DIA-CORE POLICY BRIEF

Investment risks for renewable energy projects – the case of onshore wind power

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Key Messages

- ✓ **Across all EU member states, risks related to support systems and policy design are perceived as most pressing.** Stakeholders ranked policy design risk as the most important risk, relating to the competitiveness of renewable energy sources compared to conventional sources. The support system is the most important instrument used to mitigate risks related to electricity price and demand.
- ✓ **Risk profiles differ across EU member states.** Countries from the same region or with similar market development status share a similar risk profile. For example, in southern European markets, financing risks are pressing, whereas this is less important in north-western countries. Notably, in most cases policy design risk remains most important and does not vary significantly between regional groups.
- ✓ **Low capital costs drive the deployment of renewables.** The analysis shows that the cost of capital varies between member states. As renewable energy technologies such as wind onshore require high upfront investments costs, capital costs significantly influence the business case of such projects. According to the interviewed experts, the weighted average cost of capital varies significantly, for example between 3.5% in Germany and 12% in Greece.
- ✓ **A lower cost of capital can outweigh the disadvantage of having scarce natural resources.** For example, a country like Greece has a higher solar irradiation than Germany, which results into production costs for solar power being lower in Greece than in Germany. However, taking into account that such investments have to be financed and that they have high upfront investment costs, the cost of capital can reverse this advantage of having better natural resources.

Launched in April 2013, DIA-CORE is carried out under the Intelligent Energy Europe programme. Its main objective is to ensure a continuous assessment of the existing policy mechanisms and to establish a fruitful stakeholder dialogue on future policy needs for renewable electricity (RES-E), heating & cooling (RES-H) and transport (RES-T). Thus, DIA-CORE seeks to facilitate convergence in RES support across the EU and to enhance investments, cooperation and coordination.

1 Background and model results

Background

What risks are influencing investments in renewable energy? How do these differ between EU member states? How can policies be used in order to reduce these risks and stimulate investments?

In this policy brief, insights into the risks that influence investments in renewable energy are given. Moreover, possible measures to mitigate these risks are identified.

A model is used to construct risk profiles for each EU member state. These risk profiles consist of nine risk categories (see Table 1) that can influence investments in renewable energy projects. For each member state, the impact of these risk categories is estimated based on financial models, scientific literature and existing studies. To check whether they reflect reality, these profiles have been evaluated during interviews with bankers, equity providers and project developers. Over 60 interviews have been conducted, covering 26 EU member states.[1] Based on these interviews, the country risk profiles are being finalised.

Besides testing the risk profiles, the interviews are also used to check the model assumptions and to evaluate the effectiveness of current policy measures to decrease investment risks.

Table 1: Overview and description of risk categories

Risk category	Description
Baseline rate (country risk)	Country risks refer to a set of factors that can affect adversely the profits of all investments in a country. These factors include political stability, level of corruption, economic development, legal system and exchange rate fluctuations. The sovereign debt rating to reflect country risks and compare countries with each other.
Social acceptance risks	Lack of social acceptability of renewable energy investments can cause investment risks. Mostly, this is related to negative impacts on RES installations that are perceived as NIMBY (Not In My Back Yard) effects, but it can also be related to the extent by which local communities will benefit from the project or lack of awareness on the positive effects of renewable energy. Moreover, resistance could arise due to increasing costs of RES that are paid by final consumers. Overall, social acceptance risks are defined as risks of refusal of RES installations by (a part of) civil society.
Administrative risks	In order to construct and operate a power plant, developers must obtain several permits. The total time required to obtain these is referred to as administrative lead time. Among the Member States administrative procedures can vary depending on the complexity and time required to get permits and licences[2]. For instance, as reported by EWEA (2010) administrative lead times to obtain permits can vary significantly, depending on the country and the project, ranging from 2 to 154 months. Increased lead times could be due to the absence of clear, structured procedures and mechanisms, but also to corruption.
Financing risks	The infrastructure required to generate power from renewable sources is capital intensive. For renewable energy almost all of the investments take place in the first stage of development. This requires the availability of capital such as equity, but also public financing support such as grants and soft loans enabling investments in the Member States. If this is not available, this can lead to capital scarcity. Main reasons for capital scarcity are under-developed and unhealthy local financial sector or global financial distress. Furthermore, limited experience with renewable energy projects combined with tighter bank regulations (Basel 3) could result in inability of developers to finance their projects. Risks that arise from the scarcity of available capital, are called financing risks.

[1] In all EU member states financial experts have been contacted and interviewed. Only for Luxembourg and Malta the project team did not manage to conduct interviews.

[2] For more information, please refer to the following websites: PV LEGAL (http://www.pvlegal.eu/nl/home.html), PV GRID (http://www.pvgrid.eu/home.html) and wind barriers (www.windbarriers.eu)

Technical & management risks	Technical and management risks refer to the availability of local knowledge and experience and to the maturity of the used technology. Uncertainties arise due to lack of adequate resource assessment for future potential or the use of new technologies. The probability that a loss will incur due to insufficient local expertise, inability to operate, inadequate maintenance of the plants, lack of suitable industrial presence and limitation of infrastructure are parameters that are included in technical and management risks.
Grid access risks	To become operational, the RE projects should be connected to the electricity grid. This process includes the procedure to grant grid access, connection, operation and curtailment. The convenience of connecting is influenced by different factors, such as the capacity of the current grid, the possibilities for expansion, planned reinforcements and whether the connection regime allows for RE priority. If this is all well regulated, new RE project can be connected to the grid at low risk. However, in the case that the conditions are less convenient and grid connection lead times are long and the connection procedure is unclear, grid access risks can be seriously affecting the project. Often, these risks are due to an inadequate grid infrastructure for RES, suboptimal grid operation, lack of experience of the operator and the legal relationship between grid operator and plant operator.
Policy design risk	Support mechanisms are needed for renewable sources to be competitive, as there is still a cost gap between renewable and conventional energy technologies. Each Member State decides individually for their support mechanism provided via policies. Policies aim to mitigate risks mainly related with electricity price and demand. The design characteristics of every policy indicates the degree of effectiveness of this risk mitigation.
Market design and regulatory risks	Market risks refer to the uncertainty regarding government energy strategy and power market liberation. Fair and independent regulation implies that electricity market regulation safeguards that RES-producers have non-discriminatory access to the market. Examples of risk-increasing barriers are legislation hindering participation of IPPs, incomplete unbundling or a lack of an independent regulatory body.
Sudden policy change risks	Sudden policy change risks refers to risks associated with drastic and sudden changes in the RES strategy and the support scheme itself. In the worst case, this could imply a complete change or abandoning of the present RES support scheme or retroactive changes in the RES support scheme. Policy change risks are defined as the risk of any unexpected, unanticipated, short-term announced or sudden changes of policies or policy design features.

Model results

An investment risk constitutes the possibility that the realised return of the investment is lower from what has been initially expected. An investor will demand higher return in order to invest in a risky project that has high possibility for losses. This trade-off between risk and return is a widely accepted framework in financial decision-making.

The risk assessments made by the investor is reflected in the **cost of equity**. This refers to the minimum required rate of return that investors demand in order to provide their capital to fund a project or company. Besides investors, projects depend to a large extent on financing from banks and other financial institutes. They will make a similar risk assessment upon lending capital for the project, which is reflected in the **cost of debt**.

Renewable energy projects require high upfront investments, which means that most projects are financed using a combination of both **equity** and **debt**. The costs that are accompanied with attracting capital are reflected in the **weighted average cost of capital (WACC)**. As mentioned above, both equity and debt providers will demand an interest for their investment. The interest rate will differ between providers, but in general the cost of debt is lower than the cost of capital. The weighted cost of capital will therefore depend to a large extent on the ratio between the share of debt and the share of equity. Thus, it represents the average interest rate, against which the project is financed.

The cost of equity is used as a proxy to the overall investment risk. It is estimated for each EU member state. To this end, existing modelling approaches[3] are used together with financial information and data

[3] This includes the dividend growth model and the capital asset pricing model. For more information, please consult the full report.

from literature. Subsequently, the overall risk is broken down into the above-mentioned nine risk categories. For this, data from an existing database on country-specific barriers to the realisation of renewable energy projects are used.

The modelled costs of equity are shown in Figure 1.

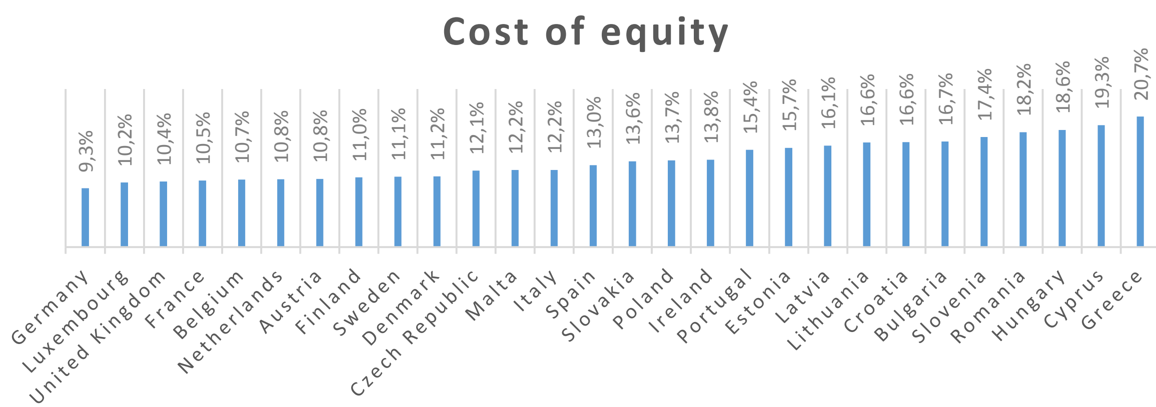

Figure 1: Cost of equity of renewable energy projects in the EU-28 (own calculation)

Based on these results, risk profiles are constructed for each member state, in which the total cost of equity is allocated to the above-mentioned risk categories. These graphs are shared with financial experts during interviews to test whether the model reflects reality. An example of such graph is presented in Figure 2.

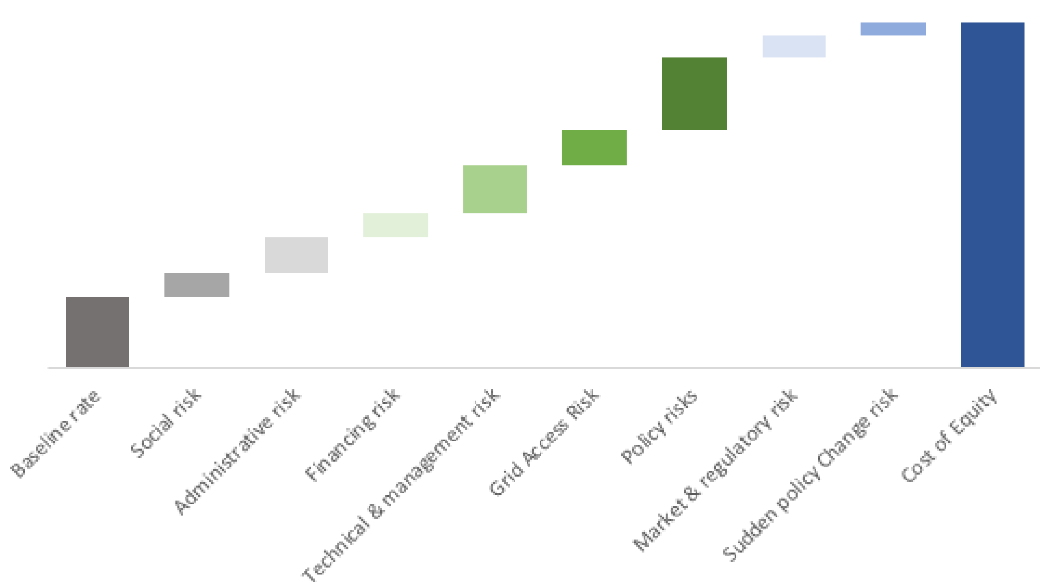

Figure 2: Example of country risk profile

2 Interview results

Numerous equity providers, project developers and bankers have been approached and invited for an interview. The aim of these interviews has been fourfold: check whether the identified risk categories are covering all risks, evaluate the modelled risk profile to see to what extent they hold in practice, evaluate the effectiveness of policy in reducing investment risks and finally check important model assumptions.

Most significant risk categories

In the interviews, financial specialists have been asked to indicate what risk categories would exert the most influence on investments in renewables (excluding country risk). The results of this interview question are given in Table 2.

Table 2: Impact of risk categories according to interviewed financial experts

Risk Categories (Level of Impact – descending order)	Frequency (%)
Policy design	27%
Administrative	17%
Grid access	13%
Sudden policy change	11%
Social acceptance	10%
Market design & regulatory	10%
Financing	7%
Technical/Management	5%

Policy design, administrative and grid access risks are considered as the risk categories exerting the most significant influence on investments according to the interviewed stakeholders. Although results vary among EU member states, these three categories are mentioned as being the most influential risk components in almost all member states.

Risk perception

The following graph gives an overview on how market actors in 24 out of 28 EU member states rank the aforementioned risks to onshore wind power projects. To make this visible, the highest ranked risk per member state has been awarded 8 points, while the lowest ranked risk has received 1 point. The results are illustrated in Figure 3.

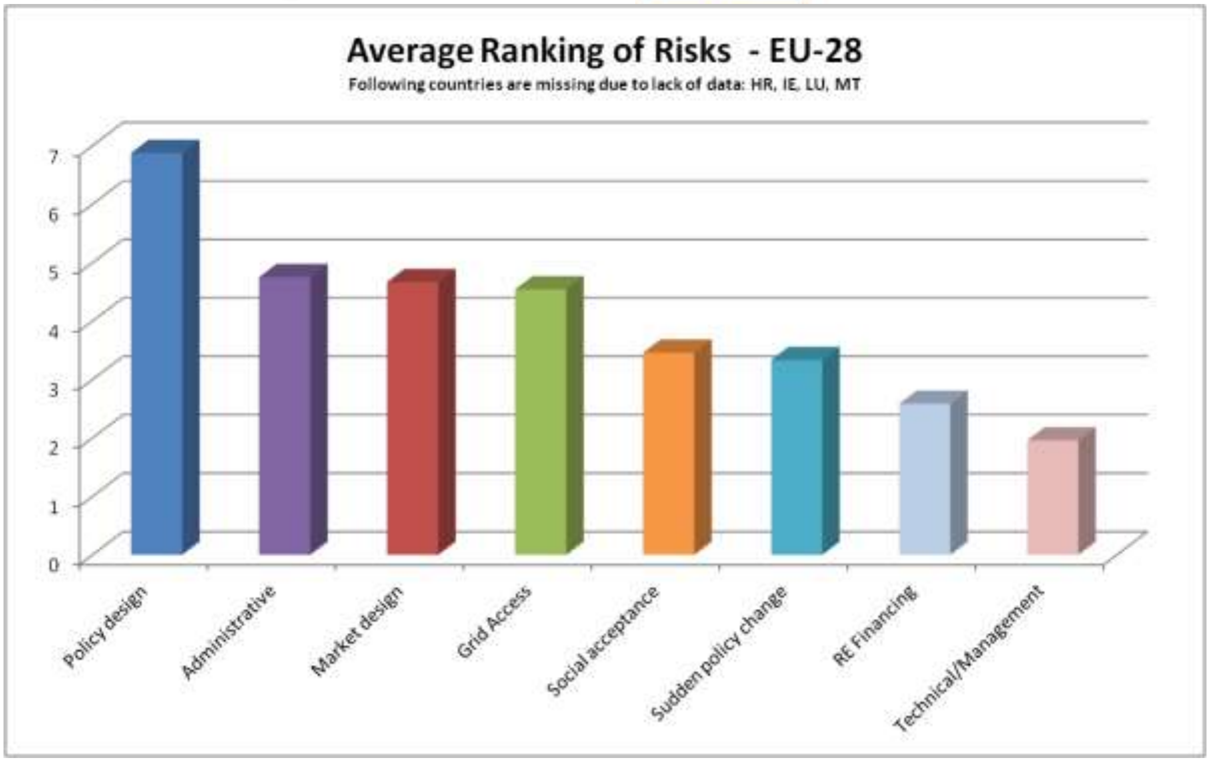

Figure 3: Average ranking of risks to onshore wind power projects across 24 EU member states (interview results)

By comparing the ranking in each of the EU member states, an overall assessment across markets is possible. The graph shows that on average policy design risks are perceived as the most pressing risk to onshore wind power projects across the EU. We can derive from this very high ranking that the design of the support system is still one (if not the key pre-requisite) for stable investment conditions. Several interviewed experts refer to the policy design accordingly as being "the rules of the game", meaning that the policy design is the most important factor influencing the RES investment environment. As policy design can be shaped in any way possible, none of the EU member states' designs are exactly the same. It is therefore interesting to see that despite these differences, the policy design risks are ranked that high. A group of risks concerning administrative issues, market design and grid access follow at a relatively equal level. The third group of risks consists of social acceptance, sudden policy change and financing risks. The risks in this group have in common that they are considered very critical in some markets while they are not relevant in other markets. Technical and management risk is ranked least important, despite the fact that resource risk is considered as a pressing issue. This challenge, however, is counted in most markets as part of the policy design.

In Table 1, the top-3 of highest ranked risk categories for wind onshore projects are presented per member state. This table allows for a more in-depth comparison between member states. The ranking reveals some meaningful details: The risk category "Sudden policy change" appears in the top-3 for many Eastern European member states (Czech Republic, Bulgaria, Hungary, Slovenia, Latvia, Slovakia), and the risk category "Financing" appears in the top-3 for many Southern EU member states (Cyprus, Greece, Portugal, Romania).

Table 1: Top-3 ranked risk categories per EU Member State

Member state	Rank 1	Rank 2	Rank 3
Austria	Grid access	Market & regulatory	Administrative
Belgium	Administrative	Grid access	Sudden policy change
Bulgaria	Policy design	Sudden policy change	Grid access
Croatia	-	-	-
Cyprus	Financing	Administrative	Policy design
Czech Republic	Sudden policy change	Policy design	Grid access
Denmark	Policy design	Social acceptance	Market & regulatory
Estonia	Administrative	Policy design	Technical & management
Finland	Administrative	Grid access	Policy design
France	Market & regulatory	Policy design	Social acceptance
Germany	Policy design	Technical & management	Administrative
Greece	Policy design	Financing	Social acceptance
Hungary	Policy design	Sudden policy change	Grid access
Ireland	-	-	-
Italy	Administrative	Policy design	Grid access
Latvia	Technical & management	Financing	Sudden policy change
Lithuania	Policy design	Social acceptance	Technical & management
Luxembourg	Policy design*	Administrative*	-
Malta	Administrative*	Policy design*	-
Netherlands	Policy design	Administrative	Social acceptance
Poland	Social acceptance	Policy design	Administrative
Portugal	Market & regulatory	Policy design	Financing
Romania	Policy design	Financing	Grid access
Slovakia	Grid access	Policy design	Sudden policy change
Slovenia	Administrative	Sudden policy change	Market & regulatory
Spain	Policy design	Sudden policy change	Market & regulatory
Sweden	Market & regulatory	Policy design	Social acceptance
UK	Administrative	Policy design	Grid access

* based on model results as no interviews could be performed for Luxembourg and Malta

The comparison of the top 3 ranked risks indicates that some risk categories such as financing or sudden policy risk appear in certain regions of the EU more frequently than in others. These average values are illustrated in Figure 4.

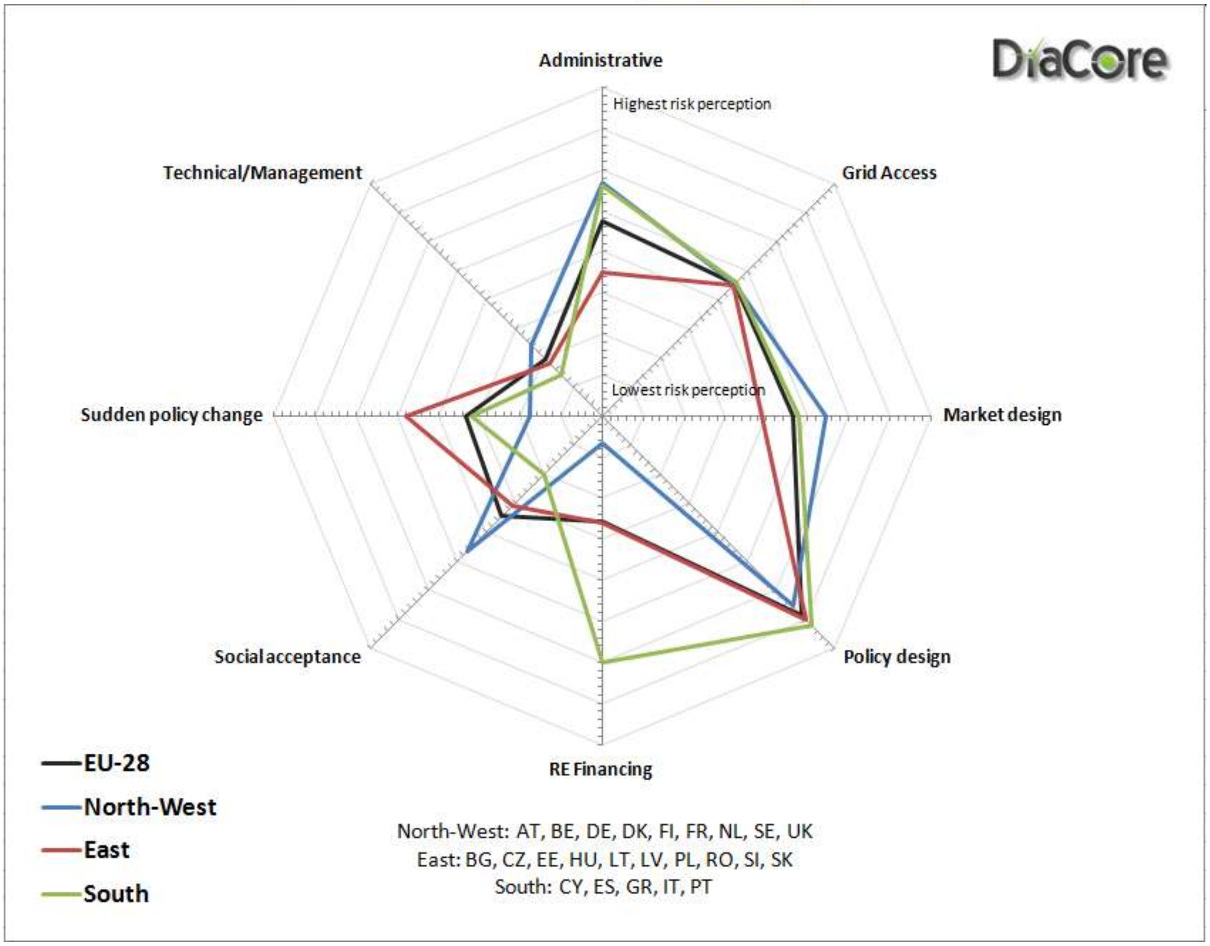

Figure 4: Risk comparison of north-western, eastern and southern EU member states (interview results)

When comparing the regions, the graph shows that there is no difference in the perception of grid access risks and a relatively small difference for policy design risks. Starting with the latter, it was already indicated that EU-wide policy design risks are perceived as the most important risk factor.

The graph also shows differences between the regions, with the biggest being the risk category financing. As mentioned above, financing is a less important issue in the north-western region, but for southern countries it is perceived as the most pressing risk after policy design. One explanation is that the financial crisis of the last years has had severe effect in particular on southern EU member states. The crisis reduced the access to credits and, as a result, makes wind power investments more risky in regions that have been hit by the financial crisis. Another remarkable result is the different perception of social acceptance risks, which rank the highest in north-western countries. The market design risk seems also to be more important in north-western countries, which could indicate that current market design and regulations are no longer fulfilling the needs of the renewable energy project developers particularly in that region. Sudden policy change, on the other hand, is reported as the most pressing risk in the eastern region.

Financial parameters

An important parameter indicating the investment climate in a country is the Weighted Average Cost of Capital (WACC). As part of the model, the WACC has been estimated for each EU member state. During the interviews, country experts have been asked to comment on the modelled outputs of the financial parameters. These comments are illustrated in Figure 5 using arrows. These indicate whether the modelled values should be higher/lower or are about right.

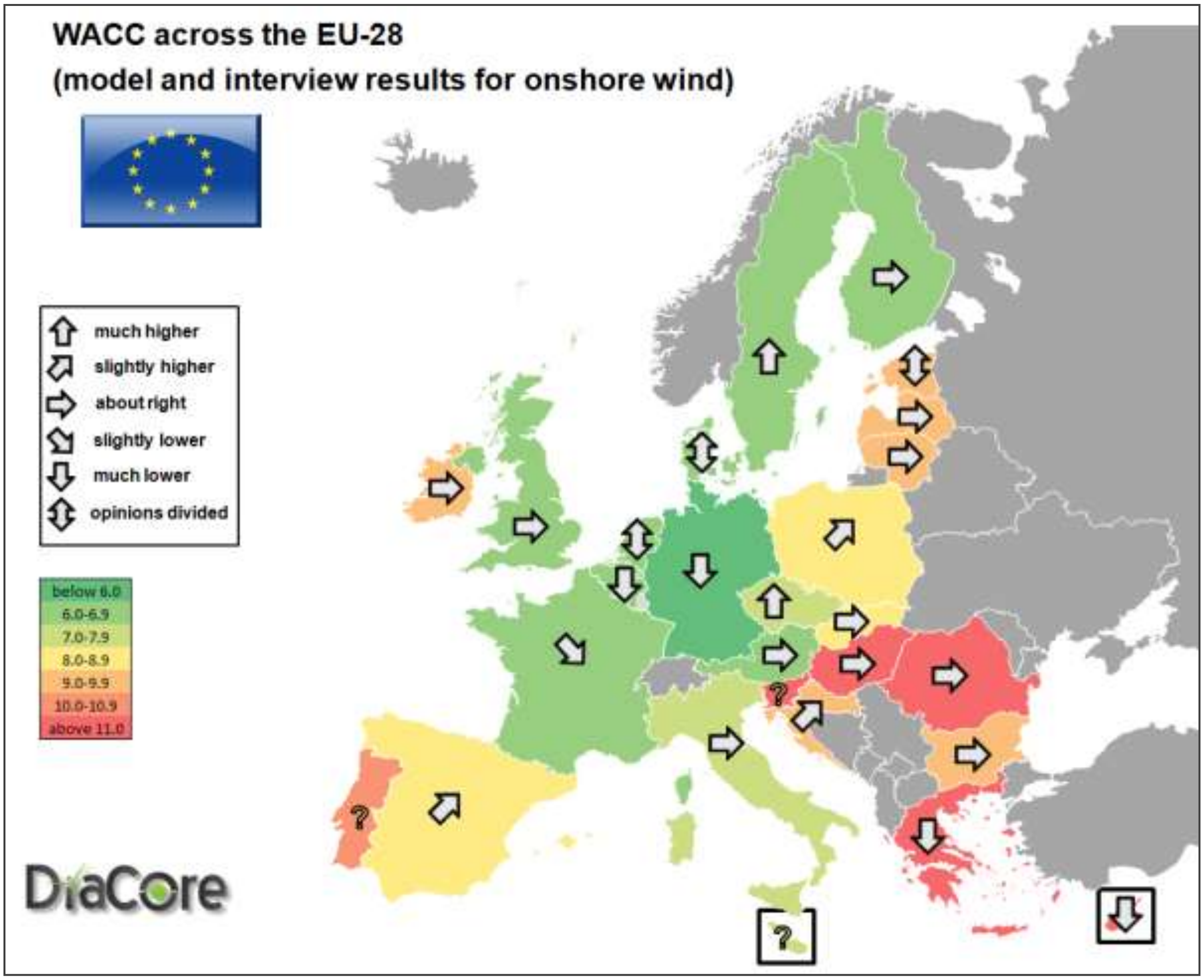

Figure 5: WACC estimations onshore wind – model and interview results combined

Interviewed experts from 11 member states have agreed with the modelled results. In five member states the WACC has been estimated (slightly) too low, while for 4 member states the modelled estimations have been estimated (slightly) too high.

The impact of a high WACC (12 member states with WACC above 8.0) is crucial for wind power projects, because capital expenditure is the main cost factor. As a result, wind power project developers will require higher incentives (e.g. a higher feed-in premium) to have a viable business case. Therefore, EU member states with higher risks have to spend more capital in order to achieve the same amount of installed capacity in comparison to a market that carries lower risks and thus lower capital costs.

The comparison also demystifies the relevance of natural conditions for the economic assessment. Markets with relatively limited wind speed conditions (such as Germany) can be financially much more interesting than markets with very good wind speed conditions (such as Spain or Portugal). This shows that natural resources are only one factor for investment decisions; other factors that have an impact on the WACC – such as the policy design risks or country risk – must be also taken into account.

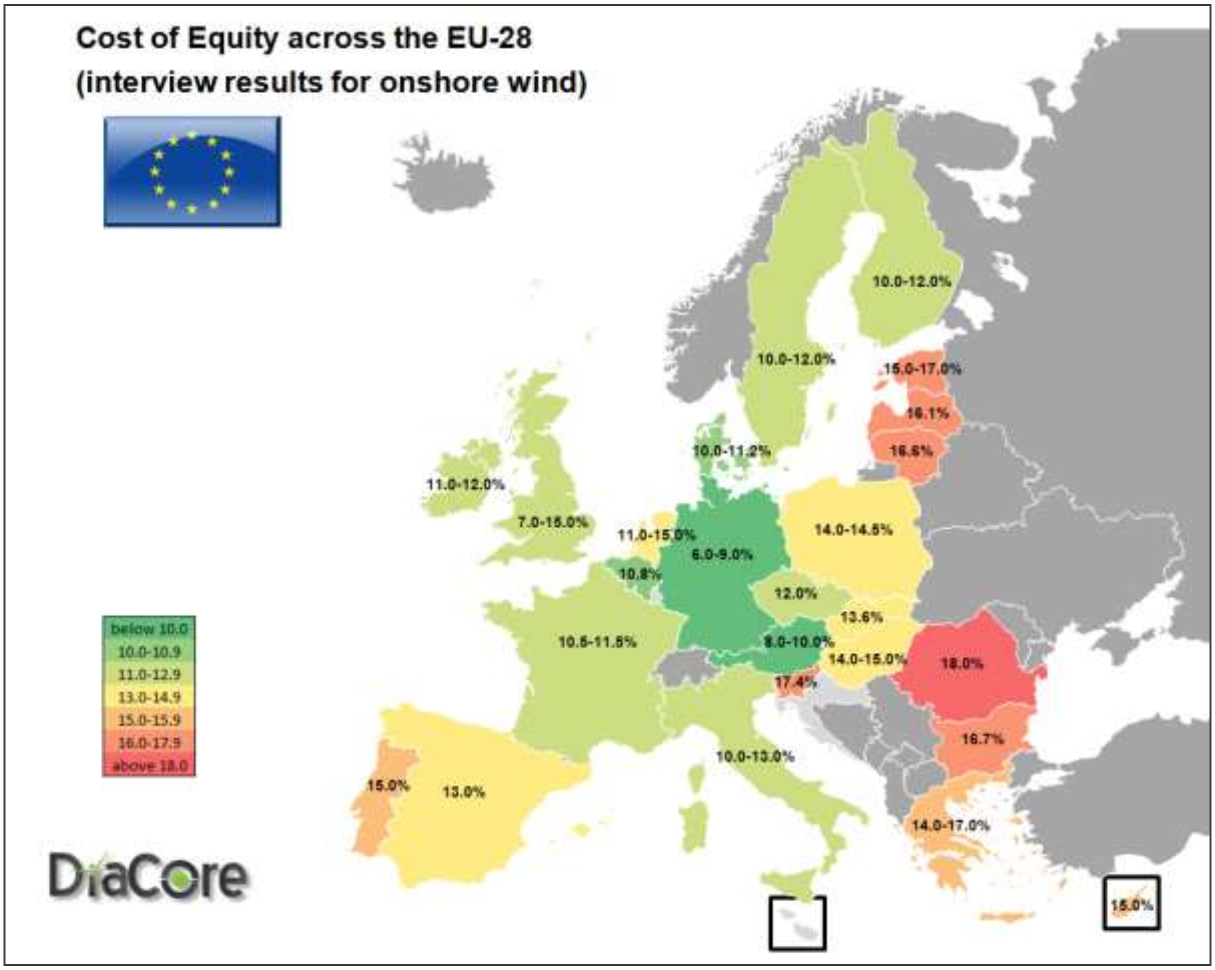

Figure 6: Cost of equity across the EU-28 (interview results for onshore wind)

Interview results for the cost of equity are shown in Figure 6. Comparing model and interview shows a general tendency towards lower values in the interview results (with some minor exceptions). Interestingly, some interviewees have explained the lower values for cost of equity somewhat counter-intuitively: The cost of equity decreased after the collapse of renewable energy investments in these markets. During the boom, the cost of equity was much higher, because lucrative feed-in tariffs were granted in these countries. However, a grid connection permit was required to be eligible for these tariffs. This led to the situation that speculative investors blocked grid capacity in advance and started selling their grid connection permits to foreign investors. This example illustrates that sustainable support systems do not necessarily require high tariffs. Quite the contrary, in some cases very attractive tariffs can cause instabilities for the overall policy design. The interplay between profitable and stable business conditions should be kept in mind when assessing or defining the policy design. Another relevant observation is that apart from very risky markets, the average cost of equity is usually (much) below 15%. It is questionable whether such values are sufficiently attractive or even viable for some of the existing market actors, which are used to higher cost of equity values in their current business models.

It is worth noting that comparisons between different support systems are only meaningful, if the overall country risk is similar. In this regard, the comparison between homogenous markets such as Denmark, Sweden and Finland is interesting. All three countries have a very low country risk but the overall WACC in Sweden is significantly higher than in Denmark and Finland. According to Swedish investors, the higher investment risk is actually mainly due to the shortcomings of the support scheme, which does not offset existing price risks. Apart from such an obvious example, for a connection between support systems and the distribution of risks, other assessments are more difficult to make; national values for WACC are to a large extent dependent from the specific design of the support system (and not only from the choice of the support system) as well as from the overall country risk of the particular market and other variables.

3 Summary and conclusions

Across all EU member states, risks related to support systems and policy design are perceived as most pressing. Investments in renewables are influenced and impacted by several risk categories. Stakeholders ranked the policy design risk as the most important risk, relating to the competitiveness of renewable energy sources compared to conventional sources. The support system is the most important instrument used to mitigate risks related to electricity price and demand. In EU member states where national governments applied retroactive measures to support systems (e.g. Czech Republic, Bulgaria, Slovenia, Spain), the risk of sudden policy change was ranked very high, too.

Risk profiles differ across EU member states. Countries from the same region or with similar market development status share a similar risk profile. For example, in southern European markets, financing risks are pressing, whereas this is less important in north-western countries. Notably, in most cases policy design risk remains most important and does not vary significantly between regional groups.

Low capital costs drive the deployment of renewables. The analysis shows that the cost of capital varies between member states. As renewable energy technologies such as wind onshore require high upfront investments costs, capital costs significantly influence the business case of such projects. According to the interviewed experts, the weighted average cost of capital varies significantly, for example between 3.5% in Germany and 12% in Greece.

The cost of equity for onshore wind projects ranges between 6.0% (Germany) and higher than 15% (Estonia, Greece, Latvia, Lithuania, Romania and Slovenia). Western EU member states generally show lower values (typically between 8-15%), while higher figures are shown in Eastern countries (16% and more).

A lower cost of capital can outweigh the disadvantage of having scarce natural resources. For example, a country like Greece has a higher solar irradiation than Germany, which results into production costs for solar power being lower in Greece than in Germany. However, taking into account that such investments have to be financed and that they have high upfront investment costs, the cost of capital can reverse this advantage of having better natural resources.