Model Assessment of Potential and Barriers to the Development of Renewable Energy Communities at the National Level

Model Assessment Structure Proposal (Background Paper #1)

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Abbreviations

EU	European Union	NGO	non-governmental organisation
MA	model assessment	RED II	recast Renewable Energy Directive
MS	member state	SME	small and medium enterprise
NECP	National Energy and Climate Plan		

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1 Context

According to the recast Renewable Energy Directive (RED II), member states (MS) of the European Union (EU) are supposed to take out assessments of barriers for and potential of renewable energy communities in their countries (RED II, Art. 22 Para. 3). The European legislator has not specified this provision, i.e. the content and form of these assessments has not been clarified (yet). It is only clear from the legal text that these assessments should be the basis of the "enabling framework" (RED II, Art. 22 Para. 4) that EU MS shall provide.

This study aims at developing a template for the assessments. Moreover, a model assessment will be carried out, though only a rapid and short version of it, for two countries – Germany and Poland. In the following, we will describe the draft structure of the proposed assessment process. We will give an overview of the process (Section 2) and describe the elements of the process (Sections 3-9). Most of these are detailed in further background papers.

The final model assessment (MA) template includes short explanations of the elements and some lists and tools that may help for different steps of the assessment.

2 Overview of the Assessment Process

The assessment of barriers and drivers and the potential of energy communities should fulfill three criteria:

1. First, it builds on a monitoring system and surveys and/or interviews of experts and thus is **empirically informed**.
2. Second, it is **participative** to increase the acceptance of assessment results and policy conclusions drawn from this process, but also to include local and expert knowledge that help to generate meaningful findings.
3. Third, the use of an impact model and/or of theoretical considerations in the development of the assessment framework make the assessment **theorically founded**.

Overall, we propose an assessment with four modules (see respective background papers for details):

- Module I = assessment of barriers & drivers
- Module II = evaluation of costs & benefits
- Module III = assessment of the potential
- Module IV = policy database

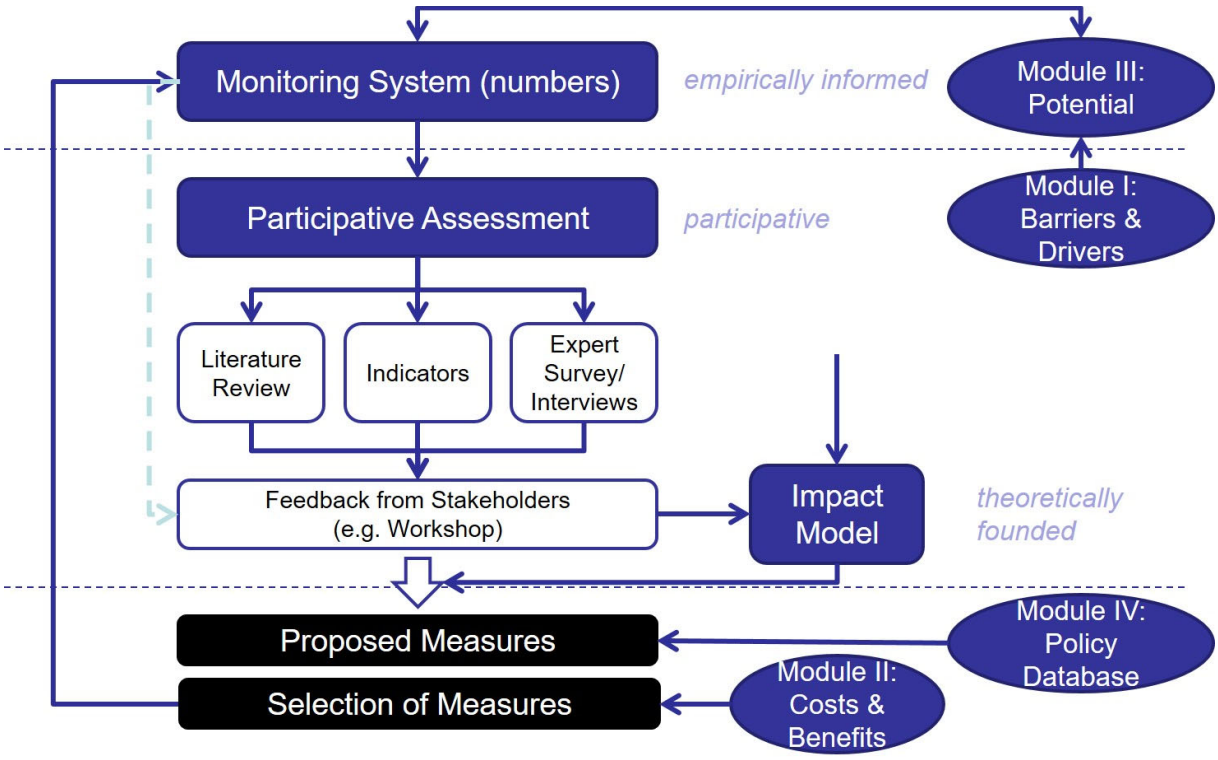

Figure 1: Flow Diagramme of the Assessment Process

The process runs from monitoring system or assessment of the status quo and development of energy communities in the country over the assessment of the potential, the assessment of barriers and drivers to the selection of policy measures, using the collection of public policies and the evaluation of costs and benefits. Effects of those policy

measures implemented should be monitored, so that further steps can be taken if these measures were not yet successful (see Figure 1).

The assessment builds the basis for deriving policy measures that form the "enabling framework" for energy communities. Therefore, an **assessment of barriers and drivers** is the first module. The selected measures should address the most pressing challenges or make the most important drivers work in the country. The **monitoring system**, as detailed in the next section, (ideally) forms the basis for this assessment of barriers and drivers. Module I should lead to (a) a proposal of concrete policy measures and (b) a better understanding of the institutional setup in the country, the reasons for the status quo of energy communities and the effect that different policy measures may have in this context. We call the second outcome "**impact model**" (see Section 5). Both elements, monitoring system and impact model, will be country-specific, at least at the beginning. Therefore, we do not include them as separate "modules". Proposed policy measures could come from a **collection of public policies**, but need to be adapted to the respective institutional environment. The selection of policy measures should be informed by an **analysis of costs and benefits** and the impact model.

In the following, we discuss the elements of our proposed assessment process. Modules I-IV are described in much more detail in separate background papers. Therefore, we keep the discussion of these brief here. Monitoring system, impact model and feedback loops are not detailed in those background papers. Hence, we explain them more thoroughly here.

3 Monitoring System as Basis for Assessment

3.1 Aim

A proper monitoring system illustrates past and present developments of the energy community sector in a country, if possible including a breakdown of sub-sectors, i.e. according to technologies, sizes and types of energy communities. Findings on developments could be used for stakeholder interviews to explore reasons that help to explain changes in the sector and potential barriers and drivers. These numbers could be used to contrast them with qualitative data and survey results. A third aim could be to develop specific indicators that allow us to draw conclusions on specific barriers or drivers, e.g. market structures. Lastly, a monitoring system should be installed to measure the effects of policies implemented as part of the "enabling framework".

3.2 Status Quo

EU MS are supposed to report on the state of energy communities in their National Energy and Climate Plans (NECPs). Most EU MS did so, but often only very briefly (European Commission, 2021). Nevertheless, NECPs can give a first idea of which type of energy communities exist or how a country or government apprently perceives what energy communities are.

Besides information provided in NECPs, data availability differs quite significantly between countries: There are various collection efforts in past and running research projects. The EU has commissioned the development of a repository that is supposed to collect those data and make them available in a single place. National umbrella organisations provide data with different levels of detail and coverage of different segments within the energy communities sector (see Table 1 for some examples). The REScoop database of energy cooperatives in Europe has some systematic biases, but could be a starting point at least for some countries.

Table 1: Examples of Country Data that Could Be Used for Monitoring or Serve as Good Examples

Country	Data Collections
Germany	DGRV annual survey (registered cooperatives in member associations) (DGRV, 2021) Netzwerk Energiewende jetzt! database (registered cooperatives) (Netzwerk Energiewende jetzt e.V., 2022) Leuphana/ECOLOG database on community energy companies (Kahla et al., 2017) COMETS project (solar cooperatives) (Wierling et al., 2021)
The Netherlands	Local Energy Monitor (HIER opgewekt, 2022)
Sweden	Magnusson & Palm (2019)
United Kingdom	Community Energy State of the Sector report for England, Scotland and Wales (Community Energy Scotland et al., 2022)

Beyond data availability, heterogeneity of the sectors poses challenges – not only between countries differences in types of energy communities, which complicates the development of a uniform monitoring system for all EU MS,

but also within country differences, which requires regional differentiation of the monitoring system and assessment and can lead to different policy recommendations for different regions.

3.3 Implications for the Assessment

As data are not available in all countries for all segments of the energy community sector and on the needed disaggregation level, there is a need for a differentiated approach to the assessment (see Table 2): from the "ideal case" monitoring system to a "shortcut" via literature review.

Table 2: Differentiation in the Assessment Approach Based on Data Availability for the Monitoring System

Data Availability	Approach
Full availability with regional disaggregation	Ideal case: use monitoring system to form regionally differentiated policy recommendations
Full availability on national level only	Almost ideal case: use monitoring system to develop national policy recommendations
Availability for individual segments	Intermediate case: build on segments as indicators for the whole energy community sector, if available with qualitative specifications for the other segments
Approximate data only	"Shortcut" case: build on literature available to qualitatively describe developments of the sector

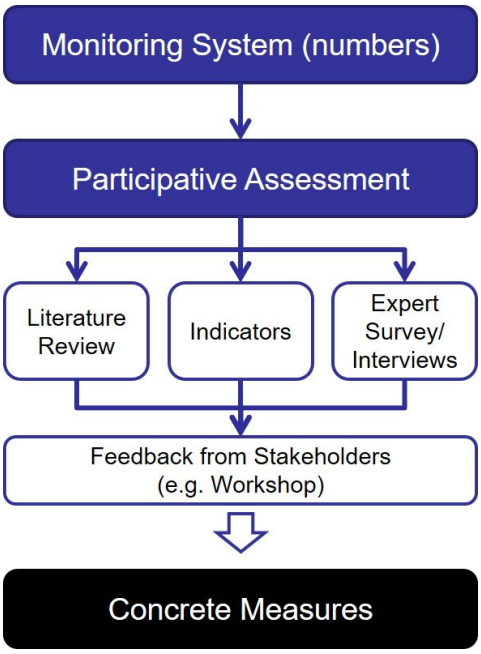

Figure 2: Assessment of Barriers & Drivers – Flow Chart of Process for the Ideal Case

4 Module I: Assessment of Barriers & Drivers

4.1 Process in the Ideal Case

The assessment of barriers and drivers is described in more details in Background Paper #2. Therefore, we concentrate on some process elements here as depicted in Figure 2 and Figure 3. We distinguish two cases here:

- An **ideal case** where a full monitoring system or database exists and resources are available to conduct a participative assessment of barriers and drivers over several steps;
- A "**shortcut**" version of the assessment if data are not available and resources are limited, e.g. if a smaller non-governmental organisation (NGO) carriers out the assessment.

In the ideal case, the process starts with the monitoring of different energy community segments in the country under investigation and different regions of this country (see Figure 2). The assessment itself would then begin with a review of the literature on barriers and drivers in this country to inform the development of an indicator set, which draws from data of the monitoring system, and a standardised survey and/or expert interviews. Results are presented to stakeholders together in a joint workshop and/or separate workshops for different types of stakeholders.

A differentiation by region makes sense where the monitoring system indicates great variance between geographical areas.

Hence, literature review, indicators, survey and expert interviews complement and inform each other. This is the reason why they are lined up in Figure 2. In fact, this assessment can be designed in multiple steps, not only two with those three elements in parallel.

As such a process is resource-intensive, we propose to carry it out once and develop other feedback mechanisms together with stakeholders for further "cycles" after measures have been implemented.

4.2 Assessment Process if Resources Are Lacking

If EU MS are reluctant to carry out the assessment and/or smaller organisations, e.g. national umbrella organisations or dedicated NGOs, want to do the assessment, there could be a need for a less resource-intense version of the assessment as depicted in Figure 3:

- Instead of a full monitoring system, the assessment is informed by a review of existing scholarly work and policy documents. If no numbers on energy communities and their development are available, the assessor may still describe the status quo qualitatively.
- Instead of a resource-intensive participative assessment of barriers and drivers, the organisation carriers out a rapid assessment using a literature review and the expert survey developed in this MA project.
- Concrete measures are proposed building on this short assessment cycle without feedback from stakeholders via workshops. If time and resources allow, the assessor may collect feedback through responses to an assessment paper via e-mails or a webform.

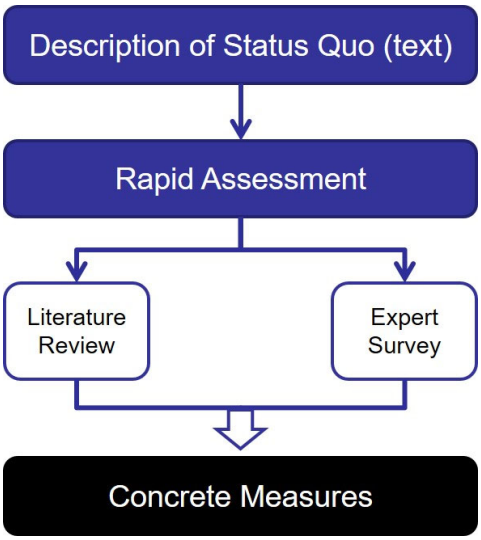

Figure 3: Assessment of Barriers & Drivers – Flow Chart of Process If Resources Are Lacking

4.3 Templates & Benchmarking

We propose to use a common typology of barriers and drivers in all countries, e.g. the one developed in Background Paper #2, which we use in this MA project. Templates of the surveys are provided separately. For the test of the survey template, we utilised the software Easy-feedback (https://easy-feedback.de/). Templates in English, German and Polish are available in lss format, i.e. LimeSurvey's xml data format.

A common typology allows to compare results between countries and makes cross-country learning possible. Even if countries may feel the need to adapt the process to their specific circumstances and different contractors for the assessment are certainly inclined to build their own evaluation tool based on their respective expertise and views, we would highly recommend to use same or very similar questionnaires for a survey as a "core" element – "core" in the sense that this standardised survey shall be included in all assessments no matter if "ideal case" or "shortcut" version.

5 Impact Model for the Evaluation of Policy Measures

EU MS should select policy measures that help to overcome barriers and strengthen drivers. The link between these – barriers/drivers and policy measures – are described by an "impact model" or a "theory of change" as Weiss

(1995) has called it. Put in other words: it describes how and why an initiative works (Weiss, 1995). Such an understanding of how and why the measures introduced help to overcome barriers or reinforce the drivers can be implicit or explicit, but is always present. Sources could be:

- Theoretical model(s), which are, however, not yet readily available as a kind of "toolbox" for this purpose, but still under investigation by researchers;
- General findings from empirical research, e.g. on investments by private households ("household finance") and in the community energy sector specifically;
- Expert statements on such kind of social mechanisms in the interviews conducted as part of the assessment of barriers and drivers.

The first step in this process is to make sure of the goals to be achieved by the implementation of the measures. More energy communities is usually not considered a goal in itself. Rather, EU MS might want to secure social acceptance of renewable energy projects, accelerate the transition in their country or initiate regional development processes, to name a few potential goals. These are discussed in Module III as potential benefits of energy communities.

In the end, evidence should be reviewed using the monitoring system. If measures fail to achieve the goals, the impact model or theory of change needs to be revised or complemented if a cofounding factor missing in the original model led to the failure.

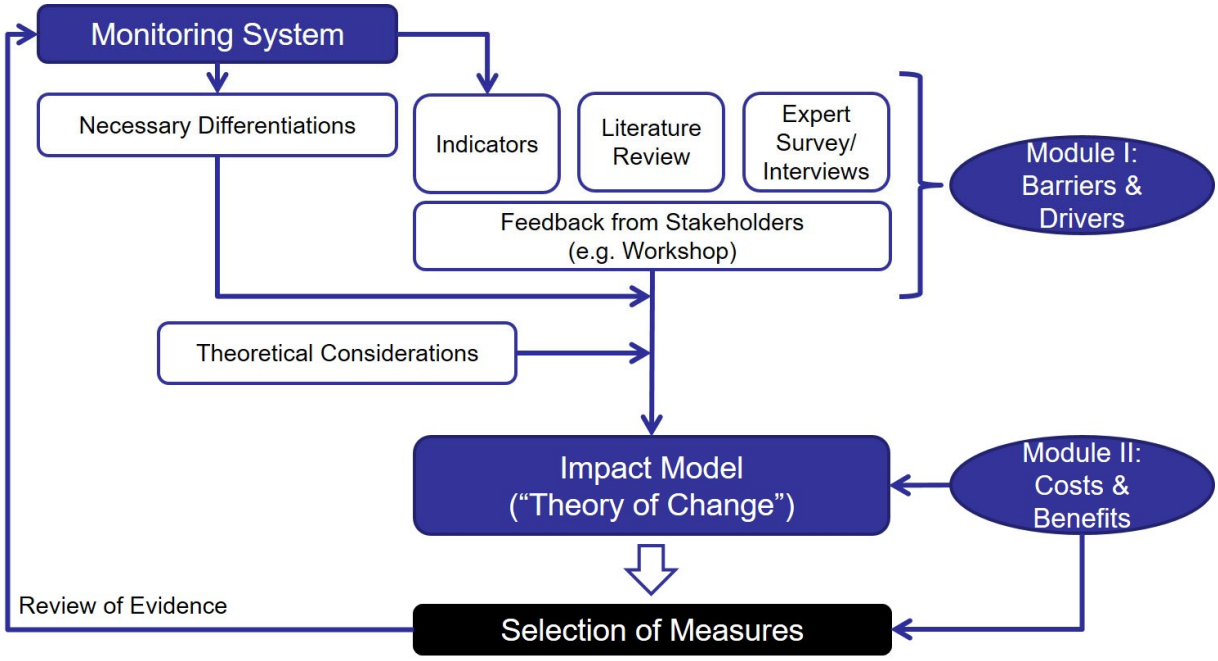

Figure 4: Development of an Impact Model and Its Use

We depict this procedure of developing and using the impact model and the interlinkages with other elements of the assessment process in Figure 4.

6 Module II: Evaluation of Costs & Benefits

The process for the evaluation of costs and benefits is described in more details in Background Paper #3. We focus on some core process aspects. Evaluations of costs and benefits can mean:

- Analyses of costs and benefits that increasing numbers of energy communities generate for the energy system of the country or the region under investigation, its economy, society and/or the environment, or
- Cost-benefit analyses (CBA) of specific interventions, i.e. policies and measures, to increase the number and/or size of energy communities.

We use "evaluation of costs & benefits" in both senses (see Background Paper #3 for more details).

As outlined in the background paper, the evidence base is still quite small regarding many of the potential benefits and costs associated with energy communities. Moreover, they usually depend on the type of energy community and how this energy community is implemented. It could also depend on external factors and differ between countries and regions. Therefore, further research is needed to establish "known effects".

Principally, the evaluation of costs and benefits can build on a review of the literature or an own evaluation (see Figure 5). We propose to use a common typology of costs and benefits based on the literature review. If the strength of effects is known from the literature or past evaluations, the evaluator can use these "factors" for the quantification of effects. For some benefits, especially "regional value added", tools have been developed that quantify effects based on literature values and specifications by evaluators for selected parameters. Own evaluations are relatively resource intensive, no matter which type of evaluation is used (see Background Paper #3). Hence, the evaluation of costs and benefits may include only literature-based analyses and/or focus on selected (costs and) benefits.

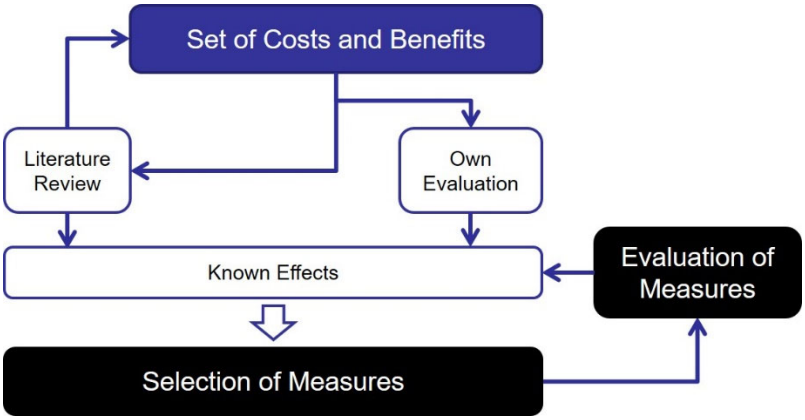

Figure 5: CBA Process

After the selection of policy measures, EU MS should evaluate the implementation in its results. For this, they need to establish a monitoring system that ideally includes metrics of costs and benefits that could be attributed to those policies. Findings from this programme evaluation feed back into "known effects" and selection of measures.

7 Module III: Assessment of the Potential

7.1 Differentiations

The assessment of the potential is described in more details in Background Paper #4. Here, we briefly recapitulate main differentiations and give a short outline of the assessment process. Projections of energy community potential build either on extrapolations from existing energy community data or on hypothetical investment propensity.

- Pure extrapolation of energy community growth, using scenarios partly substantiated by a reflection of the institutional and technological environment and its development and/or some kind of time series analysis. The UK community energy study by Capener (2014) can be probably seen as a good example.for this. We call this the "**sector development approach**". It can focus on two different target measures: projected installations and investment amounts or the community share in overall investments.
- Stated preferences, i.e. willingness to invest in energy communities, disposable income and some assumptions about the split of the investment portfolio combined with growth of renewable energies (or other technologies), cost projections and assumptions regarding financial structures. While principally open for input from energy community data, this essentially is the COME RES approach (Laes et al., 2021). We call this the "**bottom-up modelling approach**".
- The previous approach can be combined with as much input as possible from energy community analyses. CE Delft (2016) follows such a "**mixed approach**" using community energy data from two selected countries, the Netherlands and France, as default for countries, for which there are no other data available.

Different from Capener (2014) and Laes et al. (2021), CE Delft (2016) includes small and medium enterprises (SMEs) and local authorities. The existing assessments of energy community potential further differ regarding coverage of technologies.

We do not recommend a specific modelling approach. Rather, we think that the selection of the approach highly depends on data availability and purpose. Ideally, assessments of potential using different approaches can be compared.

7.2 Process

The assessment process starts with the selection of the modelling approach and collection of input data. The "sector development approach" needs energy community data in high resolution. If a monitoring system is in place, data could be drawn from this (see Figure 6).

A "bottom-up modelling approach" relies on data of different nature and from different sources. We group them into "investment data", "technology data" and "financial data". Disposable income or wealth and population or household data can be taken from official statistics. These should be available for private households as well as SMEs and local authorities. Data availability might be better for private households, though. The same is probably true for data on asset allocation in private households', SMEs' and local authorities' portfolios and for willingness to invest in renewable energies and other technologies. The latter is usually taken from surveys (Laes et al., 2021) or experimental studies (Pons-Seres de Brauwer & Cohen, 2020), even if the approach is principally open for including data on actual investments by citizens, SMEs and local authorities. Projections of future installations at a certain point in time or over a certain period are usually taken from external sources – model scenarios, policy targets or physical/technical potentials. Installed capacities are then translated into monetary units by multiplying them with cost projections. Since private households, SMEs and local authorities usually combine equity that they invest into these projects with other forms of financing and sometimes co-invest with other actors, further assumptions regarding financing conditions and ownership structures are needed. These could build on market data for those technologies under investigation, on specific energy community data or on expert interviews. While the first two options would mean to extrapolate past data into the future, the latter option could include experts' expectations of future developments regarding financial structures.

Pathways constructed using the "sector development approach" should be checked against results from the assessment of barriers and drivers. Both should be consistent.

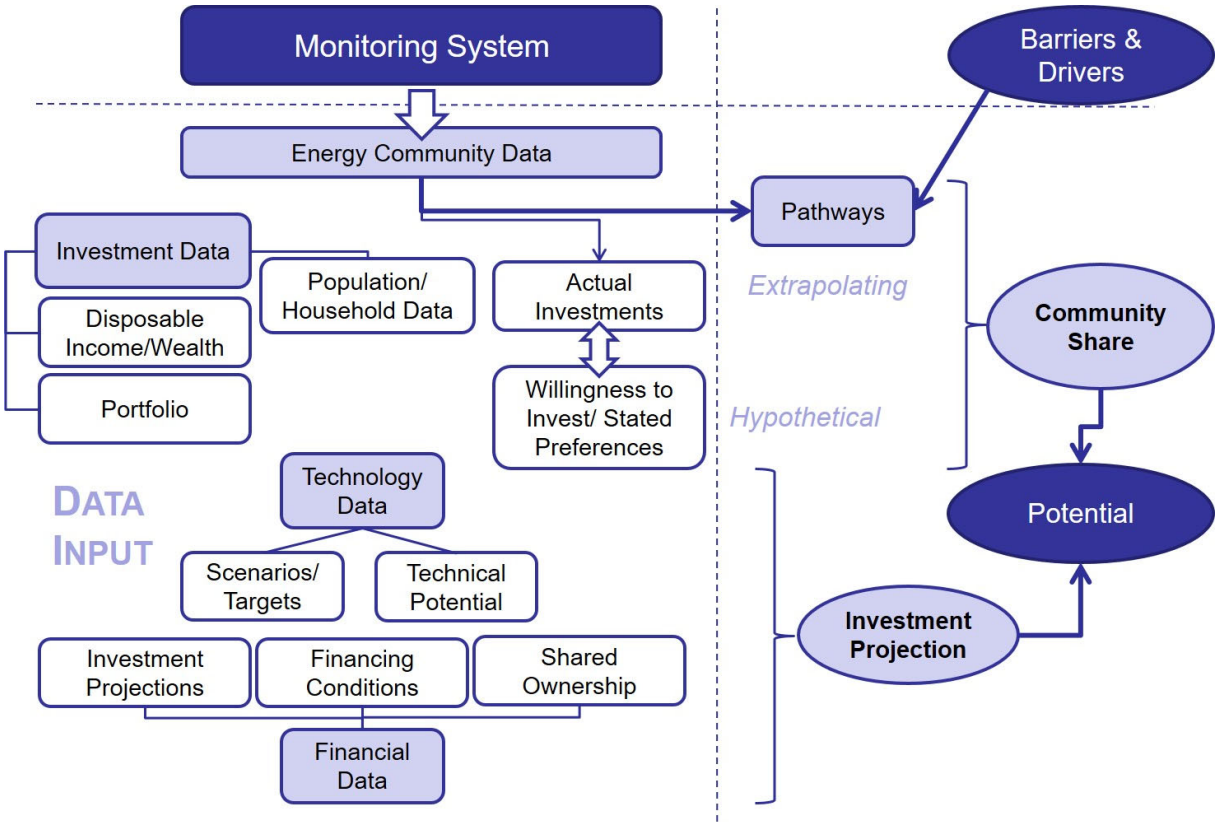

Figure 6: Assessment of the Potential – Process

8 Module IV: Policy Database

Module iV includes the collection of public policies, which is described in more details in Background Paper #5. The goal of this collection is to provide a list for stakeholders, especially public administrations and political decision-makers, but probably also civil-society actors lobbying for energy communities. The stakeholders can use this list of policies or strategies as a basis for their proposal of measures, which are then assessed to make the final selection (see Figure 7). The first collection will certainly build on a review of the existing academic and policy literature. Ideally, the collection in its final form includes some elements of assessment, i.e. statements on the effectiveness, efficiency and legitimacy of those policies. Information for this assessment can be taken from the literature and the evaluation of measures implemented in previous cycles.

Finally, we recommend to build a repository of public policies – commissioned either by the European Commission or using REScoop resources. The repository should contain information on time of implementation, geographical scope, type of strategy/policy, financial volume (if applicable), effects (where available) and references.

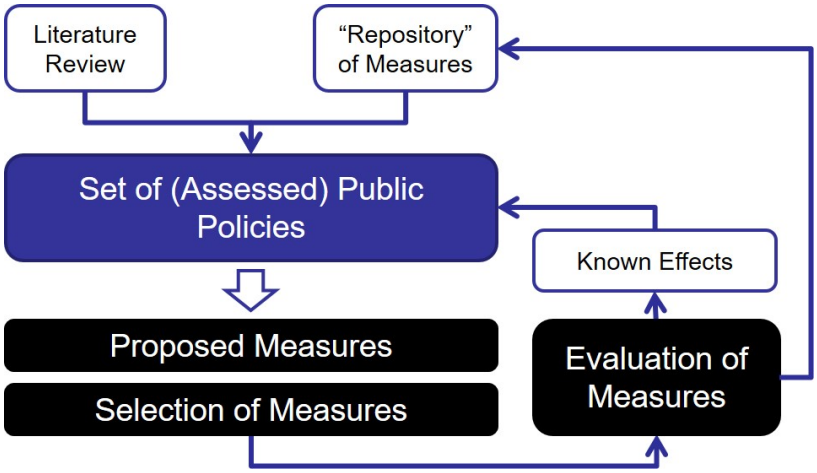

Figure 7: Collection of Public Policies

9 Resulting Enabling Framework and Evaluation (Feedback Loops)

All parts of the assessment described so far result in a policy programme that shall "enable" energy communities to develop in the respective EU MS. This enabling framework according to RED II, Art. 22 Para. 4 may already be in place without (proper, explicit) assessment of potential and barriers. Nevertheless, it could still be strengthened by conducting the assessment as outlined above.

However, this assessment should not be a one-off endeavour. Rather, feedback loops should ensure that policy goals are in fact realised. Hence, the implementation of the enabling framework and its results should be evaluated after a certain time. This could, for example, be integrated into the process of revising the NECP. Thus, we do not regard the process depicted in Figure 1 to be a linear one. Second and further assessment cycles, however, could build on shorter and quicker assessments.

Finally, we propose to review the assessment processes in EU MS and step-by-step to standardise the assessments, at least those elements of the assessment which do not demand country- or region-specific deviations. Core elements could include:

- The general structure of the monitoring systems;
- Standardised elements for the assessment of barriers and drivers (typology of barriers and drivers, codebook for analysis of the literature, questionnaires for surveys, core questions for interview guidelines),
- A common impact model;
- The typology of costs and benefits;
- A common list of public policies;
- An agreed methodology for assessing costs and benefits.

10 Qualifiers: Standardisation and Experimentation

While we acknowledge the need to adapt to country specifics and different resources available, this kind of standardisation certainly helps to compare findings between countries and may encourage EU MS and smaller actors with less resources to conduct assessments. However, we do not want this plea for standardisation be misunderstood: Some variation beyond the "core" might be useful, as experimentation can help to improve assessments.

Lastly, we recommend to collect all the assessments in one place, which would make learning from experiences and findings made elsewhere easier. This place could be the Energy Communities Repository (European Commission, 2022).

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