



Providing operational economic appraisal methods
and practices for decision-making on climate and
environmental policies

The operational decision support toolbox

Deliverable 5.2



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¹ D5.2 has been submitted in PDF format but will also be integrated into the online tool, D5.1 One-Stop Shop.



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1. Description of the Decision Support Toolbox

The Decision Support Toolbox has been developed by modelers within the PATTERN project to offer a clear and structured overview of the various modelling approaches used in policy appraisal. The toolbox categorizes the methods applied in the project into distinct sections, ensuring clarity in their application and purpose. The main objective of this toolbox is to assist decision-makers in selecting the most appropriate methodologies for policy appraisal and to guide them through the evaluation process.

This toolbox builds on the ex-ante and ex-post methods outlined in Deliverables 3.2 and 4.1. It is designed to simplify the process of policy assessment by offering insights into different analytical frameworks. The methods are categorized into three sections:

- Preference and Behavioural Analysis
- Sustainability Assessments
- Economic and Environmental Impact Assessments

For each method, a diagram illustrates the modelling approach, complemented by an explanation box that summarizes the methodology in clear, non-technical language, ensuring accessibility for all evaluators. Additionally, reference is made to other deliverables and literature, offering further context and detailed insights for users who wish to explore the methods more deeply.

2. How to use the Decision Support Toolbox?

The following steps need to be followed for an optimal use of the tool:

1. Define the Type of Appraisal:

Begin by selecting the type of appraisal you want to conduct: ex-ante (before policy implementation) or ex-post (after policy implementation). This choice will guide the subsequent steps of the evaluation.

2. Identify the Research Question of the policy evaluation:

After defining the appraisal type, choose the specific policy question you aim to answer through the appraisal. This selection will help narrow down the appropriate methodologies.

3. Method Selection:

Once both the appraisal type and the policy question have been chosen, the toolbox will automatically recommend the most suitable methodology for your analysis. This feature ensures that you choose the correct approach with minimal effort.

4. Review the Explanation Box:

Each method includes an explanation box with a brief description of the approach, the type of data required, the analysis process, expected results, and examples from the PATTERN project. This section helps ensure that the methods are understood in simple, non-technical terms.

5. Explore the Categories:

The methods are organized into three main categories based on your focus: Preference and Behavioural Analysis, Sustainability Assessments and Economic and Environmental Impact Assessments.

By following these steps, the Decision Support Toolbox provides a user-friendly and structured way for policymakers to navigate the complexities of policy assessment and identify the appropriate methodologies for their needs.



3. Appraisal Methods

3.1 Preference and Behavioural Analysis

3.1.1 Discrete Choice Experiment (DCE) and the Q method

A) Diagram illustrating the modelling approach



B) Explanation Boxes

Q Method →

What? The Q method is a qualitative-quantitative method to identify the perspectives/viewpoints of different stakeholders regarding a policy. More specifically, it reveals consensus and disagreement among stakeholders.

Data? Data should be collected by doing interviews with the targeted stakeholders. During these interviews, respondents sort statements about the research topic on a grid. After the sorting process, an 'exit-interview' is performed to identify the reasoning behind the sorting process.

Analysis? Factor analysis (e.g., by using free software such as KADE and PQMethod) and qualitative data analysis.

Result? An Identification of distinct viewpoints among stakeholders. The result reveals a few key perspectives (i.e., factors) that represent shared ways of thinking, highlighting both commonalities and differences in opinions.

For more information on how to apply this method check out D1.4 Section 13.

And/or some related relevant documents:

Watts & Stenner (2012) book "doing Q methodological research"

DCE →

What? DCE is a quantitative method used to analyze preferences by presenting respondents with a series of choices between different alternatives. It helps identify the trade-offs people make and the factors influencing their decision-making.

Data? DCE data should be collected through surveys where respondents are presented with different choice scenarios reflecting real-world trade-offs. Participants select their preferred option in each scenario.

Analysis? Choice models (e.g., the Latent class model and the mixed logit model).

Result? DCE identifies preferences by analyzing how respondents make choices between different alternatives. The results reveal key factors influencing decision-making, highlighting trade-offs, shared patterns, and differences in preferences among individuals or groups.

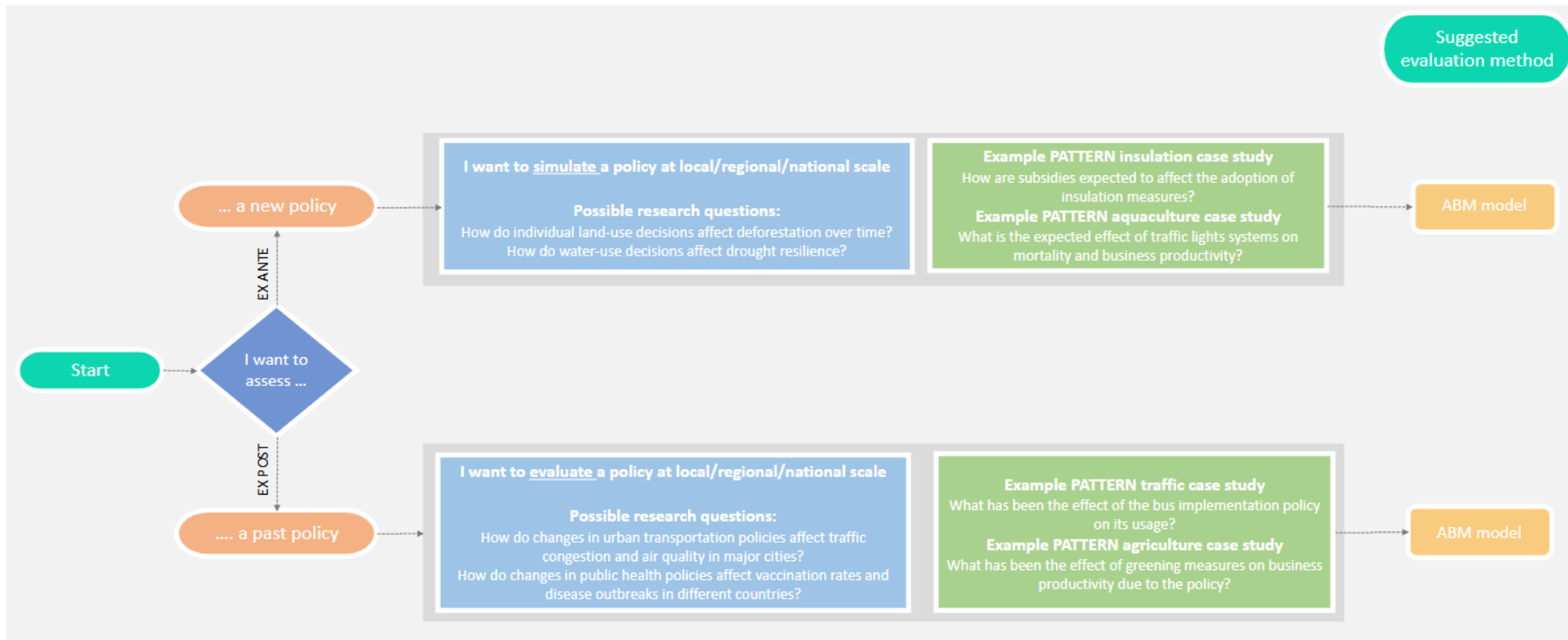
For more information on how to apply this method check out D1.4 Section 14.

And/or some related relevant documents: **TO ADD name of document here**

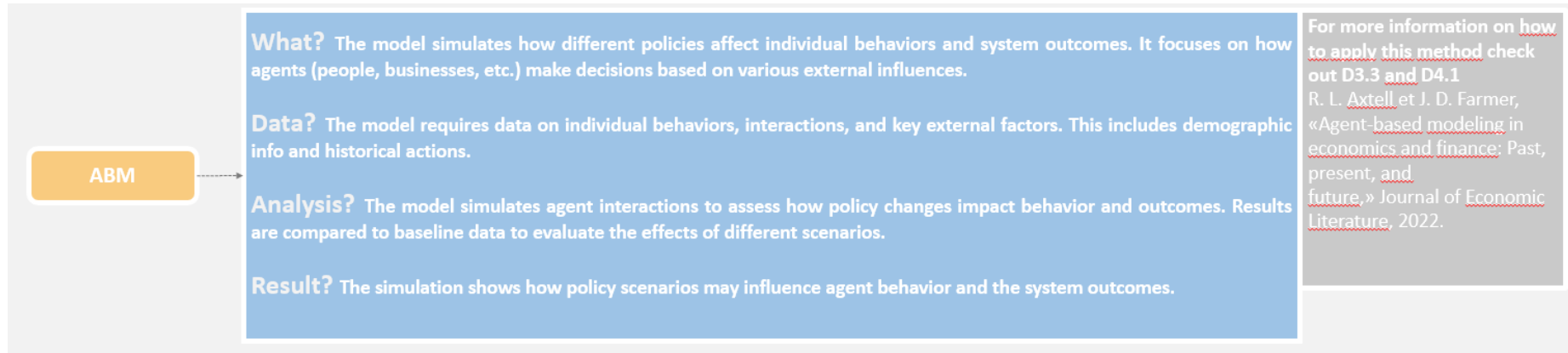
[10.1023/A:1008287310583](https://doi.org/10.1023/A:1008287310583)

3.1.2 Agent Based Modelling (ABM)

3.1.3 Diagram illustrating the modelling approach



A) Explanation Boxes



The diagram illustrates the Agent-Based Modeling (ABM) process. On the left, a yellow box labeled "ABM" has a dashed arrow pointing to a large blue box. This blue box is divided into four sections: "What?", "Data?", "Analysis?", and "Result?". To the right of the blue box is a grey box containing a reference for further information on applying this method.

ABM →

What? The model simulates how different policies affect individual behaviors and system outcomes. It focuses on how agents (people, businesses, etc.) make decisions based on various external influences.

Data? The model requires data on individual behaviors, interactions, and key external factors. This includes demographic info and historical actions.

Analysis? The model simulates agent interactions to assess how policy changes impact behavior and outcomes. Results are compared to baseline data to evaluate the effects of different scenarios.

Result? The simulation shows how policy scenarios may influence agent behavior and the system outcomes.

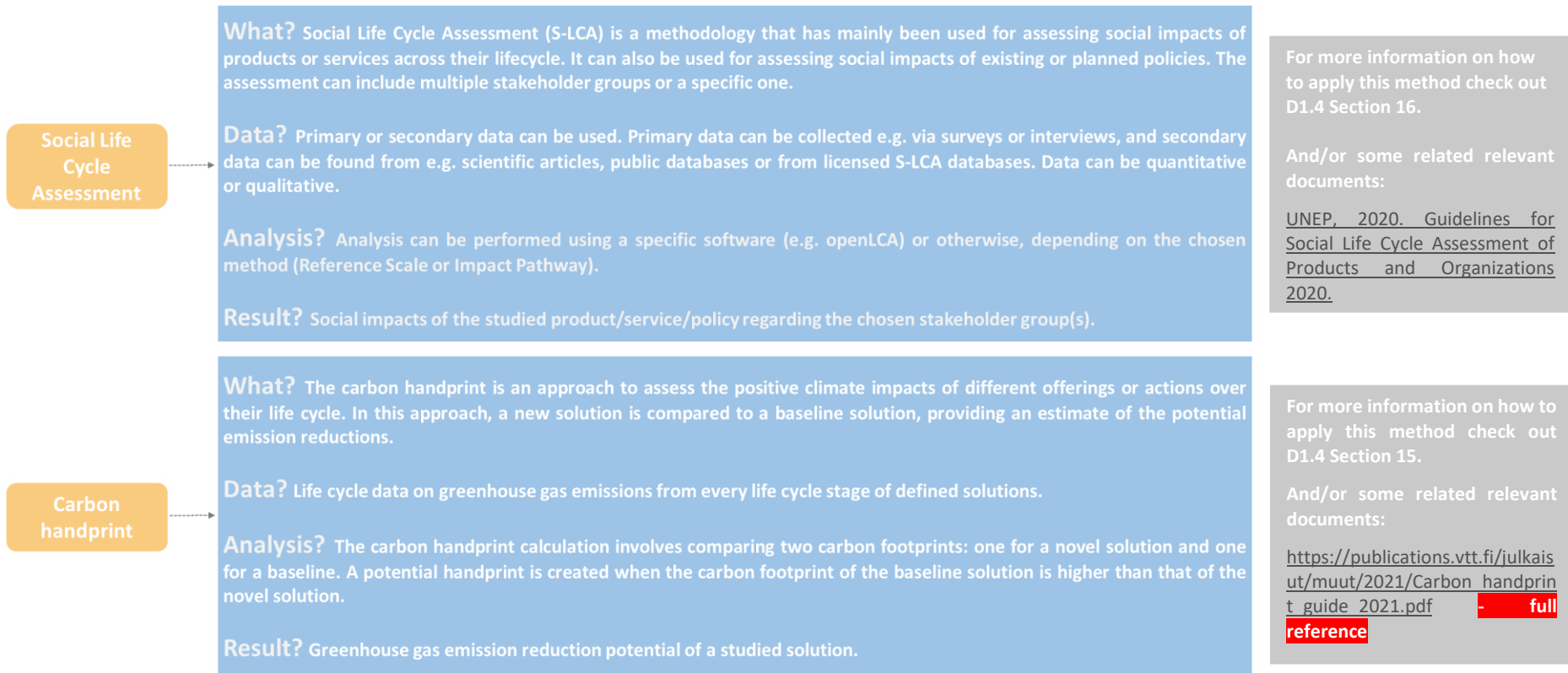
For more information on [how to apply this method](#) check out [D3.3](#) and [D4.1](#).
R. L. Axtell et J. D. Farmer, «[Agent-based modeling in economics and finance: Past, present, and future](#),» [Journal of Economic Literature](#), 2022.

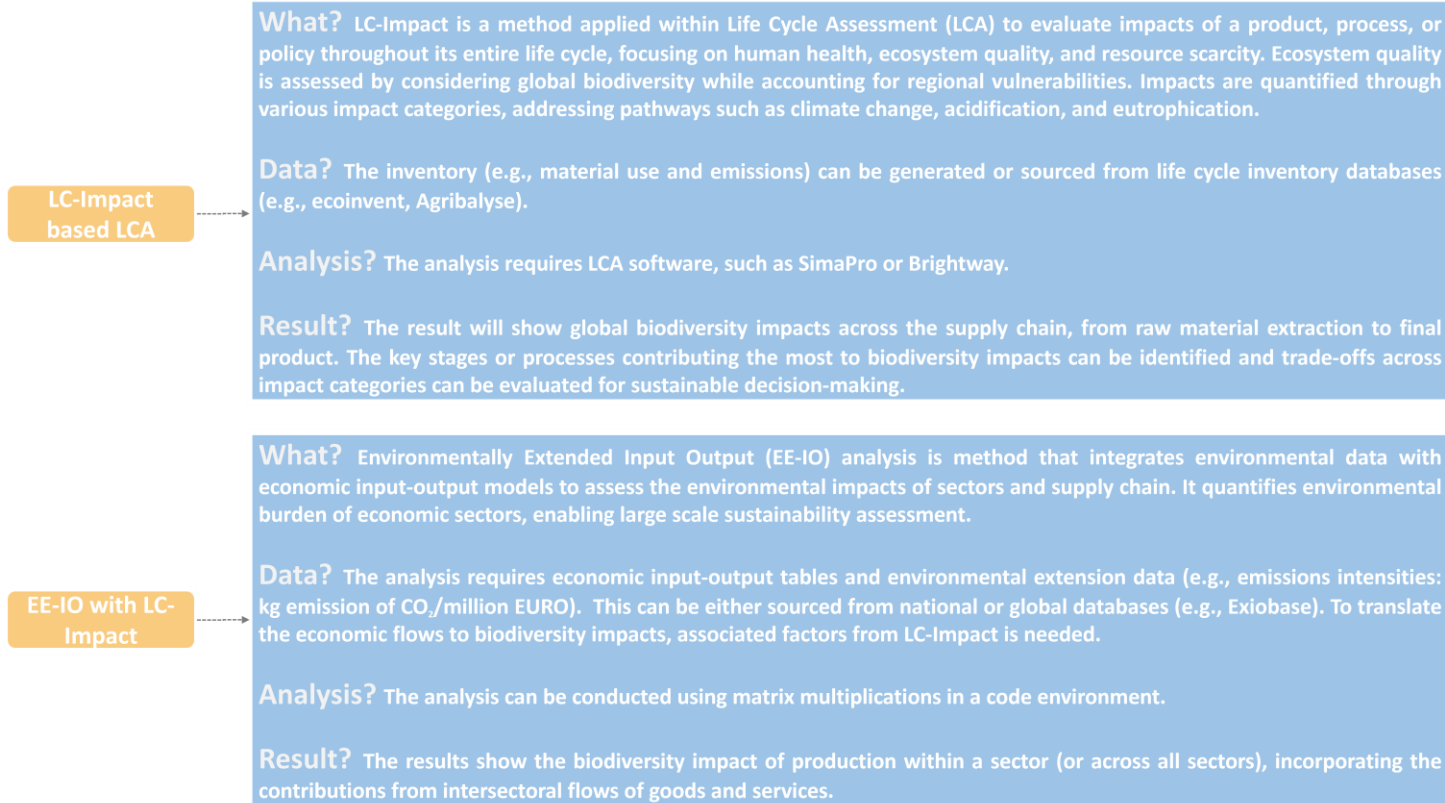
3.2 Sustainability Assessments

A) Diagram illustrating the modelling approach



B) Explanation Boxes





For more information on how to apply this method check out D1.4 Section 20.

Veronesi, F., Hellweg, S., Antón, A., Azevedo, L. B., Chaudhary, A., Cosme, N., ... & Huijbregts, M. A. (2020). LC-IMPACT: A regionalized life cycle damage assessment method. *Journal of Industrial Ecology*, 24(6), 1201-1219.

For more information on how to apply this method check out D4.3 Section 18.2.3

Schaffartzik, A., Sachs, M., Wiedenhofer, D., & Eisenmenger, N. (2014). Introduction to environmentally extended multi-regional input-output analysis (EE-MRIO). NILU. Retrieved from https://folk.nilu.no/~dmor/pdf/Schaffartzik_IntroToEEMRIO.pdf

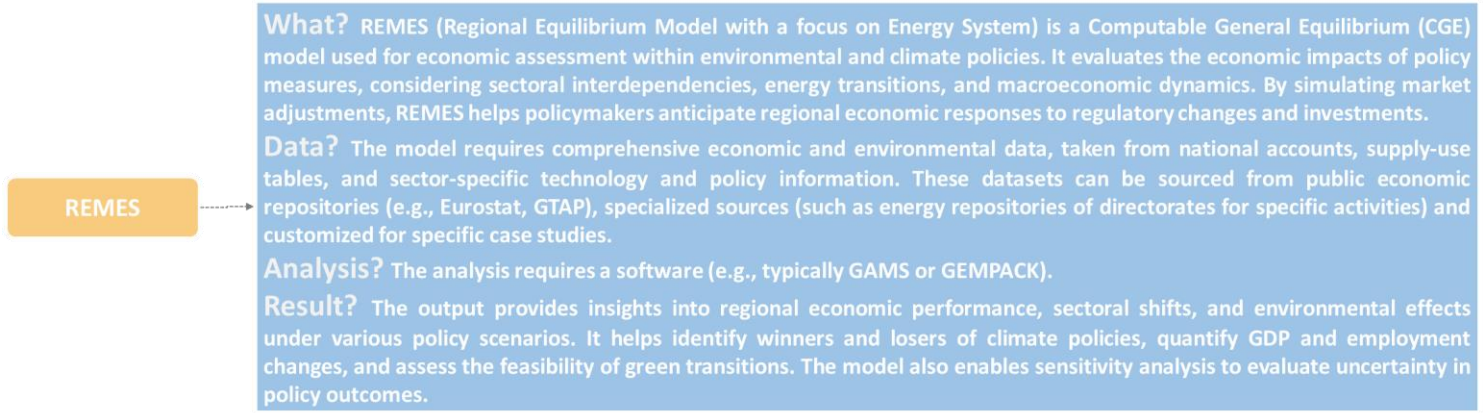
3.3 Economic Assessments

3.3.1 Regional Equilibrium Model with a focus on Energy System (REMES)

A) Diagram illustrating the modelling approach



B) Explanation Box



REMES

What? REMES (Regional Equilibrium Model with a focus on Energy System) is a Computable General Equilibrium (CGE) model used for economic assessment within environmental and climate policies. It evaluates the economic impacts of policy measures, considering sectoral interdependencies, energy transitions, and macroeconomic dynamics. By simulating market adjustments, REMES helps policymakers anticipate regional economic responses to regulatory changes and investments.

Data? The model requires comprehensive economic and environmental data, taken from national accounts, supply-use tables, and sector-specific technology and policy information. These datasets can be sourced from public economic repositories (e.g., Eurostat, GTAP), specialized sources (such as energy repositories of directorates for specific activities) and customized for specific case studies.

Analysis? The analysis requires a software (e.g., typically GAMS or GEMPACK).

Result? The output provides insights into regional economic performance, sectoral shifts, and environmental effects under various policy scenarios. It helps identify winners and losers of climate policies, quantify GDP and employment changes, and assess the feasibility of green transitions. The model also enables sensitivity analysis to evaluate uncertainty in policy outcomes.

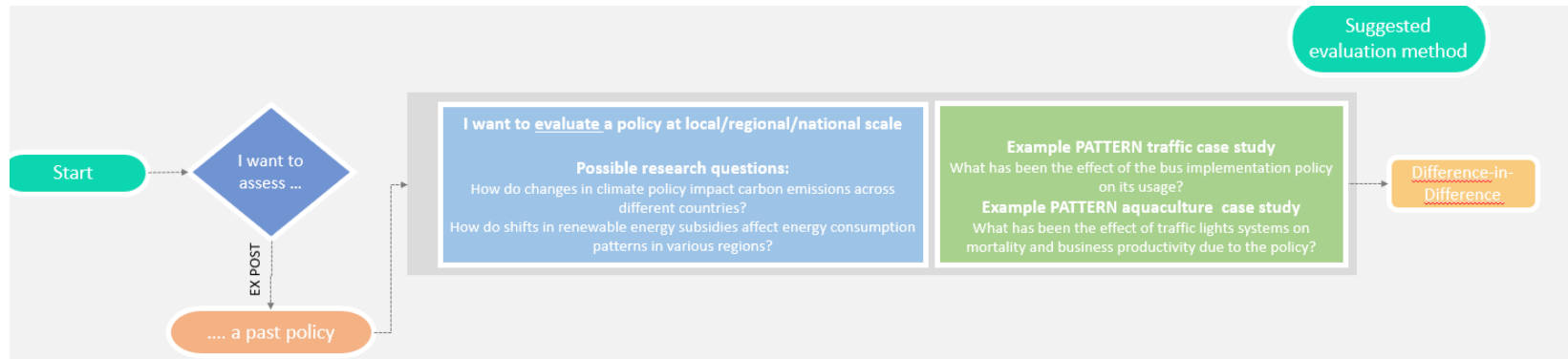
For more information on how to apply this method check out D1.4 Section 18.

And/or some related relevant documents:

<https://www.ntnu.edu/web/iot/energy/energy-models-hub/remes>

3.3.2 Difference in Difference estimation (DiD)

A) Diagram illustrating the modelling approach



B) Explanation Boxes

<p>Difference-in-Difference</p>	<p>What? The DiD model assesses the causal impact of a policy by comparing changes before and after its implementation between treated and control groups.</p> <p>Data? Data includes pre- and post-policy outcomes for both groups, with key demographic or behavioral variables</p> <p>Analysis? The DiD method compares outcome changes between groups, controlling for confounders and checking for parallel trends before implementation.</p> <p>Result? The policy had a significant/no significant impact on the treated group compared to the control, providing insights for future policy decisions.</p>	<p>For more information on how to apply this method check out D3.2</p> <p>Arkhangelsky, D., Athey, S., Hirshberg, D. A., Imbens, G. W., & Wager, S. (2021). Synthetic Difference-in-Differences. <i>American Economic Review</i>, 111(12), 4088–4118. https://doi.org/10.1257/aer.20190159</p>
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4. CONCLUSION

The Decision Support Toolbox is a valuable resource for policymakers and analysts, providing clear guidance on selecting the most appropriate modelling methods for policy appraisal. By categorizing methods into distinct sections and offering easy-to-understand explanations, the toolbox simplifies the decision-making process and ensures that the right approach is chosen for different types of evaluations. With its focus on both ex-ante and ex-post methodologies, along with practical examples from the PATTERN project, the toolbox helps users navigate the complexities of policy assessment, fostering more informed, effective, and transparent policy decisions.



The PATTERN project aims to improve practitioners' capacity for decision making on climate and environmental policies by developing a One-Stop Shop for the economic appraisal of policies and measures. With this One-Stop Shop and its different components, PATTERN will provide decision-makers, stakeholders, and the public with more realistic ability to systematically assess the options and their consequences. It will provide a basis for improving (i) methodologies, techniques and models for conducting economic appraisal of climate and environmental policies (ii) the broader policy evaluation framework and practices currently used in European countries and their regions and (iii) tailored analysis and engagement strategies structures for participation and co-creation with relevant stakeholders and key actors to enhance operational capacities of economic appraisal methods and improve the impact of European policies on climate and environment.



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