EVALUATING FUTURE FITNESS

WHAT MATTERS TO DECISION-MAKERS WHEN CONSIDERING WHETHER A HYDROCARBON INVESTMENT IS FUTURE FIT?

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Smart Prosperity Institute

energyfutureslab
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About Energy Futures Lab

The Energy Futures Lab is is an award-winning, multi-stakeholder initiative to accelerate the transition to the energy system that the future requires of us. Initiated in the Fall of 2013, the Energy Futures Lab is powered by The Natural Step Canada, in collaboration with a number of Convening Partners and Funding Partners. The EFL also involves dozens more organizations in an unprecedented series of innovative partnerships and collaborations.

The Energy Futures Policy Collaborative is a new and exciting initiative developed by the Max Bell Foundation and the Energy Futures Lab to explore how Alberta and Canada can harness its existing hydrocarbon resources, assets, and expertise to build the clean economy of the future. Smart Prosperity is a member of the Working Group, and is serving as a strategic advisor on the project.

About Smart Prosperity Institute

Smart Prosperity Institute is a national research network and policy think tank based at the University of Ottawa. We deliver world-class research and work with public and private partners – all to advance practical policies and market solutions for a stronger, cleaner economy.

TABLE OF CONTENTS

EVALUATING FUTURE FITNESS

Introduction

Alberta's energy sector faces a period of sustained uncertainty. Global trends towards lower-carbon energy systems, an oversupplied global market for the province's core commodity products, and a changing geopolitical climate have raised questions around the future landscape of Canada's oil and gas sector. As an indication of this uncertainty, capital spending in the province's oil and gas extraction sector experienced year-on-year declines for 4 out of 5 years between 2015 and 2019.[1] With capital expenditures declining even further in 2020 as a result of both the trends above and pandemic-related market turmoil, discussions about the future of the sector have only grown more pertinent.

This period of uncertainty also represents new opportunities. Clean technology and clean growth solutions represents an expected $26 trillion global market opportunity in the coming decade, one that will potentially create 65 million jobs worldwide. The beneficiaries of these economic returns will be those who make investments and develop solutions in resource-efficient, low-carbon solutions.

For Alberta, some of these new opportunities will emerge from investments in future fit hydrocarbons. These investments offer an opportunity to capture some of this market opportunity while advancing principles of sustainability, resilience and innovation within Alberta's energy sector. Realizing the economic opportunities that come with future fit hydrocarbons first requires understanding which technologies and projects are, in fact, future fit in Alberta given the global context.

Critically, there is no overarching definition of future fitness commonly used by stakeholders. Around the world, investors, policymakers and academics (referred to collectively as decision-makers) are trying to assess the future fitness of technologies and projects to inform investment and policy. Given that the economy is shaped by the choices made by these decision-makers, it is important to understand the criteria they use in their own assessments of future fitness. This will provide clarity on their shared objectives and the common attributes of future fit technologies and projects. It will also help to inform the ongoing development of coordinated strategies and longer-term visions.

This policy brief contributes to this definitional discussion by outlining a set of common assessment criteria that are currently used by decision-makers to assess the future fitness of technologies and projects in the face of uncertain potential futures. This brief identifies key themes in established standards and typologies used by decision-makers, and highlights areas of consensus that emerge through this analysis to identify which factors and characteristics should be included in discussions of future fitness of investments in Alberta's oil and gas sector.

While this guide has been developed to inform decision-making in Alberta, this analysis can be useful to a broader audience. It examines internationally-relevant decision-making frameworks and identifies shared objectives among them. This analysis can help inform the ongoing international debate on which technologies and projects are fit for an uncertain future.

How do investor and policymakers think about the future?

The world is shifting towards lower-carbon emissions. The world's three largest carbon emitters (USA, China and the European Union) have all indicated an intention to reach net-zero emissions by 2050 or 2060[2]. In a world where this level of rapid economic transformation is expected, simply projecting today's technology investment patterns outwards offers limited insight about what the future may bring. The levels of uncertainty around future policy, market direction, and technology cost-profiles mean that discussions of future fitness must take a range of futures

1 StatsCan, 2020. Table 25-10-0054-01 Capital expenditures, oil and gas extraction industries, Canada (x 1,000,000).
2 Energy and Climate Intelligence Unit, 2020.

into account, notably going beyond stated net-zero goals to include scenarios where the world achieves its objectives of maintaining temperature increases to levels called for by the international community.[3]

Within the financial community, frameworks have emerged for decision-makers to evaluate the future fitness of a given project or investment in the face of this uncertainty. These investment frameworks fall into two broad categories: The first are taxonomies or standards that evaluate the fitness of individual projects or investments against stated emissions reductions objectives. These project-evaluation standards, compiled in "transition taxonomies", assess how projects fit within a broad transition framework for a given country or region. The second type of investment framework is not project-specific but assesses the degree to which a portfolio held by companies, banks or investors is aligned with a particular objective or set of principles. These often have dual objectives of supporting climate objectives and reducing risk exposure for investors.

For the policy and academic community, assessing whether a given technology or solution fits within the future adds an additional factor: it matters whether a solution can create the future they want to see. For policymakers, achieving policy objectives involves considering how levers that markets consider as risks (such as policies, market direction, regulation) can enable greater change and support the achievement of policy objectives. Future fitness is therefore also about whether a solution can help create a future where policy objectives are realized.

For assessing how a given technology can help create a desired future or achieve a set policy target, policymakers and academics can assess solutions through a "pathways" lens. This approach involves selecting a desired future state and identifying the factors that may influence a given technology's or solution's ability to reach this future state. This allows experts to evalute what policies or actions would be required to support this vision being realized. The technologies that appear promising or attractive in helping create this future can then have pathways developed around them to support their growth or deployment. Pathways approaches often take a systems approach to identifying fit within a future, assessing how a range of factors can impact the achievement of a policy objective.

"This analysis can inform discussion about Alberta's oil and gas sector, and help decision-makers evaluate which technologies and proejcts are fit for an uncectain future."

This brief details three types of frameworks used by decision-makers to evaluate future fitness in resource sectors. The first is **national and intraregional transition taxonomies**; the second is **socio-technical low-carbon transition pathways**; and, the third is **responsible investment frameworks** that outline targets, scenarios or principles for investors to ensure investments align with a desired future state[4]. This third category – responsible investment frameworks – is composed of groups of mainstream investors, or guidelines issued from mainstream financial bodies, that outline criteria to evaluate investment against a set of scenarios, principles or targets. A full list of the frameworks, taxonomies and pathways literature examined for this brief can be found in the Annex of this brief.

3 IPCC, 2019.

4 This policy brief does not examine ESG Frameworks currently used within investment markets. Although they were originally scoped into preliminary assessments, a decision was made not to include them in this analysis. This is because ESG Frameworks are used to assess the current performance on a range of monetary, social and environmental factors, not to assess the potential future viability of technologies in an uncertain future. Some factors used to assess current corporate performance, such as the quality of corporate governance, are not readily applicable to assessments of the future fitness of technologies. This makes a comparison of the factors that matter to decision-makers in evaluations difficult. In areas where shared objectives were identified, the criteria used to assess current performance vs. future fitness were found to be distinctive, and could not be meaningfully compared.

What is a ..

Transition taxonomy

Taxonomies are a set of standards that allow us to classify a set of objects or ideas. Taxonomies are used in sustainable finance to categorize and classify set of activities, notably which activities or investments should be considered "sustainable" or which are aligned with emissions reductions objectives. Ensuring that a standard exists for calling an activity sustainable is useful for preventing "greenwashing" of projects or portfolios and for reducing confusion amongst investors.

Transition taxonomies are a taxonomy developed specifically to set standards and classify activities that support a transition towards net-zero greenhouse gas emissions. These taxonomies outline standards for activities (by technology, sector or process) that help investors identify which activities within a given country or region are aligned with the achievement of that region's greenhouse gas emissions reduction targets. Mark Carney, the current UN Envoy for Sustainable Finance, has noted that transition taxonomies play a role of creating a "middle bucket" for investors that helps identify which activities may not be "green", but which will still be necessary in the years to come while economies transition to net-zero emissions. These include activities like industrial manufacturing and natural gas co-generation facilities. This categorization helps clarify the overarching shape of a transition to concerned investors and companies.

Transition taxonomies are recognized as valuable for helping mobilize private capital into green and transition-oriented investment opportunities. Canada is currently in the midst of developing its own transition taxonomy that outlines standards for a resource-based economy. Stakeholders have noted existing taxonomies in the EU and Japan have not been developed with natural resource-based economies in mind. When released, this taxonomy will offer clarity to investors about the future investment attractiveness of Canadian resources.

Transition pathway

An established concept in energy and climate literature, a transition pathway is a theoretical framework outlining the 'pathway' that an economy can take to transition from point A (a high carbon present) to point B (a low-carbon, or net-zero emissions, future). Each pathway is a combination of social, economic and technological factors that push progress in one direction, or trajectory, over another.

Transitions theory explores changes in social and technological landscapes through the dynamic interactions between three dimensions: **The landscape**; regime actors (incumbents); and niche actors (innovations and innovative groups) (Geels & Scot, 2007). The landscape is a term used to describe the broader system; the set-up of actors, technologies and processes that make up the world being examined. **The regime** is a term used to define the actors, players or technologies who make up the status quo; in energy terms, these actors would include the fossil fuel industry, mainstream political parties and the internal combustion engine (Meadowcroft, 2016). **Niche actors** are those looking to upend the status quo or disrupt the landscape. These include renewable electricity technologies and environmental activists.

The trajectory of a given transition pathway is shaped by the interactions between regime and niche actors within the existing landscape. Pathways are a distinct concept from scenarios. Scenario development and modelling aims to project potential futures, whereas pathways approaches aim to outline how a given scenario can come to pass by examining how changes might occur to bring that scenario about. Using a pathways approach is useful for understanding how complex interactions can bring about a desired change or future, making them a complementary framework to scenario analyses.

Methodology

This brief examines the criteria used in decision-making frameworks to evaluate technologies and projects, and divides them into four categories : technology characteristics, environmental performance, market characteristics, and social and culture factors. These four categories are further outlined below :

Technology characteristics

Which technology-specific characteristics matter when considering whether a given project is future fit? These could include factors like technology-readiness-levels or technological performance.

Environmental performance

How is environmental performance being measured? Which metrics are being used to assess whether a given solution is future fit, and what matters most to investors?

Market characteristics

How is fitness within a future market being evaluated? Which parameters are being used as proxies for risk by investors, and which factors are viewed as essential for enabling market transformation in the policy and academic community?

Social and cultural factors

Are there social or cultural factors that are commonly seen across discussions of future fitness occurring in different audiences?

These four categories represent the primary thematic areas identifed in this research as important by decision-makers, with researchers adding in social and cultural factors as an additional category to better understand whether these factors are being considered as relevant criteria in future fitness discussions. Each is explored through the approches of different decision-makers, first with investors, then with policymakers and academics.

Technology-related characteristics

This category refers to the technology-specific characteristics that decision-makers consider relevant when considering the future fitness of a solution.

Investor approaches

Investors emphasize the importance of different characteristics across a range of financial taxonomies and frameworks, with no two frameworks identifying the exact same characteristics. For some, technology performance (relative to average industry performance or best-in-class standards) was relevant[5]. For others, technology was assessed based on its existing viability, and potential to scale in future[6]. Both of these factors identify the importance of assessing the performance or potential of existing technologies, an attribute that notably differs from earlier stage investments into "moonshot" technologies that have yet to be deployed outside of pilot projects. This is likely reflective of the type and scale of investor who is concerned with large-scale bond issuances, given that their fiduciary responsibility ensures they seek to minimize risk within their portfolios.

Other investment frameworks assess a technology based not on its individual performance, but on its capacity to integrate with existing infrastructure[7]. Some investors emphasize that if a technology requires large amounts of new, specialized infrastructure to be built to support its use, this adds an element of risk and complexity to its deployment. This is relevant in policy discussions, since areas where large amounts of specialized infrastructure are required will likely require greater government support in financing and construction to catalyze private investment.

Policymaker and academic approaches

Within policy and academic approaches, notably in pathways literature, technology is viewed through a longer-term and broader systems change lens. This time horizon means that technology is perceived differently than in investment taxonomies and frameworks. The characteristics that matter when considering the role of a given technology in a transition to net-zero emissions are less dependent upon its performance today, and place greater emphasis on its potential to evolve over time.

5 ICMA, 2020.
6 CBI, 2020.
7 UNEP-FI, 2020.

This focus on a technology's potential to reach net-zero, or evolve over time, is evident in identified characteristics. One characteristic in pathways literature is whether a given technology will be deployed in an environment that supports/rewards experimentation[8]. If so, it is seen as having greater potential/flexibility to evolve. This focus on the broader environment has policy relevance, since it emphasizes the role incentives play in supporting innovation. Pathways literature also discusses the importance of evaluating whether a given technology could integrate with existing infrastructure, a similar characteristic to those listed in investment frameworks[9]. Finally, the literature noted an additional measure of whether a given technology offered "incremental vs radical" change, a framework for considering how technology would impact factors including social beliefs and market design.

Key findings

- Decision-makers note that the infrastructure needs of a given solution are important to understand.
- Not all parties believe solutions need to have a capacity to integrate into existing infrastructure.
- Outside of understanding infrastructure requirements, there are no shared characteristics between decision-makers.

Environmental performance

Investment frameworks, transitions taxonomies and pathways literature all recognize the importance of supporting beneficial outcomes for the environment. However, these decision-making frameworks can track performance in three ways: They can measure absolute performance towards a target; they can assess relative performance against historical data, or; they can measure improvements in resource-efficiency at the facility-level. Depending on the performance metric used, certain technologies and projects are going to be perceived as more attractive than others, thereby indicating how environmental performance is being measured in discussions of future fitness.

Investor approaches

Taxonomies and investment frameworks often track environmental performance in multiple ways, depending on the type of project or environmental objective being sought. Absolute emissions reductions, and alignment of a given project with science-based scenarios that limit global temperature increases from 1.5°C-2°C of warming above pre-industrial levels, are the primary metric for assessing environmental performance across taxonomies and frameworks. In frameworks where alignment with science-based scenarios of limiting warming are included, but not the primary metric, alignment with national, regional or international emissions reductions targets are used. Alignment with national Paris targets, or net-zero emissions objectives, are commonly referred to within these frameworks as being a perquisite for future fitness. This shared assessment metric shows that global investors, almost uniformly, judge the future fitness of projects and investment based on their potential to reduce absolute emissions in line with limiting overall planetary warming or meeting ambitious mitigation objectives within a few decades.

In some investment frameworks and taxonomies, environmental performance is also judged by reductions in emissions intensity or improvements in resource-efficiency. These relative performance measures are commonly used to assess performance for two types of activities. The first is "Transition activities" within transition taxonomies, wherein performance relative to an industry benchmark is used to evaluate activities that are understood to be temporary in a longer-term transition. The second is in measurements of progress towards environmental objectives beyond emissions reductions in areas like water consumption, recycling rates, and waste diversion. While both are important, it should be noted that neither is the primary metric against which performance is being judged within investment taxonomies and frameworks. In all cases, they are secondary, or temporary activities, that are not prioritized to the same extent as reducing absolute emissions in line with limiting planetary warming.

Policymaker and academic approaches

Within pathways literature, there is typically an assumption that any transition pathway should be examined for its potential to reach net-zero emissions. Absolute emissions reductions in line with achieving

8 Geels & Schot, 2007.
9 Geels et al., 2016.

a net-zero target are therefore the environmental performance indicator most commonly used within a pathways approach. Pathways typically discuss this measure as an assessment of whether an individual pathway has the technical potential, or "depth", to achieve this level of emissions reductions.

Key findings

- Absolute emission reductions in line with science-based scenarios limiting planetary warming to 1.5°C-2°C above pre-industrial levels, or in alignment with national, regional or international targets, are the metric used by almost every decision-maker to assess environmental performance[10].
- Relative performance factors are used as a complementary measure for activities that are deemed "temporary" by transition taxonomies, or for other environmental measures (waste reduction, water conservation, etc.).
- The primary measure of environmental performance is absolute emissions reductions, and decision-makers view other measures as complementary or secondary.

Market characterstics

Decision-makers recognize that markets will ultimately be arbiters of which technologies and projects are future fit. When assessing how the market will perceive given technologies and projects, the same characteristics can be viewed through a lens of risk or opportunity. Investors typically view market changes and trends as risks, given that trends have the potential to increase the risk of stranded assets or negatively impact returns if regulations change. Policymakers and academics similarly consider market trends, but in an effort to understand how changes may enable or hinder progress. The same factors identified as risks to investors represent opportunities to policymakers and academics looking to create change.

Investor approaches

The primary risk factor within transition taxonomies and investment frameworks is exposure to transition risk. Transition risk is defined as the impact market shifts will have on the viability or profitability of future assets[11]. The UNEP Net-Zero Asset Owners Alliance notes transition risk measures sensitivity on three dimensions: policy and regulation, technology development, and changes in consumer preferences[12].

Investment frameworks identified robustness across different scenarios as key to mitigating transition risk. Assets that are already net-zero, or compatible with a net-zero future, are viewed as the least risky investments since they face the smallest risk exposure in the face of ambitious policy futures. Within transition taxonomies, transition risk is sub-divided by activity-type[13]. Activities that are deemed temporary, or seen as necessary during a transition but not in a net-zero world, do not have the same risk assessments applied as non-transition "brown" projects. However, taxonomies still stress the importance of aligning activities with long-term market direction, noting that transition risk will likely increase over time as the transition begins to unfold at a faster pace.

Policymaker and academic approaches

Similar to investor perception, policymakers and academics emphasize the need for investments to be aligned with future market needs. Factors like policy/regulatory changes and shifts in market demand are viewed as determinants of the speed and level of disruption a transition will bring[14]. Pathways literature stresses that solutions that offer the greatest opportunity to bring about this change are those aligned with a net-zero future. Despite this difference in framing from investors, the literature notes that a solution's future fitness within the market is also assessed by how robust a solution is in the face of disruptive changes to markets.

Pathways literature also identifies other market-related factors, such as whether a given solution will require the development of new business models[15], and whether a given solution is likely to spur diversification or

10 The only investment framework that does not call for absolute emissions reductions in line with these two standards is the Green Bond Principles Framework released by the People's Bank of China (PBOC, CSRC & NDRC, 2020). However, this framework was released before the recent national commitment to reach net-zero emissions by 2060, and will likely be revisited in the face of newfound political ambitions (Mallapaty, 2020).
11 UNEP-FI, 2020.
12 UNEP-FI, 2020.
13 Study Group on Environmental Innovation Finance in Japan, 2020.
14 Geels & Schot, 2007.
15 Geels et al., 2016.

transformation within a given market. These factors are largely acknowledged as secondary or complementary to robustness across multiple possible futures.

Key findings

- Even if decision-makers each view policy and regulatory changes through different lenses, there is consensus that future fitness should be evaluated by assessing how robust a given solution is across a range of futures.
- The primary variable in these futures is the pace of decarbonization, identifying that the least risk exposed investments are those already aligned with a net-zero or zero emissions future.

Social and cultural factors

This research also sought to examine whether there were social or cultural factors that decision-makers considered in assessments of future fitness. Ultimately, while themes of equity or inclusivity were mentioned across frameworks, taxonomies and literature, there was no formal consideration of these factors within any of the decision-making frameworks considered. This lack of inclusion does not mean that decision-makers are apathetic to social concerns. Rather, it illustrates that there are no widely shared or commonly-agreed upon social objectives that are currently being used to evaluate the futurefitness of technologies. This should be considered in the development of future frameworks.

What do investors and policymakers care about most?

There are a number of characteristics that matter to decision-makers in assessments of future fitness. However, three factors are notable for how frequently they appear across frameworks, and for the emphasis placed on each.

1 – Absolute emissions reductions in line with science-based scenarios

Across all attributes considered in transition taxonomies, investment frameworks and pathways literature, the most frequently mentioned criteria used to assess future fitness is absolute emission reductions in line with science-based scenarios limiting planetary warming to 1.5°C-2°C above pre-industrial levels. Alignment with science-based scenarios, or alignment with national, regional or international targets, are the primary metric used to evaluate environmental performance.

2 – Robustness across different decarbonization scenarios

Robustness across potential futures is the primary lens which investors use to assess risk and which policymakers and academics use to evaluate attractiveness within a low-carbon future. Solutions are assessed based on fit within different futures, in which the primary variable is how factors such as market demand affect the rate of decarbonization. In the eyes of investors, this reduces both the risk profile of overall portfolios and reduces the risk of stranded assets at the project level.

3 – Understanding infrastructure requirements

Investment frameworks, taxonomies and pathways literature identify that the infrastructure needs of a given solution are important to understand. Investors note that if specialized infrastructure is required, this can add risk to investment. The pathways literature, which is often used by policymakers and academics, notes that an ability to use existing infrastructure can enable faster adoption and deployment. If there are specialized infrastructure requirements, decision-makers note that greater government support will likely be required to catalyze deployment.

Outside of these three criteria, there is less consistency across frameworks, taxonomies and literature.
The majority of technology-related characteristics are specific to one or two individual frameworks/ taxonomies, and environmental performance metrics beyond absolute emissions reductions vary by taxonomy. Therefore, the three noted above stand out as being the only characteristics used to assess future fitness that are consistently considered.

Relevance to Canadian discussions

While this analysis highlights what mainstream investment frameworks, existing transition taxonomies and socio-technical pathways literature identify as relevant in discussions of future fitness, there are additional elements to consider within the Canadian context.

First, Canada's transition taxonomy, currently under development with the Canadian Standards Association, has yet to be released[16]. While this framework will not single-handedly set the standard all global investors will seek to follow, it will offer an indication of how Canada assumes its domestic transition to net-zero emissions will unfold by identifying timelines. The taxonomy will set Canadian standards that will likely outline additional criteria that will matter to investors interested in investing in Canadian energy, which should be considered in discussions of future fitness evaluations in Alberta. However, it should also be noted that Canada's current national target of reaching net-zero emissions by 2050, and the recent introduction of *the Canadian Net-Zero Emissions Accountability Ac*t, are likely to feature in discussions of alignment with emissions reductions targets as well. When investors consider alignment with science-based scenarios within their broader portfolio, a national transition taxonomy will likely be one of a number of factors that inform investment decisions into resource sectors.

Second, the criteria outlined above do not disqualify consideration of any other characteristics. In order to select pathways that offer promising economic opportunities, any region will need to have the physical, human and knowledge infrastructure to turn leading ideas into prosperity. Social and cultural factors are a notable area where a Canadian region could develop objectives, and further outline targets for social inclusion, reconciliation with indigenous peoples, or equitable growth within their own assessments of future fitness.

Third, it is important to note that policy can play a role in both leveraging existing technologies to achieve objectives and helping to shift the overall landscape in a more future fit direction. Previous work on the subject of clean innovation from Smart Prosperity has identified that well-designed policies can both drive existing future fit technologies to market, and help create a regulatory landscape to spur innovation around attractive technologies. There is a critical opportunity to develop and support policies, such as carbon pricing and stringent, predictable and flexible regulations, that help scale existing technologies and create an environment that drives innovation into solutions whose attributes mirror those identified in decision-maker discussions of future fitness.

In order to select pathways that offer promising economic opportunities, any region will need to have the physical, human and knowledge infrastructure to turn leading ideas into prosperity.

Finally, while these criteria are useful for decision-makers to evaluate which characteristics may support future fitness within a given solution, they offer little insight into which investments can support future economic opportunity within regions in the midst of a transition. Additional research into methods for assessing competitive advantage within a country or region, a burgeoning field in the academic literature on industrial policy, would be beneficial to support ongoing discussions. Identifying which solutions offer the economic outcomes desired by policymakers goes beyond this analysis, and should be the basis of future research into this area.

16 CSA Group, 2020.

APPENDIX 1: LITERATURE REVIEWED IN THIS THEMATIC ANALYSIS

Investment frameworks

- Climate Bonds Initiative: Climate Bonds taxonomy (CBI, 2015)
- Climate Bonds Initiative & Credit Suisse: Transition Bond Standard (CBI & Credit Suisse, 2020)
- Transition Pathway initiative (FTSE Russell et al., 2019)
- Group of 30: Mainstreaming the transition to net-zero emissions (G30 Working Group on Climate Change and Finance, 2020)
- United Nation Environmental Programme Finance Initiative: Net-zero asset owners alliance (Net-Zero Asset Owner Alliance, 2020)
- United Nation Environmental Programme Finance Initiative: Beyond the Horizon: new tools and frameworks for transition risk assessments from UNEP FI's TCFD Banking Program (UNEP-FI, 2020)
- International Capital Markets Association: Sustainability-linked bond principles: Voluntary protocol guidelines (ICMA, 2020)
- United Nation Environmental Programme Finance Initiative: Principles for Responsible Banking (UNEP-FI, 2018)

Transition taxonomies

- European Commission: Action Plan on Financing Sustainable Growth; "The EU Taxonomy" (Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the Establishment of a Framework to Facilitate Sustainable Investment, and Amending Regulation (EU) 2019/2088 (Text with EEA Relevance), 2020)
- People's Bank of China, China Securities and Regulatory Commission & the National Development and Reform Commission: Green Bonds Endorsed Projects Catalogue (PBOC, CSRC & NDRC, 2020)[17]
- Transition Finance Study Group in Japan: Transition Finance Guidance; "The Japanese Taxonomy" (Study Group on Environmental Innovation Finance in Japan, 2020)

Pathways literature

- Geels Sovacool, Schwanen & Sorrell: The Socio-Technical Dynamics of Low-Carbon Transitions (Geels et al., 2017a)
- Sovacool & Hess: Ordering theories: Typologies and conceptual frameworks for sociotechnical change (Sovacool & Hess, 2017)
- Geels, Kern, Fuchs, Hinderer, Kungl, Mylan, Neukirch & Wasserman: The enactment of socio-technical transition pathways: A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990–2014) (Geels & Schot, 2007)
- Djik, Orsato and Kemp: Towards a regime-based typology of market evolution (Dijk et al., 2015)

17 While this document by the PBOC is not an official transition taxonomy, it is recognized as a taxonomy for determining the green status of projects and activities. The Chinese government has indicated that these principles will be updated (CBI, 2019).

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