FIRECE – Interreg CENTRAL EUROPE Project CE1131

WPT2 Implementation of the instruments, testing and transferability actions

Preparation of PA 1: CE Ex-Ante Assessment Analysis report

(Saxony, Germany)

DELIVERABLE

D.T2.1.2

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Abbreviations

AVO	Ausführungsverordnung (Implementing decree)
DZ Bank	Deutsche Zentral-Genossenschaftsbank (German Central Co-operative Bank)
ECB	European Central Bank
EE	Energy Efficiency
ESI	European Structural and Investment
ERDF	European Regional Development Fund
ESIF	European Structural and Investment Fund
EU	European Union
FI	Financial instrument
KfW	Kreditanstalt für Wiederaufbau (German state-owned development bank)
LDS	Saxony regional office
LSV	State Office for Road Construction and Traffic
LTSV	Saxony state dam administration
OP	Operational Programme
PMC	Private marginal cost
P2P	Peer-To-Peer
RE	Renewable energy
R&D	Research and development
SAB	Saxonian Reconstruction Bank
SME	Small and medium sized companies
SMI	Saxon State Ministry for Internal Affairs
SMK	Saxon State Ministry of Culture
SMS	Saxon State Ministry of Social Affairs and Consumer Protection
SMUL	Saxon State Office for the Environment Agriculture and Geology
SMWA	Saxon State Ministry for Science and Art
SMWK	Saxon State Ministry of Economics, Labour and Transport
SOA	Saxonian Oberbergamt
TGFS	Technology Start-up Fund Saxony Management

1. Subject of the ex-ante evaluation

This ex ante analysis serves to prepare the content of pilot action 1 (D.T2.4.1) within the FIRECE project. It is based on the already developed structure and the aim is to work through financing gaps and to develop innovative financial instrument for the region of Leipzig and the federal state Saxony. The content was developed by PP6.

The ex ante evaluation is based on the provisions of Article 37 of Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions for the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Marine and Fisheries Funds and laying down general provisions for the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Marine and Fisheries Fund and repealing Regulation (EC) No 1083/2006 (AVO).

This requires that support for financial instruments to be based on an ex-ante evaluation, which identifies market weaknesses or sub-optimal investment situations and derives the estimated level and scope of public investment requirements, including the types of financial instruments to be supported. The contents of an ex ante evaluation will be specified by Article 37 (2) (a-g) of the AVO. The ex-ante assessment is focused, on one site, on the European financial instruments, but, on the other hand, on the available financial instruments on national and regional level, which give a financial support for SME for investing in energy efficiency measures.

After the overview of the subject matter of the study and the methodological approach in Chapter 1, the structure of the further report is based on the structure of Article 37 (2) (a-g).

Accordingly, Chapter 2 contains general macroeconomic information about the economic development of Saxony, Germany, in the last years, as well as the corporate structure in the region and the development and changes in the energy sector regarding energy supply and energy efficiency. On the basis of certain macroeconomic indicators, the ex-ante analysis follows the transformation in the region and is looking for trends, indicating the further regional development or signs, revealing possible future difficulties. In addition, this chapter study and analyze the different financial options for SME to invest in green projects. This is done regarding the three level – European, national and regional. The supply and demand side weaknesses are also traced and revealed in this chapter according desktop research and own empirical data.

Chapter 3 contains a short overview of the development of the alternative financial market. The analysis starts with information about the three big markets – Asia-Pacific (incl. China), America (incl. US) and Europe and continues with more specific data about this development on national level in Europe. The rest of the chapter keeps its focus on Germany and the development of specific alternative financial instruments in Germany as well as the development of this financial instruments for specific areas like SME and energy efficiency projects. The goal of chapter 3 is to detect the level of development of the alternative financial market and if some of the financial instruments on this market are available and suitable for financing green projects regarding SMEs in Saxony, Germany.

Chapter 4 sums up the conclusions made in the previous chapters and give an overall perspective of the development as well as the chances and weaknesses in Saxony, Germany, with respects to SMEs' investments in green projects.

2. Analysis of market failures, suboptimal investment situations and investment needs

Figure 1: Main Steps of Ex-Ante analysis in chapter one[1]

The starting point for the ex-ante evaluation pursuant to Article 37(2) of the AVO is an analysis of the extent to which there are market weaknesses in SME[2] financing or sub-optimal investment situations in the Land of Saxony. The analysis should thus provide an assessment of whether there is a need for additional co-financed funds in Saxony in the areas of promoting the reduction of CO2 emissions or there are other market weaknesses, e.g. asymmetrical information, which embarrass the decision for financing of energy efficiency measures[3].

For this purpose, a brief description of the macroeconomic framework conditions in Saxony is given, followed by the development of the energy efficiency in Saxony as well as an analysis of existing market weaknesses and suboptimal investment situations in the relevant fields.

2.1 Macroeconomic context analysis in Saxony

In 2018 the Free State of Saxony had 4.08 million inhabitants. The largest metropolitan area and state capital is Dresden, the most densely populated city is Leipzig. In the same year Saxony's GDP per capita (in current prices) amounted to EUR 31,008 [4] and was thus significantly - by 23 percent - below the national average of EUR 40,339[5]. Saxony has the highest per capita income of all the eastern German states.[6] The gross domestic product of the Free State of Saxony reached a value of € 126.4 billion in 2018. Price-adjusted, it rose by 1.2 percent compared to 2017. In Germany as a whole, the gross domestic product increased by 1.4 percent in real terms. Thus, the growth rate in Saxony was slightly below average. In the five new federal states, the combined gross domestic product increased by 1.0 percent in 2018. In the old federal states (excluding Berlin), real growth was 1.4 percent and in Berlin 3.1 percent.[7]

[1] European Investment Bank und European Commission 2014, S. 32.
[2] According to the definition of micro, small and medium-sized enterprises of the commission recommendation from 6 May 2003 (notified under document number C(2003) 1422).
[3] OP Sachsen EFRE 2014-2020 2018.
[4] Statistisches Landesamt des Freistaates Sachsen 2019c, S. 3.
[5] o.V. 2018a, S. 47.
[6] Arbeitskreis "Volkswirtschaftliche Gesamtrechnungen der Länder" 2019, S. 7.
[7] Statistisches Landesamt des Freistaates Sachsen 2019d, S. 7.

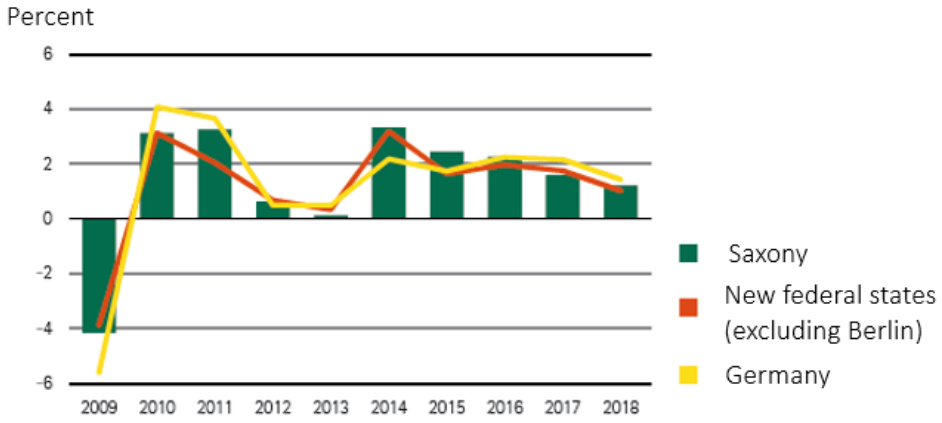


Figure 2: Gross domestic product price-adjusted 2009 to 2018 - Changes compared to the previous year[8]

A closer look at the economic structure of the Free State of Saxony over the past ten years reveals a high degree of consistency, which was only interrupted by the economic crisis in 2008 and 2009. The share of services in gross value added was 68.5 percent in 2010 and 66.8 percent in 2018. The share of the manufacturing industry shows a slight upward trend from 30.7 percent in 2010 to 32.5 percent in 2018. The share of agriculture, forestry and fishing is just under one percent in this period. Within the manufacturing sector, the share of the construction industry in total gross value added increased from 6.7 percent in 2010 to 7.7 percent in 2018.[9]

Structure of the corporate environment in Saxony

The respective regional corporate structure is of great importance for the design of support programs aimed at facilitating economic development. In the following, the distribution of enterprises and employees by size class as well as the research activities of Saxon enterprises are examined. A total of 165,174 [10] companies were active in the Free State of Saxony in 2017.

Differentiated by economic sector, the majority of companies in 2018 were active in the service sector (66.8 percent) followed by the manufacturing industry (32.5 percent) and almost an insignificant share belongs to the agriculture, forestry and fishing (under one percent).[11]

In 2018, a total of 164,556 of the above-mentioned active Saxon companies belonged to SMEs (up to 249 employees). This corresponds to a share of 99.6 percent. Figure 3 shows the share of the companies within the certain industry and corresponding to the size of the company. It is clear to be seen that the most companies have no more than 9 employees, followed by companies with 10 to 49 employees and only in certain industries like water supply, wastewater & waste management, manufacturing industry and mining the staff members are between 50 and 249. It is also not surprising that the share of the big companies in Saxony are not only in some few industries (e.g. water supply, wastewater & waste management, health and social services, education and teaching etc.) but also have only a tiny share compared with the SMEs in the same area.

[8] Statistisches Landesamt des Freistaates Sachsen 2019d, S. 7
[9] Statistisches Landesamt des Freistaates Sachsen 2019d, S. 8.
[10] o.V. 2018b, S. 11.
[11] Statistisches Landesamt des Freistaates Sachsen 2019d, S. 8.

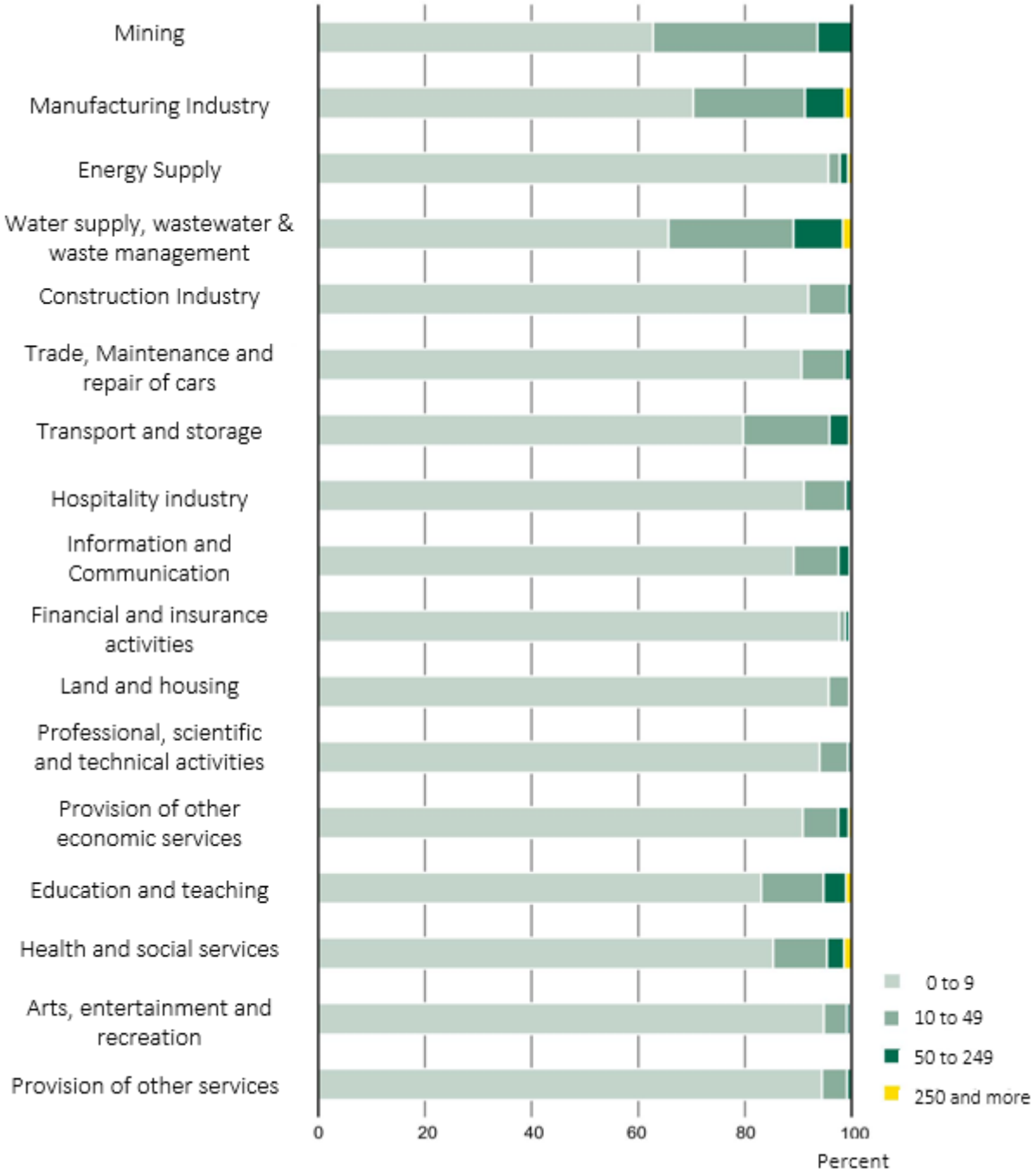


Figure 3: Enterprise size classes according to number of employees and economic sections (2017)[12]

Increasing the competitiveness and innovative strength of Saxon companies requires further investment. Due to financial obstacles, which are particularly common among smaller, young and innovative enterprises, the public sector can provide support here.[13]

The following core aspects of Saxony's economic situation are therefore relevant to this analysis:

- the **below-average R&D expenditure** in Saxony's business enterprise sector
- the improvement of the framework conditions for an economic **conversion of R&D results into marketable products**
- **below-average productivity**, which may to some extent be caused by a capital stock in need of improvement, and correspondingly the underinvestment of the economy.

[12] o.V. 2018b, S. 23.
[13] PwC 2015, S. 28.

The following Figure 4 shows the development of the number of enterprises according their size and the development of the profit of the relevant group of enterprises in the period 2010 and 2016 in Saxony. There is a growth in the profit among all the groups and it is remarkable, that the growth of the profit by SME and big enterprises is very similar. The figure also shows that the number of large companies rose most (with 45,3%) for the period 2010 – 2016, but in real numbers it means additionally 81 enterprises to the already existing 260 big enterprises in Saxony. For this reason, it should be mentioned that the growth of 1,4% of SME is relevant to additionally 1996 SMEs, if we observe it in real numbers. This shows one more time, that the corporate structure in Saxony rely very strongly on SMEs, their profit and development.

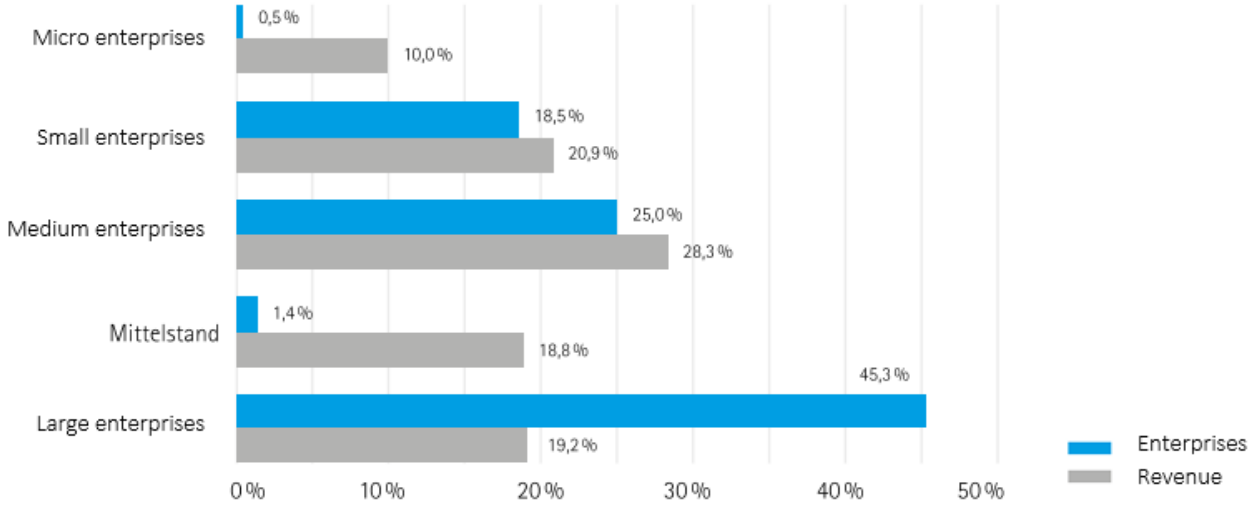


Figure 4: Company by size and turnover development in Saxony (comparison 2010-2016)[14]

In the following, the investment situation in Saxony will be analyzed with regard to these aspects and conclusions drawn accordingly to the investment requirements.

R&D intensity

R&D expenditure is an important indicator of the competitiveness and sustainability of an economy. In the context of a knowledge-based economy, as highlighted in the Europe 2020 Strategy, high R&D (or R&D&I) rates aim at economic dynamism. In the future, the private sector will have to bear a growing share of these expenditures.

[14] Bräuninger 2018.

Federal States	State, private non-profit institutions	Universities	Economy	Total
Baden-Württemberg	0,41	0,52	4,71	5,64
Bayern	0,31	0,44	2,34	3,09
Berlin	1,19	0,85	1,37	3,41
Brandenburg	0,74	0,37	0,57	1,68
Bremen	1,10	0,77	0,88	2,75
Hamburg	0,38	0,53	1,24	2,15
Hessen	0,28	0,44	2,20	2,91
Mecklenburg-Vorpommern	0,64	0,58	0,58	1,79
Niedersachsen	0,37	0,54	2,20	3,10
Nordrhein-Westfalen	0,30	0,56	1,23	2,09
Rheinland-Pfalz	0,18	0,47	1,78	2,43
Saarland	0,36	0,53	0,86	1,74
Saxony	0,79	0,79	1,21	2,78
Sachsen-Anhalt	0,51	0,57	0,41	1,49
Schleswig-Holstein	0,34	0,38	0,83	1,55
Thüringen	0,48	0,61	1,10	2,19
Deutschland [2]	0,42	0,53	2,12	3,07

Figure 5: Share of research and development in gross domestic product [15]

The analysis of R&D expenditure by sector (state, universities, industry) clearly shows that Saxony occupies a leading position compared to the other eastern German territorial states. In the state and higher education sectors, Saxony has a significantly higher share than the German average. On the other hand, there is a backlog in R&D expenditure in the corporate sector. In Saxony, however, only 2.78 percent of GDP was spent on R&D (the German average is 3.07), which is still compared with the other state a remarkable achievement and put Saxony on place 6 within the altogether 16 federal state.[16]

Productivity

Saxony's gross value added (in current prices) was just under 113,944 Mio Euro [17] in 2018. At 54,909 Euro [18] per employee in 2018 and very significantly - by around 27 percent - below the national average of 75,511 Euros[19]. This shows that the Free State of Saxony still needs to make considerable efforts to catch up with the western German states in terms of productivity.

Investment and capital stock

In terms of investment intensity (investment per person employed), Saxony shows a significantly lower level compared to the German average. The gap to Germany becomes particularly clear when looking at the overall economic capital stock, which is built up from past investments and reflects the degree to which the

[15] o.V. 2019a, S. 1.
[16] o.V. 2019a, S. 2.
[17] Statistisches Landesamt des Freistaates Sachsen 2019a, S. 1.
[18] Statistisches Landesamt des Freistaates Sachsen 2019b, S. 1.
[19] Statistisches Bundesamt 2019, S. 75.

economy is equipped with productive physical capital. In 2011, Saxony's capital stock amounted to around 574 billion euros, which corresponds to a share of four percent of the German capital stock. From the point of view of support policy, it is therefore necessary to provide targeted support at company level for the ability of SMEs to enable necessary investments on their own and with external funds for their growth.

Capital Stock	107,42	106,25	105,37	104,18	103,43	101,84	100	98,35	97,05	95,26	92,99	91,22	89,46
Year	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004

Figure 6: Capital Stock Saxony[20]

Energy supply and Energy efficiency

This section will give a closer look of the energy consumption in Saxony, the energy sources as well as the development of the final energy consumption in general and among industry sectors. The energy intensity of different industry sector will be also observed as well as the possible energy savings for SME.

The changes mentioned above among the different industries and the size of the companies strongly affect the energy consumption in Saxony within the last 30-35 years. Following tendency could be summarized observing the situation in the mentioned period:

- The primary energy consumption in Saxony drop down with about 50 % between 1990 and 1999. After 1999 there is a grow of the primary energy consumption but a clear tendency could not be identified (Figure 7). The fact is that the consumption remain between 600 and 700 PJ till 2014, which is still a drop down with about 30% compared to 1990. The reduce consumption is not only because e.g. of better energy efficiency in the companies but mainly because of the changes in the main industries and also because for certain period of time (especially 1997-2000) Saxony was not allowed to export energy in other German states;
- A clear change in the energy source is also observed in the period between 1990 and 2014 in Saxony (Figure 7). From coal as main energy source in 1990, there is a significant reduction of the use of this energy source so that on one hand a reduction of the use of coal as energy source with more than 50 % in 2014 is observed. On the other hand, the mix of energy sources is changed and coal is only about 50% from the total energy source. The other main energy sources are oil, gas and renewables. Another interesting fact is the continuous growing share of the renewable energies since 2002;

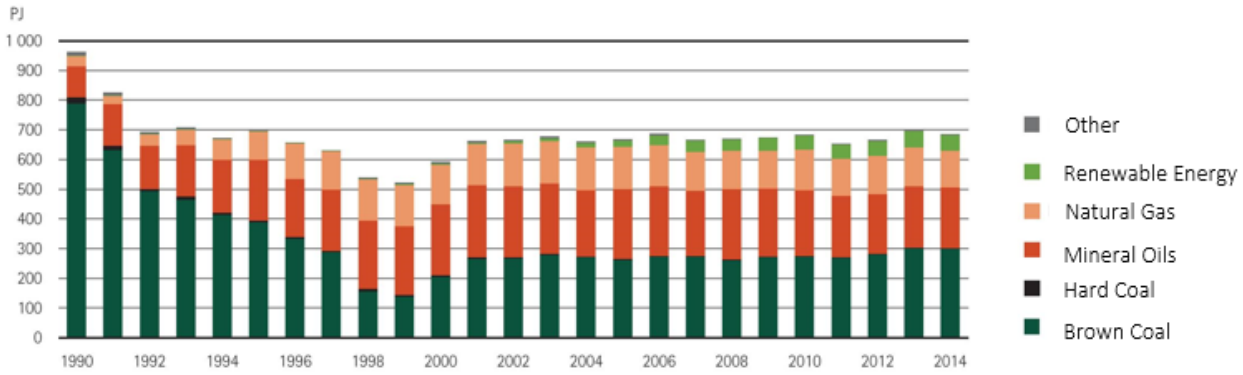


Figure 7: Primary energy consumption by energy source (1990 to 2014)[21]

- As mentioned above, the share of the renewable in the energy mix is growing continuously. On Figure 8 is shown that Saxony is very near to achieve its goal in 2020 (goal: 6,1 TWh (p.a.))[22] as the generated electricity in 2017 from renewables was 5,8 TWh;

[20] Statistisches Landesamt des Freistaates Sachsen 2019c, S. 3.
[21] Statistisches Landesamt des Freistaates Sachsen 2017, S. 6.
[22] https://www.vee-sachsen.de/erneuerbare-energien-in-zahlen-sachsen

- The main energy source of renewables was is still is the wind power in Saxony, followed by production of energy by biomass and photovoltaic plant as shown on Figure 8. The production of energy by the certain renewables shows almost constant direct ratio during the whole observed period with the exception of the solar energy. The share of the solar energy within the energy mix of renewables is up to around 2,5 time between 2011 and 2017;

Figure 8: Volume of electricity generated from renewable energies in Saxony[23]

- Another goal in Saxony is the share of renewable energy for electricity to reach 28% in 2020 compared with 2011[24]. Figure 9 shows that there is a significant achievement between 2011 and 2017 from 15,9% to 22,3%. The grow and the changes in the last years do not give a clear picture, if this goal could be achieved though;

[23] Statistischen Landesamt des Freistaates Sachsen und SAENA 2018, S. 1.
[24] https://www.vee-sachsen.de/erneuerbare-energien-in-zahlen-sachsen

Figure 9: Share of renewable energies in electricity consumption in Saxony[25]

- The final energy consumption in Saxony from the manufacturing industry is growing continuously between 2007 and 2012 with about 81,5 % (Figure 10). In the period 2012 and 2017 the changes have different directions but the consumption remains between about 148 500 TJ and 161 000 TJ, which is still a grow of about 80% compared to 2007;
- It is very clear to be seen that the gas and the electricity are the main final energy product used by the manufacturing industry. The consumption of all the shown energy sources is growing but the growth of the electricity consumption is the biggest one with about 16% (Figure 10);

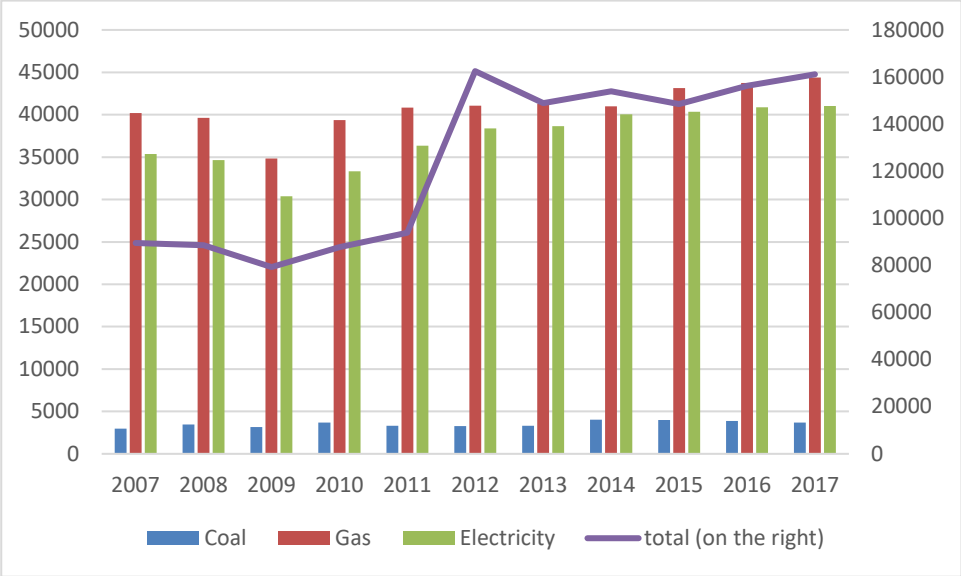


Figure 10 Energy consumption in Saxony (in TJ).[26]

- The biggest energy consumption are the transport and the household (2014). The industry is on third place and only the last sector in Saxony (including self-employment, distribution and trade) uses less

[25] Statistischen Landesamt des Freistaates Sachsen und SAENA 2018, S. 1.
[26] Own illustration on the basis of www.statistik.sachsen.de, sachsen.de 2020, S. 1.

energy that the industry sector (Figure 11). It should be mentioned again that the reduction of the energy consumption by the industry is mainly because of the abolishment of big industry company in Saxony;

- The consumption of energy by the industry sector in Saxony (2014) is a little bit under the average energy consumption by the industry in Germany as general (25% vs. 29%) as shown on Figure 11;

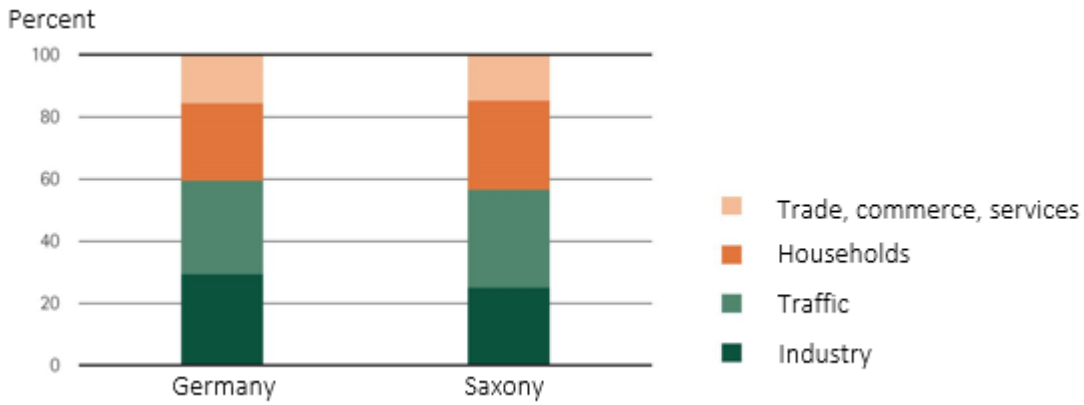


Figure 11: Energy consumption in Germany and Saxony[27]

- Figure 12 shows the adjusted energy consumption (in PJ) by the specific industries and its changes in the period 1996 and 2015. By some of the industries a huge growth of the energy consumption is observed (e.g. manufacturing of digital video (DV) devices, timber products and vehicles production);

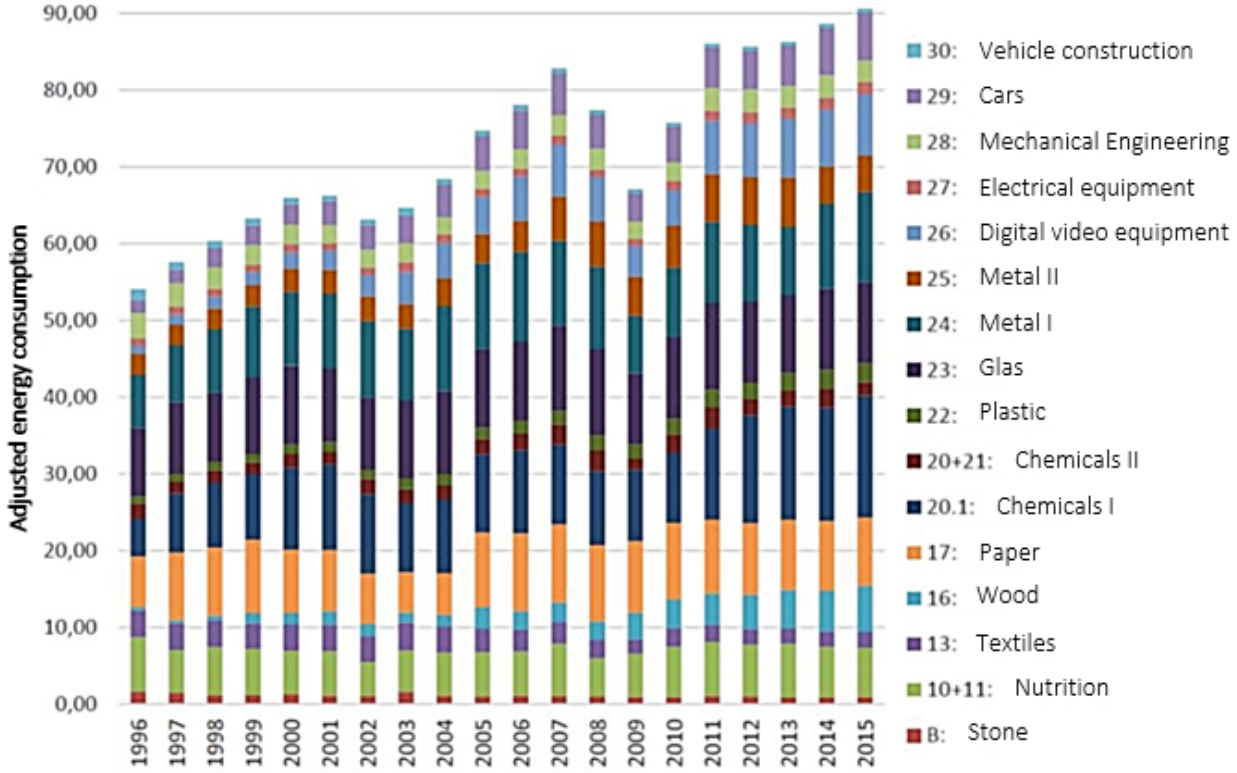


Figure 12: Cumulated energy consumption of manufacturing sectors in Saxony (in PJ)[28]

- the manufacturing of chemical raw materials remain the industry with the highest energy intensity in Saxony although between 1997 and 2010 there is an almost continuous drop down. Nevertheless,

[27] Statistisches Landesamt des Freistaates Sachsen 2017, S. 9.
[28] Sächsische Energieagentur GmbH 2016.

the energy intensity of this industry manage to grow from around 35 PJ/ bn euro to around 45 PJ/ bn euro in the period 1996 – 2015 which means that this industry has the worst energy efficiency in Saxony (Figure 12);

- there is a change in the four most energy intensity industries in Saxony between 1999 and 2015. The energy intensity in the two industries – manufacturing of pulp, paper and paper products as well as the metal industry, show inconstant results but in the long turm there is a drop down in both industries (respectively from around 27,5 PJ/ bn euro to 21 PJ/ bn euro and around 23 PJ/ bn euro to a little bit lower than 20 PJ/ bn euro) for this period. For this reason the four industries with the highest energy intensity respectively with the worst energy efficiency in 2015 are manufacturing of chemical raw materials, manufacturing of non-metallic mineral products, timber industry and manufacturing of pulp, paper and paper products (Figure 13);
- two industries stand out with the biggest growth in the energy intensity in Saxony in the period between 1996 and 2015: the timber industry and the manufacturing of non-metallic mineral products respectively from around 3 PJ/ bn euro to 25 PJ/ bn euro and from around 12,5 PJ/ bn euro to 28 PJ/ bn euro (Figure 13);
- the most of the industries in Saxony have in 2015 an energy intensity under 8 PJ/ bn euro (Figure 13);

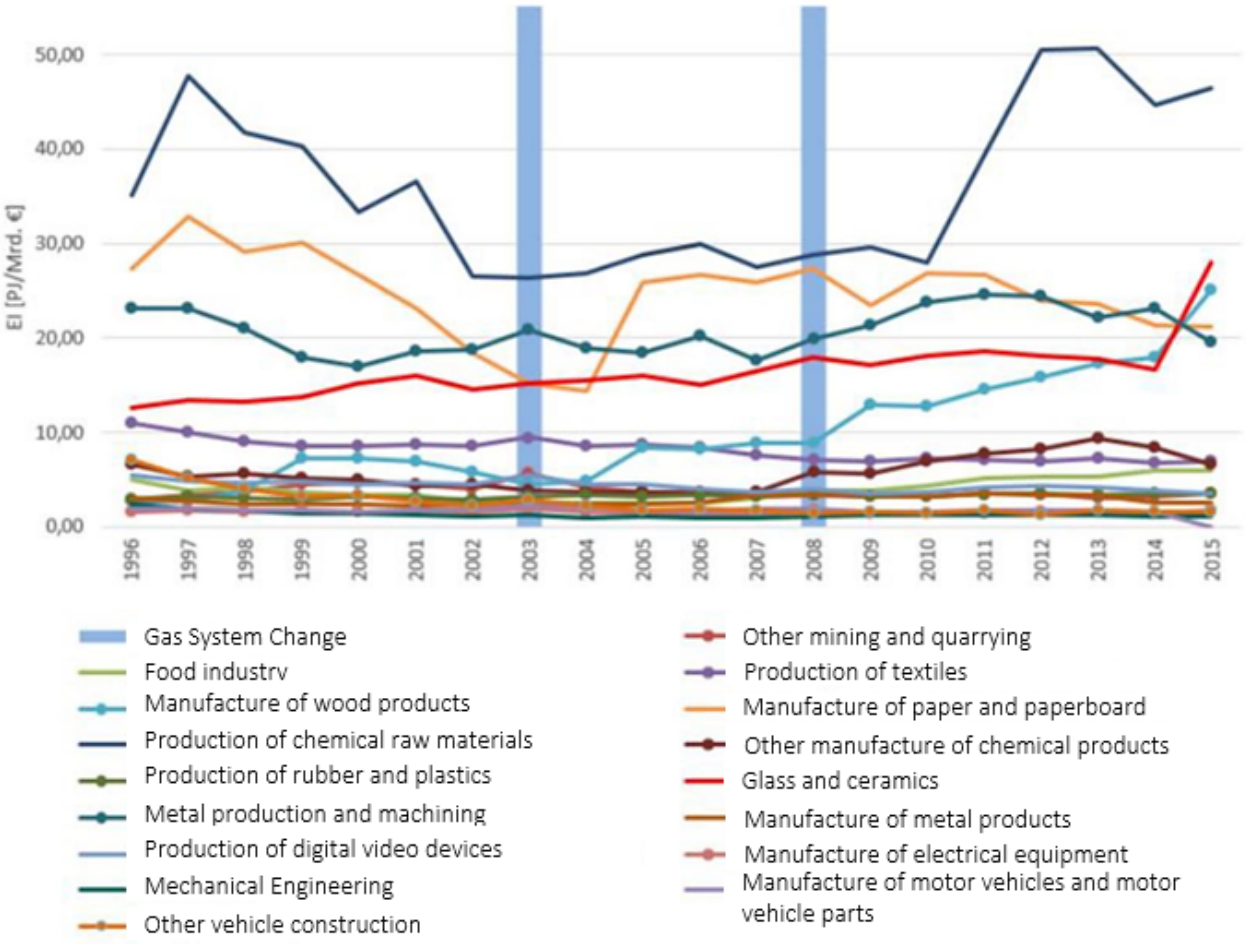


Figure 13: Energy intensity of manufacturing sectors in Saxony[29]

- According to the energy agency in Saxony the highest potential for saving electricity for SME is about 5 and 10 % (Figure 14). Up to 40% electricity savings are possible though;

[29] Sächsische Energieagentur GmbH 2016, S. 2.

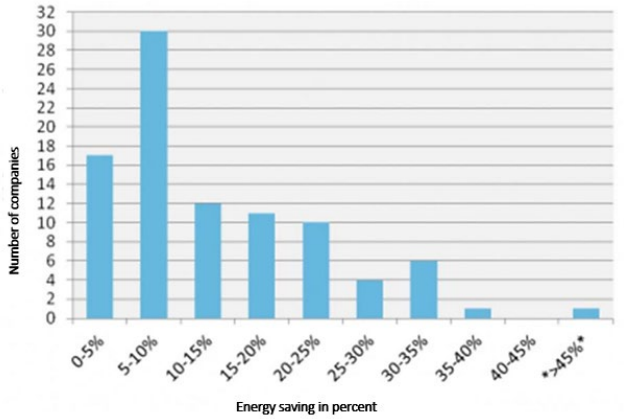


Figure 14: Energy saving potential (electricity) in Saxony's SMEs SäGEP[30]

- the highest energy saving potential for heat by SME is between 5% and 10%, but a potential up to 20% is also very likely (Figure 15). The possibilities for energy saving for heat are up to 70%.

Power saving potentials of SME in Saxony according to SAENA (n=50 SME)

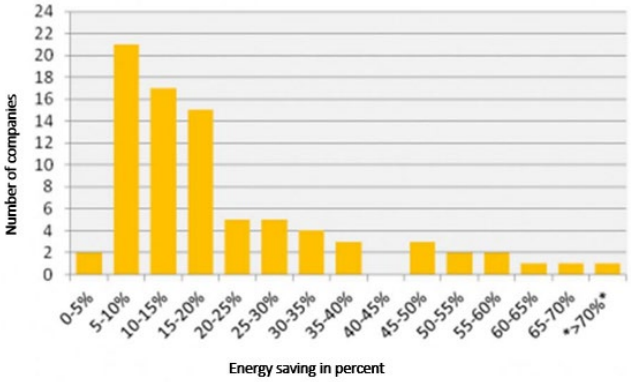


Figure 15: Energy saving potential (warmth) in Saxony's SMEs SäGEP[31]

Summing up, there is a positive development in the area of energy supply and energy efficiency. The numbers and figures show that the national and regional policy work in the same direction namely towards sustainable economic development. Another prove of this policy are the numerous initiative and consulting options in Saxony for optimizing the energy efficiency in the companies. Nevertheless, the energy supply as well as the energy efficiency among the SME in Saxony is still not optimal and more efforts are needed.

2.2 Demand-and supply side analysis

The next step is to estimate both the supply of finance for low-carbon energy projects in Saxony and the demand for finance to realize such investment projects. The rationale for this is to determine whether there is a gap between supply and demand and, hence, a market failure and, thus, in turn, a need for innovative financing instruments in Saxony's green energy market. After that, the theoretical foundations of market failures will be outlined and, then empirical data will be used to validate whether and to what extent there is a market failure in Saxony's financial market regarding the provision of green finance for companies. In this context, the type and the causes of market failure prevalent in Saxony will be examined.

Two groups of stakeholders should be addressed to understand potential market failure:

[30] Sächsische Energieagentur GmbH 2019, S. 1.
[31] Sächsische Energieagentur GmbH 2019, S. 2.

I. **Supply side stakeholders**:
   a. Public sector funding institutions;
   b. Public-private EE or RE funds;
   c. Existing EU FIs;
   d. Commercial banks;
   e. Development banks;
   f. Venture capital institutions;
   g. Leasing and factoring companies;
   h. Institutional investors.

II. Demand side stakeholders:
SMEs (in this specific context).

2.2.1 Supply Side analysis

Germany is fostering an environmental-friendly development in the country through different measures and involvement of different stakeholders, which contribute to the transformation of the industry and its sustainable development. On the Figure 16 can be seen the different measures on national level with their importance as well as the financial institutions and their share by supporting those measures.

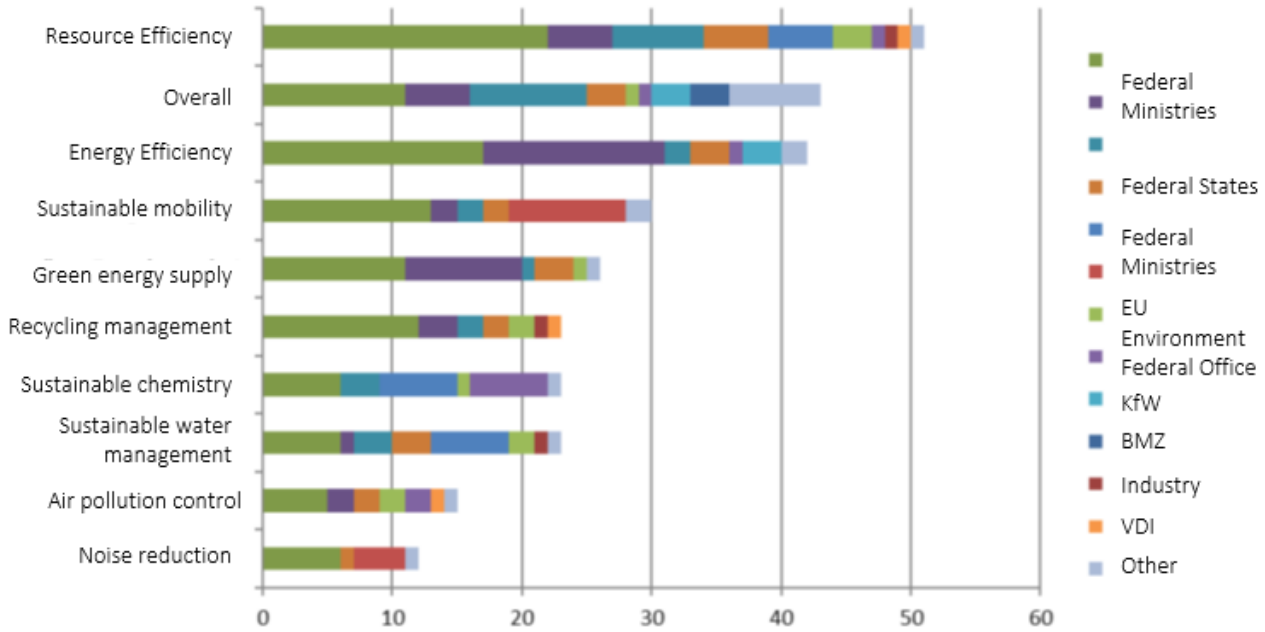


Figure 16: Number of individual measures by lead markets and main players[32]

In the following section, the supply of capital that can be used by Saxon SMEs to invest in green projects will be analyzed. It is examined to which extent public and private financiers on the federal state, federal and European level can meet the financing requirements of Saxon SMEs in this regard.

[32] Walz et al. 2019, S. 73.

At European level

The ***European Fund for regional development (ERDF)*** is particularly noteworthy. In the field of energy efficiency, it specializes in supporting SMEs in a specific priority axis.

Saxony has financial resources (ERDF plus co-financing) amounting to € 2.6 billion available for the implementation of the ERDF Operational Program 2014 to 2020. Of this amount, €2.3 billion will be allocated to the transition regions (Dresden and Chemnitz districts) and €270 million to the more developed region (Leipzig district). These funds have been allocated to the following six priority axes:

I. Strengthening research, technological development and innovation;
II. Strengthen the competitiveness of small and medium-sized enterprises;
III. Reduction of CO2 emissions;
IV. Risk prevention;
V. Sustainable urban development and
VI. Technical assistance.

The shift to a low-carbon economy will be supported through investments increasing the energy efficiency of public buildings and enterprises, and through support for environment friendly, low-emission modes of transport. This should lead to a reduction of annual greenhouse gas emissions by approximately 149,000 tonnes of CO2 equivalent.[33]

As Figure 17 shows, renewable energy and climate change mitigation are key areas in which the EFRD is active. Three out of six financing areas are related to sustainability.

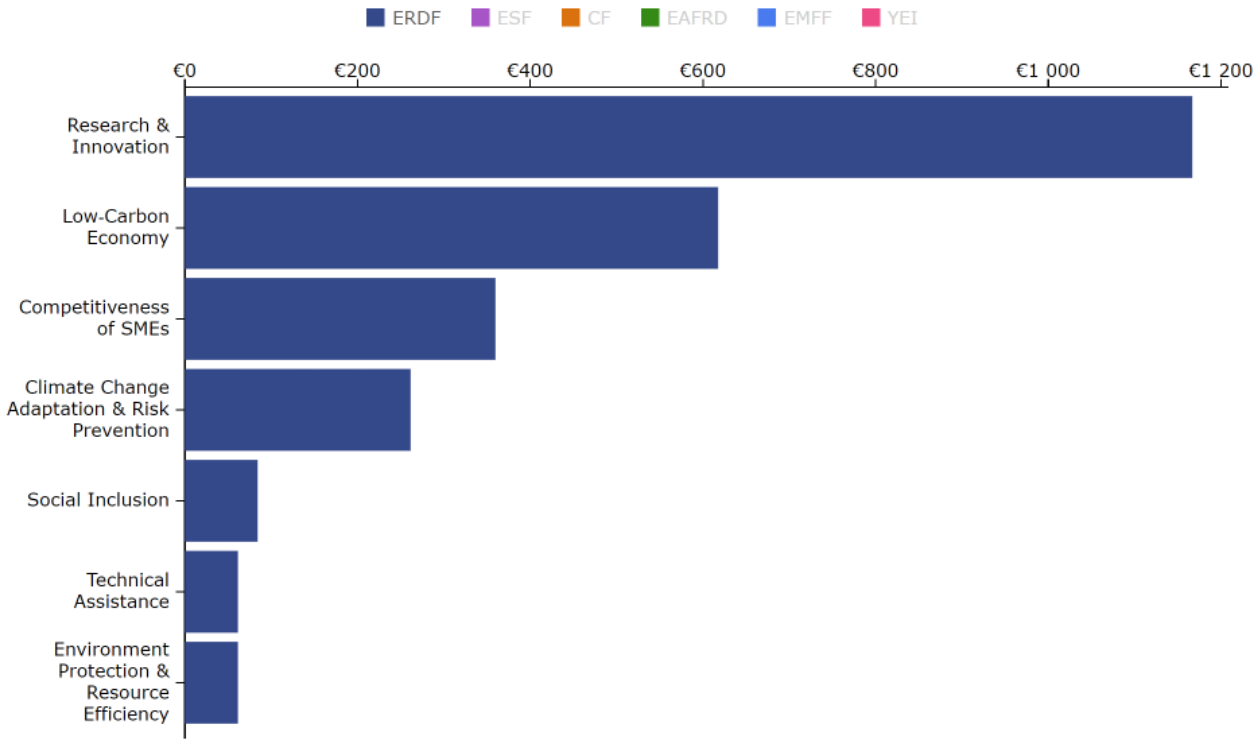


Figure 17 Total Budget by Theme; Sachsen – ERDF (EUR, billion)[34]

The following Figure 18 depict the model of the managing authorities in Saxony, Germany. As shown on the figure, the managing model of the ERDF authorities in Saxony, Germany, follows the 3-level model. This implementation is possible according to the Article 38 (4) (a) and (b). The main responsibilities and activities related to the authorities of each level are as followed[35]:

[33] EU-Regionalpolitik 2019, S. 1.
[34] EU-Regionalpolitik 2019, S. 1.
[35] GEFRA – Gesellschaft für Finanz- und Regionalanalysen 2018, S. 6-9.

ERDF Managing Authorities (according to Article 123 (1) and 125 (1) of the ESI Regulations):

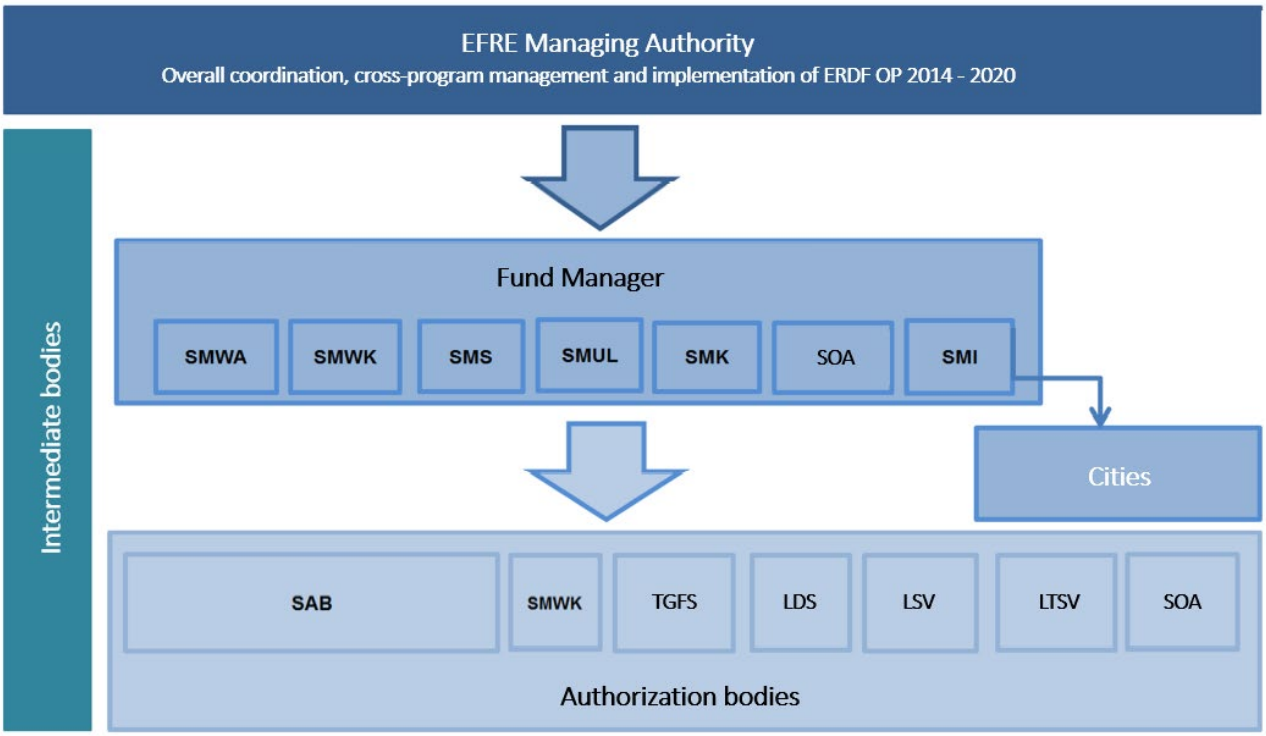
- Overall coordination of the OP;
- Cross-program tasks;
- Control tasks.

Intermediary body – Fond managers[36] (according to Article 123 (6), 125 (1), (2 c), e)), (3 a) till g)), (4 a) till d)) and 132 of the ESI Regulations:

- Support;
- Establishment and description of appropriate management and control systems;
- Adjustment of the operational program;
- Partnership;
- Information and communication;
- Auditing and evaluation.

Intermediary body – Decision maker[37] (according to Article 123 (6), 125 (2 c), e)), (3 a) till g)), (4 a) till d)) and 132 of the ESI Regulations:

- Project-specific and project-related tasks;
- Administrative-supporting function (e.g. consultation, reception of applications etc.);
- Specific application and approval of the project (e.g. examination and assessment of applications for accuracy and plausibility, examination and evaluation of the project-related costs/ expenditure calculations etc.);
- ongoing examination of the projects and the project completion;
- electronic data collection in the course of monitoring and auditing the projects.



[36] In German - Fondbewirtschafter
[37] In German - Bewilligungsstellen

SMWA = Saxon State Ministry for Science and Art
SMWK = Saxon State Ministry of Economics, Labour and Transport
SMS = Saxon State Ministry of Social Affairs and Consumer Protection
SMUL = Saxon State Office for the Environment Agriculture and Geology
SMK = Saxon State Ministry of Culture
SOA = Saxonian Oberbergamt
SMI = Saxon State Ministry for Internal Affairs

SAB = Saxonian Reconstruction Bank
TGFS = Technology Start-up Fund Saxony Management
LDS = Saxony regional office
LSV = State Office for Road Construction and Traffic
LTSV = Saxony state dam administration

Figure 18: Structure of managing authority on ERDF in Saxony, Germany[38]

At federal level

The German development bank KfW offers concessional finance through its renewable energy program. KfW promotional products are available in two forms - as a directly disbursed grant or as a loan. A special form is the loan with repayment subsidy, in which the loan amount do not have to be repaid in full. The aim is to facilitate the use of renewable energies, for example through the construction of photovoltaic, solar collector, biomass and biogas plants, plants for the energetic use of geothermal energy, cogeneration plants and energy contracting. SMEs are one of the target groups of this program. Amongst others, one financing requirement is that the project volume is minimally EUR 100,000, which can be a quite considerable amount particularly for small companies.

The ***"KfW Renewable Energies Program"*** finances low-interest investment measures for the use of renewable energies and for increasing energy efficiency in cooperation with the Kreditanstalt für Wiederaufbau (KfW). This can also be done as part of a project financing. The program is offered as ***"KfW Renewable Energy Program (Standard)"***[39] and ***"KfW Renewable Energy Program (Premium)"***[40].

At regional level

Sächsische Landesbank (SAB) provides the most important financing instruments for SMEs with a focus on energy efficiency at regional level. On the other hand, SAB is one of the authorization body concerning the EU program EFRE and it is responsible on regional level for the implementation of the program as shown on Figure 18.

With the ***"RL Promotion Guidelines for Climate Protection - RL Klima / 2014"***, SAB supports the climate and energy policy goals of the Free State in the region by means of subsidies, in order to reduce CO2 emissions in the long term and tap CO2-saving potentials. To this end, SAB is promoting investments in public infrastructure, including public buildings, to increase energy efficiency and expand renewable energies. Funding will also be provided for projects that include climate protection concepts and instruments. Grants will be made for investment in public infrastructure and preparatory measures to reduce CO2 emissions by increasing energy efficiency. Funding is provided as project funding in the form of non-repayable grants as part or fixed-amount financing. There are different subsidy rates for the program parts. As a supplementary financing option, SAB provides loans for municipal financing / pre-financing.[41]

[38] GEFRA – Gesellschaft für Finanz- und Regionalanalysen 2018, S. 15.
[39] o.V. 2019c, S. 1; GEFRA – Gesellschaft für Finanz- und Regionalanalysen 2018.
[40] o.V. 2019b, S. 1.
[41] SächsABl, S. 1445.

Under the Promotion Guideline ***"Sustainable Energy Supply – RL Energie /2014"***, small and medium-sized enterprises are supported in preparing the energy supply in the region for the future. To this end, the following is being promoted: investments to increase energy efficiency, expand renewable energies, store energy and run smart grids. The funding line promotes projects to increase energy efficiency, use of renewable energy sources and energy storage, model projects on the aforementioned topics as well as on intelligent low and medium voltage distribution systems. Furthermore, application-oriented research projects on innovative energy technologies are eligible. Funding is provided as project funding in the form of non-repayable grants as part or fixed-amount financing. There are different subsidy rates for the program parts depending on the CO2 reduction potential of the respective investment project.

Moreover, SAB supports decentralized electricity storage facilities, which are coupled with a photovoltaic system and the public electricity grid, as well as combined charging stations for electric vehicles. Eligible are the net expenditure for the electricity store and, if applicable, the charging station, including the net expenditure directly related to its construction (for example, for transport and installation services and for inverters for the electricity storage). In-house and used components are ineligible. In addition, all components that are required for the generation and feeding (inverter for photovoltaic systems) of solar power into the public grid are ineligible. The support is granted in the form of a project subsidy as fixed-amount financing (for conventional electricity storage and charging stations) or share financing (for model projects) in the form of a non-repayable subsidy. The donation is composed of the grant for the electricity storage and possibly the charging station.

As yet, only public financial institutions that primarily offer subsidized loans have been analyzed, though, private capital in the form of bank credits remains one of the most important debt instruments for SMEs in Germany.[42] Since private investors usually offer credit programs that are not tied to specific sustainable purposes, it is difficult to examine exactly what role the private sector plays in financing sustainable investments by Saxony's SMEs. Hence, it is also quite impossible to avail data on private debt capital employed in sustainable projects by SMEs. Overall, however, private providers of capital, especially banks, appears to be major actors in financing such initiatives. A study by Rödl & Partner identifies Deutsche Kreditbank, Commerzbank and Unicredit Bank as main capital providers in the EE sector.[43] The study finds also some cooperative banks active in this area such as DZ Bank or GLS Bank. The arguments regarding private banks obviously also apply to them.

2.2.2. Demand-and supply side problems

Theoretically, the optimal amount of capital is made available on the capital market through the interplay of supply and demand and the price mechanism. In fully competitive markets, goods are allocated to the demanders with the highest reservation prices, until that unit that is more costly to supply than the demander is willing to pay for it. However, in practice, at least one of the very restrictive assumption of fully competitive markets is violated and, thus, markets failure or, more specifically, market weaknesses exist. Market weaknesses or economically harmful financing restrictions for companies are present if companies - despite an economically viable business model - do not obtain financing at adequate conditions on the market. In concrete terms, this refers to a lack of financing for projects that in principle have marketable profitability (i.e. whose earnings are higher than the financing costs). The consequences are the failure of economically and environmentally viable projects to materialise, losses in growth, investment or competitiveness. Such market failures can be characterized as supply-side failures, as the cause lies in the provision of sufficient capital to realize green energy projects. Figure 20 depicts a market failure due to supply-side problems. Supply curve 1 represents the private marginal cost (PMC) of providing green finance instruments, whereas the lower supply curve 2 illustrates the social marginal cost reflecting that social costs are lower than private ones due to the cost-compensating positive externality of low-carbon energy generation. The demand curve obviously represents the demand for green energy finance. In this theoretical setting, free markets would result in a socially suboptimal outcome, namely in an insufficient quantity of

[42] Pahnke et al. 2015.
[43] Rödl & Partner 2014.

investments in green energy projects (Q_1). These underprovision of green finance can be compensated with market interventions from the government and other public authorities or financial innovation, reducing the cost of providing finance for green energy investment projects and thus narrowing the gap between the social and private equilibrium quantities.

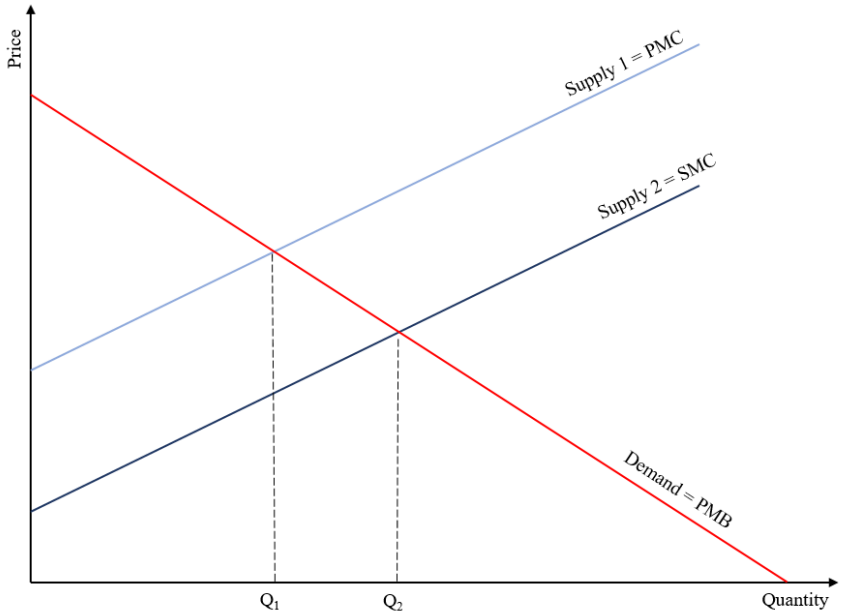


Figure 19: Market failure due to supply-side problems. Own illustration.

It is noteworthy, however, that it is not a market weakness if investment or business projects are flawed in themselves, so that their economic viability is not given. In these cases, the lack of access to financing by companies does not constitute a supply-side induced market failure and, hence, does not justify state intervention in the market.[44] The prevalence of such situations rather indicate demand-side induced market failures. Demand-side problems on the financial market arise when there is sufficient finance available to theoretically achieve the social optimum, but for whatever reason this is not being met.

As outlined in chapter 2.2.1, there are a variety of different financial instruments at the European, national and regional level available to SMEs to finance sustainable investment projects. Unfortunately, it is virtually impossible to estimate where exactly and to what extent supply side problems exist. The large number of different financing options presented rather indicate that the demand side, i.e. Saxon companies including SMEs, is exposed to sufficiently sized supply side. Another argument in favor of this notion is that the European Central Bank (ECB) has injected lots of relatively cheap money into the European financial markets. Further, this protracted low interest rate policy by the ECB has encouraged investors to put their money in relatively risky financial assets. Accordingly, the cause of the underinvestment in carbon efficient projects is probably not simply the extent of funding opportunities and money available.

As part of the research program, Fraunhofer IMW has conducted a survey among Saxon SMEs and other stakeholder on the challenges Saxon SMEs facing regarding sustainable investments. As far as supply-side problems are concerned, the participants do not see a particular problem in the mere extent of the financing offered, but rather in its downstream aspects, such as bureaucracy, regulation and conditions attached. The survey participants do not meet the management capacity requirements and cannot apply for funding just because they lack the time resources to cope with the complex application procedures. Put in economic terms, the transaction costs associated with financing sustainable projects distort the markets resulting in insufficient investment in carbon efficient projects by SMEs. Besides, an often cited problem is that many financing instruments require considerable contributions by the SMEs which they cannot afford. Another factor that may make it more difficult for SMEs to make investments could be excessively high minimum project volumes, which are specified by promoters as a prerequisite for application. For example, support

[44] PwC 2015.

from KfW's renewable energies program requires a minimum project volume of EUR 100,000. For some, especially very small, enterprises this is already a considerable investment and rather a negative incentive to consider such investments. Funding for projects below this threshold is excluded by definition.

Overall, it is evident that there are some supply-side problems that could lead to market distortions and eventually to a market failure. There is a need for approaches and financial instruments tailored to the needs of SMEs that are more transparent, less time-consuming and more accessible than the existing offer.

Despite these supply side problems, the survey also shows that there are indeed several demand-side problems. A respondent questioned the commercial viability of alternative energy projects since prices of conventional sources of energy are still relatively low. While this may be obvious for the time being, it could change in the medium and long run considering public discussions on CO2 taxes and CO2 emission trading schemes. A SME representative acknowledged his insufficient expertise about the energy prices and, in this line, a respondent suggested that responsible people's incomplete knowledge about the possibilities offered e.g. by renewable energy technologies may dampen the demand for it. This negative pressure on the demand is then further amplified when executives have a lack of confidence in the new technologies. All these remarks suggest that asymmetric information could be another cause for demand side driven market failure.

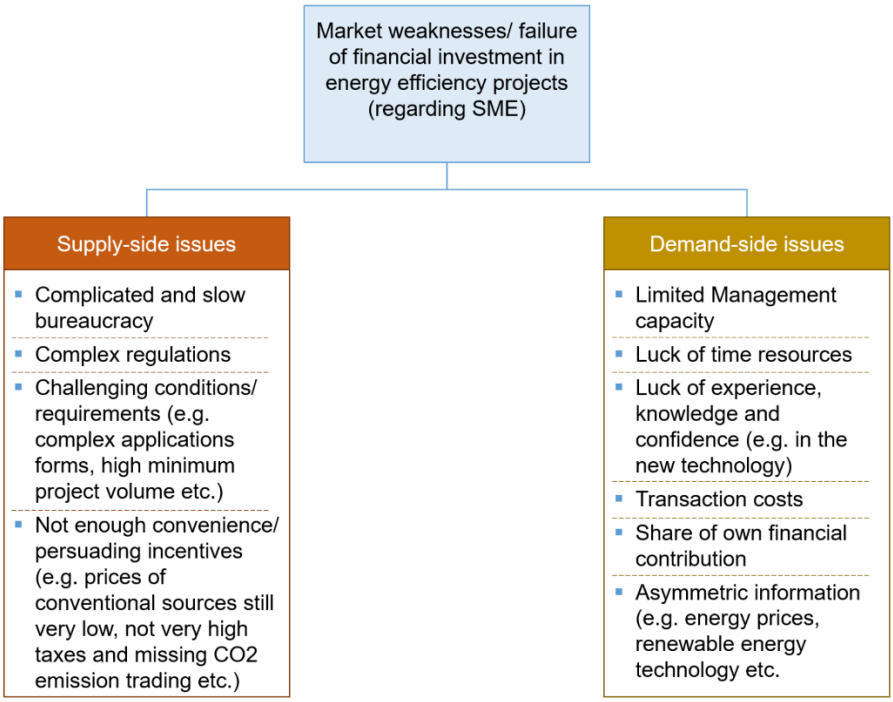


Figure 20: Market weaknesses in the area of SME investment in energy efficiency projects in Saxony, Germany. Own illustration.[45]

[45] Based on own empirical data.

3. Overview of market value added from the alternative financial market

The present chapter gives a short overview of the development of the alternative financial market in general and in Germany specifically as well as the value added of some concrete alternative financial instruments in cases of SME and energy efficiency projects. The goal is to recognize trends and/ or potentials in this market. The results will be used as basics for the next step in the feasibility study for the development of innovative financial instrument, which will be a combination of a traditional financial instrument and the most suitable financial instrument from the alternative financial market.

According to the report of Cambridge center for alternative finance there are 12 types of alternative financial instruments[46]:

- P2P Consumer Lending - Individuals or institutional funders provide a loan to a consumer borrower;
- Invoice trading - Individuals or institutional funders purchase invoices or receivable notes from a business at a discount;
- P2P Business Lending - Individuals or institutional funders provide a loan to a business borrower;
- Real Estate Crowdfunding - Individuals or institutional funders provide equity or subordinated-debt financing for real estate;
- Equity-based Crowdfunding - Individuals or institutional funders purchase equity issued by a company;
- Reward-based Crowdfunding - Backers provide funding to individuals, projects or companies in exchange for non-monetary rewards or products;
- Balance Sheet Business Lending – The platform entity provides a loan directly to a business borrower;
- Debt-based Securities - Individuals or institutional funders purchase debt-base;
- P2P Property Lending - securities, typically a bond or debenture at a fixed interest rate;
- Donation-based Crowdfunding – Donors provide funding to individuals, projects or companies based on philanthropic or civic motivations with no expectation of monetary or material;
- Minibonds - Individuals or institutions purchase securities from companies in the form of an unsecured retail bonds;
- Profit Sharing - Individuals or institutions purchase securities from a company, such as shares or bonds, and share in the profits or royalties of the business;
- Balance Sheet Consumer Lending - The platform entity provides a loan directly to a consumer borrower.

Figure 21 shows the development of this market for the period 2014 – 2017 in the three big regions – Europe, Amerika (incl. US) and Asia-Pacific (incl. China). There is a tremendous growth in all three regions within the four years, but Asia-Pacific region stands out not only with the biggest growth (more than 1500%), but also as the region with the highest market volume. The development of the alternative financial market in the past years could be a sign of the immense potential of this market based on the constant and fast market volume growth. On the other hand, the very different speed of growth of the particular regions could depend on the different stage of development of the single markets. For this reason, we will proceed observing and analyzing the alternative financial market as we concentrate on specific region, country, financial instrument and recipients.

[46] Ziegler et al. 2019, S. 31.

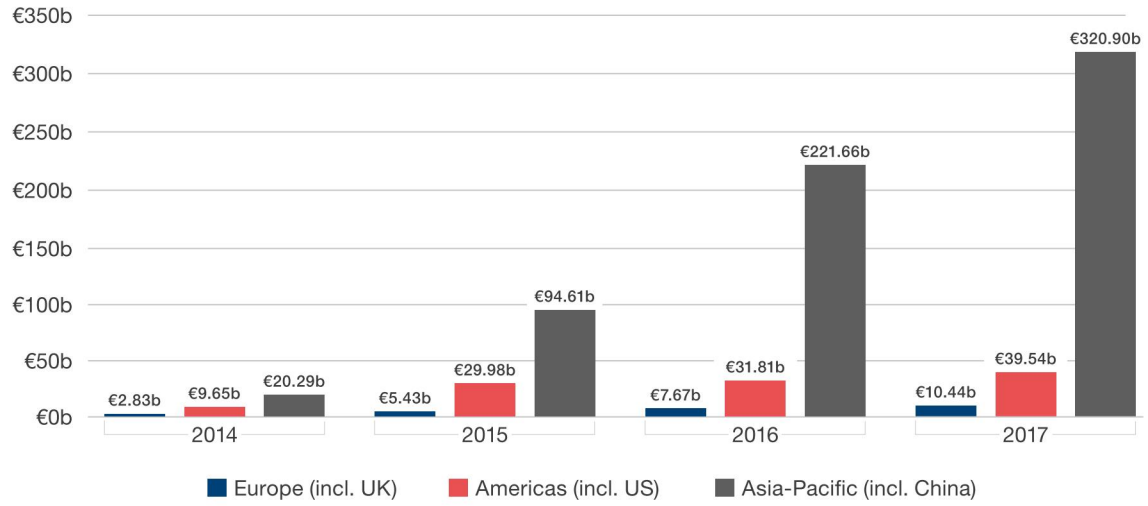


Figure 21: Regional Online Alternative Finance Market Volumes (2014-2017)[47]

As mentioned above the development of the alternative financial market in Europe also shows a vast growth with more than 360% for four years. If we observe the transactions in this financial market in the single European countries, we can conclude that the alternative financial market is on a very different stage of its development (Figure 22). The UK is the country with the most active alternative financial market as the transactions in 2017 are more than 67% of all the registered transactions in this year. The other two countries with the largest amount of transactions in 2017 are France (€ 661,37 m) and Germany (€ 595,41 m).[48]

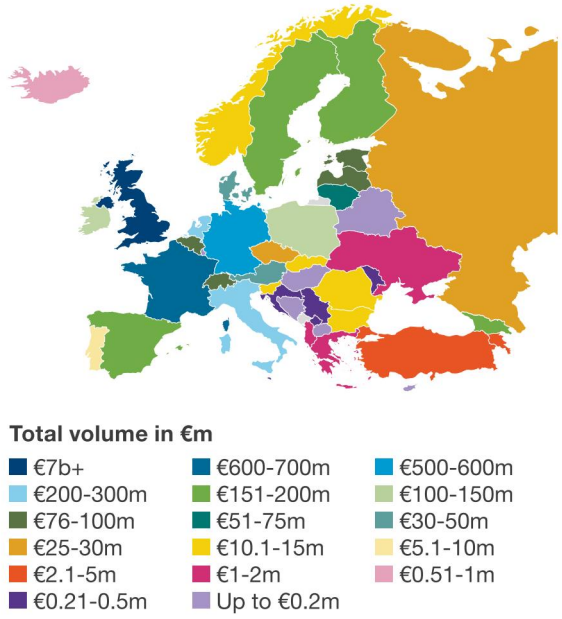


Figure 22: Comparative Market Volumes of Alternative Finance Transactions in the EU (2017)[49]

The next Figure 23 gives an overview of the development of the online alternative financial market volume in Germany for the period 2013-2017. The growth is variable but there is a constant growth with more than 900% for the five years period time. This fact can be a proof that there is still a huge potential in this market.

[47] Ziegler et al. 2019, S. 23.
[48] Ziegler et al. 2019, S. 142.
[49] Ziegler et al. 2019, S. 26.

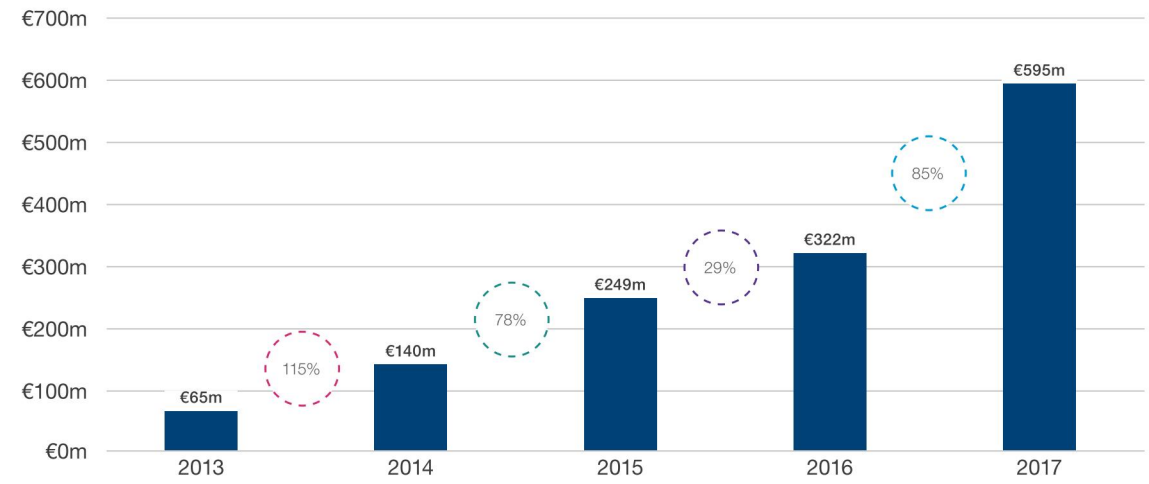


Figure 23: Germany Online Alternative Finance Market Volumes 2013-2017 (€, millions)[50]

The following two figures depict the volume of the specific online alternative financial market in Germany (Figure 24) as well as the three countries with the highest volume per specific financial instrument (Figure 25). According to the two figures the financial instruments with the largest market volume in Germany are the different forms of lending (even in front of France), followed by the two other alternative financial instruments – equity based and reward-based crowdfunding. Before we continue with the analysis of the specific financial instrument and their market volume in Germany concerning SME and energy efficiency projects we will use the determined 12 alternative financial instruments in the Cambridge report as basics and present a short definition and description of the most known alternative financial instruments in Germany.

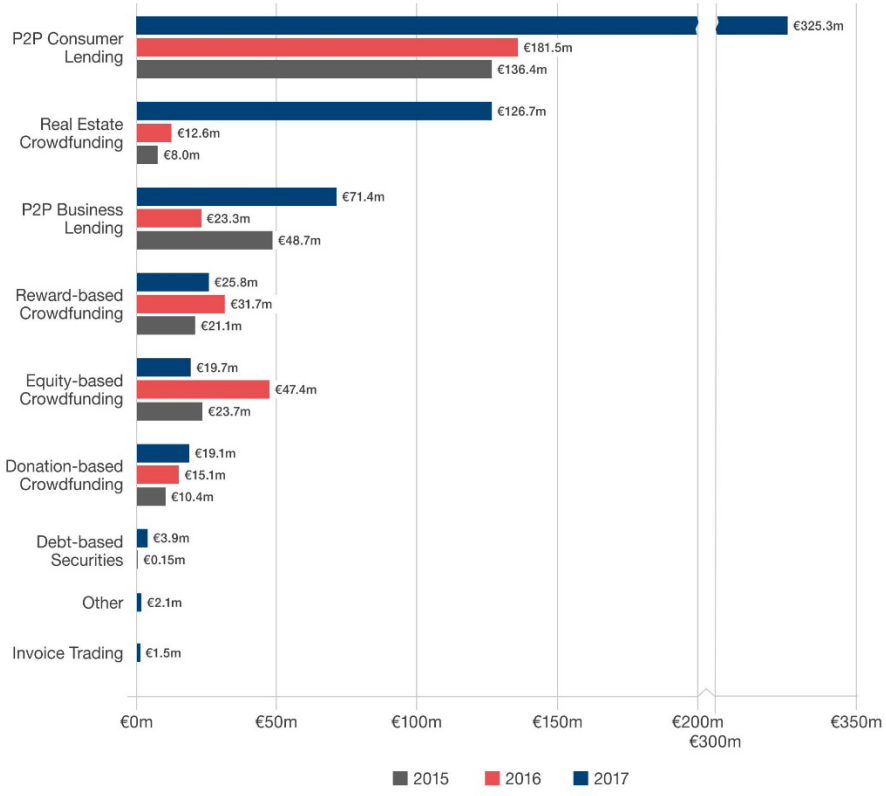


Figure 24: Total Alternative Finance Volume by Model in Germany 2015-2017 (€, millions)[51]

[50] Ziegler et al. 2019, S. 67.
[51] Ziegler et al. 2019, S. 68.

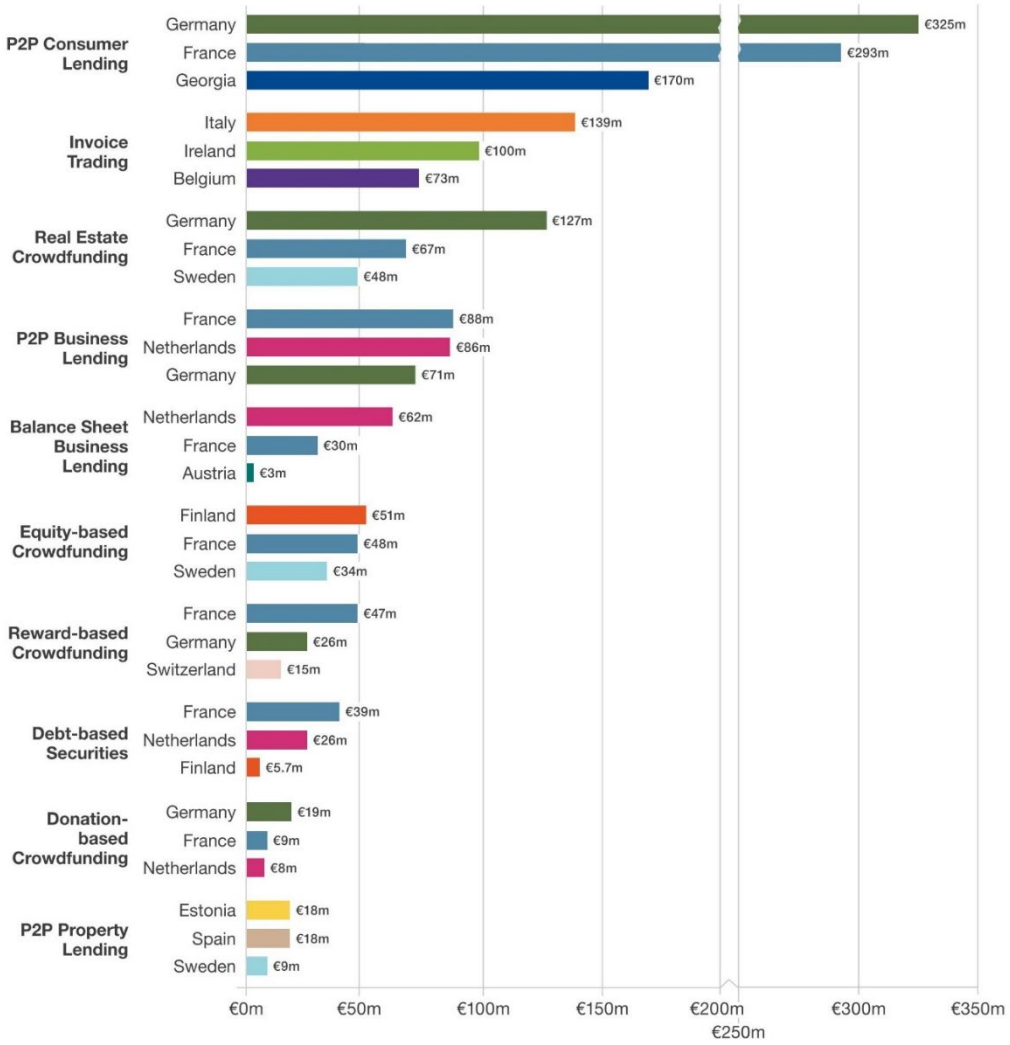


Figure 25: Top Three Countries by Key Models (2017)[52]

Four forms of crowdfunding are most know in the recent years in Germany. This differentiation is based on the consideration and motivation of the project supporters so that there can be recognized crowdfunding (reward based), crowdinvesting (equity based), crowdlending (lending based) or crowd donations (donation-based). The frequent general use of the term crowdfunding can therefore lead to misunderstandings.

The oldest and most popular form is ***reward-based crowdfunding***.[53] In this form, the crowd gives money for projects or entrepreneurship initiatives and is the first to receive the product or another form of consideration, such as vouchers and discounts as an appreciation gift.[54] In this case, the supporters can be product testers or feedback providers who can help to improve the crowdfunding project.

Equity-based crowdfunding is another form that often is referred to as crowdinvesting because it is typically bond-like investments granted to the equity capital of the crowdfunding project.[55] Due to legal obligations, the supporters get mezzanine financial instruments such as subordinated loans, profit participation rights or silent participations and no traditional shares are offered.[56]

[52] Ziegler et al. 2019, S. 35.
[53] Cholakova and Clarysse 2015.
[54] Xu et al. 2014.
[55] Ahlers et al. 2015.
[56] Hornuf and Neuenkirch 2016.

Credit-based (lending-based) crowdfunding is a third form. These projects collect money from supporters through debt-like instruments, meaning they offer an interest on the invested money after a certain period of time.[57]

The fourth form is ***donation-based crowdfunding***, in which the supporters provide financial resources for interesting product developments or projects, without expecting a material or financial return in return. It is accordingly very similar to finance certain creative and humanitarian projects as they are classic, non-profit donation.

Our research of the online platforms of the alternative financial instruments in Germany shows that the two forms of crowdfunding – lending-based and equity-based, are the financial models most used for financing SME (the reasons for the financing are very different) and energy efficiency projects. Unfortunately, there is not a reliable information as overview of the crowdlending market volume in Germany for these two specific cases. Therefore, the rest of the chapter will present the development of the crowdinvesting (equity-based crowdfunding) market in Germany and specifically in the case of financing SME and energy efficiency projects.

Figure 26 shows the amount of the online platforms using the model of crowdinvesting in Germany and through the specific platform at least one project in Germany was funded. It is clear, that the amount of the platforms raises continuously in the long term, but we also observe that every two years the growth is noticeable between 30% and 50%.

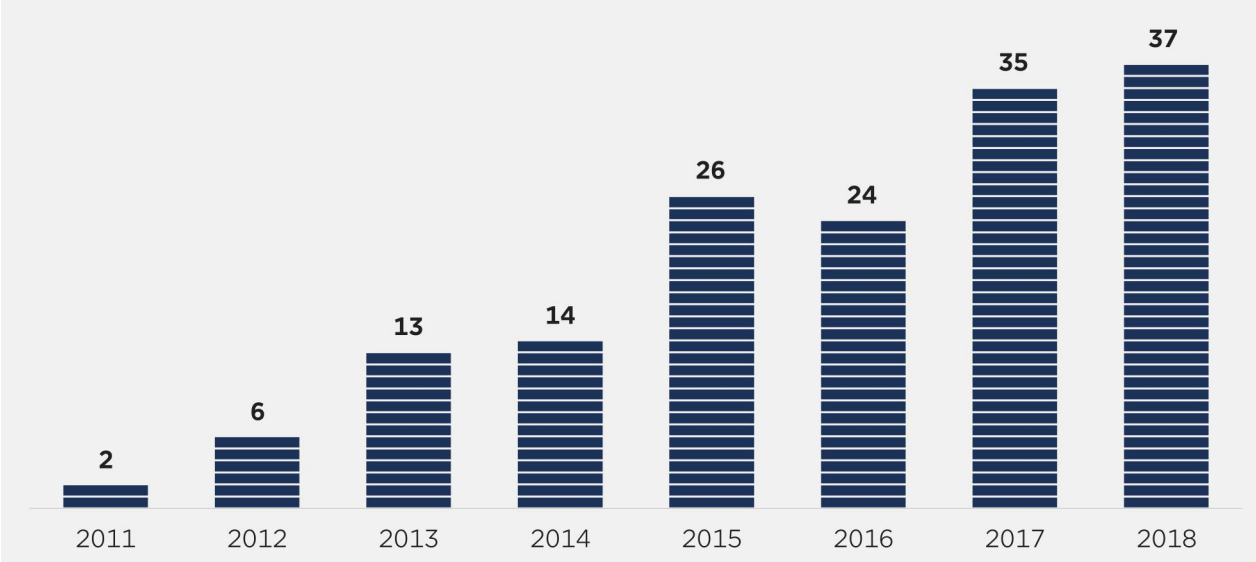


Figure 26: Crowdinvesting Platforms in Germany[58]

This development leads to a market volume of this alternative financial instrument up to more than € 297,3 m in total in 2018.[59] The largest share belongs to financing real estate projects (€ 210,7 m) and the rest are divided between financing SME (around € 80,4 m) and energy efficiency projects (around € 6 m). The highest share is a result of the tremendous and very quick growth of the market volume by real estate projects (Figure 28). It should be mentioned, that there are also other German crowdinvesting platform (e.g. Companisto), which are not included in the Figure 27, because their business model is a little bit different from the classical crowdinvesting model or as mentioned above the raised money are for financing projects, which are not in Germany.

[57] Koch and Cheng 2016.
[58] crowdfunding.de 2019, S. 15.
[59] crowdfunding.de 2019, S. 16.

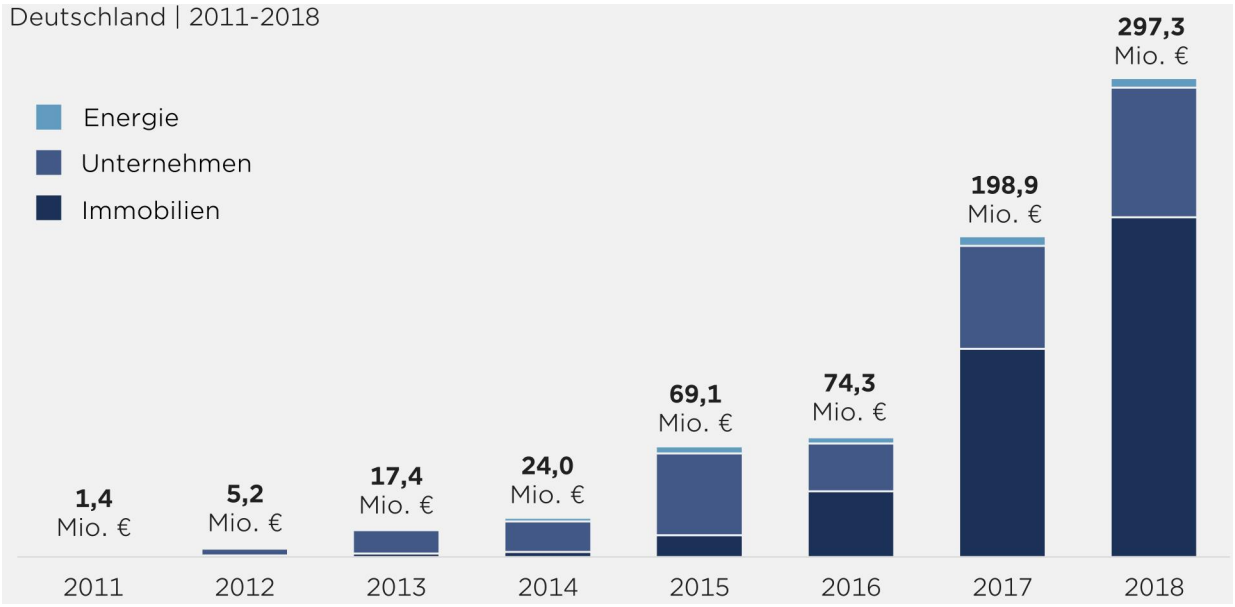


Figure 27: Development of Crowdinvesting market per topic in Germany[60]

The development in the other two cases is also not to be underestimated. Figure 29 gives a better overview of the development of the crowdinvesting market by funding energy efficiency projects. It is to be recognized that such a funding for energy efficiency projects starts two years later compared to the other two cases. It is also obvious that with two small exceptions (in 2016 and 2018) the market volume doubled almost every year, which is a sign of a still very young market with a very high potential. Another interesting fact is that many international projects were funded through nine German equity-based crowdfunding platforms.[61] In 2018 the funded amount for energy projects through those online platforms were € 4,8 m, which are not included in the Figure 29, because the figure shows only funded energy projects in Germany. This fact can also be a very good argument for giving attention of this alternative financial instrument for funding energy projects, because it proofs that the location is not a crucial premise by deciding for crowdinvesting.

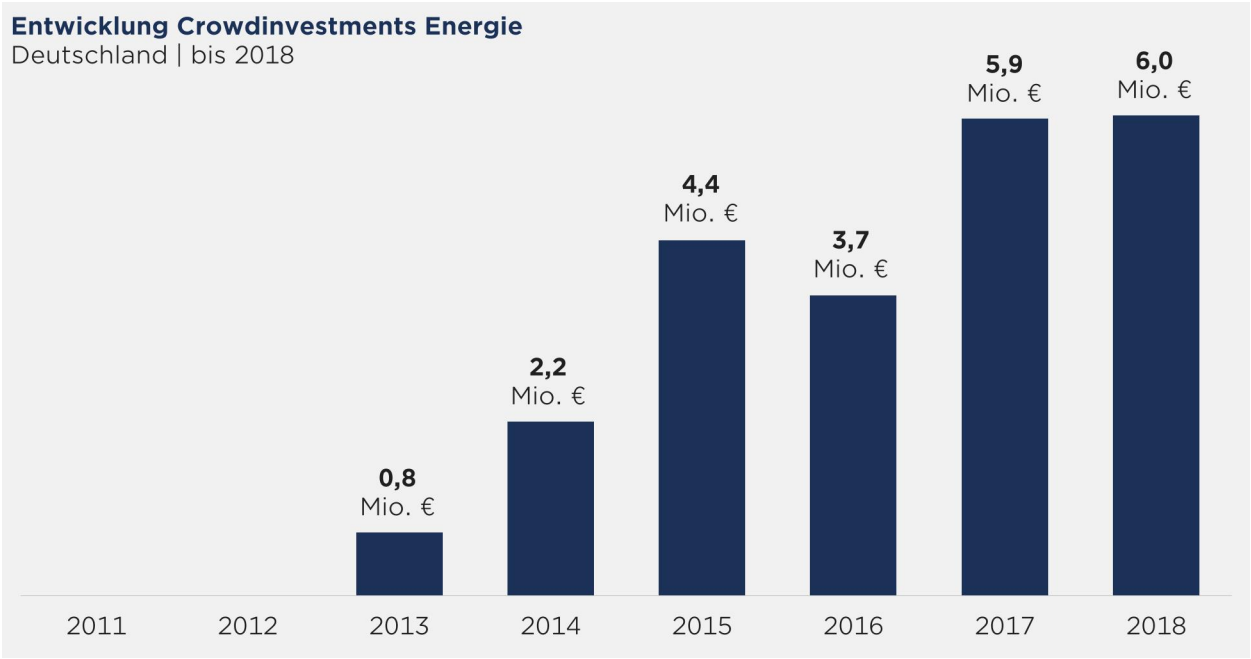


Figure 28: Development of Crowdinvesting in Germany (Energy)[62]

[60] crowdfunding.de 2019, S. 4.
[61] crowdfunding.de 2019, S. 13–14.
[62] crowdfunding.de 2019, S. 13.

Another argument for paying attention of this financial instrument is the appearance of three new crowdinvesting platforms for financing green projects in 2018 (Klimaschwarm, AuditCapital and CrowdPartner).[63] Their development is very different but one of them (Klimaschwarm) is straight on second place in 2018 by realized volume 1,4 m Euro compared with 1,51 m Euro of the volume leader in this area LeihDeinerUmweltGeld. Some other crowdinvesting platforms specialized in financing energy efficiency projects are also showing reliable results with a volume growth by more than 40% compared to results in 2017 (Greenvesting +58,4% and Econeers +42%). In spite of that, some crowdinvesting platform experienced some negative development like WiWin, Bettervest and greenXmoney. The volume on this platforms in 2018 was significant lower compared with the year before (between -78% and -87%). Nevertheless, those platforms managed to finance environmental projects for respectively 500.000 Euro, 100.000 Euro and more than 45.000 Euro. In total, the market volume 2018 of crowdinvesting financing for green projects in Germany is 6 m Euro, which has a growth of 0,6% compared to 2017. As already mentioned, this market has the smallest market share but is also the youngest one of the observed markets, which could be an argument for the still slight market share.

[63] crowdfunding.de 2019, S. 14.

4. Lessons learned

The present Ex-Ante Analysis give a brief overview of the financial market situation in Saxony, Germany, regarding the financing possibilities for SMEs investment in energy efficiency measures. The structure of the analysis trace the regional development starting with general macroeconomic indicators through indicators for regional energy supply and energy efficiency and going deeper and more concrete by investigating the currently available financial instruments for low carbon measures in Saxony, as well as empirical assessment of the existing obstacles with regard to different regional stakeholders (e.g. SME, financial institutions, managing authorities etc.).

On macroeconomic level, there is a positive economic development in a long-term in Saxony, Germany. The state has a leading position compared to the other new German federal states in this regard, but still can not be compared with the average national level by some of the indicators. A strong feature for Saxony is the remarkable role of SMEs by the regional economic development, though. As an employer, innovator and catalyzer for regional development, the further expansion of the SME culture in Saxony should be additionally supported and fostered. This include also the financial support, because as the analysis has shown, Saxony still has to catch up regarding investments and capital stock, when compared to the national average.

Observing the energy supply in Saxony and the energy efficiency indicators, a positive trend can be recognized in direction energy supply through renewable energy sources and increased energy efficiency. National and regional politic have the same opinion and recognize the importance of this topic for the regional development. Ambitious goals are settled and many stakeholders are involved so that the goals can be reached. The indicators observed in this Ex-ante assessment show the positive development in this area, but also that there is still potential for further improvements. The specific of the mentioned strong SME culture in Saxony should be also taken into account by realizing the goals. In this context, reaching these goals could not only mean sustainable regional development, but also competitive advantages for the regional SMEs.

As just mentioned, the recognition of the important role of the low carbon economy is recognized on all administrative levels. This conclusion can be also taken regarding the various financial instruments, low carbon measures and financial institutions that support the realization of this main aim. Our analysis prove that the supply side offers a large range of financial products especially for SMEs in this context. However, the empirical assessment reveals that there are some weaknesses, which interfere the implementation of the available financial instruments and therefor partly the realization of the main aim. The recognized weaknesses will be used as starting point by the development of an innovative financial instrument during the pilot action 1 (D.T2.4.1) within the FIRECE project. The goal of the pilot action 1 is to find a solution how some or all of the weaknesses recognized on regional level can be overcame and develop an innovative financial instrument suitable for the specific regional feature and context.

Keeping in mind, that the following step is the development of an innovative financial instrument the decision was taken not only to observe the regional development in Saxony within the Ex-ante analysis, but also to take a brief overview of the development of the alternative financial market. By doing so, another aspect were considered namely the combination of traditional und alternative financial instruments. This consideration was confirmed by the observed positive and promising results concerning the development of the alternative financial market on international, European and national level and the recognized possible potentials. Such a potential is recognized especially on European and national level as well as in the area of financing energy efficiency projects.

Summing up, the overall situation in Saxony is favorable for intensive implementation of low carbon measures. There is a certain financial amount available (not only through traditional financial instruments, but also considering alternative financial instruments) for SMEs as financial support to boost the process of implementation of low carbon measures and developing low carbon economy. Nevertheless, some market weaknesses on the supply but also on the demand side do not allow the efficient use of all the available financial resources.

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