory nature under the taxonomy: 'First of all, it should be said that the proposal is, in principle, very good for the Czech Republic... However, we need to understand what exactly the European Commission means by saying that nuclear energy is

35 K. Janicek (2022), 'Czech Republic opens tender for new nuclear reactor', New York: Associated Press

36 Office of Nuclear Energy (2018), '5 things you should know about accident tolerant fuels', Washington D.C.: US Department of Energy

37 M. Jirusek (2022), 'Zelená dohoda, taxonomie a krize rozvoje □eské energetiky', Brno: Pravy Breh

sustainable only temporarily...'[38]. The Czech Republic's transition away from coal and into cleaner, more sustainable energies could heavily depend on which direction the taxonomy goes in regards to nuclear energy. If nuclear power plants are not eligible under the taxonomy in the future for investments, the Czech Republic may have to rethink their 2050 carbon neutrality goal and how to reach it.

5. Conclusions

The EU Green Taxonomy looks great on paper. It allows companies to demonstrate their greenness through an objective criteria, clear goals and conditions, and straightforward activities. Companies who wish to partake are awarded with an excellent opportunity to secure ESG investments from investors, who can see the level of alignment with the taxonomy of various companies to make the investment decision they want. It rewards companies who can tangibly demonstrate their efforts in environmental sustainability.

Vehicle manufacturing is one of the largest industries in the Czech Republic and is in a good position to benefit from the opportunities the taxonomy provides. Electric vehicles are the way of the future, and Skoda is working on being a part of that future. Their electric vehicle, the Enyaq iV, increased in production greatly from 2020 to 2021, they have reduced their impact on the environment by 41% when compared to their 2010 levels, and they aim to have up to 70% of their EU sales be electric vehicles by 2030[39]. If they go through the process of demonstrating their alignment with the taxonomy, they could surely secure ESG investments and use that money to further develop and improve upon their green activities and future goals.

In the Czech Republic, coal energy is the largest polluter, but the country is making the effort to move away from coal. For now, nuclear

38 T. McEnchroe (2022), 'CEZ Director warns EU taxonomy plan could complicate Czechia's energy transformation', Prague: Czech Radio
39 Skoda Auto (2022), 2021 Skoda Auto Annual Report, Mlada Boleslav: Skoda Auto

energy is included under the taxonomy as a transitory energy. The restrictions placed onto nuclear energy could cause problems in the Czech Republic meeting its 2050 green goal of carbon neutrality. For the time being, CEZ and the Czech Government should try to secure the investments needed, before time runs out, to meet their goal of reducing their reliance on coal for energy. With one new reactor already planned and in the beginning stages of the process, perhaps it is time to think about the other possible reactors mentioned in their 2015 policy.

The Czech Republic is working on becoming carbon neutral, there is no denying that. They have an uphill battle ahead, as the hesitance of many of the EU Member States to include nuclear energy into the category of green and sustainable has put a bit of a damper on their plans. Nonetheless, they are continuing along the path to carbon neutrality by 2050, and hopefully with the help of some ESG investments obtained via the EU Green Taxonomy they can meet these goals in a financially sustainable way.

Vehicle manufacturing and nuclear energy are in good position to benefit from the opportunities of EU Green Taxonomy

CHAPTER 4

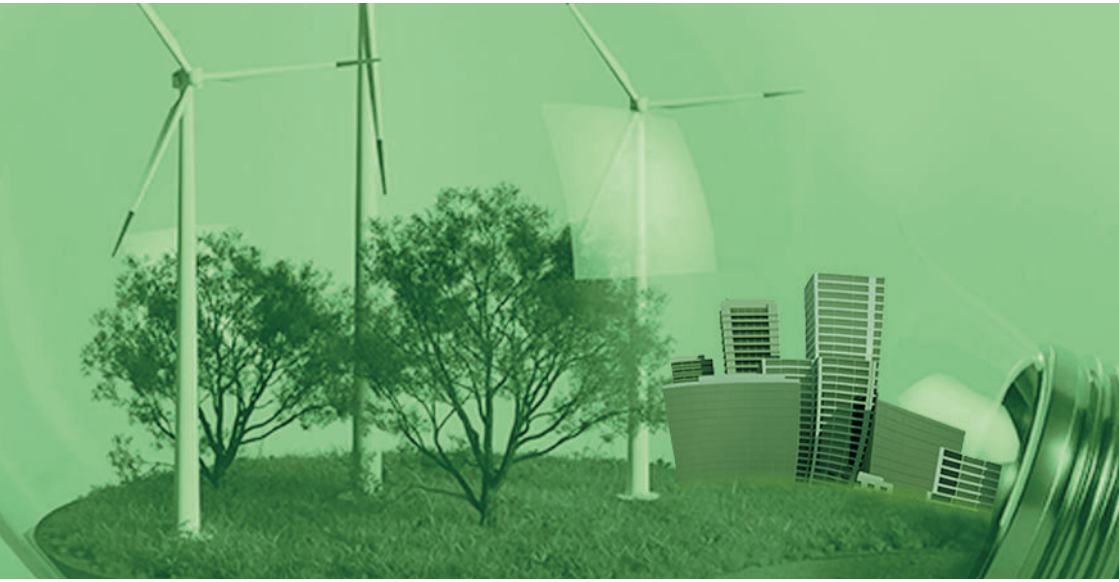
The Role of the Circular Economy in the ecological transition

Andrea Sbandati

The Role of the Circular Economy in the ecological transition

Andrea Sbandati

Freelancer and environmental economist, since the 1980s he focused his work on waste management, recycling, and circular economy. He is currently Director of Confservizi Toscana and cooperates with Assoambiente. He published the book 'The economy of waste' with Franco Angeli publishing company. He is Professor at the Post-graduate Masters' degree in Sustainable Management of Resources at the Sant'Anna School of Pisa



CHAPTER 4

Chapter 4

The Role of the Circular Economy in the ecological transition

Andrea Sbandati

1. Materials, not only energy

The efficient use of matter is as important as the efficient use of energy in decarbonisation policies. Yet, we speak almost only of energy. The two sectors have similar 'renewability' rates: renewable sources cover about 20% of the final uses of energy in Europe, recycled materials cover about 21% of the material flow. To achieve the net zero objectives by 2050, both sectors must be developed, with a strategy that is as united and shared as possible. Increasing recycling consumes less energy, and using waste as a fuel reduces greenhouse emissions. But European policies do not always clearly see the synergies between the two sectors: the European hierarchy on waste management prefers energy recovery to landfill, but the European taxonomy for sustainable finance does not consider energy recovery from waste a green investment. Why?

In the public discussion on the ecological and energy transition, the focus is almost exclusively on the actions to be developed in

the energy field: promotion of efficiency and savings, use of renewable sources, and carbon capture, with the aim of reducing the use of fossil fuels and reaching the net zero target by 2050.

In reality, sustainability policies also depend a lot on how efficiently the materials are used, considering that they are objectively a scarce resource on the planet. Circular economy strategies are based on this assumption.

The purpose of this paper is to describe the contribution that the circular economy can make to the overall decarbonisation strategy in the coming years.

The two 'worlds', energy and matter, naturally speak to each other. On the one hand, the fuels used to produce energy are themselves 'materials'; coal, oil, gas, biomass. For example, they are included in the material flow diagrams that Eurostat periodically publishes[1], alongside the various raw materials for productive use.

On the other hand, an efficient use of materials (reduction of use, recycling but also energy recovery) can generate a net benefit in terms of greenhouse gas reduction when compared to the emissions produced using virgin materials or dissipative and waste-based models. It is known that the recycling processes of iron, paper, and glass are less energy-intensive than the equivalent industrial

In a decarbonisation perspective, renewables sources and recycled material present both a similar renewability rates: renewable sources cover about 20% of the final uses of energy in Europe, recycled materials cover about 21% of the material flow

1 'Material flows true scale in Gt/year (billion tons per year)' (2020), Eurostat, 2020

processes based on virgin material. Moreover, these benefits are often confirmed considering the environmental costs of the collection and transport phase of materials destined for recycling. In other cases, the actual environmental benefit of the recycling processes must be demonstrated, even if the advantage of a lower use of the planet's resources remains.

In the case of using waste to produce energy (biomethane, biogas, waste-to-energy, co-incineration) or to produce fuels (chemical recycling), an assessment of the actual environmental convenience compared to fossil alternatives is being validated. According to a study carried out by Material Economics and commissioned by the Finnish Innovation Fund Sitra together with the European Climate Foundation, entitled 'The Circular Economy - a Powerful Force for Climate Mitigation'[2], a more circular economy could reduce industrial emissions from EU by more than half by 2050 (56% or 300 million tonnes per year).

Of course, the enhanced use of recycling would not only produce a reduction in emissions in circular industrial processes: reducing the use of landfills would imply the reduction of greenhouse emissions in the disposal phase of the waste cycle. As it is known, methane emissions from landfills are one of the main flows of greenhouse gas emissions. It is estimated that the waste sector generates 5% of global greenhouse gas emissions in the world and that landfills generate 2% of the greenhouse gases emitted on earth annually[3].

Figure 1: carbon content in virgin and recycled materials

Source: https://shrinkthatfootprint.com

2 https://materialeconomics.com/publications/the-circular-economy-a-powerful-force-for-climate-mitigation-1

3 https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20200123-1

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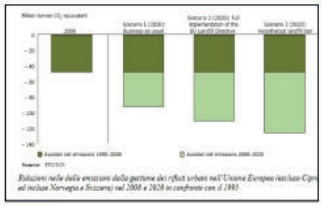
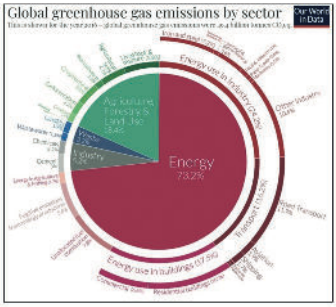
Figure 2: emissions avoided in the different waste management scenarios



Source: https://www.eea.europa.eu/data-and-maps/figures/net-emission-reductions-from-msw

Figure 3: contribution of the waste sector to the generation of greenhouse gases



Source: https://ourworldindata.org/emissions-by-sector

1.1. How many materials do we use? Flow of matter and circularity index

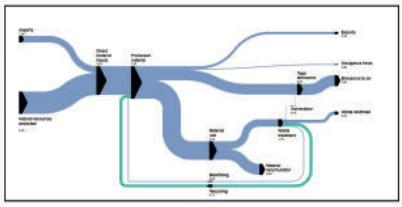
The traditional way to understand the efficiency rate in the use of matter is given by the analysis on the flows of matter (on a global, continental, or national scale), and by the elaboration of the circularity indices,[4] which appreciate how much of the material flow is guaranteed from flows of recycling and reuse of materials or products, as an alternative to the use of virgin materials. Although the indexes represent interesting assessments for monitoring the dissemination processes of circular economy programs, they are limited to a description of the results in terms of efficiency in the use of resources, and only partially

4 https://ec.europa.eu/eurostat/web/products-datasets/-/cei_srm030#:~:text=The%20circular%20material%20use%2C%20also,the%20circular%20use%20of%20materials.

capture the effects of energy and greenhouse gas emissions.

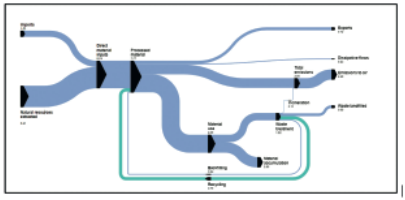
It is interesting to compare the flow of matter on a European scale in 2010 with that of 2020. In ten years, the flows have not moved much[5]. The total number of processed materials decreased somewhat from 7.83 to 7.77 Gigatonne. The recycling flow has slightly increased from 0.71 to 0.79 GT. The extraction of natural resources (In Europe) has decreased somewhat from 5.33 to 5.21 while the use as material (not as energy) decreased from 4.44 to 4.38. Small steps for a decade, but at least all positive. The data on export and import do not seem relevant for the purposes of this work.

Figure 4: flow of matter 2010 Europe 27 Gigatonne



Source: Material flows true scale in Gt/year (billion tonnes per year), EU, 2020, Eurostat

Figure 5: Flow of matter 2020 Europe 27 gigatonne



Source: Material flows true scale in Gt/year (billion tonnes per year), EU, 2020, Eurostat

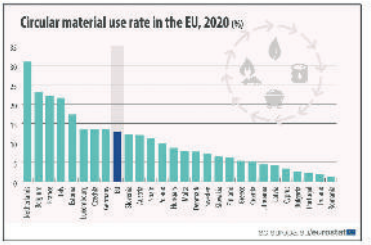
The total emissions represented by these diagrams decreased from 2.66 to 2.49, perhaps partly thanks to the contribution of recycling flows.

5 Material flows true scale in Gt/year (billion tonnes per year), EU, 2020

This type of diagram offers the possibility to obtain the annual circularity rate, which represents the percentage of recycling flow out of the total material flow. In 2020, the EU's use rate of circular material reached 12.8%. Thus, nearly 13% of the material resources used in the EU come from recycled waste materials with the circularity rate increased by 0.8 percentage points. The rate has maintained a stable growth trend since 2004 (8.3%), the first year for which data are available. Here, the circularity rate is the share of material resources used that came from recycled waste materials, thus saving primary raw material extractions.

Overall, it can be observed that the index increases but is not very high and the differentials between the various countries are still very high.

Figure 6: circularity rate Europe 2020



Source: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20200123-1

The room for manoeuvre for an increase in the circularity rate still appears very large, both in the European average and in the individual member countries. This is the basis of the new challenge, at least European, of the Action Plan on the circular economy.

2. European policies for a more circular economy and the possible expected results

The first aim of European policies in circular economy is the development of a more efficient use of materials and physical

resources, reducing the extraction of virgin matter from natural environments and enhancing recycling and reuse.

However, circular economy policies also contribute to the net zero goal, in two ways:

a) The development of recycling produces a reduction of direct greenhouse emissions (less energy-intensive industrial processes) and indirect (reduction of landfill use)

b) Greater energy use of urban and special waste has a substitution effect on the use of fossil fuels.

In partial form (in the case of incineration, with approximately 50% of the biogenic share) and in total form (in the case of the production of biomethane from the anaerobic digestion of waste).

Therefore, policies for a more circular economy have a double sustainability dividend: a more efficient use of matter, and energy at the same time. Both objectives present in the UN 2030 Agenda.

In the next section an evaluation on how European policies stimulate both of these sustainable actions will be addressed.

2.1. The European hierarchy of forms of management

First of all, the 'European hierarchy of forms of waste management' contained in the Framework Directive on waste since 2008[6], clearly indicates the priority of reuse and recycling with respect to both energy recovery and landfill. European policy is therefore strongly oriented towards recycling and reuse well before the advent of the term 'circular economy'.

6 https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en

Figure 7: European waste management hierarchy

Source: https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en

2.2. The circular economy 'package'

In 2018 a European package on circular economy was released[7], where the new directives on waste clearly indicate the 65% recycling target for municipal waste and a maximum landfill limit of 10% on the total municipal waste by 2035. Then, specific recycling targets are defined for the various types of packaging, for construction and demolition waste, and for other specific waste streams. The European Commission policies do not introduce general recycling targets for non-urban waste (special, industrial).

The Directive does not define a target for energy recovery, leaving the Member State free to decide policies which respect the hierarchy in a value that can be between 35% (in a scheme 65% recycling and zero landfill) and 25% (in a scheme 65% recycling and target value minimum landfill at 10%). This is an important step forward in defining European

European circular economy policies aim to reduce the extraction of virgin matter from natural environments and enhance recycling and reuse. An enhanced circular economy could reduce the EU's industrial emissions by more than half by 2050

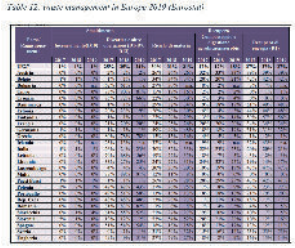
7 https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018L0851&from=EN

policies: alongside a clear 'qualitative' hierarchy that has been known for some time, now there are also defined quantitative objectives.

Will we be able to reach these goals in 13 years?

As can be seen from the table, the recycling of materials present in municipal waste concerns about 49% of total urban waste in 2019, of which 31% of dry (packaging) waste and 18% of organic waste destined for composting and/or anaerobic digestion. The European average 'hides' the results of Member States individually considered: Germany recycles 67% of its municipal waste, Romania only 13%, Italy has an excellent performance in recycling the organic fraction (23%), Slovenia recycles 54% of its waste as dry materials.

The previous directive indicated a recycling goal of the main dry fractions (paper, glass, plastics, metals) as high as 50% of the total waste by 2020, an objective still not met.



Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics

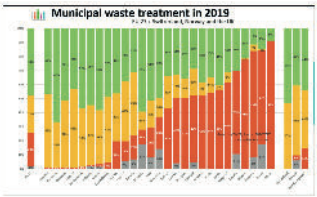


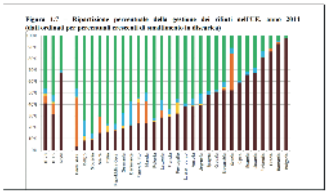
Figure 8: municipal waste treatment in Europe 2019 (Cewep)

Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics

In the municipal waste sector, we are more than halfway along the path of the circular economy. In the next 13 years (to 2035) efforts will be made to bring the recycling rate from the current 49% to 65%, and to bring the landfill rate from the current 24% to less than 10%, to respect the target of the Framework Directive. A simpler task for some countries that are already close to these targets, and much more complex for countries that are still very distant. It is no coincidence that the European Directive allows the most 'backward' countries a longer time to adapt to European objectives. After all, it is a question of bringing all European countries to the recycling rates of the most virtuous countries today.

Similar targets to improve recycling and reduce the use of landfill are not indicated in the Framework Directives[8], addressing industrial and special waste. Eurostat doesn't provide data on the special waste only, but provides (last year 2014)[9] data on the total urban and special waste with the related management methods. Overall, Europe recycles 46% of the total waste produced and sends about 40% to landfill. Therefore, if we also consider the sector of special waste, the margins for improvement of the two European targets are even wider.

It would seem advisable to have an integrated approach of circular economy policies to the set of waste flows, both urban and special, to optimize both the results in terms of efficient use of resources but also the reduction of greenhouse gases, and the achievement of the decarbonisation goal.



Source: Eurostat 2014

8 https://ec.europa.eu/environment/topics/waste-and-recycling/waste-framework-directive_en

9 https://ec.europa.eu/eurostat/web/waste/data/database

2.3. Environmental targets and industrial policy

The achievement of the European recycling objectives will depend on the various European countries with industrial choices both in the organisation phase of the collection services and in the plant engineering phase. In summary, important infrastructural investments will be needed, alongside suitable economic instruments. It will therefore be necessary to define a regulatory framework, also of a financial nature, aimed at promoting this type of investment within the ESC funding strategy being defined with the measures of the European taxonomy.

The development lines of circular economy policies should be based on the following industrial guidelines:

- The market for the recycling of dry materials (metals, paper, plastics, glass) shows a certain rate of maturity and stability. The regulatory and defining framework is clear, the extended producer responsibility mechanism functioning in almost all European countries for packaging waste, end-of-life vehicles, WEEE). Improvements in product design and manufacturing can further increase the recycling rate. The recycling chains of the different materials can be further improved in many countries, with the extension of the separate collection of biowaste, the construction of material valorisation plants and the introduction of more effective economic tools.
- The organic waste recycling market has a lower rate of maturity and stability. The prevailing destination in Europe today of organic waste collected in differentiated form are composting plants, with material recovery. The use of anaerobic digestion plants is still very limited. The compost market presents in many countries critical issues related to the legislation on fertilizers and soil improvers. It is likely a progressive replacement of the current composting plants with anaerobic digestion plants, for the production of biomethane and compostable digestate or usable for the production of biochar.
- The issue of some critical materials will have to be addressed, for

which the recycling market does not yet appear mature: textile waste, medical waste, electrical and electronic waste, some types of plastics, hazardous waste. These are supply chains that often have interesting quantitative values or qualitative aspects (rare minerals in electrical and electronic waste) which could lead to strong growth in the future.

3. A strong plan of investments and plants

Therefore, the necessary industrial policies to achieve the circular economy objectives and those relating to the net zero agenda are based on a large investment plan in plants over the next five/ten years[10]. What investments are we talking about?

First, it will be essential to develop an industrial chain for the recovery of the organic fraction coming from the separate collection of urban waste, with the new mandatory directive in EU countries. It is a flow that could find combinations with non-urban waste, such as agricultural and agri-food waste, and civil sewage sludge. The reference technology is anaerobic digestion plants with the production of biomethane and composting of the digestate, or the production of biochar.

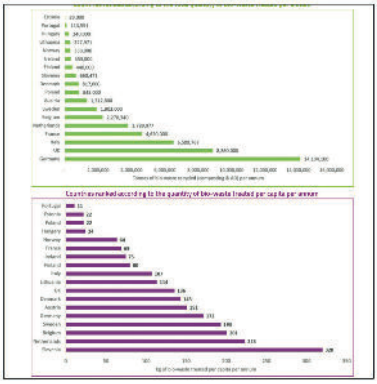
In Europe, over 4200 management plants for

By 2035 WtE plants could produce 189 TWh of useful energy per year, which would be equivalent to 19.4 billion m^3 of natural gas in terms of primary energy (over 10% of total annual amount of gas imported from Russia by Europe in 2020)

10 https://ec.europa.eu/environment/pdf/circular-economy/new_circular_economy_action_plan.pdf

the organic fraction are in operation, treating 47.5 million tons of biowaste. Most of the plants are composting plants and most of the anaerobic digestion plants are not intended for municipal waste streams but for agricultural and livestock waste. The presence of organic waste management plants is distributed in a very different way in the individual countries (Figure 9) biowaste. Italy is oriented to using the resources of the National Recovery and Resilience Plan for this, in application of the Next Generation EU package.

Figure 9: biowaste management plants in various European countries



Source: https://www.compostnetwork.info/policy/biowaste-in-europe/treatment-bio-waste-europe/

Secondly, a greater extraction of dry materials from urban and special waste collected in differentiated or undifferentiated form could be implemented: valorisation platforms, specific plants for the recycling of bulky waste, electrical and electronic waste, construction and demolition waste, medical waste (diapers), textile and clothing waste. In Italy, the so-called 'material factories' are being developed for the recovery of recyclable materials from the biological mechanical treatment plants and for the recovery of special waste sent to landfills (including landfill mining).

A third line of investments could concern the chemical recycling of some materials (plastics) for the production of biofuels (bio methanol

and bioethanol) or hydrogen. These are gasification plants of the waste to chemical supply chain, encouraged by the REDII Directive[11] which pushes for the progressive introduction of recycled carbon fuels, with mandatory quotas.

A fourth line of investments could concern the upgrading and efficiency of waste to energy plants, capable of extracting the energy component from non-recyclable waste or waste from recycling, largely composed of biogenic materials. Today, about 500 waste energy recovery plants are active in Europe, which treat about 60 million tons of waste a year. The amount of primary energy generated by WtE in 2019 was equivalent to 13.8 billion m^3 of natural gas. This corresponds approximately to 9% of the natural gas imports to the EU from Russia (155 billion m^3 in 2021).

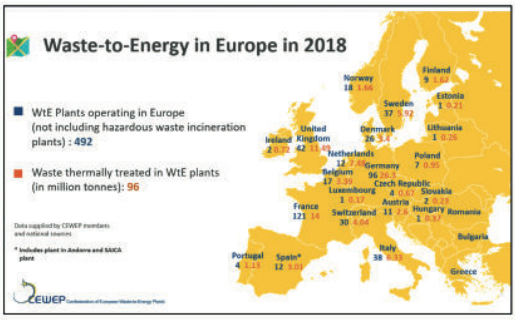
By 2035 WtE plants could produce 189 TWh of useful energy per year [2], which would be equivalent to 19.4 billion m^3 of natural gas in terms of primary energy.

Currently, Waste-to-Energy Plants in Europe can supply 18 million inhabitants with electricity and 15.2 million inhabitants with heat. This is based on 90 million tonnes of remaining household and similar waste that was treated in 2015 in Europe.

Depending on the fuel you replace – gas, oil, hard coal or lignite – between 10 – 49 million tonnes of fossil fuels emitting 24 – 49 million tonnes of CO2, would not need to be used by conventional power plants to produce this amount of energy.

11 https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en

Figure 10; WTE plants in Europe (CEWEP):



Source: https://www.cewep.eu/

According to the EU legislation, the biodegradable fraction of municipal and industrial waste is considered biomass, thus a renewable energy source. The energy output from Waste-to-Energy plants is about 50% renewable.

Waste-to-Energy technology is one of the most robust and effective alternative energy options to reduce CO2 emissions and to save limited fossil fuel resources used by traditional power plants.

Currently Europe starts energy recovery on the whole about 27% of urban waste, therefore there is no continental scale, as clearly illustrated by the Commission Communication on the role of energy recovery in the circular economy of 2017, a problem of 'plant over-capacity '. The investments in the next few years will therefore concern the countries in 'under-capacity' and the modernisation and replacement interventions, with a progressive decommissioning or conversion of the most obsolete plants, as well as the construction of plants with more advanced and efficient technologies and anhydride capture mechanisms. A reasonable target could be the achievement of 30/35% of urban waste sent for energy recovery in WTE plants and an improvement in efficiency, with a consequent increase in the production of energy from this source, which is partly renewable. This increase in supply will be added to the effects in terms of greenhouse gas reduction of the diffusion of anaerobic digestion plants for the

production of biomethane, entirely renewable, and of chemical recycling plants for the production of biofuels from carbon recycled from waste.

4. Economic and financial tools for circular economy

A European industrial policy for the circular economy and the achievement of the recycling targets contained in the Framework Directive will only be possible by putting in place adequate economic instruments. They will be indispensable on a side both for stabilising and balancing mature recyclables markets (paper, metals, glass, plastics) which are by their nature unstable and global. At the same time, new economical instruments will need to take off still unripe recycling markets and to promote industrial chains for the recycling of critical materials (biowaste, some plastics, rare materials).

Annex IV bis of the Waste Framework Directive[12] indicates some examples of economic instruments that can be used in the promotion of the circular economy such as:

EXAMPLES OF ECONOMIC INSTRUMENTS AND OTHER MEASURES TO PROVIDE INCENTIVES FOR THE APPLICATION OF THE WASTE HIERARCHY REFERRED TO IN ARTICLE 4

1. Charges and restrictions for the landfilling and incineration of waste which incentivise waste prevention and recycling, while keeping landfilling the least preferred waste management option;

2. 'Pay-as-you-throw' schemes that charge waste producers on the basis of the actual amount of waste generated and provide incentives for separation at source of recyclable waste and for reduction of mixed waste;

12 https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32018L0851&from=EN

3. Fiscal incentives for donation of products, in particular food;

4. Extended producer responsibility schemes for various types of waste and measures to increase their effectiveness, cost efficiency and governance;

5. Deposit-refund schemes and other measures to encourage efficient collection of used products and materials;

6. Sound planning of investments in waste management infrastructure, including through Union funds;

7. Sustainable public procurement to encourage better waste management and the use of recycled products and materials;

8. Phasing out of subsidies which are not consistent with the waste hierarchy;

9. Use of fiscal measures or other means to promote the uptake of products and materials that are prepared for re-use or recycled;

10. Support to research and innovation in advanced recycling technologies and remanufacturing;

11. Use of best available techniques for waste treatment;

12. Economic incentives for regional and local authorities, in particular to promote waste prevention and intensify separate collection schemes, while avoiding support to landfilling and incineration;

13. Public awareness campaigns, in particular on separate collection, waste prevention and litter reduction, and mainstreaming these issues in education and training;

14. Systems for coordination, including by digital means, between all competent public authorities involved in waste management;

15. Promoting continuous dialogue and cooperation between all

stakeholders in waste management and encouraging voluntary agreements and company reporting on waste.

This disparity in treatment must be bridged to achieve the ambitious recycling targets and to ensure a stable and effective market for recycled materials and products. It is therefore reasonable to think about the introduction of economic tools, including innovative ones. In particular, there are urgent measures aimed at giving stability to the recycling markets by introducing tools for balancing supply and demand, similar in some respects to what has been done in the energy field. In the urban waste sector, the constant and stable functioning of the outlet markets for materials collected in differentiated form or recovered from plants is essential to guarantee a public service that cannot be interrupted. This aspect is of increasing importance with the increase in the rates of recycling and energy recovery expected between now and 2035.

The field of application of the principle of Extended Producer Responsibility could certainly be extended, as the Framework Directive itself provides. One could think of the supply chains of bulky waste, textile waste, non-packaging plastics. Based on the good results in the energy field in Italy, the possible introduction of 'recycling certificates' is being discussed[13], a tool to be used alongside the

It is disappointing that EU Taxonomy on sustainable investments rewards material recovery plants as sustainable but neglects the energy recovery of non recyclable waste

13 REF research institute (2021), https://laboratorioref.it/certificati-del-riciclo-lanello-mancante/

EPR. Reduced or zero tax regimes for the sale of recycled products or materials could be defined on a European scale. Moreover, specific incentives could be introduced for energy recovery and chemical recycling.

5. Recycling plants and European taxonomy

Are the investments necessary to achieve the objectives of circular economy, efficient use of materials and energy use of waste as a renewable source today considered 'green and sustainable investments'?

From 2020 the European Union, in the framework of the Green New Deal, is defining a framework of rules for the support of sustainable investments, known as EU Taxonomy, which came into force with the EU Regulation 2020/852, which identifies the criteria for establishing when an economic activity and an investment can be considered eco-sustainable.

In summary, for an activity to be considered eco-sustainable it must meet three macro-requirements:

a) Contribute substantially to at least one of the six identified environmental objectives:

1. mitigation of climate change;

2. adaptation to climate change;

3. sustainable use and protection of water and marine resources;

4. transition to the circular economy;

5. pollution prevention and control;

6. protection of biodiversity, health and ecosystems;

b) Do not to cause significant damage (DNSH - Do No Significant Harm) to other environmental objectives;

c) Respect the minimum social guarantees indicated by international standards.

In December 2021, the EU Delegated Regulation 2021/2139 was approved, on the technical screening criteria that make it possible to establish when an economic activity contributes to the mitigation of climate change or to its adaptation and does not cause significant damage to others. environmental objectives.

The publication of the 'Environmental Delegated Act'[14] containing the activities, the technical screening criteria and the DNSH requirements for the remaining four environmental objectives, including that of the transition to the circular economy, is expected in the first half of 2024.

In the Climate Delegated Act (Regulation 2021/2139)[15], the technical screening criteria are established that make it possible to determine which activities or plants fall within the Green Taxonomy.

The activities considered eligible in the context of waste management are the following:

- 5.5 Collection and transport of non-hazardous waste in separate fractions at the source.
- 5.7 Anaerobic digestion of organic waste.
- 5.8 Composting of organic waste.
- 5.9 Recovery of materials from non-hazardous waste.
- 5.10 Capture and use of landfill gas.

As it can be seen, the European Taxonomy 'rewards' investments aimed

14 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32020R0852

15 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32021R2139

at recovering materials (including the collection phases) such as composting and recovery plants for materials from hazardous waste (excluding TMB), and investments aimed at energy recovery from biowaste (anaerobic digestion and landfill gas). For now, it does not consider the recovery of energy from non-biogenic combustible waste, therefore the Taxonomy excludes waste-to-energy, not even considering it as a transition technology.

Compared to the investments indicated above, the Taxonomy clearly identifies the activity of 'Anaerobic digestion of organic waste', which includes all the activities of construction and management of plants for the treatment of organic waste collected in a differentiated manner, through anaerobic digestion and production of biogas, digestate and/or chemicals. Anaerobic bio digestion is fully considered an eco-sustainable activity as long as certain technical screening criteria are met. Among these, the biogas produced must be used directly to produce electricity and/or heat, transformed into biomethane to be fed into the natural gas network, used as a fuel for vehicles or as a raw material in the chemical industry. Furthermore, organic waste sent for anaerobic digestion is required to be separated at the source and collected in a differentiated manner. Additional screening criteria, where applicable, refer to the digestate produced and to the performance of the organic waste treatment plants. It should be remembered that the European Framework Directive allows the use of the organic fraction sent for anaerobic digestion in the calculation of the recycling target (65%) only if the digestate/compost is actually sent for agricultural reuse.

In fact, the Taxonomy also includes in sustainable investments the 'only' composting plants that fall within the 'Composting of organic waste' activity. It is therefore the recycling of organic waste aimed at the creation of a new product which, on the basis of technical screening criteria, must be used as fertilizer or soil improver for agricultural use, in compliance with European regulations governing fertilizers or national standards. In this case as well, it is required that the composted organic waste is separated at the source and collected in a differentiated manner.

The taxonomy includes also the plants aimed at preparing for the reuse and recycling of waste, such as the sorting and transformation of non-hazardous waste collected separately into secondary raw materials, and which involve mechanical reprocessing. These activities are included in the 'Recovery of materials from non-hazardous waste', where as a criterion for technical screening it is required that at least 50% be transformed into secondary raw material, in terms of weight of non-hazardous waste collected separately. This category of green investments may include plants for the selection of the 'multi-material', plants for the recycling of inert, textile, electrical and electronic waste, factories of the material. The 50% limit of recycling output appears to be quite critical for some of these supply chains.

Finally, those activities that allow the capture and use of landfill gas in permanently closed landfills or landfill cells are considered eco-sustainable, using new or additional dedicated technical equipment and systems. The goal is to reduce the environmental impact of exhausted landfills, without encouraging the construction of new landfills. To this end, among various technical screening criteria, it is required that the landfill gas produced is used to produce electricity or heat in the form of biogas, transformed into biomethane to be introduced into the natural gas network, used as fuel for vehicles or as raw material in the chemical industry. Therefore, as in the case of anaerobic digestion, it is part of energy recovery.

Not referring directly to waste management, but included among the technical screening criteria of the activities that offer a substantial contribution to the mitigation of climate change for the manufacture of plastics in primary forms (Activity 3.17), is what is prefigured for chemical recycling.

In March 2022, a draft on the preliminary recommendations - list of activities and related technical screening criteria - for the remaining four environmental objectives was published by the Platform on

Sustainable Finance14 (PSF)[16]. This is an unofficial document, with the aim of collecting suggestions and making the criteria more solid and usable. An entire chapter is dedicated to waste management and seven eligible activities are listed in this context.

With respect to the activities related to waste management identified in the 'Climate Delegated act', there is again 'collection and transport' with a focus also on hazardous waste, and 'recovery of organic waste' as activities that can offer a substantial contribution also to the goal of 'transition to a circular economy'.

As it can be seen, the various measures related to the Taxonomy do not include waste-to-energy in the EU Taxonomy. This exclusion risks putting a brake on the path towards the goal of maximum landfilling of 10% of municipal waste by 2035. Furthermore, the European Union itself, on several occasions, has reiterated the importance of waste-to-energy in the transition path towards circular economy, within the framework of the hierarchy of forms of treatment. But above all, the failure to include all forms of energy recovery from waste in the Taxonomy does not allow a full extraction of the renewable energy content from this sector, thus incomprehensibly limiting its contribution to the more general decarbonisation policies indicated in the Union Energy Strategy.

The European Commission itself states about the loans disbursable by the European Investment Bank (EIB)[17] that an incineration plant with energy recovery is eligible, provided that the waste hierarchy is fully respected and that it does not lead to plant overcapacity.

16 https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/220330-sustainable-finance-platform-finance-report-remaining-environmental-objectives-taxonomy_en.pdf

17 https://www.eib.org/en/publications/eib-energy-lending-policy

6. Conclusions

To achieve the decarbonisation objectives, both efficiency in the use of energy and efficiency in the use of materials must be improved (circular economy).

We need coherent and integrated European and national industrial policies between the two sectors, which allow maximum recycling and reuse, and the maximum extraction of energy benefits from waste management.

In waste management, a major investment plan is announced in new plants: anaerobic digesters, composting plants, recycling plants, plants for the energy recovery of non-recyclable waste. This will require new economic tools to encourage the recycling of critical materials and to stabilize the now global and often unstable recycling markets.

The European taxonomy on sustainable investments rewards material recovery plants as 'green', but neglects the energy recovery of non-recyclable waste. A choice that could be rethought in the coming months, also in light of the global energy crisis.

CHAPTER 5

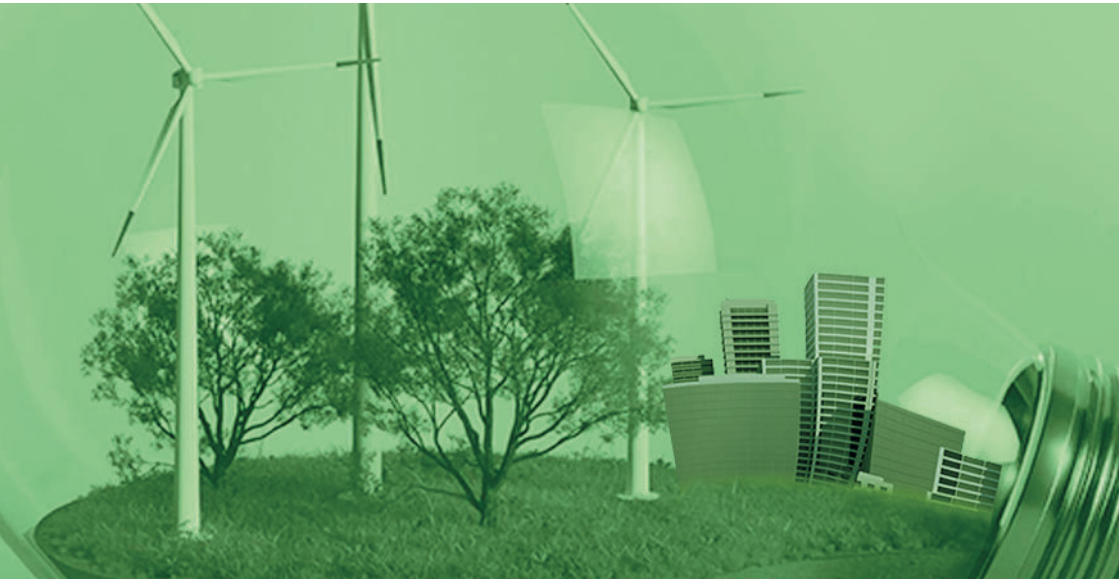
Taxonomy: Principles, advantages and problems within the context of the European policy of the Green Deal. Construction industry case study

Iskra Mihaylova

Taxonomy: Principles, advantages and problems within the context of the European policy of the Green Deal. Construction industry case study

Iskra Mihaylova

Iskra Mihaylova has an extensive career in the field of EU cooperation, regional, and environmental policy. Her path into active politics has begun in 2001 when she was appointed adviser to the minister for regional development. After the 2005 elections in Bulgaria, Mihaylova continued her involvement in regional policy as deputy minister up to 2009. In the period 2009-2013 she was Member of Bulgaria's 41st National Assembly and Chair of the Parliament's Committee on Environment and Water. From May 2013 up to June 2014 Iskra Mihaylova acted as a Minister of the Environment and Water of Bulgaria. She has participated in numerous international forums in United States, Israel, China, Georgia, Armenia, Serbia, and Azerbaijan as a lecturer and as an official representative of Bulgarian authorities. Since 01.07.2014 she has become Member of the European Parliament to the Group of the Alliance of Liberals and Democrats for Europe. From July 2014 until June 2019, she was Chair of the Committee on Regional Development at the European Parliament. She has been re-elected in 2019 as a Member of the European Parliament and has become member of the Renew Europe group and elected as a Vice-president of the Renew Europe Group. She is member of ITRE Committee and Substitute member of DEVE. She works actively in the field of energy efficiency, renewable energy sources and energy transition towards energy decarbonisation and green solutions, as well as on synergies between European policies. For her work and activities as MEP, Iskra Mihaylova was awarded the MEP Award 2017 for the category Regional Development



CHAPTER 5

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Taxonomy: Principles, advantages and problems within the context of the European policy of the Green Deal. Construction industry case study

Iskra Mihaylova

1. The EU Taxonomy

The EU commitment to the Paris Climate Agreement and the ambitious EU Development Strategy 'Green deal' require significant investments. The ambitious targets are expected to require hundreds of billions of Euros investments over the next decade to the meet carbon footprint reduction targets. In the slightly longer horizon, the investments will have to be even greater in order to achieve the 2050 carbon-neutral continent targets.

The EU taxonomy is a classification system that aims to direct public and private investments to environmentally sustainable economic activities, in order to achieve the environmental goals and succeed in combating climate change. The compilation of a dynamic list of recommended economic activities contributing to at least one of the sustainable environmental development goals and not undermining any of them is ambitious, targeted, and easy activity that brings the goals of the Green Deal closer to a whole series of economic activities. By proposing this act, the European Commission has the ambition to offer a common understanding of what distinguishes the environmentally sustainable economic investments, and to involve, in particular, the private investors, thus expanding the scope of the environmental activities and increasing the financial potential for carbon neutrality and climate change prevention.

Taxonomy is an essentially voluntary instrument and should not be obligatory. It must always be considered and implemented within the context of the common European policy and the national priorities.

The basic EU Taxonomy law is already a fact, as are the first delegated acts of the EC. The first one, on the reporting obligations of the companies, was approved on 6 July 2021 and entered into force on 1 January 2022. The process of applying the criteria is ongoing, and requires more time to measure the objectivity of the criteria, their applicability, and its impact on the competitiveness and readiness of the

Construction eco footprint: buildings in Europe consume 40% of the produced energy, emit 36% of carbon emissions and at the same time nearly 90% of the existing buildings are expected to be used by 2050

companies in the classified sectors.

The examination of the taxonomy and its impact according to the construction industry case study within the context of the EU common policy for the implementation of the Green Deal is an approach that will allow identification of the relationships, problems and potential solutions for implementing the goals, criteria and principles of the taxonomy.

The construction was chosen because of its importance for the European economy and its prospects in the coming decades, as well as its undeniable role in the improving the energy efficiency of buildings in Europe, the application of circular economy in the construction process, the use of extended-life materials, the digitisation of the buildings construction and use processes, and the implementation of the New European Bauhaus. The placement of these directions within the context of the application of the EU Taxonomy to the construction industry will achieve a system of mutually justified links that clearly show the importance of the taxonomy in achieving the Green Deal goals.

According to the Federation of the European Construction Industry[1], the EU Taxonomy Tool provides opportunities, but also poses risks to the construction industry. It illustrates and emphasises the role of the construction industry in the achievement of the Green Deal goals. Almost half of the activities listed in the regulation are related to construction.

- The potential and the role of the construction industry in the achievement of the climate goals are clearly visible, from the renovation of existing buildings, through the construction of renewable energy facilities, or the support to the developing greener transport infrastructure. Construction is the solution to the transition to a carbon-neutral continent. The construction industry

1 https://www.fiec.eu/fiec-opinions/position-papers-pl/eu-taxonomy-opportunities-and-risks-construction-sector

has the potential for transition and decarbonisation in several main directions in terms of the result of the construction activities, such as characteristics of the used materials, the application of digital technologies in the design, construction and management of buildings and infrastructure process, organisation of the work, and reduction of the carbon footprint of the construction processes.

- The construction industry is targeted and largely controlled by customers and investors. The EU Taxonomy can act as a guide for customers and investors by giving a clear definition what sustainable construction means, and how it contributes to sustainable development. Citizens often see their role in protecting the environment as participation in civic initiatives for cleaning or using certain materials, but it is difficult to make a connection between urban areas, their living environment, and the buildings they live in or work in as potential carriers of sustainable development. In this sense, the successful implementation of the taxonomy can lead to building a culture of customers and investors, which will in turn stabilize the recovery of the construction industry.
- The taxonomy is also a direction for modernisation of the internal models of operation of the construction companies, and increasing their competitiveness. The sustainable services offered by a construction company are attractive not

According to the Federation of the European Construction Industry, the EU Taxonomy Tool provides opportunities...

only to customers and investors, but also to its employees and future job applicants. The expectations of customers and creative staff would undoubtedly lead to a rapid development of digitalisation in the companies, and in the industry as a whole.

These considerations of the European Federation of the Construction Industry are concise, but behind them is a deeply thought-out position, which includes readiness for implementation, warning about the complex nature of this application, and clear position to protect the interests of the construction companies.

The construction industry in Europe is responsible for 9.5% of the total Gross Domestic Product in the European Union in 2019, and 10,6% in 2020[2]. It creates 12 million and 700 thousand jobs in the European Union. In Bulgaria, the jobs in the construction industry are 196.000 according to data from 2019, in Italy they are 1.343.000 and in the Czech Republic 375.000. Investments in construction in the European Union in 2019 amount to EUR 1.324 billion, while in 2020 they are EUR 1.402 billion. In Bulgaria these are EUR 8 billion, in Italy EUR 130 billion, and in the Czech Republic EUR 21 billion. The construction industry consists of 3,1 million companies, mostly small and medium enterprises. In Bulgaria these are 21.000, in Italy 500.000, and in the Czech Republic 190.000 (according to FIEC)[3].

The potential for development of the construction industry is expanding. Construction finds a special place in the architecture of the modern European policy, especially in the construction of the Green Deal, the subsequent initiatives and strategies, and the 'Fit for 55' package. This is a strategic level of development of the sector, whose implementation depends on national attitude and strategies, the regional and local initiatives, and the presence or absence of private investments in construction. Within the context of the EU Taxonomy, the construction industry has the potential to apply the principles, goals, and criteria within the context of the Green Deal and the Fit for 55

2 https://www.fiec.eu/library/publications/key-figures

3 https://www.fiec.eu/library/publications/key-figures

package only, and provided that the interests of investors and citizens are clearly taken into account. There are several directions of expected development of the construction industry:

- Renovation of building stock - public and private buildings;
- New high-rise construction;
- Construction of infrastructure - transport, energy, environmental.

2. Complexity of the impacts of the EU Taxonomy on the Construction industry

I am proposing a very simplified scheme of the interconnections between the impact on the construction industry of the goals, measures, and criteria of the EU Taxonomy, the European Green Deal, the Fit for 55 package and the Citizens Expectations, which can be seen as an example of the impact of the taxonomy within the EU policies context, and the expectations of the citizens according to the construction industry case study, with outlined advantages and risks of using the EU Taxonomy.

The Green Deal is a basic EU strategic document representing the overall Growth Strategy for the next 10 and even 30 years. It is no coincidence that it is included in the scheme, because the construction industry has a special place in the strategy. It sets out many responsibilities, but also strongly binds the construction in Europe to the circular

...but also poses risks to the construction industry. It illustrates and emphasises the role of the construction industry in the achievement of the Green Deal goals. Almost half of the activities listed in the regulation are related to construction

economy and energy efficiency. The special place in the growth strategy is determined by the importance of the construction industry in the implementation of all measures for a climate-neutral continent – from modern energy infrastructure, through the implementation of renewable energy infrastructure and modern low-carbon transport infrastructure, to climate-neutral, smart, and energy efficient buildings and urban areas.

The Green Deal itself contains the idea of a taxonomy, because it provides for a much wider range of investments that go beyond public budgets and involves active participation of the private capital in the investment process, as well as guaranteed and regulated by the banking sector support vehicles, public-private partnership, and private investments. The EU Taxonomy is one of the tools that could regulate these investments in sustainable projects contributing to the goals of the Green Deal. The advantages are indisputable: the EU Taxonomy offers clear criteria and an orderly classification of sustainable investments for private investors and companies implementing the projects, in our case the construction industry. The risk lies in the possibility that the directing of the investments into sustainable development may limit them and create discriminatory practices towards companies, depending on their readiness, suitability and intents to make the quality of their work public, and accessible to potential investors and clients, in terms of sustainable investments.

The Renovation Wave specifies the requirements for the EU building stock, but also sets to the construction industry a number of responsibilities related to the achievement of the ambitious goals to double the number of renovated buildings by 2030, apply modern innovative technologies, use climate-neutral or recycled materials, and establish the energy efficiency of the building stock as a key element of the low-carbon society and climate-neutral Europe. It is a well-known and indisputable fact[4] that buildings in Europe consume 40% of the produced energy, emit 36% of carbon emissions and at the same time

4 https://www.europarl.europa.eu/doceo/document/A-9-2020-0134_EN.html

nearly 90% of the existing buildings are expected to be used by 2050. As a basic tool for achieving the Green Deal goals for energy efficiency, the Renovation Wave implies a comprehensive holistic approach accompanied by financial incentives to make building renovation accessible and widespread.

First, the Renovation Wave must get out of the trap of elementary energy efficiency, and offer a comprehensive renovation, which with its complex nature or deep rehabilitation to ensure the effectiveness of measures and investments. The current experience in the building renovation or the superficial rehabilitation unfortunately shows that achieving modest levels of energy efficiency does not lead to a noticeable reduction in heating, lighting and cooling bills, and discourages some home owners and tenants from taking energy efficiency steps, especially in multi-family buildings. The process could be accessible only if accompanied by financial incentives and, at the same time, guaranteeing complex renovation, deep rehabilitation, and complex effect. The approach for integrating buildings from one neighborhood within one project is workable and recommendable in terms of financial efficiency, quality of execution, quality of materials and good architectural design.

The implementation of projects also simplifies the planning of the process, the programming of public works, and the opportunity to closely integrate the renovation initiatives with the initiatives of the New European Bauhaus. In order to achieve the desired effect, the Renovation Wave must cover all regions of Europe, not concentrating solely on large cities, despite the fact that they are responsible for the major carbon footprint, but it must also extend to remote and rural areas, which suggest more flexible solutions, both technological and financial. Such approach implies customized measures for Member State and region, where necessary. Efficiency - both of energy and materials use, implies wider use of scientific achievements and innovative solutions resulting from research and experiments. It is also necessary to ensure exchange of good practices at European level. One of the good examples of financial incentives, specific measures and innovative financial solutions comes from Italy, where the Superbonus

scheme is implemented, and which implies a tax deduction of amounts invested in building renovation. The latest revision of the scheme also allows transferring discounts to taxable persons, thus providing real support to socially disadvantaged and energy-poor people. In many countries the opportunities for advice in decision-making for property renovation are insufficient, both technical and financial.

The circular economy strategy directly affects the construction industry, paying special attention to construction materials and all recycled materials that can be incorporated in construction. Generally, the main goal of the application of the principles of the circular economy in the construction is the efficient use of resources and the circular life cycle of the materials. Sustainability of the buildings is achieved by planning their life cycle, the incorporated elements and materials, in the same time distinguishing the long-term approach to the basic building elements, and the underlying maintenance and replacement cycles. Adaptability is expressed in extending the duration of efficient operation of the building by optimising its original purpose or by changing its purpose, but always focusing on the possibility of replacement of elements and repairs. Reducing waste and ensuring high quality waste management require management of the process of reusing building elements, components, and parts, by focusing on producing less waste by demolishing buildings, and a high degree of recycling of materials resulting from destruction. This involves efforts throughout the materials reuse and recycling cycle, but also an approach to the design of details and components, and use of construction methods allowing reuse of materials and reduction of the waste.

Both the Renovation Wave and the Circular Economy Strategy correspond directly to the EU Taxonomy and its environmental goals. Undoubtedly, with the help of construction companies the taxonomy plays the role of an important tool that can direct investments towards achieving environmental goals by applying the criteria for environmentally sustainable economic activities. The construction works (including new construction, renovation of existing buildings, infrastructure construction) are among the activities covered by the EU Taxonomy. In other words, the EU Taxonomy determines the conditions

under which the construction works may be defined as environmentally sustainable.

3. Advantages and risks of the EU Taxonomy

The advantages of the EU Taxonomy within the context of the Renovation Wave and the Circular Economy Strategy are in two main areas.

First, quality of construction (and renovation), used materials, extended life cycle of buildings, elements, details and materials, as well as effective management of construction waste. Undoubtedly, these advantages correspond directly to some of the environmental goals of the EU Taxonomy - transition to a circular economy, prevention and control of pollution, climate change mitigation and adaptation to climate change.

Second, expanding the range of funding of the building stock renovation and attracting private capital by developing operable funding systems, subject to the logic of the EU Taxonomy. It is assumed that green public procurements will progressively grow and make full use of the EU Taxonomy, and that the European Investment Bank will use the EU Taxonomy for its financial activities and investment programs, and that green sovereigns bonds will make full use of the EU Taxonomy.

Circular economy in the construction is the efficient use of resources, optimizing the reuse and recycling of materials and producing less waste by demolishing buildings

At the same time, the risks are mainly related again to two areas: internal organisation, competitiveness, and innovation of companies; and potential limitations of financial resources due to the higher requirements of the EU Taxonomy.

Construction companies will need to carry out internal, financial, and human resources reorganization to achieve standards allowing them to apply the EU Taxonomy, and operate on an open market basis, while convincing private investors of their competitiveness. Construction companies listed on the financial markets will have to disclose their ranking in the EU Taxonomy. Commercial banks will have to disclose the ranking in the EU Taxonomy, and this will affect their private clients.

The Fit for 55 package is a direct continuation of the Green Deal, and populates its goals with normative content. The whole package and all its elements affect the construction industry and provide business opportunities to the construction companies, and also changes the entire construction cycle by intervening at every stage of the life cycle. Despite its direct impact on the construction process, the package impacts not only the use of energy, machinery, transport, but also the linked industries – from the production of construction materials and equipment for buildings (from heating and cooling installations to cooking appliances and technical equipment for charging electric vehicles). In terms of the whole cycle, the issue of the price of low-carbon construction and how it will be accepted by citizens and small businesses has not yet been resolved.

Here, in this scheme, we are taking into account only three Directives that are part of the Package – the Energy efficiency directive, the Renewable energy directive, and the Energy performance of buildings directive. All three impact directly the construction industry and set high standards for execution of construction works. The energy performance of buildings can achieve the goals in the implementation of energy efficiency measures, erection and operation of renewable energy installation (apart from recycled insulation materials), and application of energy efficiency logic. The basic components of energy efficiency – industry, transport, construction, energy – are completely dependent

on the construction industry and its readiness to implement the Directives and use the EU Taxonomy tool.

The amendments in the Energy efficiency directive render the energy efficiency a basic tool for achieving climate neutrality, broaden the understanding of energy efficiency, and pose a number of challenges to the industrial ecosystems linked within the life cycle of processes, including the construction processes. The direct correlation to the EU Taxonomy contributes to achieving some of the goals – mitigation and adaptation to climate change, transition to a circular economy. The amendments in the Energy efficiency directive set requirements to the construction industry in several areas – increasing the energy efficiency of the construction process, increasing the energy efficiency of the building stock, increasing the energy efficiency of construction materials, construction equipment, building stock equipment. To a large extent, these requirements can also be achieved through the application of the EU Taxonomy goals and criteria.

Despite their specific focus, the amendments in the Renewable energy directive actually affect a number of industrial ecosystems, including vocational education, because the setting of such high goals naturally poses the question of having skilled workers to achieve these goals. The implementation of renewable energy systems in strict compliance with the principle of technological neutrality in the process of construction, renovation and management of the building stock is a new challenge to the construction industry, which requires knowledge of technological solutions, new approach to planning and implementation of construction works, close observance of the architectural solutions, and skilled workers. The construction industry is also involved in the construction of renewable energy systems outside the building stock, where the technological and innovative construction solutions are a key element in the efficiency of the facilities. The progress of the investments in renewable energy shows a growing interest of private investors, while the implementation of the goals and criteria of the EU Taxonomy will be important for the efficiency of the process.

The amendments in the Energy performance of buildings directive

directly impacts the construction industry. A zero-emission building stock can be achieved through a systematic approach involving energy efficiency at building stock level and decarbonisation of energy supplies. The decarbonisation of the operational phase of the buildings also requires an integrated approach, innovative technological solutions, sustainability of the building stock itself, and flexible adaptability of the systems ensuring efficient operation with zero emissions. The need for large-scale investment to achieve the 2050 targets imperatively encompasses the private investment and implies application of the EU Taxonomy criteria. The ambitious goals may be achieved only by pragmatically balancing public and private environmentally sustainable investments. National recovery and resilience plans supported by Next Generation EU act as catalysts accelerating the process of integrated private investments in all regions of the EU.

The analysis of the links between the EU Taxonomy and the Fit for 55 package is pending, following the final adoption of the Regulations. These links are not shown in the presented scheme, while their full estimation can be done after a more in-depth analysis of accumulated case studies and effects, but it is evident that according to the construction industry case study they exist, and can not only have a serious impact on the competitiveness of the construction companies, but also contribute to the achievement of the environmental goals. The future analysis should include the effects of EU Emissions Trading Scheme (ETS, ETS II), the Energy taxation directive, the Alternative fuels infrastructure regulation, and the Carbon Border Adjustment Mechanism CBAM).

The cross-section of the link between the construction industry and the expectations of the citizens is also interesting, as well as the refraction through these expectations of the impact of the taxonomy, the Green Deal and the Fit for 55 package. The increased requirements to the quality of living and working environment undoubtedly affect the construction industry. They acquired new dimensions after the Covid 19 pandemic, during which the quality of the living environment and health conditions came to the fore in the expectations of the citizens. The

quality of the construction materials, the energy efficiency, the quality of the construction works, the opportunities for smart management of the building resources, their connection with the urban or, generally the urban environment are already among the key requirements of the modern European citizen. The EC offered an answer to these requirements by launching the New European Bauhaus, whose realization depends on the quality of the construction works. EU citizens expect the construction industry to build quickly, efficiently, beautifully, and at reasonable prices, to ensure a healthy and safe living and working environment. The modern European also has requirements for environmental protection, use of recycled materials, reducing the waste and building ecological, beautiful and socially inclusive public spaces.

The new European Bauhaus brings the goals of the Green Deal closer to the daily lives of European citizens

These expectations are a real challenge to any local government, municipality, and architect, or construction contractor. The construction industry can meet this set of expectations only by applying the goals and criteria of the EU Taxonomy and the principles of the Green Deal by working closely with the local authorities.

The new European Bauhaus brings the goals of the Green Deal closer to the daily lives of European citizens. It turns the growing public support to the measures against climate change and the environmental protection into consistent actions changing the lifestyle and living environment of the average European.

The quality of construction, the application of the principles of the circular economy, the inclusion of nature in the public urban areas, the efficient use of energy and resources, the changes of the housing space design, and the improvement of the environmental and health performance of the buildings are close to the citizens and their expectations of improvement, and they express the public attitudes towards achieving the goals of the climate-neutral Europe. The closer the expectations of citizens are to the actions of governments, local authorities and businesses, the faster Europe can achieve its goals.

We could not expect the EU citizens to know the taxonomy goals and criteria. It remains a tool to be implemented by the private business in the benefit of the communities without damaging the interests of the individual citizen. In this context, the biggest challenge is the successful implementation of the taxonomy as a system for classifying environmentally sustainable activities. The environmental sustainability of the construction companies is based on the will, control and approval of the customer or the investor, and it must be developed in a very sensitive environment as a balanced system meeting the aesthetic, environmental, and financial interests of the individual citizens or the small entrepreneurs. The role of small and medium enterprises is becoming significant in the process of adapting the public expectations to the EU Taxonomy goals and criteria. Extending the application to small and medium enterprises is fundamental to its successful implementation. Given that the majority of the construction companies are small and medium enterprises, it is natural to conclude that the construction industry is a key industry that could apply the EU Taxonomy. Due to closeness to the expectations and everyday life of the citizens, the construction industry can also act as a disseminator of information for the purposes of the EU Taxonomy.

The other area that could involve the citizens in the EU Taxonomy is banking, which could impose both principles and real practices, that are communicated to the citizens, and involving them in the processes not only as users of results, but also as active clients and demanding customers.

The Next Generation EU investment package may, in case of efficiently implemented and result-focused National Recovery and Resilience Plans, provoke a wave of private investments expected to be subordinated to the EU Taxonomy goals and criteria. Again, the construction industry may be affected by the increased investments in terms of business opportunities, decarbonisation of the entire life cycle of the construction, and as well as challenges to the internal business organisation and standards, and the presence of the companies in financial markets.

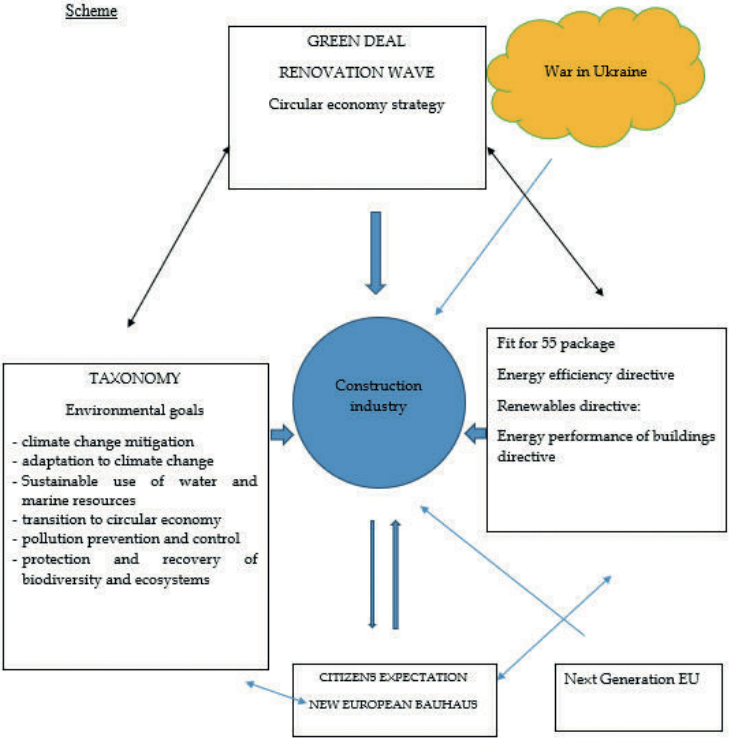
4. Conclusions

The presented scheme is a raw illustration of the complex interrelationships that emerge as the environment of the construction industry within the context of the Green Deal, the EU Taxonomy, the legislative package Fit for 55, and the expectations of European citizens. Regretfully, we need to add another element that has a direct impact on the construction industry, the linked industries, and the European economy as a whole. The war in Ukraine is not only a violation of the democratic order and violation of human rights, and rights of a sovereign state to choose its geopolitical orientation and values; the war in Ukraine, and its consequences for the energy supplies, the disruption of the supply chain for many industries, and even the threat to Europe's food security, raises questions about Europe's energy independence, requires urgent technological solutions to achieve that independence, and is bringing closer the energy efficiency targets that would reduce energy consumption across the continent. The war and the rising energy prices, the lack of supplies of some basic materials, such as steel, pose new unexpected demands on the construction industry in Europe. The implementation of the Green Deal can solve some of the problems caused by the war in Ukraine. It is also natural to conclude that, as a tool combining environmentally sustainable activities and financial instruments for their achievement, the EU Taxonomy has the potential to contribute to the overcoming of the energy, inflation and largely the economic crisis caused by the war in

Ukraine in a balanced, effective way in the interest of the citizens.

According to the presented logic, the interconnections of each industrial ecosystem included in the EU Taxonomy can be taken into account.

The EU taxonomy is a voluntary tool that can function solely within the context of achieving the goals of the Green Deal, the EU new growth strategy. At the same time, it has the potential to develop that makes it a key element in implementation of the new EU legislation within the context of the Green Deal and in overcoming the crises facing Europe. It is a business opportunity, a path to decarbonisation and effective partnership with private investors and financial institutions for most industrial ecosystems, as shown above in the construction industry case study.



CRITERIA FOR ENVIRONMENTALLY SUSTAINABLE ECONOMIC ACTIVITIES

- sustainably contribute to one of the six environmental goals
- does not significantly harm any of the environmental goals
- performed in line with the minimum social guaranties
- complying with the technical criteria set by the Commission

CHAPTER 6

Renewable energy and EU Taxonomy

Giulio Bettanini

Renewable energy and EU Taxonomy

Giulio Bettanini

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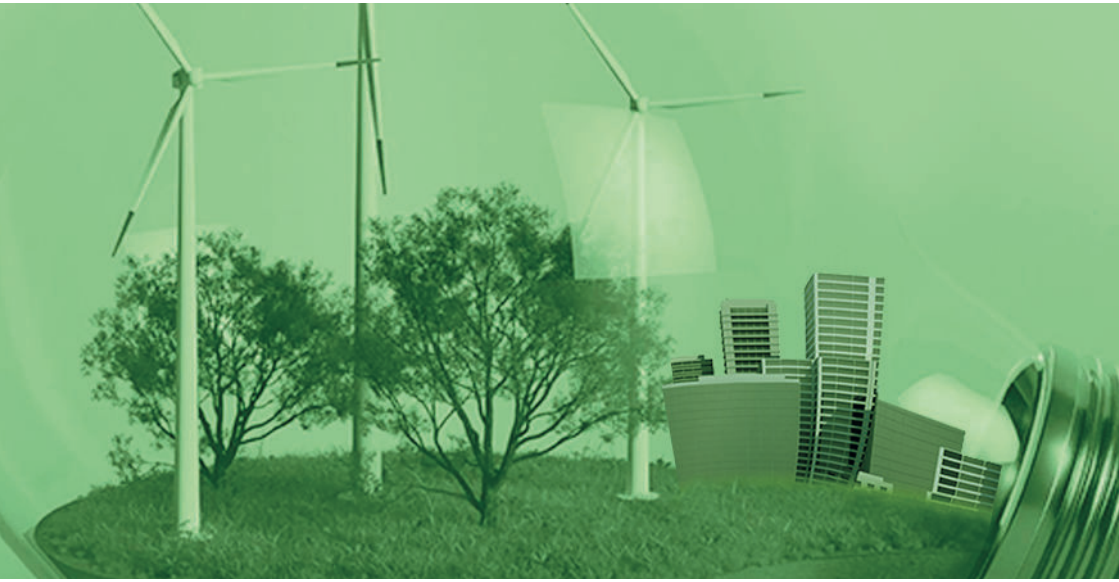


CHAPTER 6

Chapter 6

Renewable energy and EU Taxonomy

Giulio Bettanini

1. Introduction

There is no doubt that renewables fit into the European Taxonomy; in fact, it is a common feeling that no other energy sources or economic activities are more environmentally sustainable than renewables. In reality, the picture is more complex. It is not true that all renewable energy sources (RES) are automatically compliant with the EU Taxonomy. For example, hydroelectric plants in reservoir requires very large infrastructures and, in order to be compliant with the taxonomy, they will have to demonstrate that they meet the life-cycle-based GHG emission intensity threshold of 100 gCO2/kWh[1]; instead, run-of-river hydroelectricity will automatically be compliant with taxonomy. In the same way, offshore wind plants will have to exhibit the sustainable use of water and marine resources in which are installed, but with a good

1 Technical screening criteria for Hydropower - Commission Delegated Regulation (EU) 2021/2139 (2021), supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council; by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives, 4 June, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R2139

approximation we can say that energy plants based on wind and solar sources, defined as 'new renewables', are certainly eligible for new investments and, exactly for this reason, wind energy and photovoltaic are the top-notch technologies whose deployment is planned for the European green deal. In the same way, the infrastructures that allow the efficient transportation of energy produced by renewable sources from the place where the energy is produced to the place where it is consumed are in any case almost compliant with the EU-Taxonomy.

Italy failed ten years ago with extremely generous renewable energy incentives... can we today do the right thing?

The problem concerning the new renewable sources is therefore not whether they are worthy of commitment by companies, investors and policymakers; RES are indeed at the top of the 'green list'. The problem is rather to determine at the level of these investments should be. The main questions are:

1) Is the market already able to accept massive amounts of new RES plants, and therefore are RES able to be deployed without the generous incentives that have supported them in the past years?

2) Must policymakers leave room to a self-regulated market, and so limit their intervention to mild side-measures, or must they plan a top-down development of new renewable sources?

The problem of the development of the future of RES technologies is extremely complex, and the very understanding of the issue can be

different whether one is an investor, a policymaker, or a utility company.

For example, in the first half of year 2022, it may seem very attractive to an investor to invest his money in renewable energy. The price of electricity throughout Europe on average exceeding 200 €/MWh[2], which is the price of electricity that exceeds the LCOE (Levelized Cost of Electricity) of any renewable electricity generation system, even the generation costs of the most expensive renewable sources (e.g., floating offshore wind) are nowadays lower than half of the current electricity price. Presumably it will remain so even after the surge in the cost of raw materials due to the war in Ukraine, an event that will inevitably impact on the installation and maintenance cost of the plants in the next months.

The policymakers are instead concerned about the country's production sector, as well as the liquidity and competitivity problems caused by the high energy costs. Therefore, policymakers are willing to do everything to allow RES developers to install new RES plant. The investor instead will have to draw up a business plan predicting the evolution of prices for at least the next 20 years to guarantee himself (and to the bank financing him) a positive return on investment. But how many transmission networks will be needed and how many storage systems will be installed in the next years? How many RES plants will compete against each other in the electricity market in the next years? Will this competition allow renewables to have a fair return, or will it cause a widespread RES plant default? Will a public intervention be necessary to guarantee the plants a fair economic return? If a public intervention is appropriate, which is the most appropriate way to support renewable sources? Can CfDs (Contracts for Difference) or a guaranteed minimum remuneration be a solution?

Many difficult questions to which the next pages will try to find some answers, with a focus on the Italian power system.

2 Entsoe Transparency Platform https://transparency.entsoe.eu/

2. Renewables in Italy today

Up to the 1960s, Italy's electricity needs were met by the hydraulic source, a source that even today guarantees the country a substantial part of electricity production (16.6% in year 2021)[3]. Instead, the 'new renewables' in Italy have a fairly recent history concentrated in the boost given after the financial crisis who took place in the years 2007-2008. Renewable sources in Italy in the years from 2009 to 2012 enjoyed very generous incentives[4] and, particularly, photovoltaics with the first two 'Conto Energia' received huge benefit from incentives via a feed-in premium tariff[5]. In specific cases incentives exceeded 400 €/MWh, 50% higher than the German similar EEG gesetz (German RES incentives), taking into account the lower irradiance in Germany and therefore the lower annual production of the plants. This aspect has meant that in Italy in the years from 2010 to 2012, the installations of RES reached very high if not outstanding levels, bringing Italy in 2012 to become the second country in the world for photovoltaic installations after Germany[6].

Solar Power Generation by Country [TWh/y]					
2012			2020		
#1	Germany	26,9	#1	China	245,7
#2	Italy	19,2	#2	USA	123,2
#3	Spain	12,1	#3	Japan	78,5
#4	Usa	9,8	#4	India	53,5
#5	Japan	8,0	#5	Germany	48,9
#6	France	4,1	#6	Italy	25,1
#7	China	4,0	#7	Australia	21,5

The 'gold rush' for photovoltaics created in Italy a completely distorted market both for the PV systems and for the land where it was possible to install the plants. Due to the excessive generosity of incentives, the

3 Terna monthly Report (2021), 8 December, https://www.terna.it/en/electric-system/publications/monthly-report

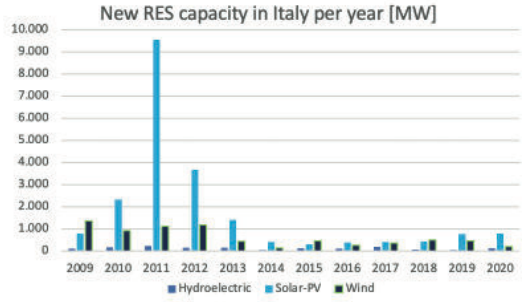
4 'Rapporto delle Attività 2020 – GSE' (2021), 31 May https://www.gse.it/documenti_site/Documenti%20GSE/Rapporti%20delle%20attivit%C3%A0/RA%202020.pdf

5 'Rapporto delle Attività 2020 – GSE' (2021) 31 May, https://www.gse.it/documenti_site/Documenti%20GSE/Rapporti%20delle%20attivit%C3%A0/RA%202020.pdf

6 IRENA, Renewable Energy Statistics (2021), https://irena.org/publications/2021/Aug/Renewable-energy-statistics-2021

Italian government was forced to set a limit of € 6.7 billion per year for photovoltaic incentives spending[7]. A similar cap, equal to € 5.8 billion in annual expenditure, was set up immediately after for the other renewable sources (wind energy, biomass, geothermal). These two measures have meant that in Italy in the years from 2013 to 2021 RES installations were limited to a few hundred MW per year.

Photovoltaics was installed mainly on buildings. Wind energy plants were forced to participate auctions managed by the GSE (Gestore dei Servizi Energetici, the society that manages incentives and renewable energy in Italy), which guaranteed fixed rates for 20-25y, but with very low quotas of installable power[8]. In other words, after 2013 the installation of RES plants in Italy virtually ceased as represented in the following image[9].



Renewables in the current Italian electricity market

The main issue regarding renewable electricity sources is how they will be integrated in the existing electricity market. The Italian and European electricity markets are based on the system marginal price (SMP), i.e.,

7 'Rapporto delle Attività 2020 – GSE' (2021), 31 May https://www.gse.it/documenti_site/Documenti%20GSE/Rapporti%20delle%20attivit%C3%A0/RA%202020.pdf

8 'Rapporto delle Attività 2020 – GSE' (2021), 31 May https://www.gse.it/documenti_site/Documenti%20GSE/Rapporti%20delle%20attivit%C3%A0/RA%202020.pdf

9 Self-made graph based on GSE data [G. Bettanini – data from 'Rapporto delle Attività 2020 – GSE' (2021), 31 May https://www.gse.it/documenti_site/Documenti%20GSE/Rapporti%20delle%20attivit%C3%A0/RA%202020.pdf]

each plant that participates in the market (fossil fuel, hydro, or new renewables) offers the energy it produces at a certain price, the offers are ranked in order of price forming the supply curve. The demand curve of electricity meets the supply curve at a certain point, determining the market clearing price, the price level at which all the plants (whose prices offered are lower than the SMP) are remunerated. Here follows a simplified scheme with the demand curve portrayed in red and the supply curve in blue.

The Italian electricity market differs to other European countries because Italy is divided into seven price zones which correspond to aggregates of regions (North, Center North, Center South, South, Calabria, Sicily, Sardinia). In these price zones, there is an equal price when electricity is able to flow between one zone and another, making market zones coupled, while when there are congestions, i.e., when electricity is not free to flow between one price zone and another, the price differences can be considerable. For example, on April 10th 2022 between 2 pm and 3 pm Northern Italy had an electricity price of 75 €/MWh, all other regions a price of only 1 €/MWh[10]. This aspect is fundamental to understand what challenges the new renewables face; in fact, in Italy the production plants are remunerated at the zonal price while the electricity purchases take place at the PUN ('Prezzo Unico Nazionale', single national price), and the PUN is determined as the weighted average of the prices of the electricity in the various price

10 Esiti dei Mercati e Statistiche – GME, https://www.mercatoelettrico.org/it/Esiti/MGP/EsitiMGP.aspx

zones of Italy. April 10th was a Sunday, a day in which electricity demand is normally at least 25-30% lower than workdays, but looking ahead, adding a lot of GW of renewable power can create the same market conditions occurring on weekends or holidays (low demand and oversupply). If Italy aims to add 30 GW of new photovoltaic systems to the current 22 GW already installed (2022), we can forecast that in the summer months during the central hours of the day the totality of the Italian electricity demand, in terms of power, could be satisfied by photovoltaic plants only, with similar effects to the one experimented on the above-described Sunday of April.

Today in Italy most of the electricity produced by RES is offered for sale in the electricity market at zero price [0 €/MWh] as most of the renewable energy plants are incentivised[11]. Producers, to be sure that renewable energy can be fed into the network and therefore incentivised, offer electricity at zero price with the certainty of still receiving the marginal price. Currently, energy from renewable sources has the almost total certainty of being dispatched, except in the rare cases when the electric demand is very low and the electricity price in a price zone is zero. In the future, with much more RES plants, the situation could be far different.

The Ukrainian war crisis has highlighted in a very clear way only one aspect of the problem concerning renewables, namely that the price for which renewable energy is paid does not depend on the production costs of the renewables itself, but on the price determined by the marginal technology, mostly natural gas plants. As the price of natural gas reached and exceeded the 200 €/MWh level in March 2022, electricity reached prices of over 500 €/MWh, mostly determined by the CCGT combined cycle gas turbine plants[12], the most efficient fossil fuel conversion plants ever built but which use natural gas, that is the most expensive fossil source. Gas-fired power plants require approximately 2 MWh of natural gas to produce one MWh of electricity, and gas plants

11 Esiti dei Mercati e Statistiche – GME, https://www.mercatoelettrico.org/it/Esiti/MGP/EsitiMGP.aspx

12 Esiti dei Mercati e Statistiche – GME, https://www.mercatoelettrico.org/it/Esiti/MGP/EsitiMGP.aspx: March 8 2022: PUN baseload 587,67 €/MWh (electricity), March 8 2022: MGP-GAS control price 215,41 €/MWh (natural gas)

have also to pay the price of CO2 emissions and on top of that they require a reasonable profit margin to operate.

Is it then correct to say that the primary source of renewable energy is almost always free, and therefore that RES are always offering electricity at prices comparable to their operating costs? In other words, do renewables always offer a cut-price which lowers the energy price, or do RES offer freely (often enjoying a remuneration that could reach € 300-400 €/MWh)? The answer is found in the data of the GME[13] (Gestore Mercati Energetici, the company that manages the Italian electricity market) which for each hour of each day of the year indicates which technology has determined the marginal price.

Eex market zone	Hours in year 2021 with SMP was determined by RES technologies*	Mean price in RES hours 2021 [€/MWh]
NORD	59	114,73
CNOR	93	94,29
CSUD	171	110,73
SARD	296	66,68
CALA	227	110,21
SICI	236	109,79
SUD	224	114,99

*RES technology: *Solar, wind, geothermal and others* (no hydroelectric)

From the data examined, relating to the full year 2021, it appears that several MWh of renewable energy are offered on the electricity market at a non-zero price. The table above clearly indicates that in the year 2021, in the 7 price zones of the Italian market, RES technologies determined the System Marginal Price (SMP) in many hours of the day, in the southern regions of the country (Sardinia, Calabria, Sicily, Puglia and Basilicata) between 200 and 300 hours – around 3% of the yearly hours. The average price at which electricity was offered (around 100 €/MWh) is by no means 'low', considering that the average market price of 2021 was equal to 125.46 €/MWh. From these data it can be derived that non-incentivised renewable energy electricity offers follow normal market rules; for example, in December 2021 in Italy in some hours the

13 Esiti dei Mercati e Statistiche – GME, https://www.mercatoelettrico.org/it/Esiti/MGP/EsitiMGP.aspx

marginal price was determined by RES with price offered at above 400 €/MWh.

During the Ukrainian crisis a serious problem emerged and was brought to the attention of public by the media: the cost of the electricity produced by RES is low, but the same kilowatt-hours produced are, on the meter, paid expensively. This is certainly true for renewables that use no-cost resources, such as sun and wind; in this case the electricity cost is mostly related with the plant installation costs. A photovoltaic system has an almost zero marginal cost of production, a wind power plant has a slightly higher marginal cost of production, determined in the order of 10-25 €/MWh, a wind turbine is in fact a complex mechanical system with many moving parts that requires constant maintenance. The photovoltaic system is static and therefore its performance has only a natural decline of 0.5-1% per year linked to the aging of solar cells; wind turbines have instead high operating cost, the same can be true for hydroelectric and geothermal plants, for such plants should also be considered the costs of the resources under concession (water, geothermal source), the variability of which often depends on the choices of the legislator. Electricity produced with biomass (e.g., ORC, Rankine Organic Cycle plants) has a marginal cost that also depends on the cost of the input material used, and therefore it can be higher than fossil fuels.

So, is the acceptance of low production costs and high sales costs holding back the spread of renewable sources? No; as we will see, the problem is exactly the opposite.

3. Renewables in Italy in the near future (2022-2030)

So far, we have described how RES participate in today's electricity market. However, by 2030 the installation of at least 40 GW of new renewable energy plants is expected in Italy[14], and such a large amount

14 'Terna - Piano di Sviluppo' (2021), https://download.terna.it/terna/Piano_Sviluppo_2021_8d94126f94dc233.pdf

of new RES capacity will have enormous effects on the electricity market, that will differ depending on the choices made by policymakers.

The question is: how will the new non-incentivised renewable plants that will be installed in the next few years (mostly photovoltaic and wind turbines), participate into the market?

First of all, it must be considered that the peak of electricity demand in Italy is currently around 55 GW[15]; it might grow by 2030, but not in an extremely significant way. For a massive growth of demand, it will be necessary to switch to electric-mobility and to the deployment of electric heating systems in houses and offices (via heat-pumps), In other words, it is necessary to replace systems that today mainly use oil refinery products or natural gas. The problem that will potentially arise in 2030 in the electricity market is the opposite of the high price current perceived problem: instead, the presence in the market of many competing new RES plants (mainly PV) could lead to a 'reciprocal cannibalization' leading to very low electricity prices, especially in the summer months and on days when demand will be lower (Saturday and Sunday in the summer months).

The new RES installations, according to

High electricity prices at night, and incredibly low prices during the day... is this the future that awaits us?

15 Terna Statistical data 'CARICHI' (2020), https://download.terna.it/terna/4-CARICHI_8d9cecef1b7dcb5.pdf

different scenarios, are composed at least 60% by photovoltaic plants. A photovoltaic plant with the capacity of 1 MW generates in Italy on average about 1,300 MWh of electricity over a whole year (obviously it depends on the latitude of the location where the installation takes place). Photovoltaic generation, as it is known, is anything but constant, ignoring to consider the problem of cloudy or rainy days in which photovoltaic systems produce little electricity; and, apart from the obvious concentration of production during the day, the less obvious difference between the winter and summer electricity productions of the plants must be considered.

In the month of December, a photovoltaic systemin Italy produces one third of the energy it produces in the month of July[16]. In the year 2030, a hypothetical new photovoltaic system without incentives will have to compete in the market in the hours of the day when the sun shines and the competition, even with the 'old' RES systems (massively installed in 2010-2012), will be very harsh. In a crowded market of renewables, the factual risk for the market itself is not being able to guarantee the survival of new plants, which requires an average yearly remuneration of around 40 €/MWh multiplied by the plant capacity and the 1.300 hours of yearly production. If in one day there are many hours in which the electricity price is 0 €/MWh, if not less than zero, how can new RES systems avoid the default?

The solution for the survival of the plants could be an 'old' solution guaranteed by the policymakers, that is, to remunerate the plants with a fixed tariff for all the energy produced and fed into the grid. This solution would require TSOs and DSOs to build many GW of grid transport capacity to allow the injection into the grid of the renewable electricity produced. The solution described is certainly convenient for the owner of the renewable plant, but it is very expensive and sub-optimal as regards the management of the electrical system. The reasonable solution appears to be not to allow RES producers to ignore the price signals that the market is giving. If the price of electricity is

16 Terna monthly Report (2021), December, https://www.terna.it/en/electric-system/publications/monthly-report

zero or negative, the market says that the energy produced has no value, there is overcapacity, and thus some plants must be curtailed or the energy must be stored. The real solution is to create new business models for photovoltaics and other new RES technologies.

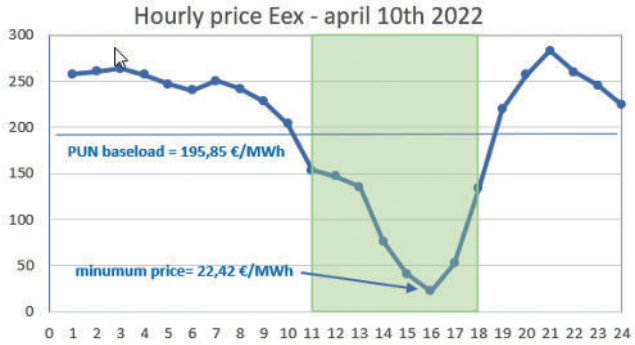
What scenarios await us regarding the market price of electricity? A plausible scenario for the next few years envisages high natural gas prices (i.e., an average price of around € 100/MWh for natural gas) at least for the whole of the year 2023 and probably even beyond. High prices of gas which should remain high in winter, when natural gas consumption is at his peak (about 9 billion cubic meters in Italy)[17] for the seasonal needs of domestic and business heating systems, and during summer months. In summer in any case 3 to 4 billion cubic meters of gas in Italy are needed to be injected in the storage facilities. A high natural gas price of 100 €/MWh implies that gas-fired power plants can produce electricity at no less than 220-250 €/MWh, depending on the cost of CO2 emissions (ETS). In a situation like the Italian one, excluding a scenario in which about 5 GW of coal fired plants can produce continuously, it is conceivable that the price can be determined in most of the hours by plants with a high marginal cost, but there will be hours, let's call it 'green belt hours', in which the price will be pushed down by the contribution of renewable energy plants.

To give an example of such a price configuration, we can look at the above-mentioned case of Sunday April 10th 2022, a non-working day in which the Italian peak demand (32 GW) was low and the effect of renewables (wind power: 6 GW_pk; PV: 12 GW_pk) has allowed prices to be significantly lowered in the central hours of the day (from 10 am to 6 pm).

Such a configuration makes it clear how the profitability of a storage plant that buys electricity at about 50 €/MWh to sell it at 250 €/MWh can be extremely high, certainly more than it was when the maximum electricity prices were of the order of 60 €/MWh. The increase and

17 Ministero della Transizione Ecologica – Bilancio Mensile Gas Naturale (2022), https://dgsaie.mise.gov.it/bilancio-gas-naturale

greater diffusion of storage systems driven by market needs could lead to a 'flattening' of the price difference between day and night. Also, in this case we see the need for a political and critical choice for the electric system: it is better to have market driven private storage systems or centralized systems managed (and owned) by TSOs and DSOs[18]?

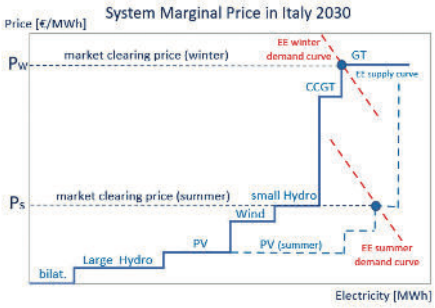


4. New business models for RES are required

What kind of scenarios await us in the future of the electricity market? Unfortunately, a likely scenario in the medium term foresees high winter electricity prices due to high natural gas prices and low photovoltaic production in the winter months (the winter PV generation is around one third of summer generation); instead, in summer prices will be very low or zero during the day. The storage systems will not be able to solve the problem of seasonal photovoltaic production (only 30% of the peak generation in the winter months), but storage systems will have a key impact on day/night differences in electricity prices during the summer months. The introduction of many GWs of new RES plants requires a new approach to the business of producing electricity[19].

18 Self-made graph based on GME data, [G. Bettanini – data from Esiti dei Mercati e Statistiche – GME, https://www.mercatoelettrico.org/it/Esiti/MGP/EsitiMGP.aspx]

19 Self-made table based on my understanding of the electricity market, [G. Bettanini – own considerations]



The trigger for a new approach must be the market price. Guaranteeing to new renewables a fixed price with the possibility of injecting all electricity production on the grid, would not secure effective and efficient changes in the electrical system. Producers from renewable sources must overcome the inertia of business-as-usual strategies; for example, a new photovoltaic system without incentives or fixed tariff to compete in the market with other photovoltaic and wind systems will have to:

1) Avoid the complete injection into the grid of the power produced by the in the central hours of the day, which can mean a partial curtailment, or the storage of the electricity produced in peak-hours in the summer months, maybe selling the summer peaks to electric cars that drive to the plant site to fill the batteries.

2) Efficiently store electricity to ensure a cost-effective continuity of production in the evening or at night.

3) Establish an optimum power level that can be fed into the electricity distribution and transmission networks.

For example, the business plan of a photovoltaic plant with 100 MW of peak capacity could foresee in the summer months the injection into the grid of a maximum power of 50 MW, the accumulation of another 30 MW of power and the curtailment or sale on site for the remaining 20 MW of summer peaks. The great unknown is the future cost of the

storage systems; it could be convenient to provide big storage systems for different photovoltaic and wind power plants not by the plants itself but located in the proximity of the primary Medium Voltage/High Voltage substations before being fed into the high-voltage power transmission network.ì

4.1. Sicily, a case study

Italy is long and narrow, so the Italian geographic conformation is characterised by a small area (just over 300,000 square km.) and a long distance between the north and the south of the country of about 1,300 km. Fortunately, Italian water resources are abundant and have allowed agriculture to occupy a large part of the uninhabited areas of the country. In comparison, Spain is very different, because it has an area of 500,000 square km. and large semi-desertic areas where wind and photovoltaic plants can be located. Germany and the European countries bordering the North Sea can enjoy a powerful wind resource which, considering the equivalent mean of yearly hours of production, is double compared to Italy (4,000 hrs vs 2,000 hrs in Italy)[20].

Therefore, the problem is where to locate the new renewable sources in Italy: in the industrialised northern Italy where the electricity demand is far bigger, or in the south where the availability of sun and wind is greater, although not exceptional. A photovoltaic system located in the north of Italy can produce for 1,100-1,200 equivalent hours, in the south it scales up to 1,300-1,400 hours while the wind source is predominantly exploitable on the coasts or on the plateau of central-southern Italy. Terna Spa, the only Italian TSO has planned by 2030 the connection to the grid of 40 GW of new plants[21], located half in the centre and north of Italy, and half in the south of the country. In Italy, the requests for connection of renewable energy plants to the electricity grids at the end of 2021 had reached 175 GW, almost all in the Southern regions. In Sicily requests were submitted for 43 GW of new RES plants, in Puglia and Calabria for a total of 70 GW and for 21 GW in

20 Wind Europe Statistics (2020), https://s1.eestatic.com/2021/02/24/actualidad/210224_windeurope_combined_2020_stats.pdf

21 Terna - Piano di Sviluppo (2021), https://download.terna.it/terna/Piano_Sviluppo_2021_8d94126f94dc233.pdf

Sardinia[22].

Renewable energy? If you love it, waste it!

To make it clear how unrealistic these projections of new RES plants are, we can consider the case study of Sicily. Sicily is an island, the southmost region of Italy, where the peak of the electricity demand is less than 4 GW of power, and more than 3 GW of 'old' RES systems are already installed including photovoltaic (1.5 GW), wind (1.9 GW) and hydroelectric plants (0.9 GW). The current power interconnections with the Italian peninsula are equal to 1.5 GW, and the grid development programs envisage a maximum of another 2 GW of interconnections with Sardinia and Italy[23]. It is therefore not rational to think that a region like Sicily could host tens of gigawatts of new renewable energy plants in the short term. Looking ahead, Sicily could become a hub for the generation of electricity in Italy, but the perspective of the energy producers must change, the business model of the plants must not be limited to an unrealistic desire to be able to feed all the production of the plants into the electricity grid. In Sicily, more than 10 GW of plants could be installed only if the transmission networks were strengthened, if storage systems were widespread, if the region's electricity demand was to increase both by hosting new industries and by converting the electricity produced into hydrogen.

22 Terna – Valutazione Ambientale Strategica del Piano di Sviluppo – Rapporto Preliminare Ambientale 2023, https://download.terna.it/terna/RP_PdS_23-signed_8da2c44ead86464.pdf

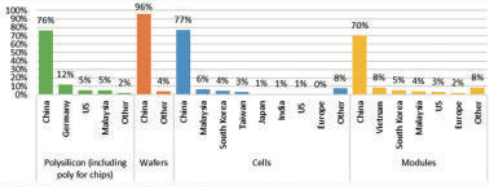
23 Terna Statistical Data (2020), https://www.terna.it/en/electric-system/statistical-data-forecast/statistical-publications

5. Developing RES (but with an eye on energy security)

One side of renewables problem concerns energy security, or more precisely the strategic dependencies of the single states. Is the deployment of new renewable energy sources making European nations and in particular Italy more dependent on foreign countries? The war in Ukraine has shown how a very strong strategic dependence from Russian gas affects countries such as Italy and Germany (the 40% of Italian natural gas consumption for about 29 billion of cubic meters is from Russia) expose them to energy shortages and limits the possibility to use political or economic measures (tariffs and trade wars).

The European commission in February 2022 published an in-depth review[24] on strategic dependencies, which highlights how dependencies are very marked in the production of strategic assets concerning renewable energy sources like photovoltaic panels, and rare earths, used for example to produce the permanent magnets, which are the basis of the synchronous generators used in many of the wind turbines currently in production.

Figure 3: China's strength along the PV value chain



Source: IEA PVPS and Trends Report 2021. Note: figures are rounded.

The above table makes it very clear that the upstream production of photovoltaic components is concentrated in Asian countries, especially China. Europe currently has a marginal market share of 2-3% in the production of photovoltaic modules, in the production of silicon wafers only 1% of market share. Europe with The European Solar Initiative aims

24 'EU strategic dependencies and capacities: second stage of in-depth reviews', publ. 22 Februray 2022

to scale up annual EU PV production to 20 GW by 2025. In Italy this task is aimed by Enel, the main electric utility in the country, which intends to increase the production of photovoltaic modules up to 3 GW from the current 600 MW. Unlike the dependence on commodities such as natural gas and oil, the dependence on photovoltaic panels or other RES components should not create the same gas price dynamics seen in the month of March 2022. Even eventual trade conflicts with China would not create particular price spikes because the demand for RES plant technologies would not be rigid (e.g., not like todays gas-fired CCGT plants which are willing to buy natural gas at any price to produce electricity), and the price dynamics would still extend in a medium-long term. Furthermore, unlike gas and oil, the international price dynamics would only concern new RES installations, not interfering in any way with the technologies already installed, except for the need for maintenance (scheduled or unscheduled), which producers can still cope with adequate extra-supplies.

Energy security does not reside only in the availability of raw materials or technologies for the installation of new renewable energy plants, but energy security extends to the concept of resilience. 'Resilience' is a word used in all areas, from economics to sports and social sciences, a concept that can also be of fundamental importance for renewable sources. Towards what events should renewable energy sources be resilient? Renewables, as seen in the previous paragraph, are already resilient to economic crises, or at least they are much more resilient than technologies related to fossil fuels. Renewable sources, however, can be sensitive to climate change, and we ask sun and wind to provide us with energy we will use to protect ourselves from the climate changes that can occur, as well as with a constant increase in average temperatures, with extreme events like excessive rains, floods, storms, fires. The extreme events can be better faced by traditional power plants thanks to their concentrated and not widespread structure on the territory. Again, mitigation and adaptation measures are needed. To give an example, wind turbines, which now reach heights of over 200 meters, produce electricity in a very limited range of wind speeds ranging from 3 meters per second of a very light wind to 15-20 m/s (54-72 km/h) of a strong wind; beyond this speed the turbine enters a

'survival mode' in which the rotor is braked and the blades are rotated to offer as little surface as possible to hurricane or monsoon winds that can reach speeds even higher than 200 km/h. Extremely strong winds in a precise region are very rare events that however quite certainly happen within the 20-25 year life span of a wind turbine.

Photovoltaics, especially if equipped with solar tracking systems, can also be severely affected by extreme events such as strong winds or exceptional hailstorms. Infrastructures, including those for renewable energy, must take climate change into account. However, the widespread diffusion of renewable sources throughout the territory can also be considered a strength, and extreme events can be localised (strong hailstorms, tornadoes), affecting only a small part of the plants. The problem will also concern the infrastructures for the transport and storage of electricity; the taxonomy will provide power lines that can withstand the weight of heavy layers of ice on the cables, withstand heat waves, and remain stable when exposed to extremely strong winds.

6. What can be done immediately to ensure the development of renewable sources

Italy needs solutions on what to do immediately regarding RES deployment, as the very high prices of electricity and gas caused by the Ukrainian crisis are expected to remain high in the medium term. Some associations envision of the possibility of the deployment from 60 GW to 90 GW of new renewable energy plants in Italy over a period of 3 or 4 years (wishful thinking, in my opinion). Let's see concretely what can be done using the available resources and minimising the expenses for networks and storage systems.

The first step is to realise that, in order to be quick and effective, the programming of the installation of new RES systems must be managed centrally or with a 'system approach', and not following the connection requests of producers – who pursue the maximum profit, but at the

same time might not consider the costs related to a non-optimal distribution of the plants. The entity that manages the transmission grid and the balancing of electrical loads (Terna Spa - TSO) is the only one able entitled to say how much renewable power can be installed and in which areas, minimising the costs for the electricity grid.

The second step is to make it possible for private investors to immediately deploy RES systems. Certainly, the installation on the roofs of houses and companies must be made simplest as possible, but for utility scale systems it must be possible to draw up business plans that allow a fair remuneration for the plants; this can be done with tariffs that guarantee a minimum yield, tariffs that will not necessarily have to be fixed, and a higher remuneration for the plant owners can be guaranteed if the electricity market prices are higher than 150-200 €/MWh.

The third step is to foresee the future developments of renewables with a focus on new technologies, i.e., with a reasoned deployment of energy-storage plants and the use of demand response, so that new technologies can blend with the existing ones. This will require in the medium term a review of the electricity market and plant remuneration criteria.

The thing that really needs to be changed as soon as possible in Italy is the relationship that the public sector has with renewable sources, which is often driven by an ideological approach (gas and oil: bad; renewable energy: good). Electricity is a commodity; electricity, unlike other commodities can also have a zero or negative price, so it is not an asset that in principle must be preserved or saved. Electricity from renewable sources can ('must') be wasted or not produced when prices are negative. RES electricity will have to be wasted and only when it has an economic sense it will have to be accumulated. The correct perspective to expect of the renewable energies to evolve is to allow RES to mature, and find its place at the service of humanity that nature and technology appointed them.

CHAPTER 7

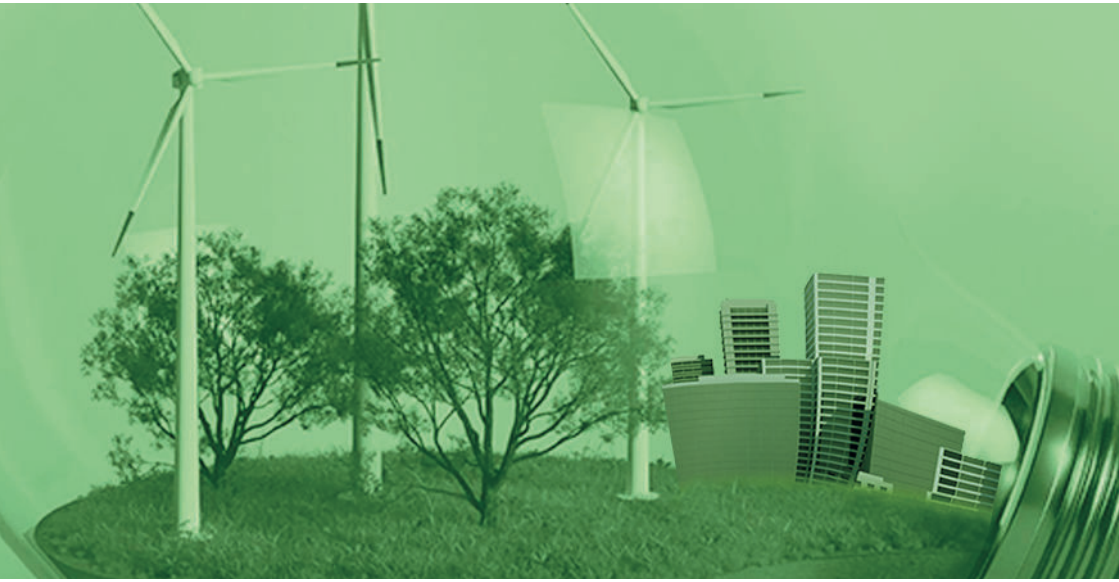
Nuclear in the EU Taxonomy: a boost or a taboo?

Marco E. Ricotti

EU Taxonomy Regulation purpose, objective, and scope

Marco E. Ricotti

His research activities are devoted to technology and economics of "new generation" nuclear reactors: Small Modular Reactors and Generation IV. Since 2018 he is chairing the International Atomic Energy Agency (IAEA) Technical Working Group on SMRs. Since 2016 he is the president of the Italian Inter-University Consortium for Nuclear Technology Research (CIRTEN)



CHAPTER 7

Chapter 1

Nuclear in the EU Taxonomy: a boost or a taboo?

Marco E. Ricotti

1. Introduction

At the end of 2021, after the European Commission decided to include both nuclear energy and natural gas into the so-called Green Taxonomy[1], a lively discussion emerged in several European countries around both the atomic and fossil options, and the more general EU policy on the ecologic transition.

Then, when in February 2022 the Russian-Ukrainian war began, a further issue attracted the attention of the citizens as well as of the policymakers: the EU energy independence or, to better say, resilience.

First of all, a flash recap on what Green Taxonomy is: the document that 'will guide and mobilize private investments in the activities that are necessary to achieve climate neutrality in the next 30 years'[2]. In other words,

1 https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

2 Valdis Dombrovskis, European Commission Executive Vice-President, Press Release,

it will be the financial guide for the energy policies of European countries. It indicates the criteria, requirements, characteristics that projects, initiatives, and achievements in the energy sector must possess, in order to be recognised as «green», therefore deserving financial support.

The European Commission sent its proposal to the Group of Experts of the Member States, then collected their comments, substantially confirmed the political line, and eventually shared the final document with the European Council. Afterwards, it will be sent to the Parliament. The Council and the Parliament will have from 4 to 6 months to object and, if necessary, vote for the cancellation of the Commission's proposal, the former by qualified majority and the latter by simple majority.

Nuclear energy like the Phoenix, is re-emerging, as part of the answer to both global warming and energy independenc e challenges. Are we ready to seriously evaluate that option?

2. Rationale and debate around nuclear into the Green Taxonomy

What are the motivations behind the choice of the Commission? A technical one and a political one. Anyway, the former – quite surprisingly – is not enough to justify the final decision. To identify the rationale, let us remember some data about global warming, the World situation, and the European contribution.

Brussels, 21 April 2021.
https://ec.europa.eu/commission/presscorner/detail/en/ip_21_1804

In 2015 in Paris (COP25) a binding agreement was reached, to be updated every five years, in which the signing Countries undertake to reduce their emissions of greenhouse gases (GHG). On that occasion, it was evaluated as essential to reduce the increase in the Earth's average atmospheric within 1.5 °C, to avoid catastrophic effects on the climate. Finally, the COP26 in Glasgow, in November 2021, confirmed the commitment to achieve the so-called Carbon Neutrality by 2050.

To reach those goals, on which aspects should States intervene to be more effective?

According to IPCC[3] (Intergovernmental Panel on Climate Change) and other studies, such as those of the World Resources Institute[4], energy consumption is by far the main anthropogenic cause of GHG emissions, responsible for 76% worldwide. The energy sector includes the production of heat and electricity (32% of total emissions), transport (14%), industry and construction (13%).

But which are the energy sources that make the world spinning? Today we mainly consume oil (31%), coal (27%) and gas (25%), i.e., fossil fuels for more than 4/5 of our needs, above all to move, to warm up, to produce. Then also water (7%), nuclear (4%), wind (2.5%), solar (1.3%). The rest are biomass and geothermal.

Is Europe substantially different? No, but we're slightly better. Fossil fuels are still largely predominant: oil (37%), gas (25%), coal (11%), then among the sources that practically do not emit GHG, nuclear (11%), water (6%), wind (6%), solar (2%) and the rest still biomass and geothermal.

The EU, responsible for less than 10% of GHG emissions in the World, has declared very ambitious objectives: the 'Fit for 55'[5] policy alias the

3 'Intergovernmental Panel on Climate Change' (2022), IPCC, www.ipcc.ch

4 World Resources Institute (2022), www.wri.org

5 European Commission, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality, COM (2021) 550 final, Brussels, 14.7.2021

reduction of emissions by 55% by 2030 (compared to 1990 levels) and carbon neutrality by 2050. While China, India and Russia, the main GHG emitters (42% in total, while the United States 14%) have set the target for 2060-2070.

After the data, the technical motivation: the differences between fossil fuels and other sources are significant, when concerning emissions. In the IPCC documents[6], values of about 12 grams of CO2-equivalent emitted for each kWh produced with nuclear power or wind power are reported, a value that rises to double for hydroelectric and quadruple for photovoltaics. But almost negligible, when compared with the 490 grams from natural gas and 820 grams from coal.

It is not necessary to be an expert in the energy sector to understand, from the simple reading of all these data, two key reasons: why the need of an 'energy transition' is perceived, and why this is so demanding, in terms of time, costs, and technology.

The massive use of renewable sources is considered the winning strategy, by almost all the players involved: governments, experts, public opinion. The other arrow in the bow is nuclear energy. Tertium non datur.

The contribution of nuclear is far from negligible. Today nuclear energy[7] – with its 441 reactors in operation and 52 under construction – provides 10% of the total electricity in the World, but represents 28% of all low-carbon electricity. In Europe, on the other hand, with its 106 reactors nuclear energy represents 26% of electricity generation, but as much as 47% of the sustainable electricity produced in our continent: it is therefore by far the first «green» source, ahead of wind (13%), hydroelectric (12%), biomass (6%) and photovoltaic (4%).

The endeavour of decarbonisation promises to be immense. It is

6 O. Edenhofer et al. (2014), 'Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change', Chapter 7, IPCC, Cambridge University Press, Cambridge, UK.

7 IAEA, Power Reactors Information System: https://pris.iaea.org/pris/home.aspx

necessary to attack as much as 80% of the energy consumption pie, represented by fossil sources. By means of renewables and nuclear, which are anyway essentially used to produce electricity. To reduce emissions and to limit global warming, it is therefore necessary to produce electricity without burning gas and coal, but it is also necessary to electrify sectors hard-to-abate that today are minimally so: transportation (by moving to electric mobility) and industrial uses, as well as heating and domestic uses, all today firmly linked to fossil fuels, mainly oil and gas.

It would then have been reasonable to assume that it was a pragmatic and realistic reading of this overall framework, which prompted the European Commission to propose the completion of its Green Taxonomy, in the Complementary Climate Delegated Act[8]: 'considering that there is a role for natural gas and for nuclear power, as means to facilitate the transition towards a future based mainly on renewables'.

In fact, in this context, it does not appear reasonable to preclude the use of half of the green options available, ostracising nuclear power. But this scientific-technical reason, apparently incontrovertible, was not enough.

Finally, the political motivation. Among the criteria to be included in the Green Taxonomy there is not only low greenhouse gas emissions, but also sustainability, a necessary as complex criterion, since it is difficult to translate into requirements and numbers. In this regard, the taxonomy requires that the adoption of a specific technology must not cause significant damage ('do no significant harm', DNSH) to the ecosystem.

Renewable energy sources were already included in the first Delegated Act (2021): while it was quite straightforward to justify these features for them (albeit a thorough Life Cycle Assessment for critical minerals could suggest caution[9]), it was not so easy to reach a consensus on

8 https://ec.europa.eu/info/publications/220202-sustainable-finance-taxonomy-complementary-climate-delegated-act_en.

9 R. Pell, et al. (2019), 'Mineral processing simulation based-environmental life cycle assessment for rare earth project development', Journal of Environmental Management, Vol. 249

nuclear energy, also or above all due to the political conflicts that this choice entails.

The Technical Expert Group (TEG) for Sustainable Finance, charged with evaluating this criterion also for nuclear, declared its inability to reach a result. The Commission therefore asked the EU scientific organisation, the Joint Research Center (JRC), to take care of it. The result was a 385-pages technical-scientific report[10], published at the end of 2021, which substantiated the assessment that the nuclear source does not involve higher risks for humans and the environment than the other energy sources provided for in the taxonomy. The document contains data and evidence, supporting the ability to prevent or avoid any potential harmful impact in the various activities and phases related to nuclear power, including the risks associated with radiation and the fuel cycle and final waste management, finally indicating the corresponding criteria (Technical Screening Criteria) to be adopted in the taxonomy.

Old and new reactors may play a significant role in a (renovated) EU energy strategy. From what nuclear technologies will a contribution come?

In reality, in addition to the technical aspects, the content of the European Commission document appears to be dictated by a political agreement between the two main players, Germany and France. Earlier on, in the past months, there was a bitter battle. Each one headed a group of countries and sent its own

10 S. Abousahl, et al. (2021), 'Technical assessment of nuclear energy with respect to the 'do no significant harm' criteria of Regulation (EU) 2020/852 ('Taxonomy Regulation')', EUR 30777 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-40538-2, doi:10.2760/207251, JRC125953.

letter to the Commission. The former, against nuclear power in the taxonomy, was also signed by Austria, Denmark, Luxembourg and Spain. The latter, in favour of the recognition of the role for the atom, was co-signed by Finland and the Eastern European bloc (Czech Republic, Bulgaria, Croatia, Hungary, Poland, Romania, Slovakia, and Slovenia).

Their interests are clear. France is fully committed in keeping up-to-date and active its reactor fleet, which today guarantees over 70% of the electricity. Indeed, it is determined to expand it, as recently declared by President Emmanuel Macron who has included the 'new nuclear' even at the first point of the French post-pandemic strategy[11]. Germany, the main sponsor of the European green deal, is dutifully interested in reducing its CO2 emissions, since it is by far the most polluting country in EU (doubling Poland's emissions). However, it is still heavily dependent on fossil fuels – lignite in the first place – to produce electricity, and therefore it intends to replace coal with gas, which is less polluting, and easier to use than renewables. The Russian-German North Stream 2 gas pipeline would have precisely served this purpose.

3. Investing in nuclear: risks and opportunities of the current technology

Nuclear energy seems, then, an option that would be very difficult to give up. But which nuclear are we talking about?

First of all, the reactors fleet currently in operation, which is on average reaching the limit of its authorized commercial life, usually in the order of 30-40 years - period after which the reactors should be shut down and then dismantled. However, the safety margins adopted in the design phase, the quality of construction and good operational management, often make these machines still suitable for continuing production for a further 10-20 years, usually after some updating of the safety systems and after replacing some components with others with

11 "France 2030" Plan, official website: https://www.elysee.fr/emmanuel-macron/france2030.

improved performance. The most important and rapid contribution of nuclear power to decarbonisation will therefore come from the life extension of the so-called second-generation plants, namely those built in the period between the 70s and 90s.

A further contribution will hardly come from Generation III[12] reactors made in the Western World if something will not change. Most of the 52 reactors currently under construction were designed at the beginning of the new millennium, with improved safety systems and strategies, so they rightfully belong to the new course. These plants are still under construction (France and United States) or were recently completed (Finland) in the Western World, while they have already been built and are operational in China, Russia, South Korea, Japan, and even in the United Arab Emirates.

Between the two experiences (Western vs others), there is a substantial difference: the plants built in the West, with American (AP1000, 1100 MWe) and French (EPR, 1600 MWe) technologies, initially designed to be built in 5 years and require investments of about 4 billion euros, are suffering embarrassing delays of over 10-12 years and cost increases of around 200-300%. While the identical Western reactors, as well as similar Russian (AES-2006, 1200 MWe), Chinese (HPR1000, 1100 MWe) and Korean (APR1400, 1400 MWe) technologies, are already in operation in the Eastern World and the Middle-East, after very contained, 'physiological' delays and extra costs, being also in that case First-Of-A-Kind realizations like the Western ones.

The heavy difference in performance between Europe-United States and the rest of the World, on the deployment of identical or similar nuclear reactors, shows that the problem is not mainly in the technologies used, or in the quality of the constructions and the safety controls. The former is at state-of-the-art, the latter are rigorous. Thus, the difference relies essentially on poor management and

12 A. Kadak, (2017), 'A comparison of Advanced Nuclear Technologies', Columbia Univ., energypolicy.columbia.edu/sites/default/files/A Comparison of Nuclear Technologies 20033017.pdf

implementation skills. An easily justifiable weakness, for the West, because of the lack of building new nuclear reactors in the last twenty-thirty years, an enormous period for such a complex technology and supply chain. In contrast, the Russians, Chinese, and Koreans have deployed at least one or even two units a year in recent decades.

3.1. Investing in nuclear: next generation technologies

Besides the old GenII and the current GenIII fleets, other new technologies will become available in the coming years: Small Modular Reactors[13],[14] (SMR), Generation IV[15] reactors, fusion reactors.

Before briefly describing the reasons of interest in these new technologies, two clarifications are necessary on specific issues often discussed around nuclear power: safety, and radioactive waste. A clear explanation of data and motivations is written in the same JRC report, so here just two brief considerations will be exposed.

Regarding the very high nuclear safety level, compared to that of all other energy sources, the analysis contained in the report substantially confirms what has already been highlighted by other studies, such as those of the Swiss Paul Scherrer Institute. Updated statistics can also be found on online sites, such as that of Our World in Data[16], fed with data collected by Oxford researchers.

Regarding the management of highly hazardous radioactive waste, a first solution will be implemented shortly: between 2023 and 2025 in Onkalo, Finland, the first definitive deep geological repository[17] in the World will become operational, for the safe disposal of long-lived and highly radioactive waste, i.e., the spent fuel. After more than 15 years of

13 'Advances in Small Modular Reactor Technology Developments SMR booklet' (2020), IAEA, aris.iaea.org/Publications/SMR_Book_2020.pdf

14 'Small Modular Reactors: Challenges and Opportunities' (2022), OECD-Nuclear Energy Agency, 14 February, www.oecd-nea.org/jcms/pl_57979/small-modular-reactors-challenges-and-opportunities.

15 'Annual Report' (2020), Gen IV International Forum, www.gen-4.org/gif/jcms/c_178290/gif-2020-annual-report.

16 R. Hannah (2020), 'Sector by sector: where do global greenhouse gas emissions come from?', ourworldindata.org/ghg-emissions-by-sector.

17 S. El-Showk (2022), 'Final Resting Place', Science, 2 February, https://www.science.org/content/article/finland-built-tomb-store-nuclear-waste-can-it-survive-100000-years.

studies and measurements, the Finns will start using the repository, created by drilling tunnels at a depth of 500 m into the granite rock, judged by geologists to be stable and 'dry' for several million years, and therefore able to guarantee the safety of the artifacts to be disposed of, for at least 100 thousand years. Similar solutions are already underway in France, in Bure, while the Swedish government recently authorised the construction at the Forsmark site. Canada is also preparing to follow this path.

Moreover, to put the whole waste issue under the correct light, from Eurostat[18] (2018 data), it appears that the annual production of EU waste is equal to 2 billion tons, 100 million of which correspond to highly hazardous or toxic-harmful waste that 'could pose a high risk to human health and environment, if not managed and disposed of safely'. Within this share, radioactive waste represents about 0.5% and among them the truly dangerous, highly radioactive, and long-lived ones are less than 1%.

Downstream of this premise, we can outline the interesting features of the three innovative nuclear technologies.

The first is that of SMRs, already available in Russia and China but destined to mature by 2030: they are reactors of reduced size, usually between 100 and 300 MWe for each module, compared to the GenIII reactors in operation or under construction today, typically between 1200 and 1600 MWe.

SMRs are designed to be built largely in the workshop, i.e., in a smoother and more controlled environment, and then transported and assembled on site. This would guarantee more certain and reduced times and costs, therefore a lower financial risk. The staggered deployment, allowed by modularity, will also allow the self-financing effect. Above all, they will be more easily integrated into an energy system and an electricity grid that will be more complex and more

18 Eurostat, Waste Statistics (2018), https://ec.europa.eu/eurostat/statistics-explained/index.php?title= Waste_statistics.

demanding to manage, due to the strong presence of renewables, which are not programmable and therefore require energy storage solutions. The SMRs will also open up opportunities for cogeneration, such as district heating, water desalination, the production of bio-fuels and, last but not least, the production of hydrogen. The electricity and heat produced by the small reactors can therefore also be used for these objectives, offering certainty of production, programmability, high reliability, and cost stability. And of course, without emitting GHG.

Finally, the small size makes it possible to think of 'transportable' reactors in remote areas, where the environmental conditions are such as to make it difficult to build energy infrastructures and traditional plants, whether they are fossil fuel or renewable sources. This is the case of the two small reactors (KLT-40S[19]) the Russians mounted on a ship in St. Petersburg and transported to Chukotka, a mining area in the far east of Arctic Russia: the ship has docked in the bay and is supplying electricity and heat for homes and the mining site.

The second technological innovation will instead be available around 2035-2040: Generation IV reactors, very different from the current ones, which promise a further step forward in terms of safety and sustainability of the fuel cycle, especially through the burning of high radioactivity elements, a sort of recycling of the most dangerous waste. In this way, the duration of waste radiotoxicity will be drastically reduced, from over 100,000 years to less than 300 years. To achieve these objectives, reactors are being developed that are no longer cooled with water but with lead or liquid sodium, or with molten salts. As a rule, they will still use uranium as a fuel, but they will also be able to exploit thorium, more sustainable than uranium because it is much more abundant on the Earth's crust, and it is capable of producing much less highly radioactive waste. The first demonstration of this new recycling solution, the "Proryv" project[20], is already under construction in Russia and is expected to be completed by 2030.

19 'Akademik Lomonosov begins commercial operation' (2020), Nuclear Engineering International, May, https://www.neimagazine.com/news/newsakademik-lomonosov-begins-commercial-operation-7938482/

20 Rosatom, PRORYV project, official website: https://proryv2020.ru/en/

So far, the opportunities. But what are the challenges?

The timing of these new technologies appears compatible with that of the ecological transition, provided that some critical items will be duly addressed. They are essentially:

- the process and the time required to obtain the design and construction license from the Safety Authority, in each country in which the reactor is to be built;
- the preparation of an international industrial supply chain for the mass construction of SMRs;
- the availability of new materials needed for GenIV reactors;
- last, and more importantly, the demonstration of the promises on the field: building the first units on-time and on-budget.

Finally, the third and definitive nuclear technology: fusion. An important step in the path leading to the future commercial phase of fusion energy will be taken around 2028, the year scheduled for the ignition of the ITER[21] reactor, the large international project under construction in Cadarache, France and in which Europe is collaborating with China, South Korea, Japan, India, Russia and the United States. In 2035, ITER will also start producing tritium, the radioactive isotope of

A pragmatic approach to the energy dilemma, leads to recognise a European Nuclear Energy Strategy as needed. What, and at what conditions?

21 'Annual Report' (2020), ITER Organisation, www.iter.org/org/team/odg/comm/annual-reports.

hydrogen which represents 50% of the fuel needed to power the machine, the other half being made up of deuterium, another isotope of hydrogen but not radioactive and easily obtainable from water. Realistically, it seems difficult to think of having the first deployed fusion nuclear power plant connected to the grid before 2050. But this technology will not produce highly radioactive nuclear waste and will not have the critical features of fission reactors, i.e., the need to guarantee at least two levels of safety: systems for rapid shutdown and those for the rejection of residual heat.

To complete the picture on nuclear innovation, the atomic start-ups – something never seen in nuclear history, since the nuclear sector has always been the preserve of state companies or large groups. The news is, in the recent years several nuclear start-up companies emerged, sometimes from universities (e.g., NuScale[22], SPARC[23]), sometimes from R&D teams (e.g., USNC[24]). Some SMRs, GenIV and fusion reactor concepts flourished outside the big players, supported and nurtured by venture capitalists or big investors, like Bill Gates with TerraPower[25].

4. A roadmap for Europe

The landscape has changed. The novelty is represented by a different, more complete awareness of the role of energy: it is now evident how important it is, for its repercussions on the geo-political dependence of nations and for its impact on the costs and availability of many goods (including the essential ones, from home heating to food).

Some lessons can be learnt from the previously depicted scenario, to shape some recommendations for the implementation of the EU Green Taxonomy about nuclear and in general for the EU energy strategy.

22 NuScale project, official website: https://www.nuscalepower.com/.

23 SPARC project, official website: https://www.psfc.mit.edu/sparc.

24 Ultra Safe Nuclear Corporation, official website: https://usnc.com/.

25 TerraPower, NATRIUM project, official website: https://www.terrapower.com/.

An energy roadmap for Europe, adapted to current times, shall implement three recommendations:

The energy game is tough, and requires a pragmatic approach: ecologic transition shall be maintained as a strategic goal – also because global warming will not be suspended because of the war in Ukraine – but the resilience of Europe on the energy side shall be addressed as well, as an equally important goal; for that purpose, suitable Technical and Strategic Screening Criteria shall be identified, similarly to Green Taxonomy, in a holistic way by duly considering a lifecycle assessment and all impacts on key sensible items, like welfare, occupation, economy, dependence on critical materials, system costs.

The just and inclusive approach, needed to solve the complex energy equation, shall implement a technology neutral European energy policy, having GHG reduction and resilience as double polar star.

The EU shall identify and financially support, similarly to any other solution able to target the above mentioned double polar star, a European Nuclear Energy Strategy for the short, medium, and long term, based on:

the life-extension of the current (Generation II) nuclear fleet;

the re-design, optimisation, and stable plan for deployment of large, Generation III reactors;

the development and deployment, also at international level, of new European reactor technologies, namely SMRs and Generation IV reactors, for cogeneration, and also waste management purposes;

the confirmation of the EU support to fusion initiatives (namely ITER), with due attention to time and budget.

The main challenge is not technical or financial: it is only political. The feasibility of such a roadmap relies on the common recognition of nuclear as part of the answer, but also on the overcoming of vetoes

(often coming from Germany, Austria, and Luxemburg), on investments and initiatives to support the development and deployment of new nuclear technologies, especially GenIII, SMRs and Gen IV reactors.

A 20-year life-extension for more than 100 Generation II nuclear reactors in EU represents a competitive and profitable business, since some hundred million euros investment in refurbishment, replacement and uprate, to obtain the new license, is a limited capital expenditure. The fuel and operation and maintenance costs are usually limited, as well, thus a large amount of CO2-free electricity will be produced for Europe at affordable costs.

Learning from non-Western countries and their ability to deploy GenIII reactors on-schedule and on-budget, it will be essential to proceed in EU with well time-distributed implementation plans, adequately preparing a European-level industrial supply chain, skilled in manufacturing and building nuclear plants, to be engaged on the next two decades.

France offers an example of such a program, possibly to be shared with other EU countries. La Republique has included nuclear energy at the top of its long-term energy strategy[26]: in addition to renewables, it programs new nuclear power plants, as done in the 70s after the world oil crisis. The French President declared the life extension strategy for the 56 nuclear reactors and the possibility of closing a plant – if necessary – but only for reasons related to its safety. Moreover, he announced the plan to build 6 new large-sized EPR2 reactors, a modified project compared to the current EPR that has shown some shadows in terms of construction time and costs. The first reactor of the new fleet is due to go into operation in 2035. At the same time, the feasibility study for another 8 reactors will be launched. The plan to 2050, as envisaged by the French electricity grid operator RTE[27], would confirm nuclear power at least at 36% of electricity needs, an important

26 'France 2030' Plan, official website: https://www.elysee.fr/emmanuel-macron/france2030.

27 'Futurs énergétiques 2050', RTE, https://www.rte-france.com/analyses-tendances-et-prospectives/bilan-previsionnel-2050-futurs-energetiques".

share (about half of the current share) despite a strong push towards renewables.

Small modular reactors are considered as well: the French scenario, which provides a total of 25 GW of new nuclear power by 2050, includes also from 5 to 7 Nuward[28] reactors.

The French approach could be followed soon by other European countries (e.g., Netherlands, Belgium).

Similarly to North America, Russia, and China, Europe owns all the capabilities, competences, and innovative ideas to become the land of new reactor technologies, from SMRs (e.g., Nuward) to GenIV (e.g., ALFRED[29], Gemini[30]) to micro reactors (e.g., Newcleo[31], Seaborg[32], Copenhagen Atomics[33]).

5. Conclusions

Nuclear energy shall be seen not as the optional and questionable choice of a single nation, but as part of a European energy strategy, with the same awards and the same supports of the other environmental-friendly sources and solutions. Europe shall embrace a technology neutral approach both on the issue of GHG and on the issue of resilience, looking at the technical-scientific-economic data of each energy source and corresponding supply chain. In the end, each country will continue to be free to choose its own energy mix, but within the framework of a European energy strategy that must be common, as it must be for defence and foreign policy, as it already is for

28 'French-developed SMR design unveiled' (2019), World Nuclear News, September, https://world-nuclear-news.org/Articles/French-developed-SMR-design-unveiled.

29 'Ansaldo Nucleare signs contract for lead-cooled reactor' (2021), Nuclear Engineering International, November, https://www.neimagazine.com/news/newsansaldo-nucleare-signs-contract-for-lead-cooled-reactor-9277875.

30 Gemini initiative, official website: https://gemini-initiative.com/.

31 Newcleo project, official website: https://www.newcleo.com/.

32 Seaborg project, official website: https://www.seaborg.com/.

33 Copenhagen Atomics project, official website: https://www.copenhagenatomics.com/.

money, finance and in some ways the economy.

About resilience, the strategic dependencies of Europe shall be duly considered. A strong signal comes directly from the European Commission, which in February 2022 issued a second report dedicated to that critical topic[34]: as an example, referring to energy sector, the document highlights that China owns 96% of the world production of wafers for solar panels, as well as 89% of magnesium, and 93% of the production of rare earths for the magnets used in wind power (including metallurgical patents).

As a comparison, an investment in nuclear power could fall around 70-80% within Europe, since almost all the technology and the industrial cycle is owned by European nuclear companies: from the intellectual property rights for the design and manufacturing of nuclear power plants, to the corresponding industrial capabilities for the deployment, to the enrichment and fabrication of the nuclear fuel. The uranium ore, needed to supply the reactors (anyway needed in vastly smaller quantities than fossil fuels by fossil fire power plants), can be obtained on the market from non-critical countries like Canada and Australia, even if some uranium deposits are available in our continent.

A serious challenge for a common European Nuclear Energy Strategy may come from Germany. Today, the somewhat schizophrenic German approach is catching the eyes: while 3 nuclear power plants were shut down in December 2021 and the last 3 in the country are going to be closed by the end of the current year, they are forced to reactivate old lignite power plants, the dirtiest coal in terms of emissions, to supply enough energy and to reduce Russian gas import. Indeed, even to the point of razing 17 villages near Düsseldorf, including a monastery from the 1400s, to make way for the expansion of the Garzweiler open pit coal mine.

Before the war in Ukraine, Deutschland was planning to substitute,

34 'EU strategic dependencies and capacities: second stage of in-depth reviews' SWD (2022), Commission Staff Working Document, 41 final. https://ec.europa.eu/docsroom/documents/48878/attachments/2/translations/en/renditions/native.

sooner or later, lignite with natural gas: not fully clean, but definitely a net gain in terms of GHG emissions. Now that geopolitics and energy resilience are two new keywords, how to solve the complex equation, without nuclear?

France may launch and foster a political as well as technological initiative, to set up and develop a European Nuclear Energy Strategy. Starting, for example, from the signatory countries of the letter supporting nuclear in the Green Taxonomy, opening to other EU nations available to consider innovative nuclear options, interested in finding a common solution to a common problem.

In the '70s the French, after the oil crisis, decided to seriously invest in nuclear power: in around just a decade, they developed their technology, creating the largest reactor fleet in Europe. Today, we can clearly see the benefits: they are the country that is furthest ahead in the ecological transition and owns the cheapest electricity production cost across Europe. Electricity that they use in their homes also for cooking and heating. They will not suffer like others in Europe, from the stratospheric cyclical increase in the price of natural gas.

This does not mean that we must retrace the example of the French. But at least draw some lessons from it.

CHAPTER 8

Taxonomy and the role of gas in the future of Europe

Gianni Bessi

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Gianni Bessi

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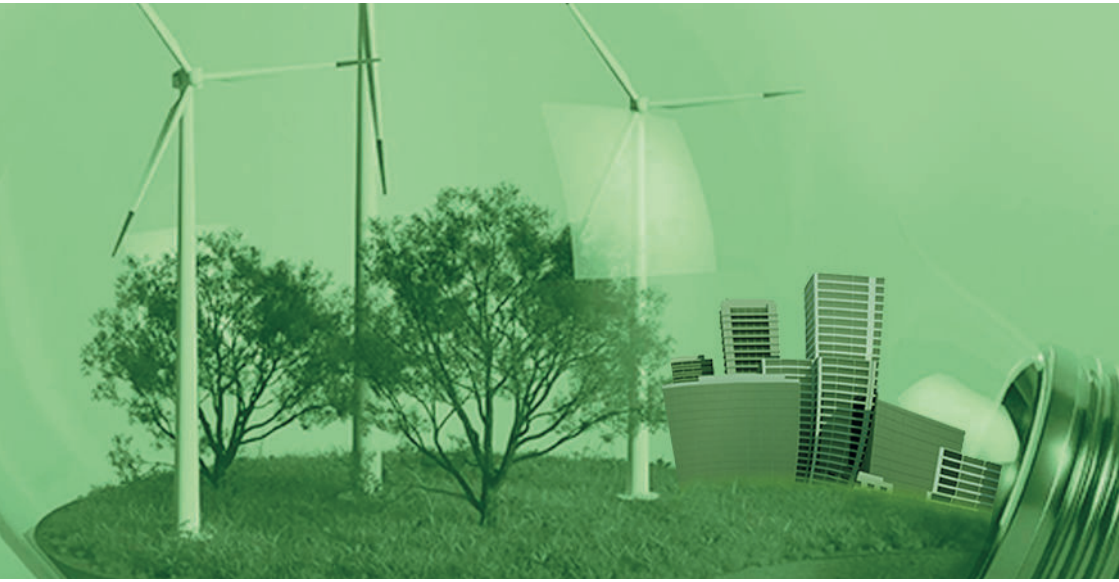

CHAPTER 8

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1. Introduction

Born to define which private investments in the field of energy may be considered as sustainable, EU Taxonomy has changed several times. Such changes occurred to make taxonomy as fitting as possible to the needs of a net zero transition, that the EU has forecasted by 2050[1]. The present contribution deals with the inclusion of natural gas within the sustainable sources: something that seemed, if not impossible, highly unlikely, but currently necessary for the exigences of several EU Member States (especially Germany – whose manufacturing industries require elevated amounts of energy, lots of which are hard abate) and to make the transition path more fluid. Such necessity is also given by the fact that Germany – like Poland – produce electric energy from a mix in which carbon still

1 https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2050-long-term-strategy_en

plays an important role, and need to replace the latter with gas[2].

The first objective of the EU energy transition is to reach the 70% of electrical energy produced by renewable sources by 2030, along with an increase of electrification in all sectors. This ambition is not only a form of environmental policy, but it requires an authentic innovation of the economic and social systems. To be realised, it is essential that a new system and a new industrial approach are implemented and financed. EU Taxonomy circumscribes which private entities are entitled to invest their resources in sustainable activities, at the same time providing investors and enterprises with a benchmark – in order to understand which features the environmental performances shall comply with. Considering all of its pros and cons, taxonomy ended up to be considered a sort of distorted and misunderstood policy – and this surely wasn't its primary objective: initially envisaged as a list of technical criteria to shape the investors' behaviours, the document has more and more often been used as a political tool, as a benchmark for the EU policy.

When dealing with the role of gas within taxonomy, it is therefore essential to consider the evolution of the actual situation – including the war in Ukraine – and to

Previously gas phase out was disputed by EU Member States, and now that all EU Member States agree that Russian fossil export is financing Putin's aggression, they are not able to quit Russian gas

2 Moreover, there is the further commitment to combine coal phase-out (which in 2021 accounted for the 28% of the German sources between hard coal and lignite) with the path to exit nuclear.

contextualise taxonomy and the role of gas in the more general scenario of the energy transition in the future of Italy and Europe.

2. How the gas entered the EU Taxonomy

With the 2 February 2022 delegated act, the gas eventually earned its place in taxonomy, thanks also to the technological innovations take make its use less impactful and enable countries to build gas plants with a lower share of CO2 emissions. But also, because (and that's a fact) gas is a source that allows to stabilise the system, this meaning, to cover all the production blackouts that inevitably occur. In fact, blackouts result from the main feature of renewable sources (that allows also their zero environmental impact): that is, the fact that the performance of renewable sources often depends on external unpredictable conditions.

The key guideline of taxonomy for those who wish to build new natural gas plants is the 100 grams mark. Of course, this is not the only rule, and the EU has explicitly established all the characteristics required for these new plants[3].

The new regulation provides that the new gas plants that will be built before 2030 shall maintain their greenhouse gas emissions lower than 270 g CO2e/kWh of energy generated, or, alternatively, an emissions average of 550 kg CO2e/kW of the plant's capacity in the space of twenty years. Such limits basically tend to exclude also the most innovative gas plants, unless their operation is bound to CO2 Capture and Storage stations[4]. But the limitations posed by taxonomy do not end here: a plant has to be powered by renewable gas fuels and/or be low carbon – a compulsory step by 2035.

This renewable gas fuel is hydrogen, seen as an essential energy vector – together with the natural gas as well – to achieve EU's ambitious

3 https://data.consilium.europa.eu/doc/document/ST-7030-2022-ADD-1/it/pdf, pag. 23

4 S. Benedettini (2022), 'Nella Tassonomia verde Ue troppi paletti pere le centrali a gas', Milano Finanza, 3 February

goals of decarbonisation. In this case as well, EU's recent legal frameworks are quite selective in the sector of production of renewable hydrogen. In this sense, it is essential to adopt an approach that harmonises the objective of a long-run decarbonisation with an industrial use of hydrogen capable of involving all the existing assets. It is likewise essential to consider that all the existing different types of hydrogen can represent an opportunity to contribute to decarbonisation in a more extensive way.

Moreover, it shall replace a high emission energy production plant, whereas it cannot be built as an alternative to a renewable energy operating plant; the capacity installed should not be 15% higher than the capacity of the pre-existing plants, and a 55% reduction of the emissions shall be guaranteed. Finally, if the plant installed still uses carbon as a source of energy, the country is required to commit formally in eliminating such type of production, clearly indicating such commitment in its integrated national energy and climate plan.

3. The war and the hypothesis for a new scenario

Surely, the Russian invasion of Ukraine began last 24 February implied an important change in the way EU and its Member States are facing energy transition. Within this context, taxonomy plays an important role, and the new international order could impact the upcoming European Parliament's discussions on the point.

The question is not only what we should expect, or whether taxonomy still represent an adequate tool for today's situation; the question is, if it is or not convenient to take advantage of the current situation to extend its objectives. Concerning the gas, to introduce (beyond the financing of the new types of gas plants) further areas of discussion, such as the logistics and the European distribution network.

In light of the Russian invasion of Ukraine, each current position on taxonomy risks to appear outdated. Before the war started, EU Member States – particularly Germany – discussed about where and how to

progressively decrease the use of fossil fuels. Discussions were not only focused on energy production, but also, for instance, in the sectors of transportation or heating systems.

Now the main issue is, inevitably, if and how it could be convenient to change the main gas provider in the EU, namely, Russia. But this is no longer enough, because the current situation has highlighted that the asset-gas has to be deeply revised in itself: not only where to buy the gas, but also how to store it, how to distribute it, and how to use it to secure the system – the European system as a whole, not the single Member State's.

An important step in this direction is represented by an agreement signed by Italy and Germany – the two main gas consumers in Europe – for mutual assistance in supplies and distribution. Perhaps, this agreement should be extended to all the EU Member States, also to those consuming lower amounts of gas – because of the convenience of having a safe system, particularly in relation to the carbon phase out in electric production.

The time to discuss whether taxonomy is good or bad is over; it is now necessary to adopt a different approach, similarly to the way the EU reacted to the COVID-19 pandemic. In any case, the debate around taxonomy presents divergent positions – even more, now that gas and nuclear are considered as activities for sustainable investments. At first, criticisms focused on how rigid the tool was, with the request of adopting a more flexible approach: the (understandable) motivation lies on the circumstance that in the energy sector technology evolves quickly. Therefore, a rigidly structured taxonomy embeds the risk of being soon inadequate.

The inclusion of gas and nuclear as sustainable sources implied the adjournment of pros and cons within the debate, and the gas and nuclear supporters found fertile ground in the issue of the operational intermittence of renewables. Among the opinions of the latter, let us recall the position of Chicco Testa, current President of Assoambiente and former President on Enel (thus, quite an expert in the field): Testa

highlighted via Twitter that if the prices of energy keep on raising, is because 'it is clear that renewables are not enough. We need more gas, and something else as well. Energy transition implies at least a doubling of the global electricity consumption'[5].

Instead, amongst those opposing the gas are the investors of the Institutional Investors Group on Climate Change, who asked to not include gas within taxonomy – while remaining possibilists on nuclear.[6]

In a critical moment like current times, a concrete choice would be not to stop on contingency, but aiming to be forward-looking and face the strategic hubs of gas – such as a possible integration of the countries in a common European distribution network, or also a network of distribution of electricity.

Therefore, it would be essential to find a common agreement on several points, still on the table of the European Parliament, such as: joint procurements for the storage of strategic reserves, evaluating the chance of adopting a price-cap system to establish the maximum price of the resource, mutual assistance between Member States, a European supply system defining the role of LNG – this means, whether it has to ensure the system's flexibility

With the energy crisis and the war in Ukraine, is taxonomy to be considered outdated?

5 https://twitter.com/chiccotesta/status/1480237176243769345?s=21

6 S. Pfeifer (CEO of IIGCC) (2022),'As the cornerstone of the EU's sustainable finance agenda, the inclusion of gas would undermine the credibility of the taxonomy as well as the EU's own commitment to climate neutrality by 2050', 12 January https://www.iigcc.org/news/iigcc-publishes-open-letter-calling-for-gas-to-be-excluded-from-the-eu-taxonomy/

or else if it has to be its structural component. Basically, the new discussion on taxonomy should not be limited to point out the boundaries or the rigidity of the tool, but rather to analyse how to ensure the energy system's sustainability also under a financial point of view, and how to make investments attractive to private entities.

This change of perspective, that the war made more evident, must be able to be possible. As Mario Draghi proposed, it could be useful to think about adopting extraordinary interventions in the energy system. Recent historical experiences teach us that Europe has been capable of rising from ashes of World War II thanks to the institution of economic communities, which had the aim of producing, sharing, and equally distributing the sources of energy between participating countries. I.e., the European Coal and Steel Community, founded in 1951, and the European Atomic Energy Community, founded in 1957[7]. Why then couldn't the next step be the creation of a European gas and renewable gases community?

4. Gas and the rules for energy transition

The target set by the European Union with the document on energy transition is always the same: reaching 70% of the electric energy produced by renewable sources by 2030. This is not only a matter of environmental policy, but it requires a true innovation of the economic and social systems. Basically, it needs a new system to be achieved, a new industrial approach that has to be financed. Through taxonomy, the EU identifies the sectors in which private entities can invest in sustainable activities. In the meantime, it provides investors and enterprises with a clear reference to which features the environmental performances shall respect. Amongst others, it defines a technologically-neutral performance threshold for electricity generation in the energy sector, called the 100 grams mark[8]: an energy

7 P. Balduzzi (2022), MoltoEconomia – Il Messaggero, 7 April

8 https://ecostandard.org/wp-content/uploads/2021/12/EUTaxonomy_100g_7points.pdf

plant emitting sub-100g of CO2e/kWh contributes to achieving the Paris agreement, whereas if it emits more than 270 g of CO2e/kWh, there would still be a significant environmental impact.

This has represented a key rule to include the gas in taxonomy, thanks to a delegated act approved on 2 February 2022: the document included gas and nuclear among the sources that may be considered as sustainable, and therefore those sources that can be exploited for private investments.[9] The latest version of the document has been officially illustrated by Mairead McGuinness, European Commissioner for financial services, who clearly pointed out the role of the gas in the path of the EU to carbon neutrality: energy activities envisaging the use of gas – and the nuclear as well – are considered as transitory, comparing to those included in the original taxonomy. The abovementioned delegated act acknowledges the gas as essential in order to support the transition to climate neutrality, allowing the passage from coal to renewables. Nevertheless, the use of gas is intended to be transitory, and has to respect rigorous conditions.

The delegated act will now sift through the European Parliament and the Council of Europe: still four months left before this procedure is finalised and, shall the measure be approved, it will enter into force on 1 January 2023. In the meantime, the conditions underlying its drafting have changed: while the inclusion of gas and nuclear in taxonomy resulted from the political momentum of several EU Member States that ground their energy policy on these sources (Germany and France), the current Russian-Ukrainian conflict could question the order of things. In fact, it is impossible not to consider the ongoing sanctions in relation to the commercial relationships with Russia.

The framework that taxonomy had tried to normalise became even more complicated, since it is currently crucial to review both the short-term and the long-term energy strategies. For instance, in 2021 Italy increased gas import by 10% compared to the previous year, reaching

9 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM%3AC%282022%29631&qid=1647359214328

an amount as high as 72,728 billion cubic meters – of which 28,988 of Russian origin[10]. It is essential to recall that in Italy, methane accounts for almost 45% of the electric production mix.

The Minister for Ecological Transition Roberto Cingolani has already pointed out which path Italy will follow, that is, the independence from Russian gas within three years. A path that implies increased supplies from other countries, especially with regard to liquified natural gas (LNG), which could ensure 10 out of the 70 billion cubic meters of the domestic demand. Moreover, the Minister predicted that national deposits might provide for extra 2 billion cubic meters, in addition to the 3 billion and 300 million currently extracted cubic meters.

Despite its limits – considering its potentialities – such an approach still represents a change of perspective compared to the recent past. A significant decrease in investments on the research of new deposits has been registered, due to the fact that the gas market had very low prices, but also as a consequence of the political decision to basically suspend the research and production of hydrocarbon.

5. Germany, Italy, and the role of the gas

The scenario has changed dramatically at the end of 2021, as a price spike undermined the energy system of several nations, including Italy. Despite a considerable growth in the use of renewables – according to the Italian government, Italy has well behaved in the path to decarbonisation – the gas is indispensable for the country's industrial system. In fact, the Italian industrial system is characterised by a lot of hard to abate realities, that is, energy-intensive industrial activities which cannot be powered solely by renewable energy (given their intermittency). Moreover, households are currently experiencing the highest increase in electricity prices in years.

10 https://dgsaie.mise.gov.it/importazioni-gas-naturale

Beyond the policies adopted to make the country independent from Russian supplies, in Germany Olaf Scholz [11] – which took office on 8 December 2021 – included the use of gas in the government programme: for several years energy will be also produced by clean state-of-the-art gas-fired power plants to ensure supplies. In the meantime, Germany will speed up the construction of several plants powered by renewable sources. Most obviously, the new gas plants will be constructed in such a manner to be capable to be converted in climate-neutral gas power.[12]

How to replace Russian gas? New suppliers or boosting in-house extraction?

Instead, the limitations set by the EU might represent a problem for Italy, namely, for those who are constructing gas plants in accordance with the capacity market. The latter is a tool used by Terna (an energy transmission networks operator) to ensure a constant production of electric energy, as well as to avoid blackouts – as better specified above. Terna finances the construction of gas plants capable of ensuring a productive capacity: therefore, the boundaries set by taxonomy could lead to a raise of the remuneration provided by the capacity market, or in the worst scenario, to make useless the investments made in the state-of-the-art gas plants[13].

11 The so-called 'traffic light' after the three colours identifying the parties composing it: red for Spd, green for Grüne, and yellow for the liberals of Freie Demokratische Partei

12 We are accellerating the massive expansion of renewable energies as well as the construction of modern gas plants, as to cover the growing demand of electricity and energy at competitive prices in the next few years. Gas plants capable of ensuring supplies through renewable energies can be built in such a way to be converted in climatically-neutral gases (H2-ready). Natural gas is indispensable for a transitory period (Koalitionsvertrag Zwischen Spd, Bündnis 90/Die Grünen Und FdP, pag. 61)

5.1. The 'new gas' is in the Mediterranean

In a recent article, the Frankfurter Allgemeine Zeitung questioned why Italy does not access its gas reserves, importing nearly the 90% of its supplies from abroad – and considering as well all the difficulties and the environmental impact[14].

This suggests the need of a new approach focused on a zero-kilometer gas extraction. For Italy, such a new approach would imply not to focus only on national deposits of gas, but to consider the bigger picture of the Mediterranean Sea, which, as Franco Bernabè said, 'is full of gas, but policies on the infrastructures are essential'[15]. Therefore, in the Mare Nostrum there are a lot of reserves, lots of which belong to EU Member States. The idea of creating a Mediterranean network between Italy, Slovenia, Croatia, Greece, and Cyprus for gas exploitation, logistics, and distribution could be a viable option. Basically, it would be a network that extends from the Adriatic Sea until the Middle-Eastern region and North Africa, where Southern Europe – Italy above all – would operate from a European hub. This solution could turn upside down the asset of gas supply, from the current East-West (Russia-EU) horizontal axis to a South-North (Mediterranean Sea-Europe) vertical axis.

Coming back to the Italian deposits: a re-start of the activities of extraction could allow significant savings on gas prices for the households. To make it simple, each cubic meter of domestic gas would be one cubic meter less to import. Seemingly, this can be applied also to the kWh produced by offshore wind-farms – another Mediterranean reality. Let us not forget that the Italian gas has – and will foreseeably have – a more competitive price compared to the natural liquified gas, identified as an alternative to gas supplies from Russia. Perhaps, only the Egyptian gas could be as economically competitive as the Italian gas, since Eni (Ente Nazionale Idrocarburi) found the Zohr mega-deposit of gas, the biggest of the Mediterranean, and is currently exploiting it.

13 S. Benedettini (2022), 'Nella Tassonomia verde Ue troppi paletti pere le centrali a gas', Milano Finanza, 3 February

14 www.faz.net, Streit über Italiens vernachlässigten Gasschatz, 18 January 2022

15 Il Messaggero, 20 February 2022

Besides the increase of the domestic production, which is obviously not enough to cover the missing Russian gas, the government plans to take further steps. A key role will be played by regasification plants: three of them are already in function and operate only for half of their potential. Moreover, the government is planning to use floating regasification plants as well. This should ensure to Italy an overall 10 billion cubic meters NLG per year.

Regasification plants represent only one of the elements of the solution. In fact, let us not forget that there isn't enough NLG worldwide to compensate the stop of the supplies of Russian gas – currently accounting for the 40% of our demand. On top of this, NLG is the least suitable quality of gas for energy-intensive industries, which are quite several in a manufacturing country like Italy. For this reason, perspectives on the use of regasification plants need to be extended to the whole Europe, as this would also imply a strengthened European strategic function. In conclusion, it is crucial that also us Italians start thinking European.

6. A European network

The new scenario of the energy market raises not only procurement issues, but also in terms of logistics. The European Union can live without the 140 billion cubic meters of gas arriving from the Siberian permafrost (more than half of which are used by Germany and Italy), as long as they can be replaced by supplies from other providers. Shall this be the case, the next step is still to understand how to distribute the gas in the entire continental territory. It currently lacks a European network capable of optimising distribution between countries; seemingly, there not exists common storage facilities: in short, each country makes it on its own.

An even bigger problem is that nowadays facilities like the regasification plants became indispensable, since they are capable of re-transform NLG to the gaseous state, and in addition they should be able to operate in seaports that can accommodate transporting ships and serve

as distribution hubs.

Energy is not only a matter of operating factories or recharging smartphones, but also a matter of national (and European) security. And the war showed how security can be fragile when facing dramatic events such as the conflicts. By solving the issue of gas, the EU might then finally find not only an economic agreement with the goal of creating a common European energy network capable of bringing the gas from collection centres to all EU Member States.

6.1. Limitations and obstacles of taxonomy on the gas

The EU provided an ad hoc regulation for investments (including the verification of their compliance with taxonomy) because that is in its institutional nature. Nevertheless, this nature, surely an overall important development engine, carries the risk of representing a curb in private investments in the energy area.

Moreover, taxonomy aims at fixing several flaws of the previous regulations on energy, the same that eventually led to prices increase as seen at the end of 2021. In short and as previously stated, since the gas is able to stabilise the system (as a source capable of ensuring production when renewables can't), the grow in demand due to unforeseeable external events led to rise in prices. On top of these unexpected contingencies – often possible, at least until we will have the most affordable storage technologies – there is the lack of a uniform EU energy policy. So far, the EU has in fact been unable to reach the main objective: to reach net-zero and at the same time to ensure competitive prices as well as the energy security.

Taxonomy – or the delegated act – had to overcome such a rigidity, but instead it will end up strengthening it. Under this standpoint, taxonomy leaves no way out: it previously and punctually defines with secondary legislation which technologies are allowed to realise sustainable activities. These rigid rules surely might curb big projects, and so does the inner contradiction of including in taxonomy a number of activities that are then not regulated by subsequent acts.

On top of this, it is essential to recall that the credit institutions – which are obviously involved within the process of investments in sustainable activities – are held accountable for several aspects they had never dealt with before. Facing these responsibilities requires additional resources and expertise that would definitely burden on their budgets.

Is taxonomy too strict? Private investors have no doubts

This is overall a sensitive issue, because taxonomy is vital for the future of the EU: energy policies mix up with industrial policies, and have an impact on the society of the future. Investors criticise one main aspect: taxonomy cannot work, if it represents only a rigid list of dos and don'ts. Only a flexible taxonomy would positively contribute to investments, considering as well the tight lap times of design and developing technological innovations. In short, there's no taxonomy without financial sustainability.

7. Conclusions

The present contribution draws only provisional conclusions, and aims at being a stimulus for a debate on the role of gas in the European Taxonomy and on energy transition policies – also in light of the most recent events. A debate that today sees EU Member States quite uncertain on whether adopting a common strategy to do without the Russian gas – and, if yes, which strategy.

Replacing the Russian gas in the short term is very complex, and it still remains difficult in the

long term as well. Future challenges for the European governments are politically complicated, and mutual support is crucial if the EU wills to overcome the crisis and minimise its effects.

If even tougher sanctions will be applied, aiming at targeting the gas as a backbone of the Russian economy, the EU has to be prepared to serious repercussions.

Natural gas represents Russia's most powerful economic leverage towards Europe. If it clear that the good functioning of the energy system is one of the EU Member States economies' pillars, a common European interest must prevail on the single Member States' interests.

The response to such a dramatic and evolving situation is a political adaptability. Two political, social, and economic systems are currently facing each other. Two antagonist systems in many ways, as it had already happened during the Cold War, representing two different models of capitalism, the Asian and the Western, fighting for the global economic supremacy. The energy sector will be one of most crucial battlefields: this is the reason why the Western World should find common strategies. In this sense, a successful energy transition would be essential, not only as a mean of defence of the environment and health, but also as an example of modern liberal democracies.

For the EU, one of the key steps of this process will be aiming at technological neutrality: looking for alternative suppliers might work in the short term, but only the availability of new technologies will allow us to escape from the energy trap in the long term. In this perspective, gas in taxonomy is not only a visiting guest – as it isn't the nuclear – but one of the cornerstones of a new forward-looking European energy policy. For this reason, the choice of including gas and nuclear within the framework of the activities eligible for private investments tied to energy transition, has been strategically unquestionable. Many possible evolutions of the current situation might require an update of taxonomy, as to make it more flexible. But most of all, it is essential to adopt a plan of extraordinary measures, a systemic plan capable not only of facing the emergency, but of creating a new European energy

model.

Energy transition is at stalemate: which are Europe's possible choices?

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