



PROSEU

Prosumers for the Energy Union:
mainstreaming active participation of
citizens in the energy transition

Stakeholder Report on Financial Innovation for Prosumer Expansion

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Summary of PROSEU

PROSEU aims to enable the mainstreaming of the renewable energy Prosumer phenomenon into the European Energy Union. Prosumers are active energy users who both consume and produce energy from renewable sources (RES). The growth of RES Prosumerism all over Europe challenges current energy market structures and institutions. PROSEU's research focuses on collectives of RES Prosumers and will investigate new business models, market regulations, infrastructural integration, technology scenarios and energy policies across Europe. The team will work together with RES Prosumer Initiatives (Living Labs), policymakers and other stakeholders from nine countries, following a quasi-experimental approach to learn how RES Prosumer communities, start-ups and businesses are dealing with their own challenges, and to determine what incentive structures will enable the mainstreaming of RES Prosumerism, while safeguarding citizen participation, inclusiveness and transparency. Moving beyond a case by case and fragmented body of research on RES Prosumers, PROSEU will build an integrated knowledge framework for a socio-political, socioeconomic, business and financial, technological, socio-technical and socio-cultural understanding of RES Prosumerism and coalesce in a comprehensive identification and assessment of incentive structures to enable the process of mainstreaming RES Prosumers in the context of the energy transition.

Summary of PROSEU's objectives

Eight key objectives at the foundation of the project's vision and work plan:

- **Objective 1:** Document and analyse the current state of the art with respect to (150-200) RES Prosumer initiatives in Europe.
- **Objective 2:** Identify and analyse the regulatory frameworks and policy instruments relevant for RES Prosumer initiatives in nine participating Member States.
- **Objective 3:** Identify innovative financing schemes throughout the nine participating Member States and the barriers and opportunities for RES Prosumer business models.
- **Objective 4:** Develop scenarios for 2030 and 2050 based on in-depth analysis of technological solutions for RES Prosumers under different geographical, climatic and socio-political conditions.
- **Objective 5:** Discuss the research findings with 30 relevant stakeholders in a Participatory Integrated Assessment and produce a roadmap (until 2030 and 2050) for mainstreaming RE Prosumerism.
- **Objective 6:** Synthesise the lessons learned through experimentation and co-learning within and across Living Labs.
- **Objective 7:** Develop new methodological tools and draw lessons on how the PROSEU methodology, aimed at co-creation and learning, can itself serve as an experiment with institutional innovation.
- **Objective 8:** Create an RES Prosumer Community of Interest.

PROSEU consortium partners

Logo	Organisation	Type	Country
	FCIENCIAS.ID ASSOCIAÇÃO PARA A INVESTIGAÇÃO E DESENVOLVIMENTO DE CIÊNCIAS	Private non-profit association	Portugal
	U.PORTO FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO	University	Portugal
	ICLEI EURO Local Governments for Sustainability	Small and medium-sized enterprise	Germany
	CLIENTEARTH	Non-governmental organisation	United Kingdom
	UNIVLEEDS	University	United Kingdom
	DRIFT	University	the Netherlands
	UNIZAG FSB	University	Croatia
	LEUPHANA UNIVERSITÄT LÖNEBURG	University	Germany
	ECO-UNION	Non-governmental organisation	Spain
	IÖW INSTITUTE FOR ECOLOGICAL ECONOMY RESEARCH	Private non-profit limited company	Germany
	CE Delft Committed to the Environment	Small and medium-sized enterprise	the Netherlands

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Executive summary

Objective: This report gives examples of financial innovations already available to prosumer business models and establishes how they can be integrated into the diverse financial markets in the European Union. The main goal of this report is to inspire stakeholders – such as financial institutions and community energy intermediaries – either to adopt these models or to adapt them to their respective national and local contexts. For this purpose, we give an overview of 10 cases - local initiatives, supporting organisations and/or financial institutions - and show how they have developed their model within the respective institutional environment.

Methodology: We observe and compare financial innovations from 10 cases in five different European countries: Croatia, France, Germany, Portugal and the United Kingdom (UK). These cases include five crowdfunding platforms and five other examples that contain several layers of financing, including for the development of collective prosumer projects. The cases are:

- Abundance Investment (UK),
- Brighton and Hove Energy Service Cooperative (BHESCo, UK),
- Coopérnico (Portugal),
- DKB's placeholder capital for community energy projects (Germany),
- Energie Partagée (France),
- GLS Crowd (Germany),
- GoParity (Portugal),
- Križevci PV powerplants & Križevački laboratorij inovacija za klimu (KLIK, Croatia),
- Lumo/Saint-Varentais Wind Park (France), and
- Croenergy, operated by the Regional Energy Agency of Northwest Croatia.

Cases were selected as pioneers (“archetypes”) in their context. Through crowdfunding, community financing or other forms of public support they each address specific financing gaps for prosumer business models. Data on the cases were selected via internet search, e-mail and phone interviews.

Results: We identify commonalities, differences and other general lessons learnt across seven domains - (1) **digitisation**, i.e. the use of crowdfunding platforms either as the main point of sale or as a supporting tool; (2) the four main **functions** that platforms fulfill, i.e. close funding gap from traditional sources and for more innovative business models, divert savings into ethical investments and widen the investor base; (3) the levels at which the models operate and the role of **locality**, especially of local or regional networks to identify projects and build trust; (4) different solutions to raise **risk capital** developed in the cases; (5) sources of **complementary capital** (publicly-owned banks, public-private investment funds, European and national cooperatives, public grants); (6) different paths taken regarding the mix of **forms of financing**; and (7) the extent to which the models analysed contribute to a **democratisation** of energy financing.

1. Introduction

A major obstacle for implementing new and innovative business models in the energy sector, including collective prosumer business models, is financing. The literature describes a funding gap for the innovation phase between demonstration and commercialisation, which has been called “technology value of death” (Grubb, 2004; Murphy & Edwards, 2003; Nemet et al., 2018; Weyant, 2011). Similarly, such a gap can occur after a phase of high policy-driven return when policy-makers underestimate risk exposures to investors or overestimate cost decreases. In a similar vein, Karneyeva and Wüstenhagen (2017) have called this the “policy value of death”.

Energy communities tend to include risk averse local inhabitants. Especially in the early phases of market development and / or the project development cycle, energy communities typically need other financiers on their side to help with provisioning risk capital and project development funds (Holstenkamp & Degenhart, 2014). If a larger project requires more money, local initiatives often have to tap external capital. Energy communities do not always have access to organised markets (e.g. stock exchange) for this purpose, however. Financial innovation and tailored financing solutions that are offered by established or new financial institutions can therefore help to address the financing gaps for citizen-driven renewable energy projects.

To contribute to overcoming such a major obstacle, this report provides examples of financial innovations that are already available to prosumer businesses. We also take into account how such financial innovations can be integrated into the diverse financial markets in the European Union (EU). The main goal of this report is to inspire stakeholders – such as financial institutions and community energy intermediaries – either to adopt these models or to adapt them to their respective national and local contexts.

In this report, we highlight pioneering (“archetype”) cases and real experiences of financing renewable energy projects in different European countries. Our synthesis of innovative finance options and new business models for the prosumer transition is directly targeted at addressing gaps in the mobilisation of equity and debt for energy communities. Our findings are based upon a comparative study of 10 cases from five countries: Croatia, France, Germany, Portugal and the UK (see 3.2). In each country, data was gathered over a 6-month period from March-August 2020. We used a mix methods approach, combining desk research and a closed questionnaire with follow-up interviews. We analysed data using basic manual coding.

As we will explain below, the cases typically include more than one type of financing used by a single entity to finance multiple renewable energy installations or energy efficiency projects. Therefore, we will: (1) include different levels of financing, where they exist; (2) take into account the organisational setting in which the financial innovations have been developed; and, (3) briefly describe the institutional context in which innovation has taken place.

This report is structured as follows: In Section (2), we begin by describing and comparing the 10 cases and introduce the analytical framework that we deployed. In Section (3), we then provide an overview of the 10 cases and describe each one in more details. Finally, in Section (4), we develop a comparative analysis that synthesises our evidence, leading to recommendations for how to adopt or to adapt existing innovative finance options for mainstreaming the prosumer energy transition.

2. Framework

In this Section, we introduce a set of terms and classifications that help us to characterise and to analyse our 10 selected cases. First, we explain those elements and typologies present within our cases in order to establish the most common types of innovative finance options currently being used in energy communities. This allows us to make some general statements as to what they have in common and how they vary. Second, we introduce and then apply our analytical framework to these 10 case studies by utilising the work of Brown et al. (2019).

2.1 Financial systems

2.1.1 Elements of financial systems

Financial systems are composed of financial intermediaries and financial markets (Mishkin, 2018). The former includes banks, contractual savings institutions, such as life insurance companies or pension funds, and investment intermediaries such as mutual funds. Sometimes contractual savings institutions and investment intermediaries are summarised as “non-bank intermediaries”. In the context of this study, specific intermediaries – such as public promotional or development banks, local banks or value-based intermediaries – play a major role. They may be publicly- or privately-owned and profit-seeking, socially-oriented or not-for-profit/charitable.

Financial markets comprise:

- Stock markets, as the most important equity market segment; and
- Bond markets, as an example of debt markets.

Financial markets can be divided into primary vs. secondary markets, the latter enabling equity- or debt-holders to sell their securities to buyers. Secondary markets are further bifurcated into ‘exchanges’ (i.e. centrally organised meeting places for buyers and sellers) and ‘over-the-counter’ (OTC) markets (i.e. where buyers and sellers meet bilaterally).

Another important distinction is between “traditional / conventional finance” and “alternative finance”. By “alternative” we mean financial models that connect fundraisers directly with funders, such as crowdfunding platforms or peer-to-peer (P2P) lending, who operate without the need for a traditional institution acting as the intermediary. In this report, we especially look at:

- Crowdfunding, which is typically divided into donation-based, reward-based, and investment-based models (Davis & Cartwright, 2019; Sedlitzky & Franz, 2019), including debt-based securities and mini-bonds (Altman et al., 2020; Ely & Martell, 2016) and;
- Community shares (Bauwens, 2020; Braunholtz-Speight et al., 2020).

Some would also classify microfinance as a form of “alternative finance”, whereas The Cambridge Centre for Alternative Finance (CCAF) restrict the term “alternative finance” to online platforms and thus to technologically-enabled disintermediation (Ziegler et al., 2020). In this deliverable, we define the term more broadly, subsuming both types mentioned above. This is because, of the 10 cases we have selected as pioneering examples in Europe, none fits neatly into any of these standard categories, but rather use different elements of each. In our crowdfunding cases, for example, the electronic platforms are a pivotal part of the innovation.

2.1.2 Typologies of financial systems

Using the above distinction between financial intermediaries and financial markets, the literature has tended to classify financial systems into ‘market-based’ (i.e. Anglo-Saxon systems, usually associated with Common Law countries), and ‘bank-based’ (i.e. continental systems, usually associated with Civil Law countries in a rough approximation) (Allen & Gale, 2000). Market-based financial systems are associated with (more) radical forms of financial innovations, whereas more incremental innovations are said to prevail in bank-based systems.

Empirical work using cluster analysis, however, has demonstrated that this simple binary classification of ‘market-based’ and ‘bank-based’ systems may oversimplify circumstances in real life (Antzoulatos et al., 2008). Farkas (2011), for instance, identifies five different clusters of financial systems. Antzoulatos et al. (2008) generate the same number of clusters and similar assignments of countries to these groups. Overall, the financial systems of countries is an outcome of legal infrastructures, political traditions and of economic and financial histories (Fohlin, 2016; Zingales & Rajan, 2003). Moreover, Deeg (2009) identifies variations even within national financial systems. While forms of financing seem to converge in internationally-oriented firms, established national patterns seem to dominate the financing of unlisted small and medium-sized enterprises (SMEs). Thus, any generalisation based on simplified typologies need to be handled with care.

Most energy communities fully own or hold shares in an SME and share a sense of mission purpose, with their financing structures – heavily influenced by national financial systems. The typologies described in this section help to cluster these institutional contexts and to generalise findings from cases to a broader set of countries. They also guided the case selection, as detailed below.

2.2 Forms of financing used

2.2.1 Institutional fit and embeddedness

Renewable energy finance has been standardised to some extent. Stable cash flows and larger project sizes enable project finance to be acquired through banks and other financial intermediaries. Smaller-scale projects, typically initiated by local inhabitants with less securities and more unstable cash flows, require more equity to be collected and invested in these undertakings. It is not only the cash flow characteristics that determine the type of financing used in specific cases, however, but also the institutional environment. As institutional analyses have shown, there must be a kind of “institutional fit” for an organisational or financial solution to work. In other words, it must acquiesce to the institutional environment in which it is embedded and conform to the existing institutional “repertoire” (Gawel & Bedtke, 2016; North, 2010; Ostrom, 2005). In our case, this means that the form of financing depends, among other things, on the energy regulation (Brown, Ehrmann, et al., 2020) and the financial system in the country or region (Hall et al., 2016, 2018). As the institutional literature emphasizes the importance of an “institutional fit” and the diversity of institutional arrangements (Greenwood & Hinings, 1996; Kondra & Hinings, 1998; Lejano & Shankar, 2013; Ostrom, 2005; Volberda et al., 2012), the transfer of innovative finance models from one country to another will likely be successful only with adaptations to each respective national and local context.

Moreover, along with Granovetter (1985), we can argue that economic activities such as financing are embedded in specific social relations. Through these relations, intermediaries and investors build trust (Davis et al., 2020). Different organisations must cooperate to develop or to adapt forms of financing. Hence, we need to look more closely at social relations, especially relations between different organisations, in order to understand better exactly how and why certain financial innovations 'work' in certain contexts.

2.2.2 Common forms of financing in energy communities

Drawing upon recent analysis of different forms of financing in energy communities (Bauwens, 2020; Brauholtz-Speight et al., 2020; Fischer & Wetzel, 2018; Holstenkamp et al., 2018; Kahla, 2019), we can state that the most common forms are:

- Equity held by community members (e.g. community shares) and self-financing;
- Non-investment-based contributions (e.g. voluntary work);
- External finance collected through crowdfunding;
- Debt from traditional banks;
- Public grants and other forms of public support (e.g. guarantees, concessional funding or technical assistance).

Moreover, when implementing larger-scale projects, energy communities usually invest together with other incumbent or new energy market players. These cases of 'co-ownership' or 'shared ownership' (Goedkoop & Devine-Wright, 2016) may often involve additional types of funding.

2.3 Elements of a financial model

In order to describe the 10 pioneering "archetype" cases in this report, including the exact type of financing utilised and the nature of the underlying renewable energy projects, we utilise an analytical framework developed by Brown et al. (2019). As such, when we speak of a 'financial model' we mean to include not only the financial instrument itself, but also the sources of capital, repayment channels or revenue streams, security and underwriting, point of sale and project performance for each case. To illustrate, we describe below these important elements of a 'financial model':

Source of capital: This can include banks, institutional investors, firms, citizens and local or national governments. As the PROSEU project focuses upon collective prosumers, we focus specifically on how to include citizens. There are two common forms of engaging citizens as sources of capital across European countries: first, through the purchase of community shares; and second, by engaging citizens through different crowdfunding models. Financial structures typically include layers of different sources of capital, with the subsequent mix of (private, public, citizen-led) sources of capital posing some risks through the possibility of emerging conflicts over goals and motivations – i.e. clashes between the purpose and function of finance – which can lead to 'mission drift'. In this respect, the normativities and governance models in place can help to mitigate some of these conflicts (Brown, et al., 2020a).

Financial instrument: Finance may take the form of debt or equity, or a combination of the two (see *Section 2.2.2 above*). **Debt** finance typically consists of loans provided by financial institutions or equipment providers (Sorrell, 2005). Debt may be issued directly to the homeowner or upstream to

energy suppliers, ESCOs or to a special purpose vehicle (SPV) (Rezessy and Bertoldi, 2010). Through **securitisation**, loans are aggregated into tradeable ‘securities’, drawing in sources of capital that would normally only invest in larger projects (The Organization for Economic Co-operation and Development (OECD), 2015). Bundling small-scale loans to households into securities and sell them onto secondary markets in the form of bonds is an example of such a securitisation process (Zimring et al., 2013). In our cases, issuers use **bonds** to replace bank loans and collect money in small, tradable units from private households through secondary markets. **Equity** takes the form of part ownership or share issues. Stakeholder models such as cooperatives adopt largely equity-based approaches (Kahla, 2019; Walker, 2008), although in commercial finance equity tends to be costlier than debt.

Project performance: This concerns certain requirements that financiers may place on performance of the project. This may include criteria for sustainability as a condition of lending. For example the UK ethical lender Ecology Building Society place minimum energy performance requirements as a condition of their mortgages, and offer interest rate reductions for ultra-low energy projects (Brown et al. 2019). Further, energy performance contracts (EPC) may be linked to verified project performance outcomes such as solar output or kWh savings, where failure to meet these requirements may lead to contractual penalties or remedial measures (ibid). We adapt this aspect here and subsume all criteria or conditions for being financed under this point, i.e. project selection criteria including, but not restricted to, performance, e.g. minimum or maximum size of investment or specific type of project.

Point of sale: This is the point where funders and fundraisers meet, including how projects and investors find each other in the first place. If other services are offered besides the direct financing of projects or businesses (known as ‘cross-selling’), then additional benefits can be achieved for customers of the platforms. For example, users of these other services may be pointed towards available financing opportunities, thereby increasing the reach of the platform.

Security & underwriting: Securities are highly dependent upon the type of project under consideration, including mortgages and liens or cession of project proceeds. According to the major securities for providers of debt capital (senior or mezzanine levels), a difference is made between (non-recourse) ‘project finance’ – which is usually deployed for larger-scale projects as it is based upon assets and cash flows of the projects – and ‘corporate finance’ – which is based upon the credit-worthiness (solvency) of the business itself. As a given project develops over time, banks or other traditional intermediaries may also build their case for investment on an in-depth evaluation of the general concept (known as ‘concept finance’), especially in changing regulatory and energy market environments in the energy transition process. In contrast, a lower level of security is a defining characteristic of equity capital.

Repayment channels: In renewable energy projects, the basis for repayments to financiers are typically the revenues that these projects generate, which in turn depend upon energy market regulations (Brown, et al., 2020b). Energy efficiency efforts or hire-purchase/leasing models drive down energy costs and repayment is made through the associated savings. Investors get back their money in various forms depending on the type of financing, e.g. dividends and sale of shares (equity) or interest and repayment (loans). Finally, some investors may replace others. This is, for instance, the objective of placeholder capital, which is why we subsume the conditions for such a replacement under this heading as well.

In the 10 cases we have selected, two organisational levels have been considered. These are: 1) the 'project level', which means the renewable energy installations or energy efficiency measures that are financed with contributions from the community; and 2) the 'intermediary level', which is the entity through which these financial contributions are collected. The forms of financing used can vary between these two levels. For example, different categories of 'green bonds' (i.e. debt finance) that are collected through a crowdfunding platform but which are issued by another entity (i.e. a municipal government) that itself invests equity into rooftop solar installations (Davis & Cartwright, 2019).

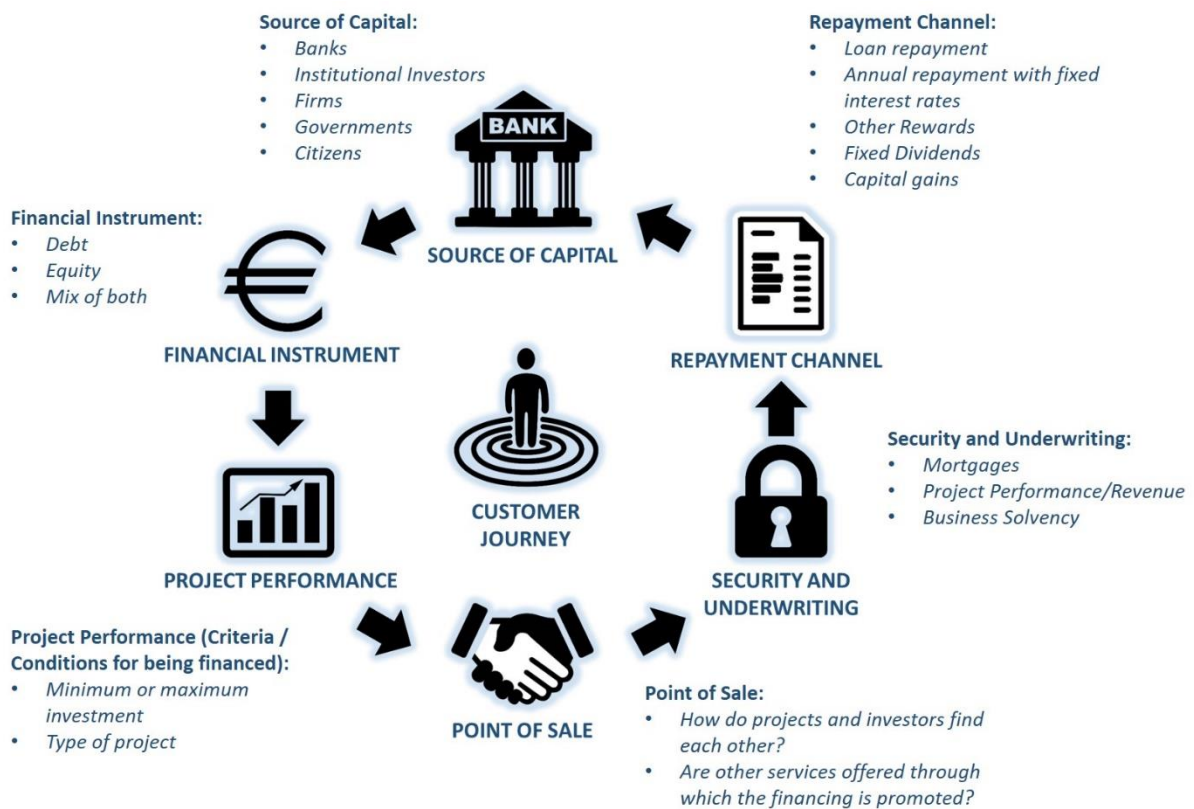


Figure 1. Framework for describing the cases.

Source: Adapted from Brown et al. (2019).

3. Description of cases

3.1 Selected countries

In seeking to provide examples of financial innovations already available to prosumer business models, two steps were followed in selecting our cases. : First, we chose five countries:

- Croatia,
- France,
- Germany,
- Portugal and
- the United Kingdom (UK).

Secondly, we chose two pioneering “archetype” cases within each country (see Section 3.2).

We selected France, Germany and Portugal because they are generally classified as ‘bank-based’ financial systems. The UK was selected as an example of a mature ‘market-based’ (i.e. capital market- or securities-oriented) financial system. Croatia was selected because it does not fit neatly into either classification, but instead belongs to a group often labelled as “emerging Europe” or “transition economies”. Even so, bank intermediation remains dominant within Croatia’s financial system.

Overall, this selection allowed for different levels of comparisons: 1) comparisons within the ‘bank-based’ group of countries; 2) a comparison between advanced ‘bank-based’ countries and ‘emerging markets’ with dominant bank intermediation; 3) a comparisons between ‘bank-based’ and ‘market-based’ economies, and 4) a comparison between ‘market-based’ economies and ‘emerging markets’. In Table 1, we elaborate these classifications in more details and go beyond the simple binary typology of ‘bank-’ and ‘market-based’ financial systems by drawing upon the work of Antzoulatos et al. (2008) and Farkas (2011). Table 1 also includes data from partners in the PROSEU project on renewable energy finance for each selected country, which partly reflects the status quo of renewable energies and prosumer markets (Campos et al., 2020; Horstink et al., 2020).

Table 1. Overview of selected countries and their financial systems.

Country	Market- vs. bank-based State of development	Differentiation (Antzoulatos et al., Farkas)	Further characteristics (especially financing energy transition)
Croatia	Bank-based Developing/emerging	(less developed/less competitive) (New member states)	Support from European funds/banks (EIB, EBRD), national development bank (HBOR)
France	Bank-based Developed	Middle group with declining banking sector [relative to capital markets] Well-developed, less concentrated banking system	CDC and ADEME support Relatively strong sustainable finance market and social & solidarity economy Partly regional support programmes
Germany	Bank-based Developed	Middle group with slower growing stock market Well-developed, less concentrated banking system	Strong position and support from national development bank (KfW) Strong local banks Partly support from federal states (Länder)
Portugal	Bank-based Developed	Middle group with growing banking and stock market Well-developed, less concentrated banking system	Transition in aftermath of financial crisis Dominant: project finance for wind parks and corporate finance of public utility companies Large share of banks' credit portfolio related to construction and property promotion
United Kingdom (UK)	Market-based Developed	Well-developed banking & capital markets with fast growing stock market Well-developed banking & capital markets with average concentration	Strong national banks but mature alternative finance sector provides most support Growing local government involvement in infrastructure projects

Abbreviations: ADEME: Agence de la transition écologique, CDC: Caisse des Dépôts et Consignations, EBRD: European Bank for Reconstruction and Development, EIB: European Investment Bank, HBOR: Hrvatska banka za obnovu i razvitak, KfW: Kreditanstalt für Wiederaufbau

Source: Own compilation, based on internet search and Andreas, Burns, & Touza (2019), Antzoulatos et al. (2008), Farkas (2011), Holstenkamp (2019), Nelson, O'Connell, De Lorenzo, & Huxham (2016).

Table 2. Overview of cases compared – types of financing.

Country	Name of case	Category	Types of financing
Croatia	Križevci PV power plant	Community shares/ risk capital	Intermediary level: crowdfunding (investment-based, debt) Project level: third-party financing (lease, pay-as-you save)
	Croenergy/Naša Radost kindergarten	Crowdfunding	Project level: crowdfunding (donation-based)
France	Energie Partagée (EnRciT)	Community shares/ risk capital	Intermediary level: community shares (stocks) Project level: equity; replacement capital for early development phase (EnRciT)
	Lumo/Saint-Varentais Wind Park	Crowdfunding	Project level: crowdfunding (investment-based, debt)
Germany	DKB Finance GmbH placeholder capital (among others) for community energy	Community shares/ risk capital	Project level: placeholder capital (mezzanine) alongside community shares
	GLS Crowd	Crowdfunding	Project level: crowdfunding (investment-based, mezzanine)
Portugal	Coopérnico	Community shares/ risk capital	Intermediary level: community shares, initial funding from RESCoop partners Project level: equity, crowdfunding (investment-based, debt)
	GoParity	Crowdfunding	Project level: crowdfunding (investment-based, debt)
United Kingdom (UK)	Brighton & Hove ESCo	Community shares/ risk capital	Intermediary level: community shares Project level: loans, hire-purchase solar PV or leases
	Abundance Investment	Crowdfunding	Project level: crowdfunding (investment-based, debt)

Source: Own compilation based on internet search and interviews.

3.2 Selected cases

In each of these five countries, we selected two pioneering cases (“archetypes”, see Table 2) that focused specifically upon alternative finance models. To this end, we included at least one crowdfunding model and one case that contained several different layers of financing. Given the wider focus of the

PROSEU project, this latter cases also included some form of financing for the development of (collective) prosumer projects (see Table 2). These cases are:

- Crowdfunding platforms in Germany (GLS Crowd), Portugal (GoParity) and the UK (Abundance Investment), with a specific focus upon a single project in Croatia (Croenergy/kindergarten in Pregrada) and France (Lumo/Saint-Varentais Wind Park);
- Cases with more complex, layered financing structures or different levels of financing. This includes community shares, elements of risk capital, seed money, or some other mechanisms through which to provide the capital needed for single households or groups of local citizens to develop projects: ZEZ/Križevci in Croatia; Energie Partagée in France; DKB mezzanine financing for energy communities in Germany; Coopérnico in Portugal; and, Brighton & Hove ESCo in the UK.

Table 2 gives some background information about the types of financing involved on both levels – the ‘intermediary level’ and the ‘project level’. We only describe a single level where the other does not play a role for our analysis. This is typically the case for crowdfunding platforms through which people can invest into different projects. In these cases, we deliberately exclude the financing of the platform operator as an ‘intermediary’.

In alphabetical order, below we provide some further elaboration of the 10 cases and signal how the two organisational levels (‘project level’ and ‘intermediary level’) are realised:

Abundance Investment (UK) is an investment-based crowdfunding platform. Their primary objective is to bring together renewable energy projects that seek funding with investors who want to enable a positive impact by funding positive green and social infrastructure projects. In 2012, they conducted the first crowdfunded energy investment in the UK, with a minimum investment threshold of just GBP £5. The platform offers three different types of accounts with different tax implications. These are: innovative finance individual savings accounts (IFISA); standard portfolio; and, pension portfolio [*intermediary level*]. Investors can invest in private or public companies, as well as local government councils, which take action against climate change or that build more resilient communities through purchasing fixed-income debt securities, i.e. bonds or debentures [*project level*]. The projects financed can be different kinds of renewable energy production, housing, and/or green and social infrastructure. In some cases, short-term construction costs are refinanced through longer-term community municipal investments (CMIs) offered by local governments and typically structured as ‘green bonds’ (Davis & Cartwright, 2019; Harder, 2018). Abundance also has a secondary marketplace, where investors can buy / sell securities and take over investments from other customers on the platform.

Brighton and Hove Energy Services Coop (BHESCO) (UK) is a cooperative social enterprise, which empowers property owners in the regional county of Sussex to meet their heat and power needs with efficient buildings and clean, affordable, community-owned energy. Members of the cooperative include customers, employees and investors. The cooperative makes offers to investors via an equity-based crowdfunding model [*intermediary level*] and also lends on the money to customers who pay back their loans via energy bills savings [*project level*]. In addition, BHESCO offers hire-purchase solutions for solar PV. The cooperative is a community-owned intermediary that helps to finance small and medium-sized energy efficiency and solar PV projects, which otherwise would not be financed by traditional finance institutions. In its start-up phase, BHESCO funded its work through the existing resources and grants. Later, it placed shares through existing social networks and the UK crowdfunding platform Ethex (Cairns et al., 2020).

Coopérnico (Portugal) is a cooperative, which has the aim of including citizens and companies in renewable and decentralized energy system (Coopérnico, n.d.). The cooperative implements renewable energy plants and is an electricity provider. For the initial development of the business [*intermediary level*], the Portuguese funders collaborated with three European cooperatives to mobilise the capital needed for quickly developing projects under the soon to be discontinued feed-in tariff scheme. Equity from European partners has been replaced within less than two years. Members can give loans to projects developed by the cooperative, partly announced through online platforms (investment-based crowdfunding) [*project level*].

Croenergy (Croatia) is a crowdfunding platform operated by REGEA ULAGANJA d.o.o., the investment subsidiary of the North-west Croatia Regional Energy Agency (Regionalna energetska agencija sjeverozapadne Hrvatske, REGEA). REGEA worked together with the Center for Social Innovations and Sustainable Development (Centar za društvene inovacije i održivi razvoj, CEDIOR) who had previous experiences with crowdfunding. Based on its Croinvest platform, both partners created Croenergy with the aim to establish crowdfunding in the region and collect money from regional investors [*intermediary level*]. In our analysis, we specifically focus on the Naša Radost project in the city of Pregradi [*project level*]. In this case, REGEA collected 20% of the investment capital needed for a complete renovation of the kindergarten from local citizens through its crowdfunding platform in the form of donations (E-FIX, 2018; REGEA, n.d.).

DKB Finance GmbH (Germany) is a subsidiary of the bank DKB that, in turn, is a fully-owned subsidiary of the Bavarian state bank BayernLB [*intermediary level*]. They offer placeholder capital to community renewable energy projects, so these can already start the project and meanwhile collect money from local investors (DKB AG, n.d). Through this, the programme accelerates project implementation or even enables it in the face of competition for projects. DKB Finance co-invests equity-like mezzanine capital after successful participation in wind (or solar PV) auctions, i.e. after the first project development phase [*project level*]. The initial risk capital product, which DKB Finance had also offered, was discontinued in 2020.

Énergie Partagée (France) is an association that offers support and financing for 100% renewable energy projects led by local communities. The financing comes from investors who buy stocks of the investment fund Énergie Partagée Investissement [*intermediary level*]. The cooperative energy supplier Enercoop, together with La Nef and Solira Développement, built a cooperative that manages the investment fund as a general partner. The Énergie Partagée Association promotes this fund through its regional networks and nominates the investment committee that decides into which projects the investment fund will invest [*project level*]. The cooperative also administers a risk capital fund for early development of community energy projects called EnRciT. Public sector financing institution Caisse des Dépôts et Consignations (CDC), cooperative bank Crédit Coopératif and public pension fund Institution de retraite complémentaire des agents non titulaires de l'État et des collectivités publiques (Ircantec) invested €5m (CDC) and €2.5m (each of the other two) into EnRciT.

GLS Crowd (Germany) is a platform that promotes sustainable projects from certain business fields and facilitates the search for investors via investment-based crowdfunding (subordinated loans) [*project level*]. Though the platform uses the name of the bank GLS, which offers sustainable banking services, it is operated by a separate and independent legal entity. Project proposals, however, come via GLS Bank [*intermediary level*] (GLS Crowdfunding GmbH, 2020).

GoParity (Portugal) is a platform operated by Power Parity Lda. that promotes sustainable projects via a model of loan-based crowdfunding, including renewable energy projects (Marchant, 2020; Power Parity, Lda., 2020). In Portugal, legislation for crowdfunding (decree law 102/2015) was approved in 2015 and subsequently implemented in February 2018, opening up opportunities for different platforms. Launched in 2017, GoParity offers individuals (>95%) and companies investment opportunities starting from €20 [*intermediary level*]. Until August 2020, they had managed to finance successfully 41 projects in line with the Sustainable Development Goals (SDGs) [*project level*]. Like Abundance in the UK, GoParity also offers a secondary marketplace on its platform, which allows the trade of ongoing investments, and uses MangoPay as a payment solution provider.

The 30 kW_p **Križevci PV powerplant** is the first application of loan-based crowdfunding for renewable energy installations in **Croatia** (Compete4SECAP, n.d.; Covenant of Mayors, 2020; Renewable Networking Platform, n.d.). Together with the city of Križevci, the Green Energy Cooperative (**Zelena energetska zadruga, ZEZ**) developed the model. ZEZ collected €31,000 from 53 investors through the cooperative's crowdfunding platform [*intermediary level*]. ZEZ used the money to install the solar PV rooftop installation, which it leases to the Križevački poduzetnički centar (KPC) as manager of the Križevci Development Centre and Technology Park. The city of Križevci pays back the loans through savings on electricity bills. ZEZ generates further income through public campaigns before the beginning of the project and fundraising. The model has been replicated for a similar project at the local public library. Using this experience, local investors have formed a local energy cooperative called KLIK for further projects of this kind in the city.

Lumo Investissement (France) is an investment-based crowdfunding platform that promotes environmentally friendly projects. In 2018, Société Générale S.A., France's third largest, private universal bank, acquired the company. Through the platform, project special purpose vehicles (SPVs) and companies can issue (small) bonds [*intermediary level*]. In the case of the **Saint-Varentais Wind Park**, French renewable energy developer Valorem collected money for further studies to obtain building permits [*project level*]. The securities issued were structured as corporate bonds secured by Valorem SAS. The project functioned as trial for new "participatory financing" regulations (Harder, 2018).

As these short case descriptions show, each case typically involves several organisations. You will find a summary and classification of these organisations in Table 3. This table also includes a description of the 'locality' of investors and intermediaries:

- Local – money is (mostly or only) collected from local residents or there is a preference for local investors. The literature calls this a "community of place" or "community of locality" (Hinshelwood & Tawe, 2000).
- National – money is collected from investors all over the country. The literature calls this a "community of interest" (Hinshelwood & Tawe, 2000).
- Strong local or regional networks or ties – typically used by national organisations to strengthen the interactions between members and the ties between investors and intermediaries in order to build trust (*see Section 4*).

Table 3. Overview of cases compared – organisational characteristics.

Country	Name of case	Locality	Types of organisations
Croatia	Križevci PV power plant	Local (preference), public campaigns	Cooperatives: national (ZEZ), new: local (KLIK); payment services provider Crowdfunding platform
	Croenergy	National	Public agency, social enterprise; payment services provider Crowdfunding platform
France	Energie Partagée (EnRciT)	National, regional networks	Association, cooperative, ethical bank; regional networks Investment funds (public, community-owned)
	Lumo/Saint-Varentais Wind Park	National	Bank subsidiary, project developer Crowdfunding platform
Germany	DKB Finance GmbH placeholder capital (among others) for community energy	National/regional presence Project level: local	Subsidiary of publicly owned bank
	GLS Crowd	National	Bank, service provider Crowdfunding platform
Portugal	Coopérnico	National with strong local networks	European cooperative association, cooperatives; regional networks Crowdfunding platform
	GoParity	National	Social enterprise; payment services provider Crowdfunding platform
United Kingdom (UK)	Brighton & Hove ESCo	Principally open, but strong local ties	Cooperative; local networks Crowdfunding platform
	Abundance Investment	National	Social enterprise / Certified B Corp Crowdfunding platform

Source: Own compilation based on internet search and interviews.

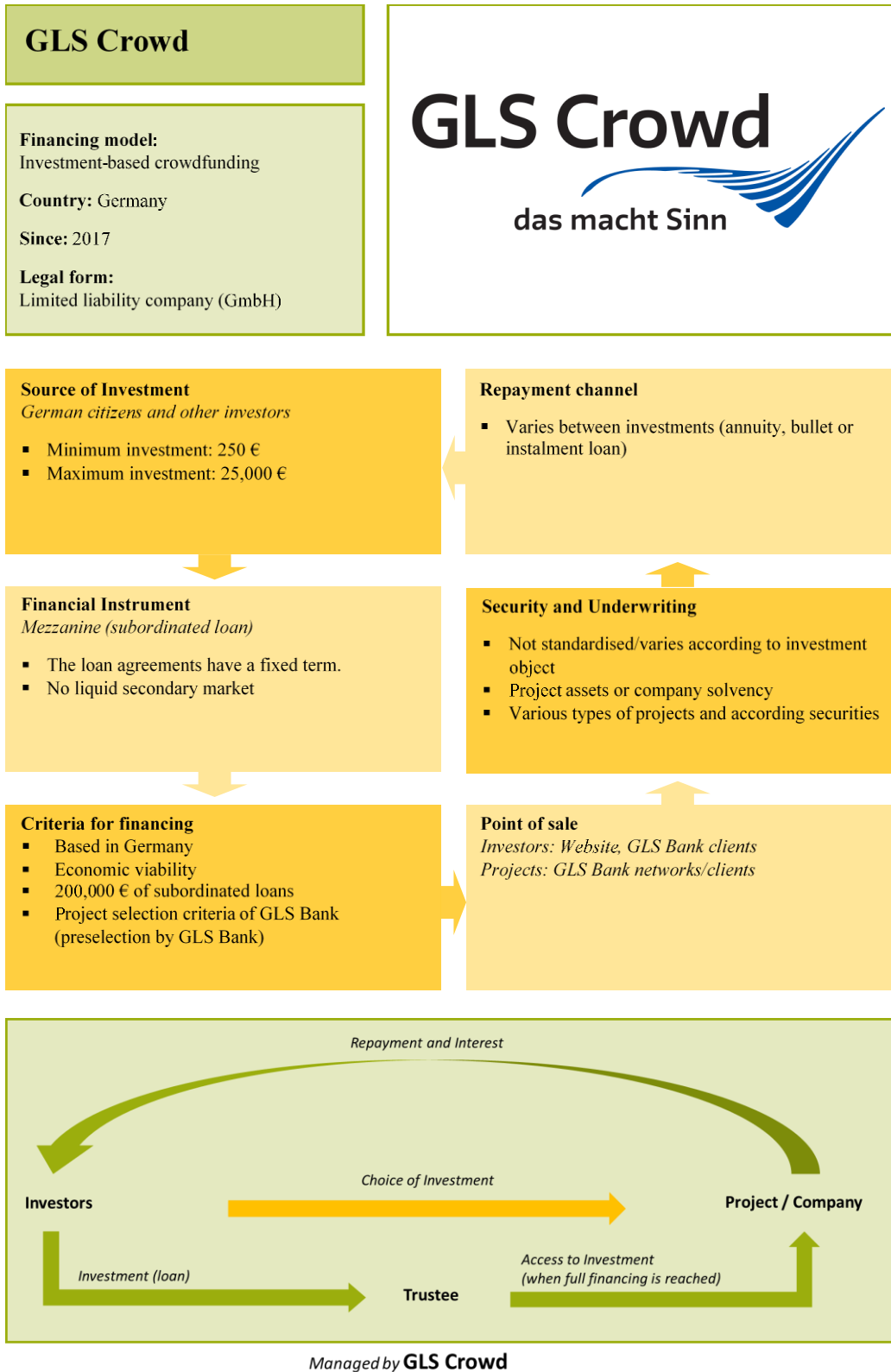
3.3 Characteristics of cases

3.3.1 Crowdfunding platforms

Having described our 10 cases in detail, we now apply the analytical model developed by Brown et al (2019) to summarize clearly their main characteristics through the use of infographics. We start with the crowdfunding platforms in the 5 countries, followed by the community finance cases. In the first category of cases, we begin with the general descriptions of the three platforms in Germany, Portugal and the UK and their respective financing models and contexts. For Croatia and France, we provide general information on the two platforms, but also zoom in on two specific projects.

GLS Crowd (DE)

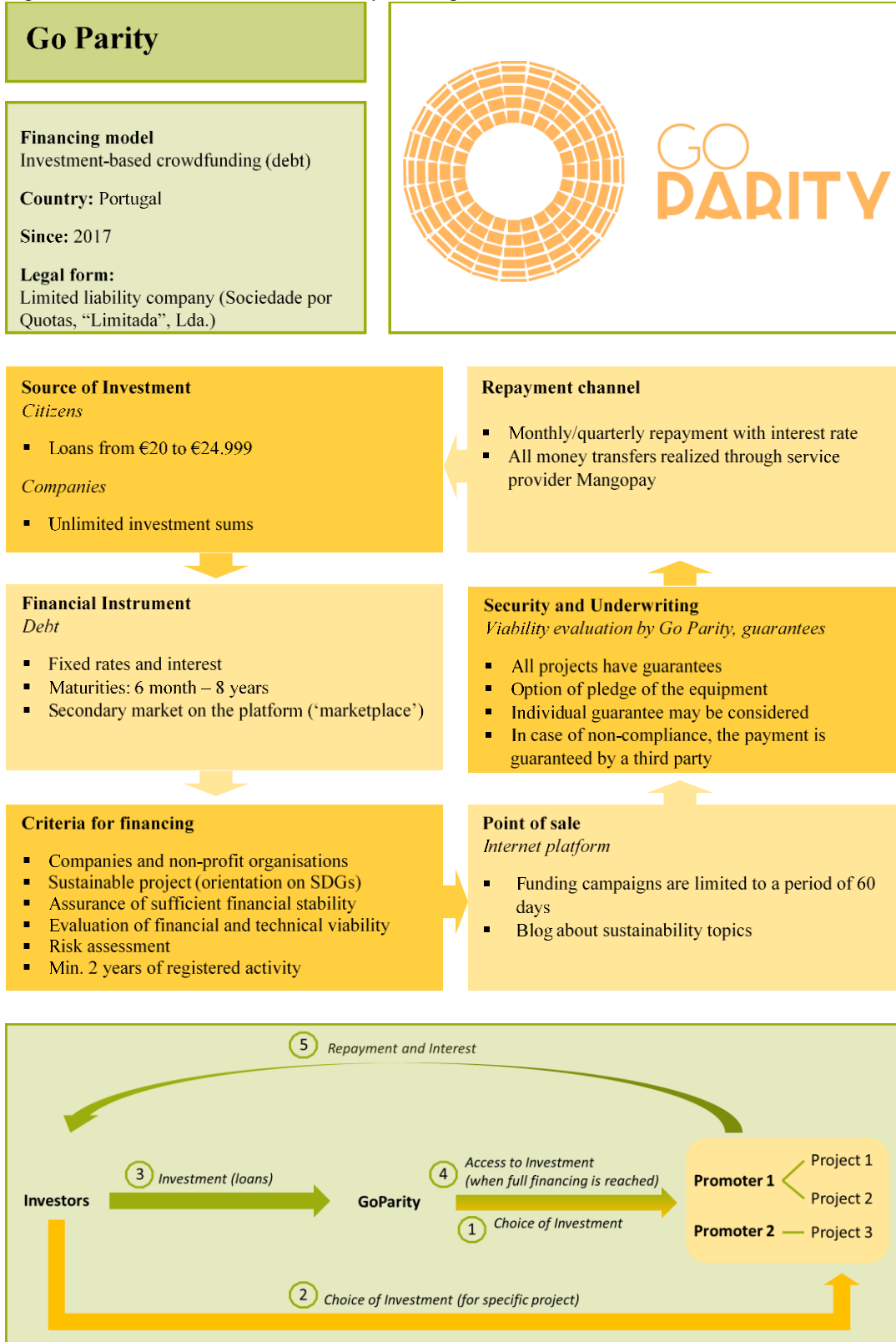
Figure 2. Characteristics of the GLS Crowd, Germany.



Source: Own compilation.

GoParity (PT)

Figure 3. Characteristics of GoParity, Portugal.



Source: Own compilation.

Abundance Investment (UK)

Figure 4. Characteristics of Abundance Investment, UK.



Source: Own compilation.

Croenergy/Naša Radost kindergarten (HR)

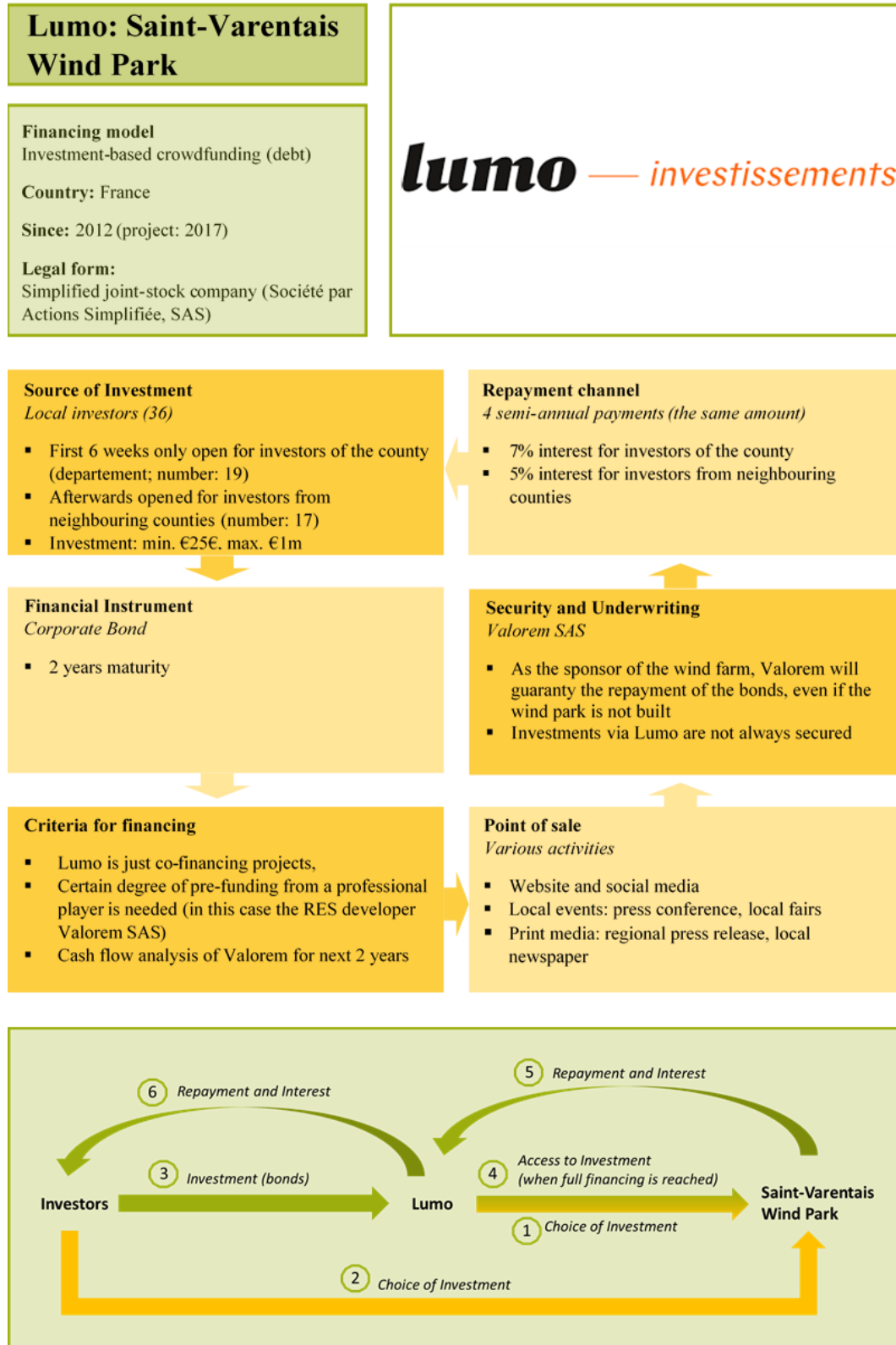
Figure 5. Characteristics of Croenergy and the Naša Radost kindergarten retrofit project, Croatia.



Source: Own compilation.

Lumo/Saint-Varentais Wind Park (FR)

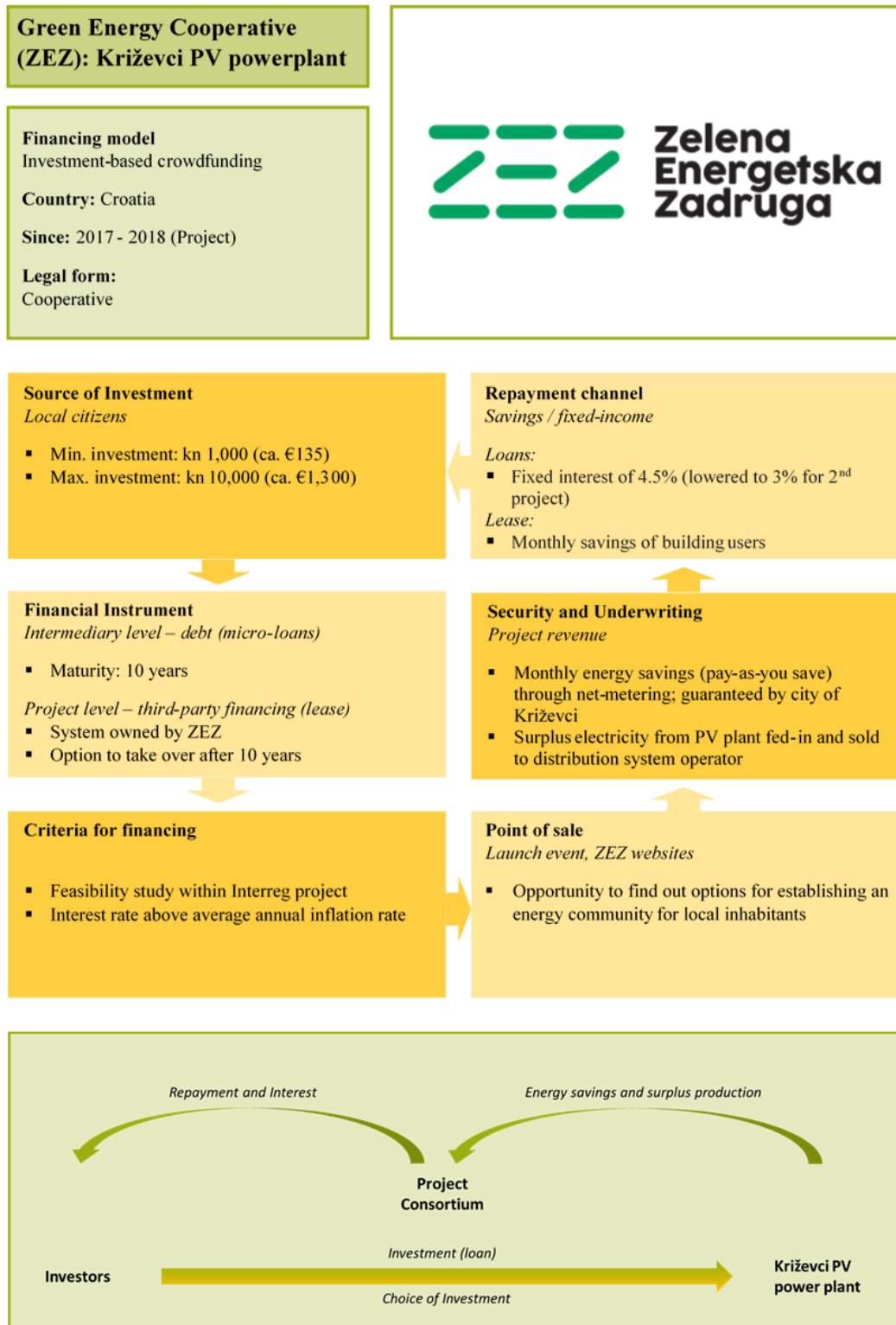
Figure 6. Characteristics of Lumo and the financing of the Saint-Varentais Wind Park, France.



3.3.2 Community shares

Križevci PV powerplant

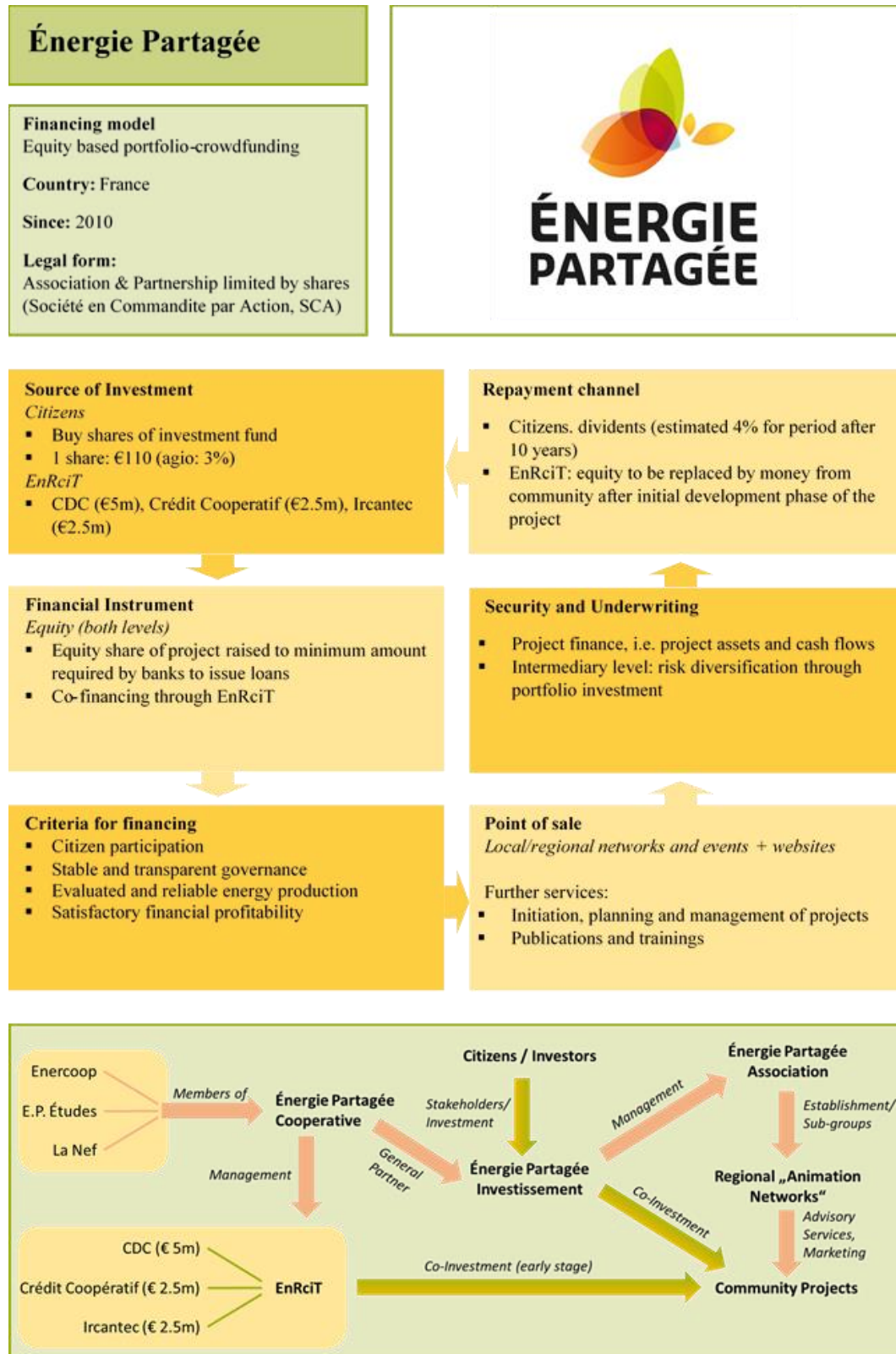
Figure 7. Financing of the Križevci PV powerplant through ZEZ, Croatia.



Source: Own compilation.

Energie Partagée (FR)

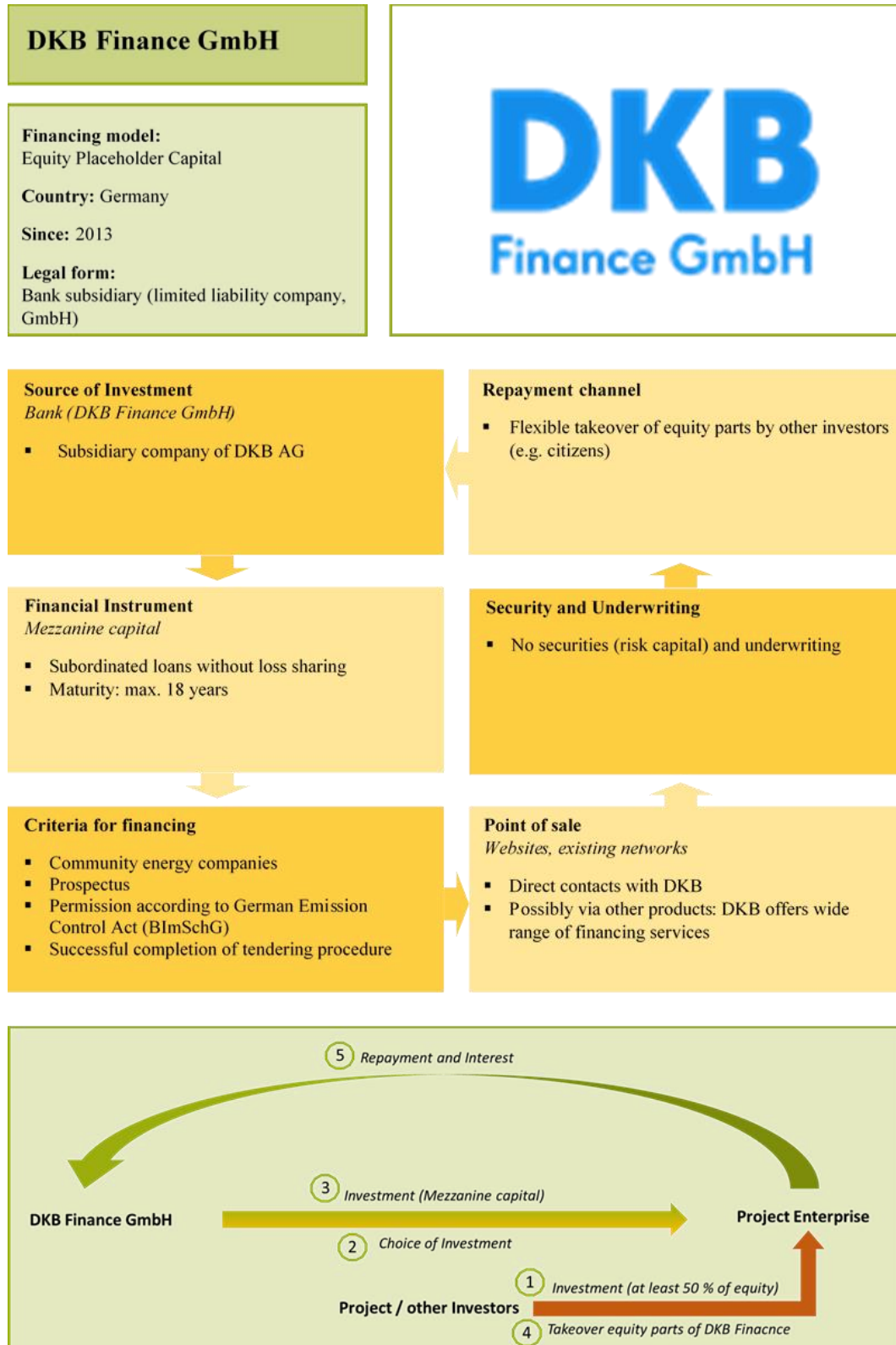
Figure 8. Financing of/through Energie Partagée and EnRciT, France.



Source: Own compilation.

DKB placeholder capital for energy communities (DE)

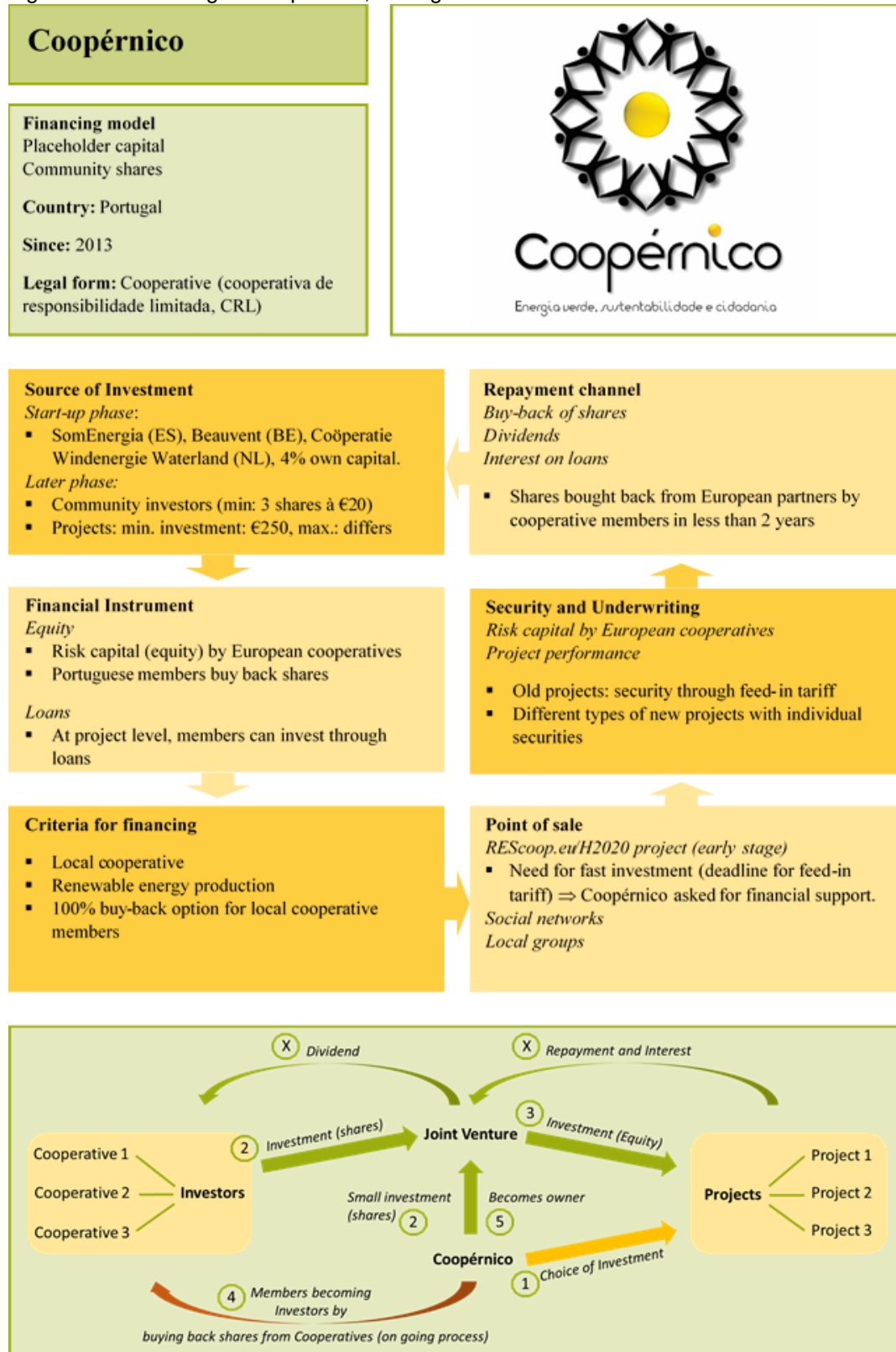
Figure 9. Characteristics of the DKB placeholder capital product for energy communities, Germany.



Source: Own compilation.

Coopérnico (PT)

Figure 10. Financing of Coopérnico, Portugal.



Source: Own compilation.

Brighton & Hove ESCo (UK)

Figure 11. Financing of and through the Brighton & Hove ESCo, UK.



4. Conclusions: lessons learnt

There are different ways of financing renewable energy and energy efficiency projects across Europe. Today, many involve the use of “alternative finance” models to reduce the reliance on traditional banks and lower the cost of capital, to channel savings into ethical investments, and/or to support more democratic governance structures. We have selected 10 cases of “alternative finance” models to show how this is already working well in Europe, with information provided on the different forms of financing involved at both the project and intermediary levels, as well as their institutional environment and social relations in which they are embedded.

From our analysis, certain commonalities, differences and other general lessons can be drawn (see also Table 4 for challenges addressed):

1. **Digitisation:** In most of our cases, a crowdfunding platform is used either as the main point of sale (crowdfunding platforms; Križevci) or as a supporting tool (Coopérnico, BHESCo).
2. **Function:** Crowdfunding platforms (1) address the lack of funding from traditional sources due to comparatively small project sizes and missing collateral or securities (Abundance, Coopérnico, GoParity, Križevci); (2) provide investment opportunities and divert more savings into ethical investments (Abundance, Lumo); (3) widen the target group, especially if the local investor base is too small for projects to be realised (Énergie Partagée); and (4) close the funding gap for more innovative business models, substituting or adding to public funding (GLS, Croenergy).
3. **Locality:** Crowdfunding platforms often collect money on a national level from a “community of interest”. In only a few cases, the target group is local or regional (Križevci, BHESCo). In the more complex community shares projects, often the local combines with the regional or national level. Success rests on building strong local or regional networks to identify projects and to support project development (Énergie Partagée, Coopérnico), and to build trust (Coopérnico) and as a means to create a sufficient investor base (Križevci).
4. **Risk capital:** Energy communities tend to lack risk capital in the early phases. Collection of equity generally takes more time in the case of larger-scale projects. Solutions developed include: (1) widening the investor base, often in rounds, from local or regional to national (Énergie Partagée; crowdfunding cases); and (2) collecting seed money or placeholder capital from different sources (see next point).
5. **Complementary capital:** Risk capital and placeholder capital for intermediary phases is mobilised from different sources – publicly-owned banks (DKB Finance), public and private investment funds (EnRciT), European cooperatives (Coopérnico), national or European research grants (BHESCo, Križevci), and a national cooperative (Križevci). It is used for developing the business model (BHESCo) and for project pipeline (Énergie Partagée/EnRciT, Coopérnico, Križevci), as well as for accelerating project development (DKB Finance).
6. **Forms of financing:** In our cases, debt is more common than equity capital. In the upscaling process, we observe a shift from grants/donations to equity and further on to mezzanine or debt (UK, partly FR). In France, Énergie Partagée deliberately takes a different path as equity capital means more rights in decision-making processes on the projects; de-risking is achieved through a portfolio approach here. Financial regulations for crowdfunding and the lack of experience of potential investors complicate matters in the Croatian case.

7. **Democratisation:** Crowdfunding and community shares help to broaden the investor base in the energy sectors of all countries. The extent to which this happens is a matter of dispute (M. Davis et al., 2020) and an area for further scientific investigation. Énergie Partagée and Lumo, both in France, illustrate two different approaches taken for more participation and handling the trade-off between decision-making rights and risks that are associated with specific forms of financing (Holstenkamp, 2014).

Table 4. Financing challenges addressed in the cases through financial innovations.

Name of case	Financing gap or challenge addressed with the model	Challenges during implementation
Abundance Investment [UK]	Lot size and risks of renewable energy investments ⇒ crowdfunding, small minimum invest, debt	
Brighton & Hove ESCo [UK]	Lack of funding for small-scale retrofit projects ⇒ community-owned ESCo	Complex & new business model ⇒ longer early phase No debt funding from specialised intermediaries ⇒ equity
Coopérnico [PT]	Lack of debt from banks for projects ⇒ crowdfunding Lack of risk capital for cooperative ⇒ external equity through cooperative network Complex and changing regulatory environment ⇒ placeholder capital from external sources to speed up process	Historical legacy and mistrust (cooperative model associated with communist party) ⇒ trust through first projects + local groups
Croenergy [HR]	Co-funding needs ⇒ donations collected from crowd	National regulations for crowdfunding discourage use of investment-based crowdfunding
DKB Finance GmbH placeholder capital [DE]	Lack of equity or longer collection process in intermediate development phase ⇒ placeholder capital	
Energie Partagée (EnRciT) [FR]	Project level: community energy projects to meet equity requirements by banks ⇒ national fund Investors: too high risk of single investment ⇒ portfolio	EnRciT: lack of risk capital for early development phase ⇒ external risk capital Regulatory instability, limited instruments to foster citizen energy ⇒ lobbying through association
GLS Crowd [DE]	Lack of financing for innovative business models ⇒ mezzanine from crowd	
GoParity [PT]	Lot size and risks of renewable energy investments ⇒ crowdfunding, small minimum invest, debt	

<p>Križevci PV powerplant [HR]</p>	<p>Lack of funds for third-party financing models ⇒ crowdfunding among regional investors</p>	<p>Lack of experience with crowdfunding ⇒ public campaigns, networking</p>
<p>Lumo (Saint-Varentais) [FR]</p>	<p>Savings often not used for positive impact investments (lack of investment opportunities) ⇒ crowdfunding, small minimum invest, debt</p>	<p>High risk of early development phase ⇒ corporate bond (instead of project bond)</p>

Source: Own compilation based on literature review and interviews.

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