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Renewing Risk Analysis for Renewable Energy Transitions

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Introduction

Renewable energy projects are risky endeavours with investments, grid connections and stakeholder support being all but certainties. [1]Risks – potential undesired occurrences that lead to the frustration of a project's goals – pose a threat to successful completion of renewable energy projects. With a "successful" project, I mean a project that has accomplished its goals and requirements within predefined constraints, such as budget or time. By keeping an eye out for these risks and taking appropriate measures, projects are kept on track and prevented from crashing. That is why good risk management is necessary for renewable energy projects.

Nowadays, risk managers focus on hard metrics, such as time, budget and quality targets. Like technicians tuning cars' engines, brakes and tires. Yet a growing body of research shows the importance of soft aspects like stakeholder engagement[2] and energy justice[3], with one report even stating that a third of renewable energy projects are halted because of local resistance. [4]You might have a nice car, but if it is not allowed on the road, it is useless. Successful risk management in renewable energy projects must therefore take into account soft aspects.

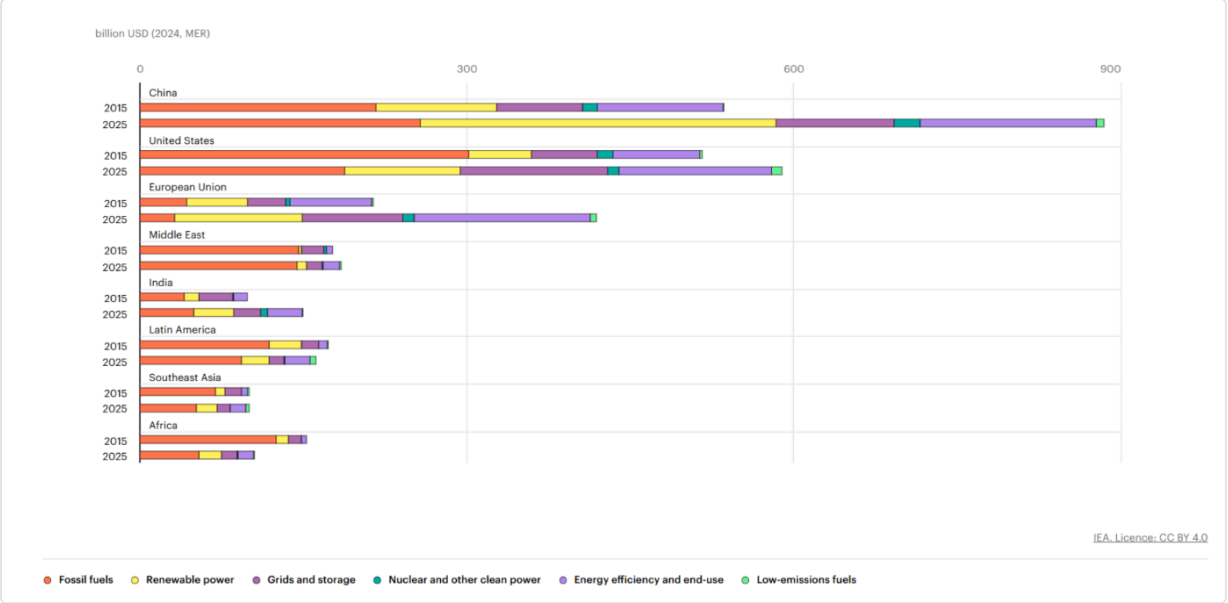
The main purposes of the article are (i) to argue that including social acceptance as a control variable in risk management for renewable energy projects is important to reach the goals of the energy transition, (ii) to show that energy justice, as an indicator for social acceptance, is an effective concept to increase renewable energy projects' chances of success, (iii) to operationalise energy justice for risk management by imbedding it in the RISMAN method's framework, and (iv) to discuss the implications that imbedding energy justice in RISMAN has for consultants. In doing so, the article aims to point consultants to an existing hole in the market and to provide them with a tool to take on this unique opportunity.

The global energy economy The global energy economy is moving towards a green trajectory. Total annual investments in clean energy surged from $1.209 billion to $2.146 billion between 2015 and 2025[5], renewables accounted for the largest share of growth in the total energy supply in 2024, and the increase in energy-related CO2 emissions moved from 1,2% in 2023 to 0,8% in 2024 with lower levels predicted for future years.[6] At face value these numbers indicate that the energy sector is moving from its carbon past into a future where renewable energy takes centre stage.

Despite these promising numbers, there is a serious short term challenge on the horizon – namely the 2030 commitments agreed upon by the United Nations at COP28. At COP28 the United Nations committed themselves to triple the world's installed renewable energy generation capacity to at least 11.000 GW by 2030.[7] Currently investments lag behind to deliver on these agreed upon renewable energy goals. The International Energy Agency (IEA) states that annual investments have to double

in order for the generation goal to be reached.[8] The lack of investments in renewable energy are therefore a threat to achieving the stated COP28 goals.

Consequently, the lack of sufficient funds to finance renewable generation capacity presses the need to come up with creative ways to attract more investments.



Graph 1: Investments in the energy sector per region in billion USD in 2015 and 2025. Source: IEA (2025), Energy investment across regions and sectors, 2015 and 2025, IEA, Paris. Licence: CC BY 4.0

The lagging investments are an indicator that investors believe renewable energy projects are too risky of an investment, i.e., that they are not guaranteed to result in sufficient returns. After all, it is widely accepted by financial scholars that risk plays a significant factor in investment decision-making procedures.[9] So introducing methods that decrease risks within renewable energy projects are essential to increase investments within renewable energy projects and to steer closer to the COP28 goals.

The fact that the renewable generation capacity goals are slowly slipping out of sight therefore underscores the need for proper risk management in renewable energy projects. Let's remind ourselves once more that renewable energy projects are risky undertaking with many uncertainties, such as investments, grid connections and stakeholder support.[10] By actively monitoring these risks and taking appropriate action where needed, the negative consequences of risks are limited to an absolute minimum – ensuring that projects are successful. This is why risk management plays a crucial role in renewable energy projects.

The added value of risk management in the energy sector has long been recognised, with the benefits of managing financial risks[11], time risks[12] and quality risks receiving most of the attention.[13] By controlling for these metrics risk managers ensure that the budget limits are respected, deadlines

are met and technologies function as they are supposed to do. However, there seem to be other risks that influence the success of renewable energy projects, because many projects that stay within their time and budget constraints still fail.[14]

Consequently, to make risk management more effective we should ask why renewable energy projects fail, since the answer to this question points us to the risks that slip past the radar of the most prominent metrics. Though data on failed renewable energy projects is scarce, there is evidence that suggests it is worthwhile to look beyond hard metrics such as time, money and quality within risk management. For example, a 2024 survey amongst American wind and solar farm developers reported that approximately a third of all wind and solar applications in the period 2016-2023 were cancelled due to community opposition.[15] As associate professor Sarah Mills from the university of Loughborough puts it: social acceptance is the new bottleneck.[16]

Case studies from around the world underscore the significant factor social acceptance plays in the success of renewable energy projects. A report from Australia which contains case studies of nine development sites showed that project costs rose as a result of expensive legal procedures which occurred in cases where there was lower social acceptance. The local resistance therefore negatively impacted the feasibility of the concerning sites.[17] Another study on onshore wind and solar farms in Great Britain even identified twelve social acceptance variables which were found to be significantly correlated with the planning outcomes.[18]

Social acceptance not only pertains to local communities, but to other actors too, such as market actors and local governments. For example, a 2015 study on Colombia reports that market players were unwilling to contribute to renewable energy projects as they feared that the costs of producing renewable energy were too high, thereby keeping their distance from the product. The same report also states that political difficulties make it hard for renewable energy to gain some footing.[19] Explanations for the opposition to renewable energy projects are oftentimes ascribed to unequal distributions of costs and benefits[20] and infringements on people's perceived identity and rights.[21]

To return to the question of why renewable energy projects fail then, it seems that social acceptance plays a crucial role in the success of renewable energy projects, and that projects are in peril where social acceptance is absent. A sole focus on time, money or quality will not be sufficient to account for the social acceptance aspect, because these three metrics are primarily concerned with meeting predetermined quantitative thresholds, whereas social acceptance concerns itself with qualitative considerations of rights and fairness. Therefore, risk management that incorporates social acceptance risks in addition to hard metrics is bound to reduce the overall risk within renewable energy projects.

Furthermore, investments in renewable energy projects could increase by accounting for social acceptance risks, since controlling for social acceptance tackles risks that the hard metrics miss. It is

necessary to introduce a framework that captures drivers of social acceptance in order to be able to control for social acceptance within risk management. Otherwise it is as possible to steer for social acceptance as it is to drive a car without an engine. As shown, we can control risks, increase investments and help the COP28 goals come closer to being achieved. The next section will therefore focus on a framework to help us better understand how we can nurture social acceptance within renewable energy projects.

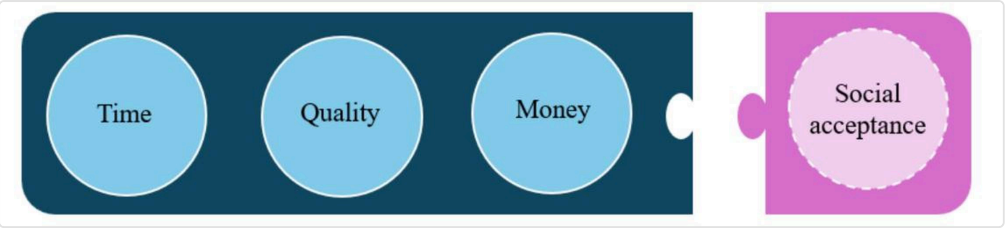


Image 1: Control aspects for successful risk management.

Energy justice

Viewing the energy transition as more than a technical and economic construct isn't new. In fact, international declarations already mention non-technical and non-economic objectives in relation to decarbonisation of the energy system. For example, in the COP28 declaration, participating countries explicitly commit themselves to ensuring that communities affected by the transition also benefit from the opportunities the energy transition offers.[22] We can also find examples of non-economic and non-technical objectives on a national level. In the Netherlands for instance, where behavioural measures are mentioned as a means to enhance the effectiveness of energy policy.[23] The aim of such measures is clearly to increase social acceptance of the energy transition.

Acknowledging that social acceptance might be key for a successful energy transition is one thing. Mobilising social acceptance in order for the energy transition to prosper is another. To be able to control for social acceptance in risk management, we therefore need something that mobilises social acceptance and makes it more tangible. A promising contender for the mobilisation of social acceptance is energy justice.[24] Energy justice applies justice principles to the energy system. Its main purpose is to identify, eliminate and prevent harm from being done in and by the energy system. It does so by considering different justice perspectives – or what I call lenses – to see if certain energy-related initiatives are problematic from the point of view of a certain lens. Using these lenses makes social acceptance tangible and applicable by setting out what socially acceptable is.

The three main lenses are[25]:

1) Distributional justice, which concerns the distribution of costs and benefits of energy systems throughout society. Under this lens, justice is respected when costs and benefits of the energy

system are distributed approximately evenly amongst the members of society. Injustices can occur when costs and benefits of the energy system are distributed unevenly. The uneven distribution can be geographical – e.g. when communities living close to generation sites are faced with severe externalities without additional benefits to compensate the costs – or social – e.g. when lower income groups face more barriers for adopting to renewable technologies compared to higher income groups.

2) Procedural justice, which stresses the importance of meaningful participation and access to legal procedures for challenging decision-making procedures. Justice is achieved through equal access to meaningful participation and legal procedures for all groups and individuals. When certain groups or individuals are excluded from the decision-making process injustices occur. A highly practical example is the absence of indigenous groups in energy decision making processes in some countries. [26]

3) Recognition justice, which underscores the acknowledgement of different needs and experiences and to call attention to both the privileged and underprivileged.[27] By allowing the energy system to meet the needs and desires of all members of society, justice is attained under this lens.

Injustices occur when the energy system fails to address needs and desires of certain groups. Issues can for example relate to the higher demand for energy of some groups, such as the elderly.[28]

Image 2: Lenses of energy justice.

There are some speculations for why energy justice would increase the social acceptableness of renewable energy projects. An important reason is that groups or individuals feel that their concerns can be properly addressed through energy justice. Disproportionate costs, or the failure of the system to address the needs of groups or individuals are therefore less likely to occur, cushioning most of the friction between energy transitions and personal interests.[29]

The theoretical reasoning linking energy justice to social acceptableness seems to hold out in practice too. The energy justice framework has gained traction as of recently, because research indicates that the presence of energy justice in energy projects correlates with their chances of success. For example, a 2018 paper that examined local renewable energy projects in Denmark and

Germany found that perceived fairness of procedures was a pre-condition for legitimacy of outcomes, stating that the procedures were consistent with procedural justice.[30]

Another example is a 2018 case study in Canada where researchers applied procedural and recognition justice to organise a solar energy program with success.[31] Though no causal claims can be made, based on the vast body of research available it is safe to say that upholding energy justice is a good indicator of social acceptance and success of renewable energy projects.

Since energy justice is a good indicator for success in renewable energy projects, it is time for risk managers to take note of energy justice and steer projects clear from energy justice-related risks. In the next section I will zoom in on the application of energy justice in risk management. More specifically, the focal point of the application will be risk analysis, since this is the starting point of any risk management. Incorporating energy justice in the risk analysis ensures that energy justice is considered in the entirety of the process and that risks to energy justice are spotted proactively. Time to put the pedal to the metal and operationalise energy justice.

Risk analysis and Energy Justice

But how do we put the pedal to the metal? In this section I will map out how we can steer for energy justice by extending the RISMAN method's risk analysis model.[32] RISMAN is a leading method in the field of risk management. Originally devised in 1995 for application in large scale infrastructure projects, the method now sees a wide adoption by both public and private organisations. RISMAN predates, yet shows a great similarity with the ISO 31000 standard in regards to the overall approach of embedding risk management into all aspects of the organisation.

The RISMAN method for risk management divides the risk analysis into four steps: goal-setting, risk mapping, prioritising risks and mapping control measures. The aim of the risk analysis is to map risks and potential control measures. Within RISMAN risk analysis is the first action for risk management. Therefore, the inclusion of energy justice within the risk analysis ensure that social acceptance is controlled for.

Image 3: RISMAN risk analysis model.

As concluded earlier, proper risk management increases a project's chances of succeeding and hard factors are well accounted for within risk management in energy projects. This is no different for RISMAN. However, by extending RISMAN's scope with energy justice's lenses, the method could be more effectively used in renewable energy projects. Thereby not only increasing projects' chances of success compared to current applications, but also helping us move closer to the 2030 renewable generation goals – boosting investor trust.

Let's move beyond theoretic examples in the coming discussion on the compatibility between RISMAN and energy justice of how RISMAN and energy justice could be fused. To illustrate energy justice's applicability in practice, I will take the following real-life case as an example:

> *Electrifying Dutch service stations (EDSS): the Dutch government creates new policy for service areas on its motorways, aiming to pave the way for the zero emission mobility transition and to create benefits for entrepreneurs within the service areas market through more investment certainty and lower market barriers.*[33] *However, existing entrepreneurs fear that the new policy can cause small retailers to be forcefully pushed out of the market since*

> *they will not be able to compete with larger firms under the new policy as they do not have the same amount of capital.*[34]

Let's check how eager risk managers tasked with identifying risks and control measures in the policy project could apply energy justice to control for social acceptance in this case.

Step 1: Goal-setting

The first step of risk analysis in RISMAN is to set a goal; what is the desired state of the project that we eventually try to achieve? Only risks regarding this goal are relevant for this analysis, thus defining the scope of the analysis. After the completion of this step, there should be clarity regarding the purpose and scope of the risk analysis. Specifically, three questions ought to be answered during this step:

1. Why is the risk analysis performed? Do we want to improve our project management, set our priorities straight, or justify a decision? By answering the question of 'why' we determine what the risk analysis will and will not do. Furthermore, the answer to this question provides clear direction to the participants in the risk analysis.

2. Who are the stakeholders that should be involved in the risk analysis? Based on the reason for the risk analysis, participants and perspectives for the analysis are selected. Perspectives refer to the different ways from which a project can be viewed, e.g. economically, technically, legally, etc. Determining which perspectives are involved in the risk analysis consequently influences which expertise is required for the risk analysis.

3. To which phase is the risk analysis applicable? Delimiting a specific phase or time period helps us in specifying risks and prioritising the severity of identified risks at a given moment.

The addition of the energy justice lenses might lead to innovative outcomes during this step, especially for the second question. For example, suppose that in the EDSS case we conduct a risk analysis because we want to ensure that the new policy is just and acceptable to existing entrepreneurs to reduce social acceptance-related risks in later decision-making stages. Based on what I have argued before, in this case we want to add the energy justice lenses to the perspectives that are part of the analysis. Consequently, we will need to include a participant to the risk analysis who is knowledgeable about justice concepts and their practical implementation and, therefore, someone with a normative skillset– arguing from the point of view how things should be.

This normative skillset requires a different expertise than the skillset possessed by economists, technicians and legal experts, who focus more on descriptive considerations – arguing from the point of view of the way that things are – such as balance sheets, blue prints and law books. The innovative outcome of the energy justice is therefore that risk analyses with energy justice applied

require the inclusion of participants with a substantially different skillset than risk analyses that do not feature energy justice.

Step 2: Risk mapping

After the why, who and when are settled upon, it is time to start mapping risks. It is up to the risk manager to decide on the format that is used to gather risks. For example, through interviews or group sessions.[35] It is important to note that energy justice is approached from the perspective of the project's affected party – how the project affects their sense of justice. And so the questions asked to garner input need to be tailored to the affected party and their needs and concerns.

Exemplary questions are:

- What is the worst thing that could happen to you with this project?
- What do you like about the current system?
- How would you like to be involved in the process?
- Which needs of yours does the system at least need to meet?

After the input has been gathered, the risks can be mapped. A risk matrix can prove to be a useful tool for dissecting the participants' input and mapping the different risks. [36] The vertical axis of the matrix displays the project phase and the horizontal axis contains perspectives. Suppose for simplicity's sake that the following 1x1 matrix – using distributive justice as the perspective – was used for EDSS to scout for risks:

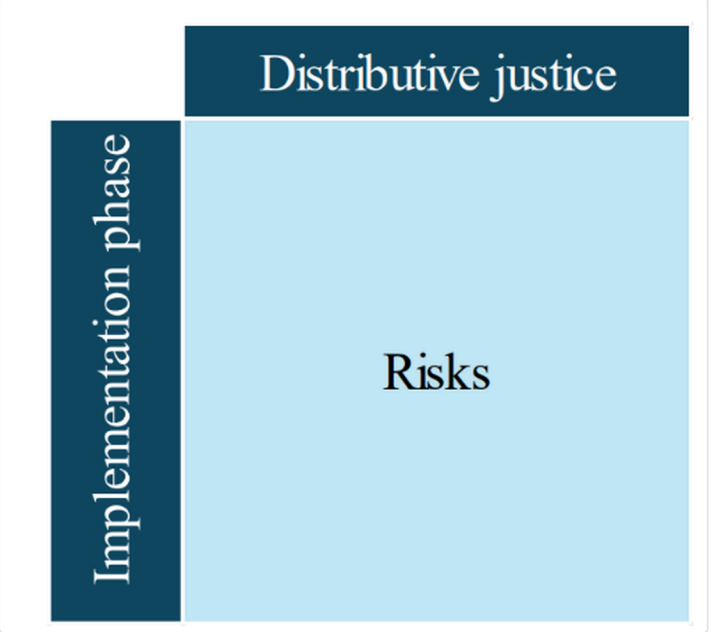


Table 1: 1x1 risk matrix.

To ensure clarity, risks in RISMAN always follow the following formulation:

The risk occurs, BECAUSE OF cause, LEADING TO consequence.

So, for example:

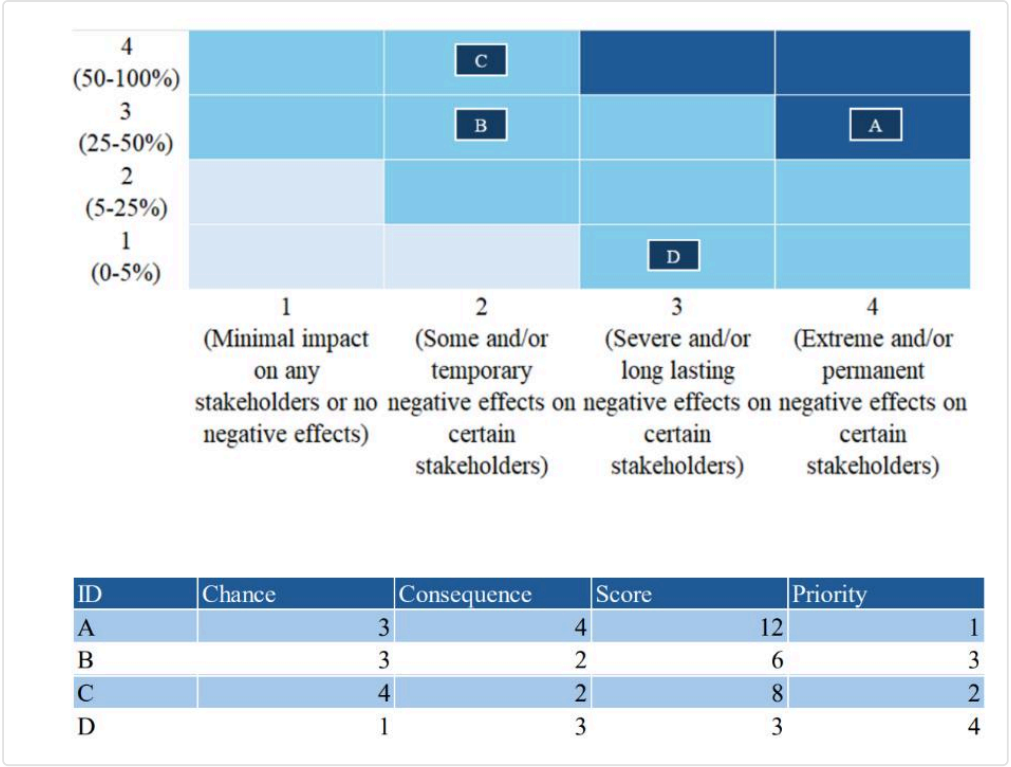
> *Small retailers are unable to compete with larger firms, because the upfront costs of realising charging stations are too high for them leading to increasing market barriers for smaller retailers in the service areas market compared to larger firms.*

Formulating risks in such a way makes it easy to differentiate between cause and effect, clarifying where we could point potential control measures. Furthermore, the extensive and concise formulation used in RISMAN assures that no misconceptions about a given risk occur. [37]

Step 3: Prioritising risks

Thirdly, prioritising risks can be done through existing methods that are used within RISMAN. A widely applied approach is the chance x consequence matrix. With this approach risks are first placed on a vertical axis that displays the likelihood of the risk occurring, and secondly placed on a horizontal axis displaying the consequences of this risk. [38] The quadrants on both axes display a number ranging from 1 to 4. The risk with the highest priority is the risk of which the multiplication of the value from the vertical axis and horizontal axis is the highest.

However, the horizontal axis, which normally displays quantitative values such as time delay or additional costs, needs to be edited to be able to facilitate energy justice, since energy justice's consequences are difficult to express in quantitative units. A suggestion for a scale that can be applied is displayed in image 4. This image demonstrates how risks can be scored and prioritised.



ID	Chance	Consequence	Score	Priority
A	3	4	12	1
B	3	2	6	3
C	4	2	8	2
D	1	3	3	4

Image 4: Scoring and prioritising of risks.

Please note that both axes contain estimations meant for the sole purpose of prioritising risks. It is up to participants in the risk analysis process to make a proper estimation of the probabilities and effects of risks yet the values may need not mirror the actual probabilities or severity of negative effects once the risk actually occurs, since these cannot be known upfront.

Step 4: Mapping control measures

Finally, after identifying our risks and settling on the top priorities it is time to map control measures – also called risk response – for the risk. There are roughly four types of control measures. Namely:

1) Evasion, meaning to fully eradicate the risk. Eradication of the risk can be achieved by stopping the activities that might cause the risk;

2) Transfer of the risk to another party. A risk can be transferred to another party by making a third party responsible for the activities that form the root cause of a risk;

3) Reduction of the severity and/or chance of the risk. Reducing the severity or chance of a risk can be achieved by identifying proactive actions that would reduce the risk's impact and by adding additional controls;

4) Acceptance of the risk, meaning to take no further actions to reduce the risk.

Which type of measure is most appropriate to select depends on the risk appetite of the organisation facing a given risk. Risk appetite – though various definitions exist – generally refers to the amount

of risk an organisation is willing to accept.[39] The higher the risk appetite, the fewer need an organisation feels to reduce or avoid risks and vice versa. Obtaining a sense of the risk appetite within an organisation is useful, since it can help risk managers to decide which control measures are appropriate candidates and could be explored after the completion of the risk analysis. Broadly speaking, there are three sorts of risk appetite with corresponding preferences for types of control measures:

Risk appetite	Description/attitude of organisation	Preferred risk response
High	Willing to accept high risk since the potential benefits of risks are prioritised over any potential costs.	To accept risks.
Medium	Willing to take risk as long as the potential costs of a risk are acceptable and do not outweigh its benefits.	To reduce risks.
Low	Unwilling to accept risks, since the potential costs of risks are prioritised over potential benefits.	To evade or to transfer risks.

Table 2: Levels of risk appetite.

In EDSS, it seems plausible to focus on reduction control measures. The government cannot be expected to have a high risk appetite, because they are responsible for the well-being of the members of society. Furthermore, it seems unlikely that the government has low risk appetite, because they are willing to design policy that alters the existing situation, thereby allowing for new activities that bring risks with them. Consequently, it seems that the government has medium risk appetite and therefore prefers to respond to risks by reducing their severity or impact.

To address the concerns of existing entrepreneurs, we could therefore opt for measures that reduce the risk that the market barriers for small retailers increase significantly. For example, by allowing firms to pay other costs, such as permit costs, back in terms. By introducing this measure, the high upfront costs that form market barriers are less problematic for small retailers in this case, because the total upfront costs are lowered. This measure conforms with the risk appetite of the government and ensures that distributive justice is upheld, since the distribution of benefits – i.e. access to the market – is potentially made more equal for small and large retailers compared to the situation

where the measure would not be taken. The selection of control measures falls outside of the scope of the risk analysis.

After all these steps have been performed, the risk analysis is complete. By keeping track of the process schematically, the final result of the analysed risk should look like this:

ID	Lens	Risk	Cause	Consequence	Control measure
A	Distributive justice	Small retailers are unable to compete with larger firms.	The upfront costs of realising charging stations are too high for small retailers.	Increasing market barriers for smaller retailers.	Payment in terms for permits to lower total upfront costs.

Table 3: Record of an analysed risk.

By applying energy justice in a RISMAN method's risk analysis it has therefore become possible to control for social acceptance. Not only does the case above show how RISMAN can incorporate energy justice perspectives, it also shows that it is feasible to apply energy justice perspectives within risk analysis in practical contexts to control for social acceptance risk. With the addition of energy justice, it is therefore possible to prevent projects from failing as a result of social acceptance-related risks, increasing the hopes and expectations that investors can have for renewable energy projects and bringing renewable energy goals one step closer.

Implications for consultants

So far the paper has identified a gap in risk management practices within renewable energy projects and has introduced a practical tool to control for social acceptance in a risk analysis. Now it is time to explore what this tool demands of consultants and what this means for consultancy practices. Based on the discussion up until this point, the following three implications seem to hold true:

1. Imbedding social acceptance and energy justice into risk analyses challenges consultants to view renewable energy projects from a different angle than they are used to. Though this article introduced a way of dealing with this new perspective – i.e. social acceptance – consultants who have experience in risk management might feel uncomfortable at first to control for an aspect that is quite different from other control aspects. They will therefore have to adapt themselves to applying this viewpoint in projects.

At the same time, by adopting social acceptance in addition to hard control aspects in risk management for energy projects can give consultants an edge over their competitors. As was extensively discussed, current risk management practices primarily focus on hard control aspects,

yet many still fail. By building expertise in the social acceptance area, consultants are likely to find greater success rates for their project than their competitors, spearheading this underexposed aspect and taking a firmer hold on the market.

2. In addition to working with a different perspective on things, consultants are also likely to collaborate with stakeholders and experts who they would not encounter without a focus on social acceptance. After all, as we have discussed, the normative skillset required to expose and identify risks related to social acceptance are different from the descriptive skillset required to spot risks related to money or time. This provides consultants with the opportunity to expand their networks into directions they would otherwise have missed, but it also requires them to critically consider which experts have a normative skillset and to include them within the peer group that is part of the risk analysis.

3. Finally, it seems that consultants can rely on methods that they are already acquainted with, or that at least resemble methods they are acquainted with. In other words, the demandingness of adapting to the application of social acceptance within risk management methods are low. This means that consultants are likely to become quickly accustomed to applying this perspective in risk analyses. This is beneficial to consultancy companies that have already built expertise within risk management, since it means that the costs related to learning how to apply social acceptance within their consulting activities are kept at a minimum.

In short, applying social acceptance requires little from consultants besides adapting to a different perspective and exploring different networks from what they are used to. It then seems that the road to achieving renewable energy goals with the aid of risk management is well paved for consultants already active in this area.

Conclusion

This article has sought to advance the move to a renewable energy landscape by enhancing current risk management standards. Investments in renewable energy are severely running behind, putting internationally agreed upon energy goals in peril. To up investments and secure the energy goals, it is crucial to obtain a better hold of the risks faced by renewable energy projects. Social acceptance is a pivotal yet underexposed aspect of risk management in renewable energy projects. By operationalising social acceptance with the help of the energy justice framework and the RISMAN method, I have introduced a new set of perspectives to identify risks that could infringe upon social acceptance and that are applicable in a practical setting.

The addition of social acceptance and energy justice to risk analysis not only benefits projects, it also benefits the consultants that know how to apply these concepts. They are likely to outperform competing firms since they know how to steer away from social acceptance risks while competition

might not and they are provided the opportunity to enter into new networks. As an extra bonus, the proposed method is based on existing and widely adapted methods, making it easy for consultants to utilise energy justice in their day-to-day risk management projects. The tools are here. It is now up to consultants to apply energy justice in risk analysis to drive the energy sector towards a green energy future

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