Fostering green financing at the subnational level. The case of the Basque Country[*]

Although the role of the public sector in developing green financing has been analyzed, there is a gap in the literature regarding the specific funtions of subnational (or regional) governments to facilitate financing of clean technologies and sustainability projects. This research aims to contribute to the academic literature on the specific channels and mechanisms through which a regional government can facilitate green financing. To answer this question, this paper studies the role of the public sector at various administration levels (supranational, national and subnational) in facilitating the financing of sustainable investments to delineate best practices. It develops a framework to assess strategies to foster green finance, with a focus on the regional level, and applies it to the specific case of the Basque Country.

Si bien se ha analizado el papel del sector público en el desarrollo de la financiación verde, existe un vacío en la literatura sobre las funciones específicas de los gobiernos sub-nacionales (o regionales) para facilitar el financiamiento de tecnologías limpias y proyectos de sostenibilidad. Esta investigación tiene como objetivo contribuir a la literatura académica sobre los canales y mecanismos específicos a través de los cuales un gobierno regional puede facilitar la financiación verde. Para responder a esta pregunta, este trabajo estudia el papel del sector público en los distintos niveles de la Administración (supranacional, nacional y sub-nacional) para facilitar la financiación de inversiones sostenibles y diseñar las mejores prácticas. Asimismo, el trabajo desarrolla un marco de evaluación de estrategias de fomento de las finanzas verdes, con un enfoque regional, y lo aplica al caso concreto del País Vasco.

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Table of contents

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1. INTRODUCTION

The transformation of the energy system and, more generally, the economy as a whole, to achieve sustainability goals will necessarily imply large volumes of investment in new, low-carbon technologies, including renewable generation, energy storage and network infrastructure.

Energy investment stabilized in 2018 at over $1.8 trillion[1] after three consecutive years of decline. According to the International Energy Agency (IEA), average annual investment in the Stated Policies Scenario will rise to almost $2.7 trillion per year over the period to 2040, and to an annual average of $3.2 trillion to 2040 in the Sustainable Development Scenario (IEA, 2019a). Specifically, meeting the Paris Agreement challenge of limiting global warming to well below 2ºC and pursuing efforts to limit it to 1.5ºC could represent an opportunity of $12.1 trillion worth of investments in renewable power generation over 25 years ($485 billion/year on average) (Zindler, 2016).

[1] *Billion = 10^9 and trillion = 10^{12}.*

Such levels of investment effort will imply new financing needs and requirements. Green financing[2] (or sustainable financing) refers to the use of specific financial instruments (including securities, yieldcos, green investment funds and green loans, to name a few) to finance investments in clean (green and sustainable) technologies and low-carbon, environmentally sustainable projects throughout all economic sectors (Lindenberg, 2014; European Commission, 2017).

The interest in sustainable finance has grown steadily in recent years, following the Paris Agreement (Deschryver *et al.*, 2020). In the post-Covid world, sustainable finance is recognized to be a key lever for implementing the European Green Deal and the European Union's recovery strategy, in its quest for increased resilience and environmental, social and economic sustainability (EU Technical Expert Group on Sustainable Finance, 2020a).

Although bank and corporate financing has traditionally been an essential source of funding for low-carbon projects, which involve, at the initial stages, low returns, higher risks and depend heavily on policies and regulations (Sartzetakis, 2020), the intervention of the public sector will be required to meet the significant investments needed to carry out the energy transition. Until now, the academic literature has addressed a large number of topics related to green financing from various points of view, such as its relationship with sustainable economic growth (Stojanović & Ilic, 2018; Wang & Zhia, 2016), the development of green financing instruments (Lund Larsen, 2019; Jiguang & Zhiqunb, 2011), green bonds as an instrument to finance the low-carbon transition (Sartzetakis, 2020; Dou & Qi, 2019) or the relation between green bonds and financial markets (Reboredo, 2018; Tolliver *et al.*, 2019).

The role of governments in developing green financing has also been analyzed by scholars (Taghizadeh-Hesary & Yoshino, 2019, 2020). However, there is a gap in the literature regarding the specific mechanisms through which subnational (or regional) governments may facilitate green financing. They can contribute to this end because they are well positioned to create a favourable environment for economic activity at the local level (Porter, 2008), focusing on the strengths and specificities of each territory to foster their competitive advantages (Hoppe & Miedema, 2020) and better fulfill functions such as mobilizing local networks, engaging external partners and their resources appropriately and playing a leadership role (Ketels, 2017).

This paper aims to contribute to the academic literature by helping to bridge this gap. Analyzing what are the specific channels and mechanisms through which a regional government can facilitate green financing is the central question addressed in this article.

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[2] Even if there are distinctions between the terms 'green', 'sustainable', 'climate' and 'low-carbon' finance, in this article the terms 'green financing' and 'green finance' are used to include these concepts.

The remainder of this paper is organized as follows. Section 2 presents the methodology applied in the analysis. Section 3 briefly describes the main green financing mechanisms. Section 4 proposes an analytic framework for assessing the role of regional governments in fostering green finance. Section 5 applies this framework to the specific case of the Basque Country. The last section presents some conclusions and identifies avenues for further research.

2. METHODOLOGY

In order to answer the proposed research question, a non-systematic literature review on green financing instruments is conducted first. The goal is to identify a representative base of articles that, although not intended to be comprehensive, will account for the most relevant theoretical (and practical) perspectives and approaches.

The ResearchGate, Science Direct and Google Scholar engines are used to survey the literature by searching the following terms: 'sustainable financing', 'green financing', 'low-carbon financing', 'climate finance', 'green financial instruments', and 'green bonds'. The focus of the search is set initially on peer-reviewed articles; although sectoral publications that analyze current trends in green financing from International Capital Market Association (ICMA), International Finance Corporation, Climate Bonds Initiative (CBI) and Organisation for Economic Co-operation and Development (OECD), among others, are also considered.

A literature review is then carried out of the role of the public sector at various administration levels (supranational, national and subnational) in facilitating the financing of investments in clean assets and technologies and sustainable projects. The results help to identify key insights and trends in green financing around the world and delineate best practice. Based on these and other references from ICMA, Sustainable Banking Network, International Renewable Energy Agency (IRENA) and CBI, to name a few, a framework to assess strategies for the development of green financing and filling the 'financing gap' is developed, with a focus on the subnational/regional level.

The resulting analytical framework is then used to analyze the specific case of the Basque Country and derive policy implications.

3. GREEN FINANCING INSTRUMENTS

Green financing involves the use of a large variety of market-oriented mechanisms, channels, financing structures and products (Wang & Zhia, 2016).

The review of the literature suggests that the universe of green finance instruments can be broadly characterized by (1) the destination of the funds within the life-cycle of innovation activities or projects (i.e., upstream or downstream) (Polzin,

2017; Polzin & Sanders, 2019); (2) the origin of the resources (i.e., the private sector or the Government and public administrations) (GEF, 2015); and (3) the rights and obligations associated with the reception of the funds (equity, debt or grants).

Basic and common green finance instruments are based on equity and debt financing (Owen *et al.*, 2018). Additional sources of funds include grants (whether from individuals, corporations or government entities), the cash flows of projects in project finance and alternative financing schemes, including, for instance long-term contracts (e.g., power purchase agreements, PPA), on-bill and PACE (Property Assessment Clean Energy) financing structures, green mortgages, energy performance or services contracts, policy and regulatory instruments such as subsidies, tax incentives, feed-in tariffs, quota-based schemes, etc.

Besides, various instruments have been developed to reduce the risk of investments in green projects, including insurance or guarantee schemes and other contingent claim instruments (catastrophe bonds, contingent credits or nature-linked securities, weather derivatives, etc.). Technical assistance platforms and initiatives that connect project developers and financing providers should also be mentioned. Table 1 reviews all these instruments.

Table 1. **GREEN FINANCE INSTRUMENTS**

Instrument types	Comments
EQUITY FINANCING	
Seed capital	• Supports the creation of start-ups and low-TRL R&D activities. • Typically used in smaller projects with relatively high-risk and high-return. • May come from a variety of private and non-commercial sources (family and friends, crowdfunding, business angels, corporations, public institutions…).
Venture or risk capital	• Provided in early stages of projects by investors requiring high expected returns, usually after a round of initial seed funding. • Typically used in smaller projects with low capital requirements. • May come from private (individual investors and family offices, etc.) or public institutions.
Growth capital	• A type of private equity investment in relatively mature companies that are looking for capital to expand or restructure operations, enter new markets or finance acquisitions.
Investment funds	• Pooled capital in the form of mutual funds, hedge funds, private-equity funds, pension funds or insurance funds. • Green investment funds specialize in green, sustainable projects.

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DEBT FINANCING	
Bank loans	• Green loans are provided to green projects complying with guidelines (e.g., ICMA guidelines, EU taxonomy, etc.). • They are often accompanied by green credit guarantee schemes (GCGS). • Sustainability-linked loans (SLL) link parameters on Environmental, Social and Governance (ESG) ratings or other ESG-related indicators. • Green promissory note loans are offered to potential investors in the early stages of projects and are subject to less-stringent reporting requirements.
Structured banking finance and new services	• Leases, invoice factoring, supply-chain finance (e.g., purchase-order, warehouse financing), structured products, off-balance sheet financing, new financial services (e.g., new payment and working capital schemes).
Loans from governments and multilateral institutions	• Provide funds to green projects to attract additional private capital. • Concessional loans are usually offered below market rates with features such as extended repayment schedules or interest rate flexibility during the life of the loan. • Non-concessional loans are offered at near market rates to finance large projects (i.e., infrastructures). • Credit lines and subordinated debt by multilateral development banks (e.g., World Bank, European Investment Bank, etc.). • Debt-for-climate swaps cancel external debt in less-developed countries in exchange for investments in green projects.
Green bonds	• There is a variety of green bonds, including sovereign bonds, subnational and local government bonds, supranational bonds (e.g., issued by the World Bank), corporate bonds, project bonds, asset-backed bonds and financial sector bonds, among others. • Comply with international guidelines, such as the ICMA's Green Bond Principles. • Can be traded on public markets. • Ample flexibility to provide tailor-made financing solutions (flexible payment schedules, credit-extension provisions, leverage options, cost-reducing benefits, etc.). • Basis for complex bond-based financing schemes such as PACE (Property Assessed Clean Energy), whereby municipal bonds support loans for renovations in commercial or domestic bulidings.
GRANTS	
Grants	• Common in early stages of green projects (usually linked to non-revenue generating R&D activities and capacity building), can be provided by private, corporate or government agents or institutions. • Convertible grants become debt or equity once certain milestones of the project are achieved.

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OTHER TYPES OF FINANCING ARRANGEMENTS AND INSTRUMENTS	
Project finance	• A way to finance green projects via a 'special-purpose vehicle' (SPV) based on their expected cash flows and/or the operation of an asset or group of assets. • Used in combination with equity and debt financing. • Usually characterized by high debt-to-equity ratios, facilitating investments not backed by balance sheets.
Yieldcos	• Affiliated companies where a parent company spins off assets that generate stable cash flows. • Selling yieldco stocks or issuing green bonds out of it allows the parent company to raise additional funds.
Power-purchase agreements and long-term contracts	• Long term arrangements between a project's developers and users of energy that generates a stream of predictable, stable revenues over time.
On-bill financing and other contracting structures	• On-bill financing of energy investments allows utilities to update the infrastructures and equipment of end consumers and recover the investment costs via their energy bills over a period of time. • Green mortgages support home renovations and investments. • Municipal PACE schemes help to finance building renovations.
Energy services and energy performance contracts	• Under a typical contract, energy services companies (ESCOs) finance the up-front costs of investments in energy efficiency via expected (agreed) energy savings. • Energy services agreements (ESAs) are similar, except that services are paid through charges based on realized savings.
Policy and regulatory instruments	• These include subsidies, tax incentives, feed-in tariffs for renewable electricity production, quota-based schemes and other policy instruments aimed at fostering innovation in green technologies.
Risk-reducing schemes	• Insurance or guarantee schemes and other contingent claim instruments and schemes, such as catastrophe bonds, contingent credits or nature-linked securities and market risk-reducing or risk-hedging instruments, such as weather derivatives or similar. • Blended finance transactions (co-financing structures or on-lending structures) among providers of capital (institutional investors, developers, commercial banks, as well as multilateral, supranational and national development banks) provide an effective sharing of risks and returns among the parties.
Project facilitation initiatives	• Technical assistance platforms and initiatives that connect project developers and financing providers.

Source: own elaboration.

4. THE ROLE OF GOVERNMENTS IN DEVELOPING A GREEN FINANCING MARKET

Globally, sustainable investments stood at $30.7 trillion at the start of 2018, a 34% increase in two years, reaching a market share of 18% in Japan and 63% in Australia and New Zealand (Global Sustainable Investment Alliance, 2019). Despite this, reaching sustainable scenarios in the long run will require a significant increase in the rate of investments in low-carbon assets and technologies (IEA, 2019b; IRENA, 2019).

The 'green financing gap' concept refers to the inability of current energy and financial markets to materialize the high levels of investments in low-carbon assets and projects that are required to meet energy and climate policy objectives (Polzin & Sanders, 2019; Sachs *et al.*, 2019; Hafner *et al.*, 2020).

Traditional ways of funding (e.g., balance-sheet financing, project finance) are not sufficient to induce the required levels of investment. They will need to be coupled with new public and/or private sources of capital, including institutional investors (e. g., government agencies and institutions, trust funds, pension funds, insurance companies) and other non-institutional investors (Jones, 2015; Taghizadeh -Hesary & Yoshino, 2020).

In general, the literature on the green financing gap identifies barriers related to a variety of factors, including technology, regulatory and commercial risks, relatively high Capex requirements, higher transaction costs and interest rates, information asymmetries, lack of analytical capacity and knowledge, difficulty of internalizing environmental externalities, lack of clarity in the definition of «green» or «sustainable» activities and limited development of the green financial market (Polzin, 2017; Geddes *et al.*, 2018; Stojanović & Ilic, 2018; Hafner *et al.*, 2019; Hyung & Baral, 2019; Yoshino *et al.*, 2019; Hafner *et al.*, 2020; Taghizadeh-Hesary & Yoshino, 2020; Jones *et al.*, 2020).

In order to solve the green financing gap and facilitate the flow of private capital towards green projects and activities, it will be necessary to reduce the aforementioned barriers and create an adequate environment that includes business laws, rules[3] and standards, an efficient investment regime, voluntary guidelines, financial and regulatory incentives and coordination mechanisms between all actors involved (Berensmann and Lindenberg, 2019). The role of financial system regulators should be highlighted to avoid inadequate management and guarantee the coordination

[3] The regulatory framework under development in the EU within the implementation of the European Green Deal will focus on facilitating the reorientation of financial flows towards achieving carbon neutrality by 2050, with targets and obligations for public or private financiers and investors (European Commission, 2020b).

with supervisors and central banks (The de Larosière Group, 2009; Carney, 2015; Larreina, 2015; Bolton *et al.*, 2020).

4.1. **The role of the governments in developing green finance**

Private entities tend to invest suboptimally in R&D activities related to clean technologies and green projects (Hannon & Skea, 2014) because of the high probability of failure to reach the commercialization and dissemination phase (Gallagher *et al.*, 2012; Wilson *et al.*, 2012; Hannon & Skea, 2014). Thus, the role of governments in fostering investments in markets with high technological uncertainty and risk or externalities has been thoroughly studied in the academic literature.

In this context, governments can act as risk-bearing agents (Stiglitz, 1993; Mazzucato, 2018; IRENA, 2020a, 2020b, 2020d). They can induce and stimulate investments in high social return projects by providing guarantees or public funding (Jomo *et al.*, 2016), incorporating sustainability aspects for investments and placing the low-carbon transition at the core of their strategies (IRENA, 2020b). Governments play a critical role in reducing barriers for investments (adopting initiatives to simplify and standardize renewable energy project documentation), enabling adequate policy frameworks (including monetary and fiscal policies; IRENA 2020d), with clear, supportive and comprehensive policies (IRENA, 2020b).

Governments aiming to foster transitions should consider designing, implementing and assessing finance-related policy interventions (Geddes & Schmidt, 2020)[4]. They may intervene directly in the capital markets by creating and regulating financial institutions, offering loans and correcting market failures associated with costly information in credit markets, imperfect competition and certain externalities (Stiglitz, 1994). Governments can create green standards and certifications and align them with leading international best practice. They can foster the creation of domestic green bond markets with demonstration issuances (IRENA, 2020c), also offering technical assistance and economic incentives (IRENA, 2020d).

Braga (2020) argues that governments' interventions in credit markets help to reduce credit constraints and induce socially beneficial investments in a context of high uncertainty and risk. This is in line with the view in Mazzucato (2015) and Mazzucato & Semieniuk (2018) about how the public sector helps to de-risk investments with high technological uncertainty (such as green investments) by funding basic research and creating new markets for these technologies.

Governments may also reduce the cost of financing investments via equity and bond issuances, due to its capacity to bear and manage credit risk (Arrow & Lind, 1970; Holmström & Tirole, 1998; Grant & Quiggin, 2003). This also holds for pro-

[4] The British Government, for instance, defined a Green Finance Strategy in 2019 to stimulate sustainable activities (HM Government, 2019).

jects with social benefits (such as green projects) under uncertainty (Arrow and Lind, 1970). An optimal level of public debt is also found to not entirely crowd out private lending (Azzimonti & Yared, 2019).

By supporting the development of a holistic green financing ecosystem, policymakers can also help to ensure that the process of achieving the Sustainable Development Goals (SDGs) is just and equitable, maximizing socio-economic and environmental benefits (IRENA, 2020d).

There is, therefore, ample evidence favouring a significant role of governments in developing green financing markets and helping to close the green financing gap by strengthening the green market infrastructure, stimulating private investment flows and promoting synergies with private investors (Gabbi *et al.*, 2016; Climate Bonds Initiative, 2018b, 2019b; Taghizadeh-Hesary & Yoshino, 2020).

All this suggests that governments should adopt an entrepreneurial role in the transition to a sustainable economy and implement policy mixes designed to affect both the quantity and quality of green financing and to create effective institutions and adequate credit market conditions that help to fill the green financing gap (Lamperti *et al.*, 2019).

4.2. **The role of subnational governments in developing green financing**

The question arises as to whether there is a differential; distinctive role subnational (or regional) governments can play in developing green financing at the regional level. The answer partly depends on factors such as the degree of decentralization and political autonomy of the regions and their capacity to design and implement fiscal and financial policies.

In addition to designing integrated strategic plans for economic development and growth and creating appropriate structures for governance, subnational governments help to create a favourable environment for economic activity. They support local businesses and industries, help to develop human capital of local actors, foster demand, induce the optimal degree of competition and cooperation between companies and collaboration by other institutions (Porter, 2008) and play a leadership role in mobilizing local networks and engaging relevant external partners (Ketels, 2017). In 2016, more than 50% of public investments were made at the subnational level in 36 countries, and even 65% in high- and upper-middle-income economies (OECD/UCLG, 2019).

The local and regional dimension of the transition to a sustainable economy is also relevant. Balta-Ozkan *et al.* (2015) and Grillitsch & Hansen (2019) review the relevance of the local context in the development of the 'green industry' and Mattes *et al.* (2015) analyze the ties between energy transition at the regional level and in-

novation, stressing the role of individual and organisational actors as well as institutions at the local level in shaping the transition processes.

This implies that regional sustainability strategies must focus on the specific characteristics of the local firm fabric and the sociopolitical environment and its potential for developing sustainable competitive advantages (Hoppe & Miedema, 2020). A single solution will not fit all nor a set of standard tools to achieve the goal of zero net emissions in the economy exists, as local conditions matter (Grillitsch & Hansen, 2019; Mattes *et al.*, 2015).

Lamperti *et al.* (2019), in turn, argue that developing a multi-level and cross-sectoral system of governance of the energy transition will facilitate the green transition. This will require the coordination of the various layers of governments across policy instruments with an impact on multiple sectors, including the energy and financial sectors, and innovation and R&D activities. Owen *et al.* (2018), for instance, claim that a finance ecosystem approach should be taken to ensure that the diverse, complementary forms of finance for low-carbon investments are connected at the subnational, national and international levels.

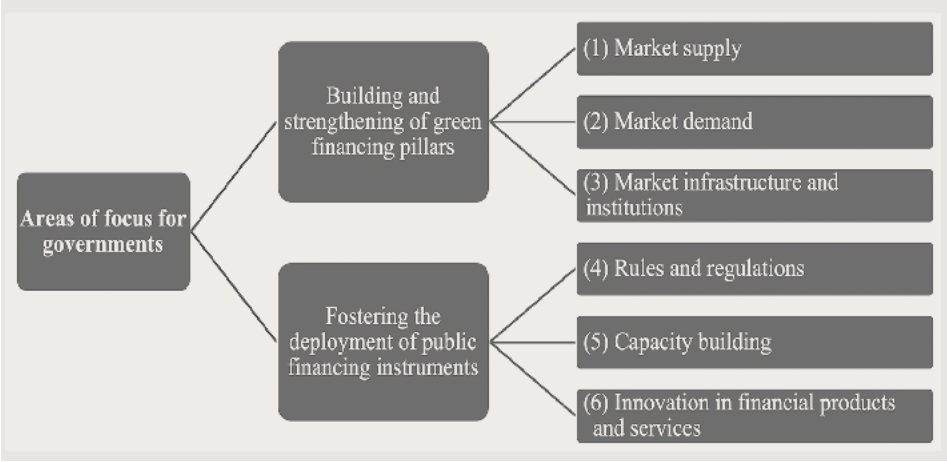
Additionally, the academic literature shows that when proper institutional arrangements and capacities are in place subnational governments play a relevant role in fiscal governance and could be crucial to the development of a sound financing environment and adequate regulations at the local level (Litvack *et al.*;1998; Bird, 2011; Oates, 2005; Vo, 2010; Liu & Pradelli, 2012; Faguet, 2014; Baskaran *et al.*, 2016).

4.3. **A framework for analyzing the role of governments**

To understand how governments can spur green financing, an analytic framework is developed around six key dimensions where they should focus, which have been reviewed in the literature (ICMA, 2018a, 2018b; Sustainable Banking Network, 2018; Climate Bonds Initiative, 2018b; Mazzucato & Semieniuk, 2018; IRENA, 2020a, 2020c, 2020d) (Figure 1).

(1) The Government can facilitate the supply of green financing via various mechanisms. Direct intervention as a supplier of green funds can take the form of equity investments, grants (e.g. Santa Monica in California and Wellington, New Zealand, offer grants to fund and support local initiatives to mitigate climate risks and adapt for climate change) or government loans offered by public banks or governmental development finance agencies. These are generally targeted to specific R&D activities and specific groups of companies (e.g., SMEs), to support investments or cash-flow needs. The issuance of green bonds is another way to channel funds to green investments and has also taken place in the past at the regional and local level (e.g., Landesbank Baden-Württemberg, Germany, with participation of the regional government and the City of Stuttgart, has executed several issuances of green bonds since 2017).

Figure 1. **THE SIX DIMENSIONS OF GREEN FINANCING WHERE GOVERNMENTS SHOULD FOCUS**



Source: own elaboration.

Specialized funding agencies or other private aggregation vehicles may also help to pool resources from institutional and non-institutional investors. In order to increase the flow of capital towards green investments from institutional investors such as pension funds, mutual funds or risk capital companies, for instance, their internal capacities, incentives, management and operating practices and investment strategies should be aligned with sustainability and green investment goals. Cooperation between investors through different vehicles and fora (e.g., Institutional Investors Group on Climate Change, IIGCC) will facilitate the diffusion of best practice in green finance, knowledge about climate-related assets and financial instruments and the development of corporate responsibility related to sustainability.

Public policies can help to reduce the risk associated with green investments. For instance, tax incentives or rebates, improving credit information and credit profiles of project developers will help to reduce financial risks and may create incentives to issue debt (IRENA, 2016; Groenewegen & Wierts, 2017). Providing public green credit guarantees on loans will reduce credit risk (IRENA, 2016). In addition, establishing new local- or community-based trust funds and addressing specific green investment risks via financial and policy de-risking tools will help to unlock capital resources (Yoshino *et al.*, 2019; Taghizadeh-Hesary & Yoshino, 2020). Project development risk may be reduced by streamlining siting, permitting and other administrative requirements and simplifying specific regulations (e.g., related to grid access or construction and other standards) (IRENA, 2020b). Technology risks may be addressed via grants supporting R&D activities, public-private co-financing, risk-sharing across agents and other tools.

(2) The demand side of the market can be stimulated by stable, transparent policies that foster the deployment of clean, sustainable technologies and the adoption of more efficient and sustainable production and consumption processes. Tax advantages for green investors (e.g., income, corporate or wealth tax rebates) will spur private green investments. Governments may also engage in active ownership regarding the ESG goals of public companies (Dimson *et al.*, 2015) or directly act as consumers of green financial services. Deleidi *et al.* (2020) find that public investments not only have a positive but also a larger effect on private investment flows than feed-in tariffs, taxes or renewable portfolio standards, thus providing evidence that no significant crowding-out effects occur. In addition, a clear identification of green sustainable economic activities and projects (such as the EU Taxonomy of sustainable activities[5] or the Climate Bonds Initiative) will help to reduce the uncertainty faced by investors (Climate Bonds Initiative, 2018a, 2018b; IRENA, 2020a; European Parliament, 2020). Specific policies and instruments also create incentives for investment, such as using spillover tax revenues from energy supply to increase the rate of return of green projects.

(3) The creation and establishment of sound market infrastructure and institutions is also a key pillar for the development of green financing markets. In the case of green bond markets, for instance, the development of indices and an active role by actors such as exchanges will facilitate access to the market by smaller issuers and national or international investors. Other stakeholders, such as rating agencies, the various types of financial institutions, government agencies and retail investors also play a critical role in strengthening the market for green financial products.

Clear disclosure rules for companies and investors and detailed regulations of the green bond market (for instance, related to project selection and evaluation or management of bond proceeds) will help to generate confidence in the nascent green financing market (IRENA, 2020c). Market oversight is another critical function that should be carried out by governments or an appointed entity subject to strict independence-preserving rules.

(4) The regulatory framework will establish boundary conditions that, if well designed, may help to foster the development of green financing. In the case of green bonds markets, for instance, harmonized definitions of green and sustainable bonds, alignment with international best practice and development of common ap-

[5] The EU Taxonomy was approved in 2020. It considers an activity as environmentally sustainable if it contributes to at least one of the following objectives: a) climate change mitigation and adaptation; b) sustainable use and protection of water and marine resources; c) transition to a circular economy; d) pollution prevention and control, and e) protection and restoration of biodiversity and ecosystems (European Parliament, 2020; EU Technical Expert Group on Sustainable Finance, 2020b). The criteria for the climate change mitigation and adaptation objectives are expected to be applicable from the end of 2021. The criteria for the rest of the objectives will be developed and applicable by the end of 2022 (European Commission, 2020a).

proaches, such as through regional collaboration, may accelerate the development of local green financing and investment (i.e. the City of Stockholm in Sweden developed a system of co-financing for transport projects). Specific rules and guidance for project selection, evaluation and reporting will lower the risk of 'greenwashing' and provide investors with more certainty about the nature of the projects and the management of proceeds (Sustainable Banking Network, 2018).

Sound regulations and standards will help to reduce information asymmetries and transaction costs and to solve problems related to incomplete markets. Moldogaziev *et al.* (2018) argue that capacity of a system to solve information asymmetries through transparency, disclosure and regulation, or ensure contractability between borrowers and lenders, controlling for the existing economic, financial and market, political, and legal institutions, is critical for the development of subnational credit markets. The resolution of information problems is particularly relevant in the case of investments in infrastructures and, specifically, in the case of green investments (Sharma & Knight 2016; Clark, 2018).

(5) Additionally, both the increase of supply and demand for green financing will be closely related to the skills and capacities of the actors involved in this market. Governments can induce the growth of the green financing market by stimulating the participation of other stakeholders, such as rating agencies, think tanks and other organizations that foster awareness and capacity building about sustainability, green assets and projects or new financing instruments. It can also help to disseminate information on best practice, guidelines and innovation in green finance markets, regulations and products, providing or inducing specialized training services for investors, technical advisors and policymakers and promoting fora where relevant stakeholders can share information and market intelligence. Chambers of commerce, associations in the financial sector and cluster associations can also contribute to capacity building, as can universities and technical education institutions through specialized programs.

(6) In addition to supporting R&D related to new financial products and services by, for instance, financial start-ups, governments can use new financing schemes and economic incentives such as funding of demonstration issuances, grants to offset issuance and reporting costs or the provision of seed capital for new financing vehicles. Alternative innovative financing instruments by governments and/or private entities based on grants, equity, debt, crowdfunding or community-based schemes also help to foster investments in low-carbon technologies (Owen *et al.*, 2018; Yoshino *et al.*, 2019). Table 2 summarizes all the above.

Table 2. **THE ROLE OF GOVERNMENTS IN CREATING A WELL-FUNCTIONING GREEN FINANCE MARKET**

Goal	Specific policies and measures to foster green financing	Impact on the development of the market
(1) Market development: supply	• Public green financing (lending, equity, de-risking instruments). • Offer tailor-made instruments. • Facilitate aggregation and joint issuance of debt and bonds to reduce costs. • Engage relevant stakeholders. • Public policy instruments (incentives, taxes, monetary policies, etc.).	• Increase the flow of funding and capital resources. • Stimulate the supply of capital from the private sector. • Better address the needs of project developers. • Increase competition.
(2) Market development: demand	• Policies enabling the development of clean, green or sustainable projects. • Governments as users of green financing instruments and services. • Application of taxonomy of green, sustainable projects. • Facilitate aggregation initiatives. • Public policy instruments (incentives, taxes, etc.). • Facilitate funding in the early stage of sustainable projects.	• Increase the leverage of public investment. • Identification of a pipeline of eligible green, sustainable projects. • Build lender and investor confidence. • Increase competition. • Induce innovation in financial products and services.
(3) Market infrastructure and institutions	• Development of green indices and participation of exchanges. • Engage specialized financial institutions. • Disseminate information. • Developing reporting and compliance standards, etc. • Implementation of a market oversight function. • Promote cooperation among stakeholders.	• Facilitate the pricing and trading of green instruments in the secondary market. • Facilitate the matching of supply and demand needs and requirements. • Increase market transparency. • Preserve market integrity and credibility.
(4) Rules and regulations	• Implementation of supranational and national legislation. • Development of a green finance strategy. • Alignment with international best practice. • Introduction of tax deductions for investments in new clean technologies (e.g., income tax, corporate tax, etc.).	• Build lender and investor confidence and green awareness. • Increase market transparency. • Increase the effectiveness of incentives. • Facilitate connections with international markets.

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(5) Capacity building	• Establish knowledge-creating institutions. • Disseminate information and intelligence on green investments and green financing instruments. • Specific training for company managers and staff, technical advisors and government agencies. • University and technical education programs.	• Access to the market by smaller project developers, investors and potential lenders. • Facilitate the creation of new specialized companies. • Facilitate innovation in financing products and services.
(6) Foster innovation in products and services	• Issuance of new products (e.g., green bonds) by public institutions. • Support alternative financing schemes (e.g., provision of seed capital, demonstration issuances, public-private schemes, etc.). • Channel R&D funds to innovative projects and start-ups.	• Induce investment by reducing the risk of green projects. • Strengthen the supply side of the market.

Source: own elaboration.

5. GREEN FINANCING AT THE REGIONAL LEVEL: THE CASE OF THE BASQUE COUNTRY

5.1. Basque energy and environmental policies and measures

The Basque Country (BC) in Spain has a devolved government that exercises major powers over critical public services. It has its own tax system and has full authority to manage, levy and collect practically all taxes. It contributes with an agreed quota to finance the services that the Spanish Government provides in this region the so-called Economic Agreement (Concierto Económico). It is structured across three layers of government (municipal, province-level and BC as a whole). Province-level governments (called Diputaciones) set and collect taxes. The Diputaciones transfer 70% of their tax revenues to the Basque Government, which has most of the revenue allocation power in the BC.

Since the eighties, the BC has been transitioning towards a low-carbon, sustainable economy via various strategies and policies. The successive Basque energy strategies, for instance, have tackled the challenges faced by an industry-based economy (23.9% of gross added value in 2019; Eustat, 2020), such as the substitution of coal and oil products in most industrial uses for gas and electricity or the improvement of overall energy efficiency.

Regarding innovation, technology and industrial development, the Basque smart specialization strategy (RIS3) focuses on three key sectors: energy, biosciences

and advanced manufacturing[6]. Specifically, in energy, the RIS3 implementation strategy (energiBasque) aims to position the Basque Country as a market leader in certain low-emission technologies (e.g., offshore wind and smart grids) and take advantage of the industrial and commercial opportunities generated by the transition to an environmentally sustainable economy (Clúster de Energía, 2019).

Environmental and sustainability goals are defined by the strategy Klima 2050 (which sets long-term emissions reduction targets), the 2030 Basque Agenda (which focuses on the United Nations' SDGs) and Basque Law 4/2019 on the energy sustainability of the BC, which focuses on reducing the energy consumption of the administration and establishes obligations regarding energy efficiency. The Circular Economy Strategy 2030 sets goals regarding the efficient use of materials and recycling and offers the opportunity to develop a competitive business ecosystem around the circular economy.

All these energy and climate strategies are currently under review to adapt them to the European Climate Law and the European Green Deal. Since 2019, a group of experts has the mandate to draft the Basque Energy Deal, a roadmap to achieving net-zero emissions in 2050.

Despite the progress made in the past three decades, much remains to be done, especially regarding emissions in buildings and transport, but also in the industrial sector. Achieving the above-mentioned energy and environmental objectives will imply significant volumes of green and sustainable investments over the next few years.

5.2. **Green financing in the BC**

Key public financing institutions

Since the eighties, the Basque Government has established several institutions and put in place and designed a number of programs and instruments to help overcome the challenges of industrial companies and, notably, small and medium enterprises (SMEs), as the Basque business ecosystem is mainly populated by this type of companies (Figure 2).

Key Basque public institutions providing resources to the industrial sector to support the creation of companies, their internationalization and investments in new technologies and R&D activities include the Basque Economic and Industrial Development Agency (SPRI), the Basque Institute of Finance, Risk Capital Management Euskadi, Basque Trade and Investment, and Elkargi (Figure 3). Usual support instruments include loans, credit guarantees and investments in equity in both government and private companies.

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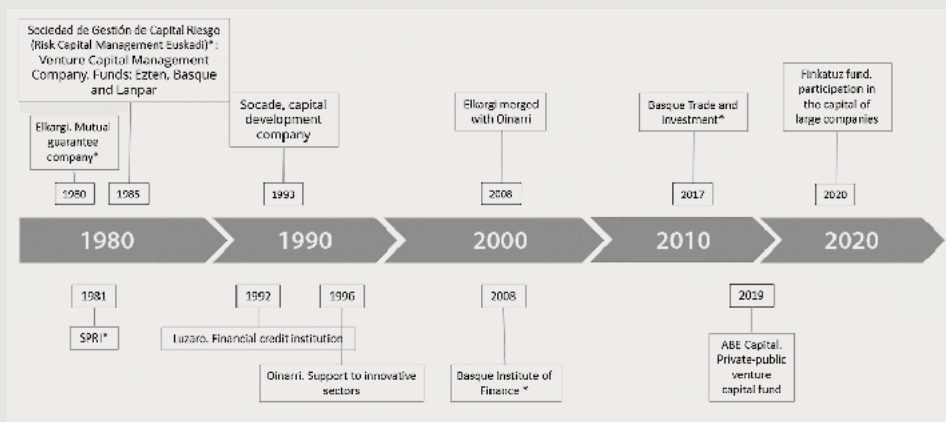
[6] Since 2019, the specialization areas of the RIS3 Strategy are under review following the European methodology and have been influenced by the megatrends, especially the three transitions: the technological-digital, energy-environmental and demographic-social. Therefore, the new three strategical priorities of the RIS3 will probably be health, cleaner energies and smart industry (Gobierno Vasco, 2019).

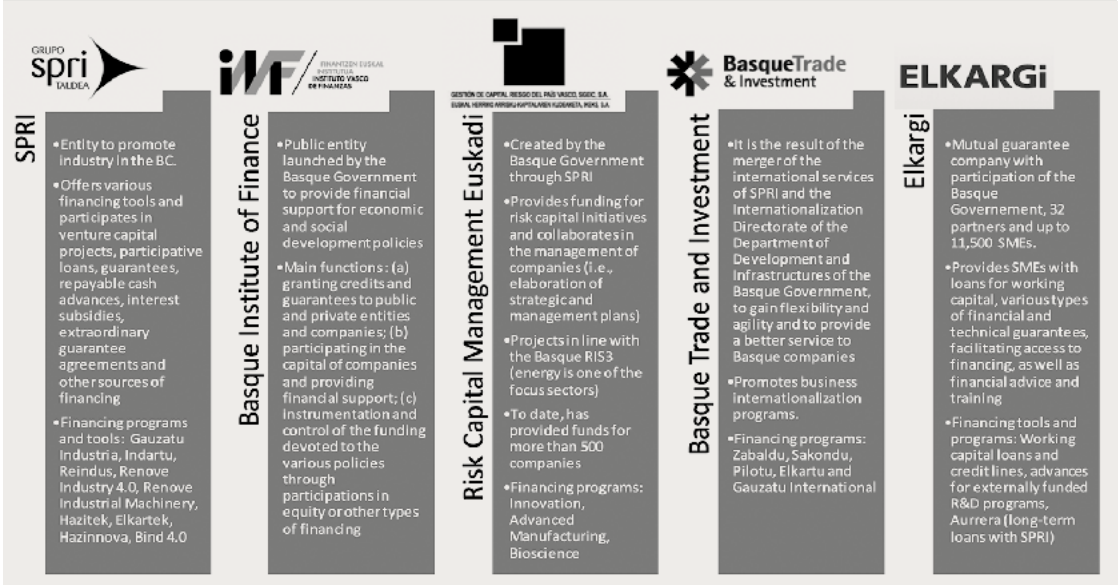
Figure 2. **FINANCING INSTRUMENTS AND MECHANISMS FOR SMEs IN THE BASQUE COUNTRY**



Source: own elaboration.

SPRI also designed the Bind 4.0 program, a public-private business accelerator program that provides financing (and other) resources to start-ups in the energy, advanced manufacturing, health and food sectors to facilitate the transition to the so-called «industry 4.0».

Figure 3. **MAIN BASQUE PUBLIC COMPANIES FINANCING GREEN AND SUSTAINABLE ACTIVITIES**



Source: own elaboration.

In the areas of energy and the environment, two public agencies of the Basque Country Government (the Basque Energy Agency, EVE, and the Basque Environmental Agency, Ihobe) play a relevant role in the financing of green, sustainable investments and projects.

Equity investments and grants from the Basque Energy Agency

Even though its main activities focus on promoting energy R&D and providing advice to the Basque Government on energy policy and planning, the EVE supports the development of new infrastructure projects and the creation of companies specializing in new technologies via equity investments and grants.

In the past, it has invested in companies developing infrastructures in the natural gas sector (e.g., Naturgas, Bahía Bizkaia Gas and Itsas Gas) and wind energy (Eólicas de Euskadi). It later divested some of its public equity participations. It still holds shares in companies such as Telur (geothermal energy), BEC Solar (solar energy), CADEM (energy efficiency and new energies), BioArtigas and Zabalgarbi (biomass), Aixeindar (wind energy), several local mini-hydro companies and other energy technology development companies such as Ibil (electric charging technologies).

In addition, the EVE has ample experience in providing grants to companies and end consumers in areas ranging from energy efficiency, deployment of renewable energies or sustainable mobility. It also participates and provides financing to demonstration projects and infrastructures related to renewable energy sources, such as marine technologies (Bimep).

Grants from the Basque Environmental Agency

Ihobe was established to support the Basque Government in the design of the environmental policy and to promote sustainability, efficient environmental management and protection of the environment in the BC. The main financing instrument used by Ihobe are grants supporting specific activities related to environmental sustainability and the circular economy.

Other grants for green activities from the Basque Government

The Basque Government Decree 202/2015 regulates subsidies to companies that make investments aimed at protecting the environment. These grants are oriented to financing innovative investments and projects that focus on going beyond environmental EU standards, early adaptation to future EU standards, recycling and reuse of waste generated by third parties, land decontamination and covering other costs (i.e., environmental studies).

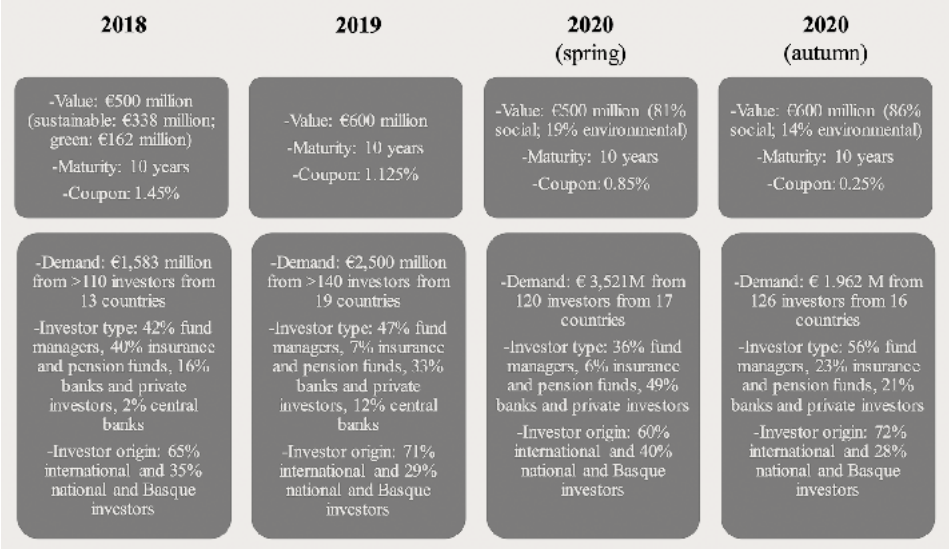
Green government bonds

In recent years, the Basque Government has been playing an essential role in the development of a sustainable bonds market in the BC by executing since 2018 four

issuances of government-backed sustainable bonds that follow the steps of earlier issuances of sustainable or green bonds by Iberdrola (starting in 2014) and Kutxabank (starting in 2015). This is part of a more comprehensive strategy to create a green financing ecosystem that helps to address the environmental, economic and social challenges of the region.

To facilitate the viability of the Basque bond issuances, the Basque Government first developed a sustainable bonds guide in 2018 (Gobierno Vasco, 2018), aligned with the Green Bond Principles («GBP»), the Social Bond Principles («SBP») and the Sustainable Bond Guidelines 2017 (Sustainalytics, 2018). The four issuances to date were listed in the Bilbao Bourse, with increasing success in terms of the volume of revenues, demand and the heterogeneity of investors (Figure 4).

Figure 4. **BASQUE GOVERNMENT SUSTAINABLE AND GREEN BOND ISSUANCES**



Source: own elaboration.

5.3. **Other green financing instruments and tools**

The Basque List of Clean Technologies

In 2004, the Basque Government approved the List of Clean Technologies, with advanced technologies (e.g., industrial equipment and other technologies) with a direct impact on energy efficiency and the reduction of resource consumption and emissions in the commercialization phase that generate corporate tax deductions of 30% of the total investment.

The 2020 Basque Country green public procurement and contracting program

This program, approved in 2016, establishes a framework for the Basque Administration to internalize the environmental dimension in their purchases and public contracting, using EU standards and setting quantitative objectives for a large number of product categories.

5.4. Discussion and policy implications: The role of the Basque Government in fostering a local green market

The experience accumulated by the Basque Government in recent decades in establishing institutions, deploying public-private initiatives and demonstration projects and putting in place financing programs and schemes to foster industrial activity and facilitate innovation in the Basque Country proves to be a good starting point to consolidate a competitive Basque green finance ecosystem.

The second column of Table 3 describes, based on the analytical framework described previously, the current situation of the green finance market in the BC and the degree of involvement of the Basque Government and other institutions. Most of these institutions, initiatives and support programs already have a presence and impact in areas closely related to green financing, as seen before. Also, a number of pioneering and innovative green finance developments (for instance, in the area of bond issuances) have taken place in the BC in recent years.

Additional strengths in the area of green finance in the BC include an array of detailed governmental energy, environmental, technology and innovation strategies and policies oriented towards making an effective transition to a net-zero emissions economy and a culture of public-private collaboration that brings together government and private actors, science, research and academic institutions and even the civil society in different fora in order to tackle challenges relevant to the Basque economy.

There is, however, a lack of a broad green finance government strategy (for instance, similar to the aforementioned, UK Green Finance Strategy) that clearly aligns the goals, incentives and actions of all interested stakeholders in the direction of fostering a competitive local green finance market. This shows, for instance, in the absence of specialized institutions, a limited amount of specialized local actors on the supply side (institutional investors, services companies) and limited activity by potential project developers and local governments (municipalities and province-level) in deploying green projects.

Such a strategy would help to strengthen the market on both the supply and demand sides and create the right institutions to facilitate the flow of public and private capital to projects that are relevant for reaching the Basque Country's sustainability goals.

The number of areas where the Basque Government can act to create a well-functioning, competitive green finance market is large (third column of Table 3).

They range from the introduction of new public green finance instruments (for instance, publicly-backed innovative investment funds) to facilitating aggregation on the demand side to lower the transaction costs faced by borrowers. Engaging all stakeholders on both the supply and demand sides of the market is also relevant to facilitate the flow of capital to sustainability projects.

The creation of new green finance institutions, or the reorientation and adaptation of the roles of the existing ones (e.g., the Basque Institute of Finance and Elkargi) that improve collaboration across actors and help to build know-how and new sets of financial skills and capacities, disseminating relevant information across the market and, in general, fostering innovation in financial schemes, products and services are also key areas where the Government can have a sizeable effect.

A promising course of action for the Basque Government would be to facilitate investment vehicles, fiscal policy tools and funding and R&D programs in the BC to include specific aspects related to green financing. This would foster the creation of a sophisticated financial cluster in the Basque Country, in line with earlier suggestions by Gómez-Bezares *et al.* (2001) and Larreina & Gómez-Bezares (2007).

Table 3. **THE ROLE OF THE BASQUE GOVERNMENT IN FOSTERING THE GREEN FINANCE MARKET IN THE BC**

Goal	Current situation in the Basque country	Actions to improve the green finance ecosystem
Market development: supply	• Long tradition of public loan vehicles and programs to foster innovation and investments in all sectors, especially industrial sectors and in SMEs. • 40-year-old mutual guarantee company (Elkargi) with presence in the Basque industry with both government and private participation. • Pioneer sustainable and green bond issuances by the Basque Government, Kutxabank and Iberdrola over the past few years. • Limited amount of specialized local actors (institutional investors, services companies)	• Engage public sector stakeholders (e.g., government agencies and institutions, municipalities, province-level governments). • Engage private-sector stakeholders at the local level (fund and asset managers, insurance companies, etc.). • Foster the creation of new, highly specialized start-ups with a focus on green financing and green financial services (legal, accounting, climate risk assessment, consulting, etc.). • Adapt Elkargi's experience to the green finance market. • Focus a specific line of activity on green financing within the Basque Finance Institute. • Facilitate aggregation vehicles for investors (especially small, private investors). • Launch new specialized public green investment funds (for equity and debt financing and grants) to leverage private supply of capital (mission-oriented, with technical assistance, etc.). • Conduct international roadshows to attract foreign capital, foreign place-makers and export specialized green financial services.

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Goal	Current situation in the Basque country	Actions to improve the green finance ecosystem
Market development: demand	• Focus of territorial strategies (e.g., energiBasque) on deploying renewables and low-emission technologies. • Strength of public-private investment and R&D initiatives in new clean and sustainable technologies, backed by well-established Basque science, technology and innovation network. • Tax deductions for investments in new clean technologies. • Extensive grant programs for R&D activities. • Specialized vehicles for start-up financing (Bind 4.0) • Limited services market for investors. • Some activity by potential project developers and local governments (municipalities and province-level) around innovative green, sustainable projects.	• Dissemination of the EU taxonomy of sustainable activities and EU fund programs across potential project developers. • Dissemination of information on energy efficiency, clean technology adoption, new materials, circular economy actions and environmental programs for homes, primary and tertiary sector businesses, industry and transportation sector. • Develop habitat banking and carbon credit programs to foster investment in conservation, biodiversity and forest development and other climate change adaptation and mitigation actions. • Foster the creation of local green finance hubs to identify high-benefit green and sustainable projects. • Foster aggregation of borrowers to reduce transaction costs and increase the scale of financing needs. • Foster the development of data tools (e.g., on climate) and technical assistance services for companies to facilitate assessment of green and sustainable project opportunities. • Strengthen Bind 4.0 objectives regarding green and sustainable projects.
Market infrastructure and institutions	• The Bilbao Bourse lists the Basque Government's Sustainable Bonds. • Limited specialized activity by main Basque financial institutions. • Limited legal capacity to develop a market oversight function. • Basque Cybersecurity Centre.	• Coordinate approach with Bilbao Bourse and main banking and institutional investors to increase the liquidity of green bonds, launch of new products (ESG exchange-traded funds, yieldco shares) and development of sustainability indices. • Foster the communication with financial entities and companies and dissemination of green financing mechanisms possibilities. • Develop a platform to connect developers of green projects with potential providers of capital.
Rules and regulations	• The Sustainability Bonds Framework paves the way for a better understanding of sustainable financial products and bonds and increases alignment with international best practice.	• Develop a green finance strategy. • Set-up a specialized task force to coordinate a green financing strategy. • Adapt EU's Green Deal strategies and regulations to the BC context. • Set-up a specialized task force to coordinate regulatory approach with Spain's and EU's regulators. • Disseminate best-practice on reporting standards and codes and adoption by public institutions. • Disseminate best-practice codes, guidelines and standards for investors and financial services organisations in line with Spain's and EU's legislation.

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Goal	Current situation in the Basque country	Actions to improve the green finance ecosystem
Capacity building	• Corporate and government experience with bonds (Iberdrola, Kutxabank, Basque Government) • No specific government-run programs to disseminate knowledge and build capacities related to green finance. • Specialized courses on ESG and sustainable finance at the University of Deusto (Deusto Business School)	• Set-up a public-private research and training institute specialized in green financing with green finance certification programs (e.g., similar to the Green Finance Institute in the UK) • Foster the creation of green-finance focused knowledge networks and fora (e.g., on climate risks, reporting, accounting, de-risking tools, corporate governance, etc.) • Facilitate the creation of a green-finance business association representing all types of investment institutions and service companies. • Strengthen specialized education programs and disseminate them to attract human capital.
Foster innovation in products and services	• Basque Government green bonds. • Some support for alternative financing schemes (e.g., provision of seed capital, demonstration issuances, public-private schemes)	• Coordinate with the Bilbao Bourse to foster the market for exchange-traded green funds. • Elkargi's experience could be used to develop new de-risking instruments specifically adapted to green finance. • Channel R&D funds to innovative projects and start-ups. • Launch specialized green-finance product and services innovation contests. • Coordinate with banks and utilities to develop green mortgage and on-bill, pay-as-you-save financing schemes and energy-efficiency savings recycling instruments to induce investments in energy efficiency of homes and buildings.

Source: own elaboration.

6. CONCLUSIONS AND FURTHER RESEARCH

This article has explored the role of governments and, specifically, subnational or regional governments, in fostering a well-functioning green financing market.

The process of transition to a sustainable economy from the economic, environmental and social perspectives will necessarily require large volumes of investment, as shown, for instance, by the European Green Deal and the Covid-19 economic recovey packages. This implies the need to unlock significant volumes of capital and new ways of financing green, sustainable projects.

In this regard, new instruments to mobilize capital, such as NextGenerationEU, a temporary financing program within the EU Recovery Plan that will complement the European Green Deal financing scheme, will play a key role in unlocking private

investment in sustainable projects, by creating an enabling framework for investors where the EU taxonomy will provide a common understanding on green investments and environmentally sustainable activities.

Investments in green technologies and projects face substantial technology, regulatory, commercial and credit risks. This has led to the development of innovative financing instruments and schemes specifically designed to cover these risks and induce greater levels of public and private investment, including green bonds. Despite these developments, a 'green financing gap' exists and the financial markets have difficulties in facilitating a steady flow of private capital towards green projects and activities.

In this context, governments can implement policies that increase both the quantity and quality of green financing and create effective institutions and adequate credit market conditions that help to fill the green financing gap. This may involve developing legislation, regulation, standards, institutions and policies that favour investment decisions by both public and private agents, inducing lending by providing a safe business environment and facilitating innovation in financing instruments and financial practices. The Government will also have to play an active role in increasing the supply of capital to finance green investments. In sum, governments might improve green financing by acting as a risk-bearing agent, an active market facilitator and a driver of financial innovation.

The research conducted in this article shows that subnational governments may play a differential, distinctive role in developing green financing at the regional level, especially in contexts with a high degree of decentralization and political autonomy. This is mainly because they are best placed to support local businesses and industries, develop human capital and the skills and capacities of local actors, foster local demand and induce competition and cooperation between local companies and collaboration across a variety of institutions, in addition to carrying out a large share of public investments and managing a variety of tools to induce economic growth and competitiveness at the local level, including research and innovation policies and tax and financial tools.

Additionally, the local and regional dimension of the energy transition is also relevant. Energy transition strategies at the regional level must focus on the specific strengths and specificities of each region and the characteristics of the local firms and institutions and the sociopolitical environment when designing the most appropriate policies, including those aiming to facilitate the financing of green, sustainable investments.

In this article, an analytic framework has been developed to assess the ways in which a government may induce better functioning of the green financing system. Six key dimensions where governments should focus to foster green finance are identified: (1) market supply, (2) market demand, (3) market infrastructure and in-

stitutions, (4) specific rules and regulations, (5) capacity building and (6) innovation in financial products and services. How specific policies and measures along each of these dimensions may have an impact on the development of the market is also addressed in the article.

This framework is then applied to the case of the Basque Country. The analysis in this article suggests that the development of a holistic, comprehensive green finance strategy by the Basque Government may consolidate a competitive green finance sector. Specific policies and actions that may be conducted by the Basque Government to effectively implement such strategy are also identified.

Future research lines on this topic may focus on developing the analytic framework presented here. This may imply studying the specific channels through which public green financing instruments and schemes and public-private collaboration schemes affect investments in innovative low-carbon technologies. In addition, the analytic framework may be complemented by quantitative indicators to assess the degree of development of a (regional) green financing market and highlight areas where government policies should focus. Moreover, a quantitative framework may help to carry out comparative assessments of various regions and countries.

Additionally, analyzing governance and collaboration models in the green finance sector between local, subnational and national governments may shed light on how to best design financial policies to spur the transition to a sustainable economy. Future work could also examine in depth the specific actions taken to improve the green finance ecosystem in the Basque Country, for instance, by setting a roadmap to their implementation, or analyzing potential new business models that may emerge in the area of green finance.

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