



INNOPATHS

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INNOPATHS

Innovation pathways, strategies and policies for the Low-Carbon Transition in Europe

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D2.2 Prototype of Policy Evaluation Tool [Online Tool]

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PU	Public	X
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1 Version log

Version	Date	Released by	Nature of Change
1	05/05/2018	C Peñasco (UCAM)	First draft
2	09/05/2018	E Verdolini (CMCC)	Revision
3	16/05/18	P Larkin (N&S)	Revision

2 Definition and acronyms

Acronyms	Definitions
FIT	Feed-in tariffs
RPS	Renewable Portfolio Standards
TGC	Tradable Green Certificates
ETS	Emission Trading Schemes
PET	Policy Evaluation Tool
EC	European Commission
EU	European Union

3 Introduction

This deliverable presents and describes the prototype for the Policy Evaluation Tool (PET) which has been developed in the INNOPATHS project.

The PET was designed to be an integrated, interactive and open online platform to be used by policy makers, industry representatives, researchers and the general public across Europe. The online tool gives guidance as to what can be expected from a wide range of different low-carbon policies. This includes both past policies and future policy options. Given the scope of the INNOPATHS project, the main focus of the tool is on the EU, but policies from other countries may be considered as well. This online tool helps policy makers and other stakeholders get a clear idea what kinds of policies, and at what strength, will be required promote technical progress in low-carbon technologies, and their widespread diffusion. We initially called the tool Policy Assessment Framework (PAF) and, after internal and external discussions, we decided that Policy Evaluation Tool (PET) would more accurately describe the fact that the tool actually does the analysis (it is not just a framework for people to apply)¹.

The overarching objective of the Policy Evaluation Tool is to provide academics and policy makers with an integrated tool analysing and synthesizing what we know regarding the impact of policy instruments which have been or can be used to support the transition to a low-carbon system. This integrated tool includes categorizations of: (a) the different policies that can shape aspects of the transition to a low-carbon economy; (b) the various indicators that are used to understand their impact on environmental, competitiveness and social outcomes; (c) the strength of the evidence; and (d) the context for the evidence to help interpret its possible applicability elsewhere.

The Policy Evaluation Tool is framed within the third overall objective of INNOPATHS project: “Proposing policy and innovation system reforms that will help the EU and Member States meet their greenhouse gas emission reduction targets”. The final version of the online and interactive tool, which will be developed over the next 18 months, will incorporate the results and insights of European experiences of climate and energy policies, and their evaluations, and which applies these insights to deriving a comprehensive set of policies and measures that will be necessary to realise the low carbon pathways and trajectories in practice. This constitutes a much needed tool for evidence to support policy decisions about alternative instruments to achieve various goals related to the energy transition.

The University of Cambridge (UCAM) has been responsible to carry out the design and development of the Policy Evaluation Tool. In addition to this, CCMC and EUI have provided comments throughout the design process and have participated in a blind double coding process. Nice & Serious have developed the application interface and the visualisation of the online tool. The current version of the PET prototype has already undergone a phase of review by project partners and stakeholders (the prototype was presented in the Stakeholder meeting in Florence), which resulted in the incorporation of their comments and modification of the tool e.g. criteria and policies, to reflect their feedback.

¹ The content and process used in this task has not changed. We have only modified the name to better reflect the added value of the tool.

UCAM will continue to work on the Policy Evaluation Tool and finalise it in month 36 of the project, when the final version of the Policy Evaluation Tool will be made available. Below we highlight the main functionalities of the Prototype of the Policy Evaluation Tool (D2.2) in this early development stage and summarizes the future planned updates and.

The prototype PET can be found at the following link: <http://innopaths-pet.niceandserious.com/#/>

4 Activities carried out and results

The present report describes the activities performed from December 2016 to May 2018 (project month 1 to 18).

The PET consists of two parts: first, the development of a framework/approach to comprehensively analyse the impact of the most relevant policy options such as procurement, carbon price, technology standards, deployment subsidies, R&D investments, etc. on the many relevant outcomes for decision makers and for scenario development such as patenting, R&D level, diffusion, cost reductions, support from different stakeholder groups, type of technology promoted, spillover benefits in local manufacturing or workforce development, and the interaction between various policies. Second, the tool is populated through a double-blind review process which collects and assesses the strength of evidence from available literature. In summary, the content of the PET consists of a set of systematic reviews of policies and a double coding evaluation of their performance.

4.1 Activities carried out

As mentioned in the introduction section, The Policy Evaluation Tool includes:

- α) A categorization/classification of those policies which can shape aspects of the transitions to a low carbon economy

To establish such a policy classification as part of the PET, we developed a single framework that builds on previous available policy classifications (i.e. those proposed, for instance, by the IEA, IRENA, ILO, OECD, ODYSEE-DATAMURE) which accounts for the particular objectives of the PET: to be accessible to both academics and policy makers and to cover the relevant aspects and factors shaping the energy transition.

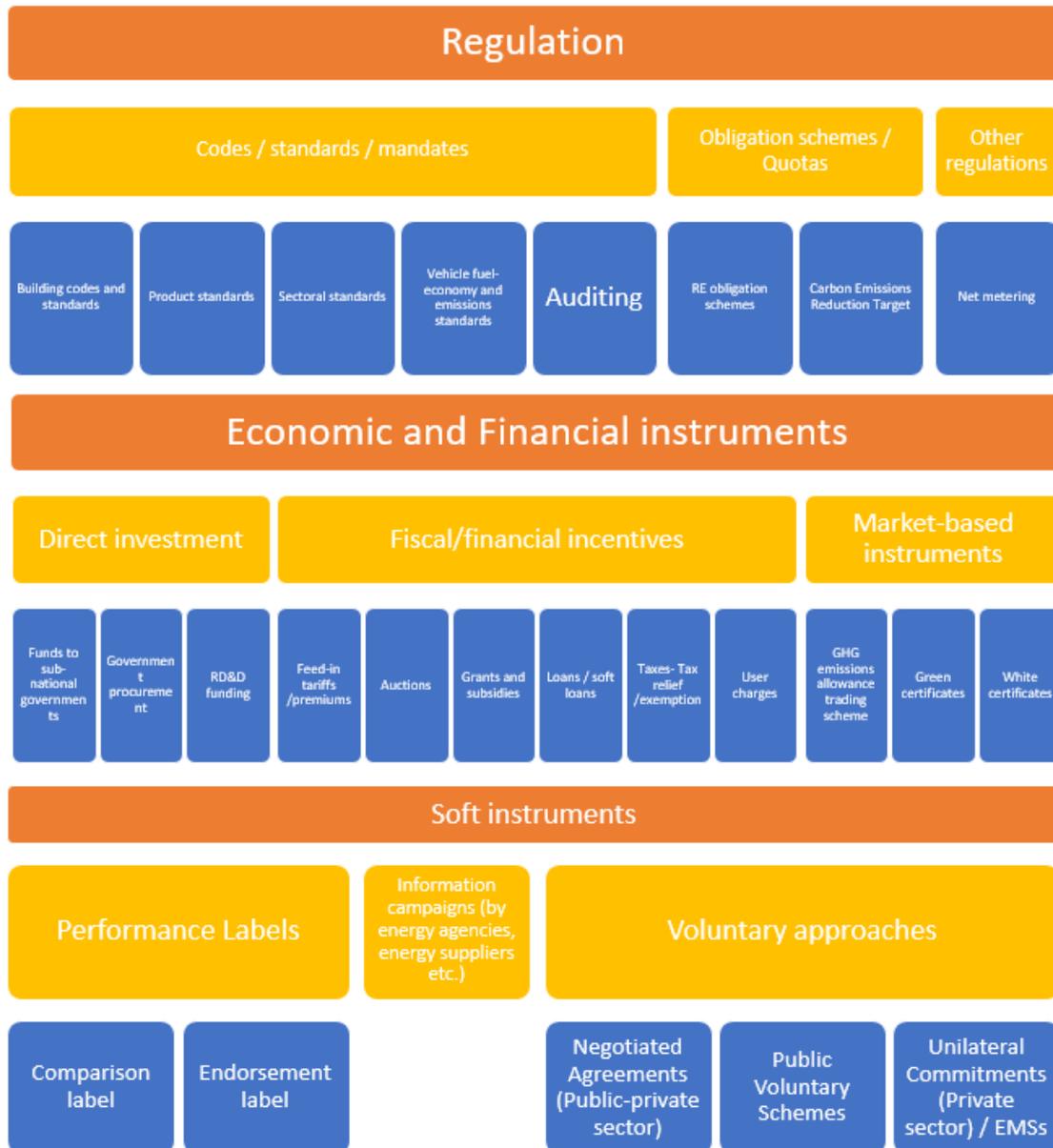
To achieve these needs, we developed a three-tiered categorization.

The first tier: 1. Regulation, 2. Economic and financial instruments, 3. Soft instruments
The second-tier: instruments highlighted by scholars & policy makers in the energy and environment space at a relatively high level

The third tier: policy instruments more familiar to narrower academics and, most importantly, to policy makers. This level includes a total of 26 types of policy instruments.

These 26 policy instruments are the ones evaluated in the Policy Evaluation Tool (Fig. 1).

Fig. 1. Classification of policy instruments for a low carbon transition.



Source: Own elaboration based on literature review.

β) Criteria and indicators used to understand their impact on environmental, competitiveness and social outcomes,

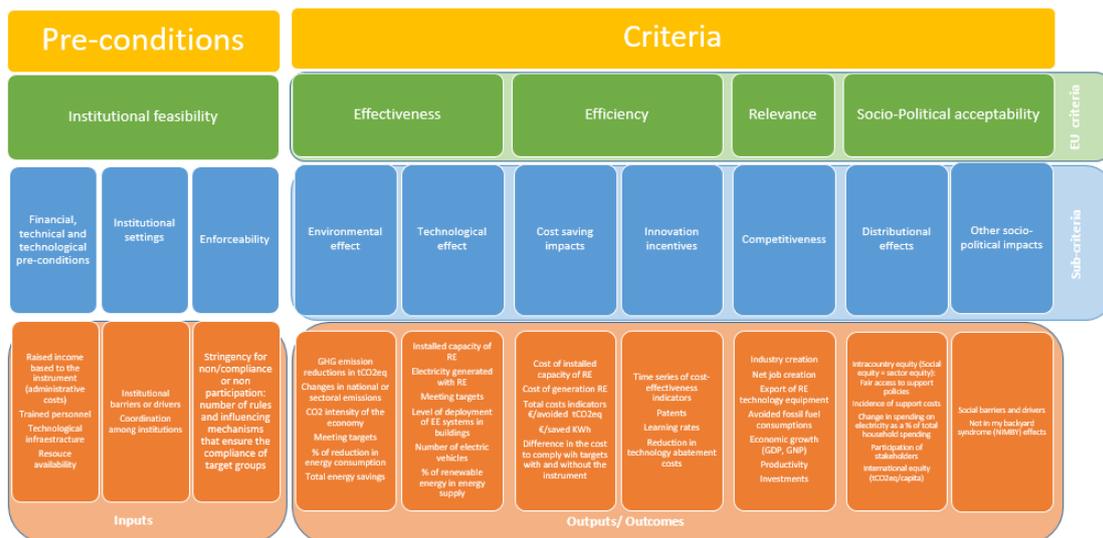
To reflect the range of outcomes and indicators that are being used to both, motivate policies and analyse them, we develop an indicator-based approach (Mundaca et al., 2016). We build on previous efforts to list indicators to come up with our own list to reflect the literature and EU priorities (See: IRENA, 2014; Konidari and Mavrakis, 2007; Del Rio et al., 2014; EC, 2015; IPCC, 2007; among others). The evaluation of policy instruments for promoting a transition to a low-carbon economy needs to consider that

policies affect the whole socio-technical system (Neij and Astrand, 2006). The management and policy literatures typically classify indicators into input, output and/or outcome-impact indicators. In this typology we focus on the latter, although in some cases we include output indicators, to facilitate policy maker efforts to project the outcomes they care about when considering a particular policy (Vedung, 1998).

In parallel, we have reviewed different policy documents and academic papers to draw our own set of criteria used to evaluate policy instruments. The EU criteria for a good policy have been used to inform our own categorization (Fig. 2)

For most policy instruments, the evidence available will only be able to populate the PET with insights about the relationship between a particular policy instrument and one or two indicators (outcomes or outputs). In other words, for most instruments the criteria dimension of the framework will look rather empty due to the lack of evidence.

Fig. 2. Categorisation of criteria (outputs and outcomes) used to evaluate what we know about the impact of policy instruments



Source: Own elaboration based on literature review

- χ) The strength of the evidence by paper and aggregated by policy and the context for the evidence to help interpret its possible applicability elsewhere.

The PET has as one of its goals to act as a tool to provide users evaluation about a specific type of policy. That is why ensuring the appropriateness of the evidence derived from literature is relevant. As none of the well-established scales fits to the purpose of the Policy Evaluation Tool (Balshem et al., 2011; Barends et al., 2017, Petticrew and Roberts, 2006; Sherman, 1998, Shadish et al., 2002), basing on, and combining previous approaches, we propose the following scale (Table 1).

Table 1. Strength of the evidence scale prototype

	Design	Scale
Randomized studies	Systematic reviews and meta-analyses of randomized controlled studies (RCS)	1
	Individual RCS with definitive results or without definitive results	2
Observational studies (Quantitative studies)	Systematic reviews and meta-analysis of non-randomized controlled studies and/or before and after studies, and systematic review of cross-sectional surveys	3
	Panel data analysis with control group	4a
	Panel data analysis with control variables (without counterfactual)	4b
	Individual cross-sectional survey with IV	5a
	Individual cross-sectional survey with control variables	5b
Qualitative studies	Self-report studies with data about feelings, attitudes and/or beliefs	6
	Comparative case studies and single case studies	7
Ex-ante evaluations	Integrated assessment modelling	8
	Other theoretical projections and literature reviews	9

Judging quality of the studies and evaluations for each type of policy is not a goal of the tool. However, strength of the evidence must follow a systematic scale without prejudice to any possible alteration in the rank.

The framework has been tested among WP leaders and in the Workshop that took place in Florence in February 2018. Several comments were taken into consideration that led to changes in the framework to reach this version of the PET. The strength of the evidence scale has been the part subjected to the higher number of changes and modifications based on WP leaders' comments. To find the balance between oppose interest we are including in the online tool a functionality that allows to modify the weights assigned to different methodologies in order to calculate the overall assessment of each policy.

At this stage, a total of 130 papers, mainly ex-post analysis, have been already reviewed. 90 of them have been subjected to a blind double-coding process by researchers in UCAM, CMCC and EUI. This set of papers covers 10 different policy instruments at this point: FITs, TGC, RPS, Government Procurement, R&D funding, tax and tax exemptions, ETS, White Certificates, Building Codes and Auctions.

In regards to the development of the online tool itself, UCAM team have work hand by hand with N&S to develop several iterations and versions of the interactive tool in order to make it user friendly. N&S started with initial sketches to work out the best structure for the online tool and identify the key user journeys. These ideas were worked up as digital wireframes, going through multiple iterations after review by UCAM and other stakeholders. After refining the wireframes, visual designs were developed in the INNOPATHS brand style and iterated on following further feedback. The development of the wireframes and design can be seen via the following links:

- Wireframes V1
- Wireframes V2
- Visual Design

The functional online prototype has been through a cycle of continuous development and refinement to reach its current status, as described in the *Results* section below.

As a summary of the activities done during this period, we have:

- Reviewed categorizations of energy and low carbon policies
- Started full literature review and categorization effort across policies and criteria for T2.5
- Circulated versions of the T2.5 framework among WP leaders
- Modification of the framework, i.e. criteria and policies, based on partner comments and the stakeholder meeting in Florence
- Presentation of the PET in the Stakeholder meeting in Florence
- Integrated inputs from WP leaders in a new version of the T2.5 framework document
- Produced a first new redesign of the strength of the evidence part
- Worked on various iterations of the database of papers
- Worked on a continuous basis with Peter Larkin from N&S to produce more than 4 versions of the online tool
- Produced initial visual designs of the tool
- Classified over 130 papers according to the framework
- Developed and codified in Excel an automatic method for aggregating the evidence on the impact of different policies on different metrics
- Produced instructions to allow other T2.5 researchers (Laura Diaz'Anadon, Elena Verdolini and Stefano Verde) to double code 90 papers
- Sent the aforementioned 90 papers for double coding to CMCC and EUI researchers
- Present the framework in Venice Workshop in February to get feed-back from WP leaders and Policy Makers
- Received double-coding results to integrate in the tool
- User-experience design, visual design and web development of the online tool by N&S

4.2 **Results**

The aforementioned activities have derived in a database with 130 papers regarding innovation policy instruments for the transition to low carbon economies.

The review of each paper includes

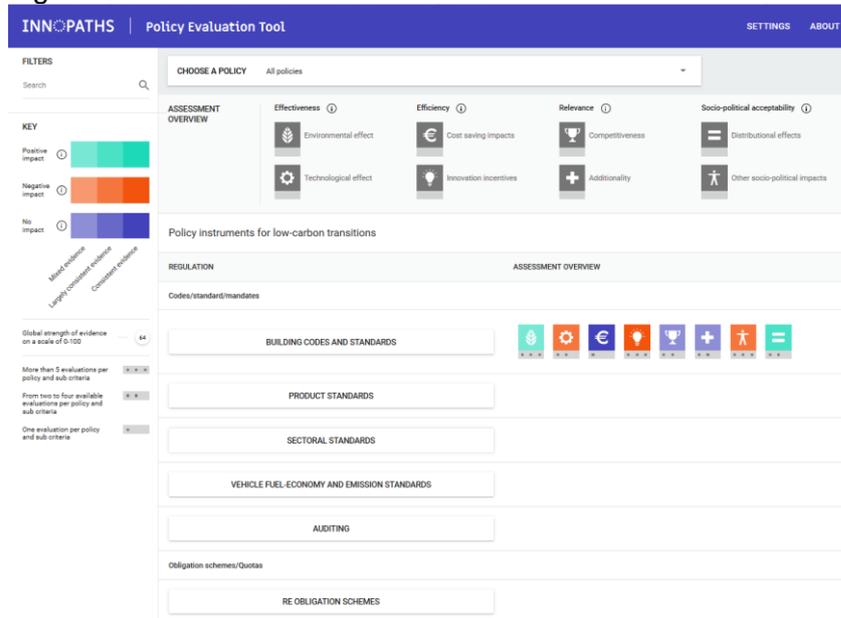
- The type of instrument analysed
- The criteria analysed
- The output – outcomes analysed
- The methodology applied in the paper
- The geographical scope and the time frame
- Jurisdiction level
- Technology field
- Sector
- Type of data
- Type of evaluation
- Evidence type
- Studied methodology categorisation

The review and assessment of the policies are the core of the Policy Evaluation Tool Prototype.

The Prototype of the Online Tool is one of the main results to highlight.

Figure 3 is a screenshot of the main page of the online tool. This page provides the general view with all the policies and indications of the tool.

Fig. 3. General view of the online tool

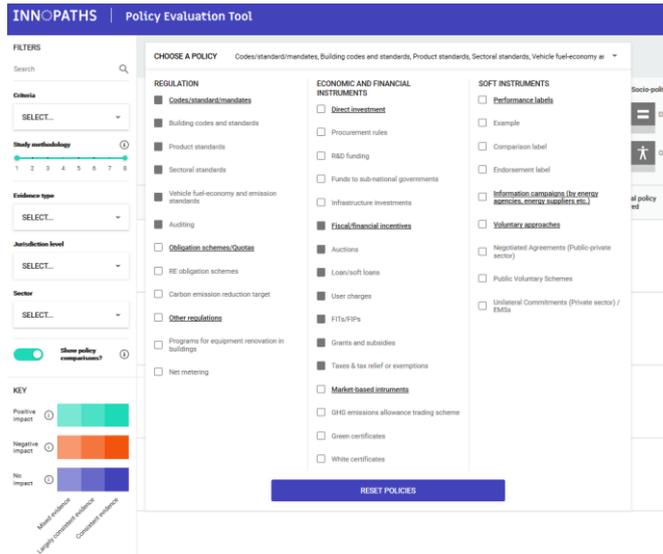


The interface allows the user to modify a set of input parameters, assisted by a sort of guidance e.g. information buttons, key codes in the left-hand bar and “about” section in the upper bar.

The search functionality will be able to cope with terms that are largely synonymous, and an easily accessible glossary is provided by the interactive platform.

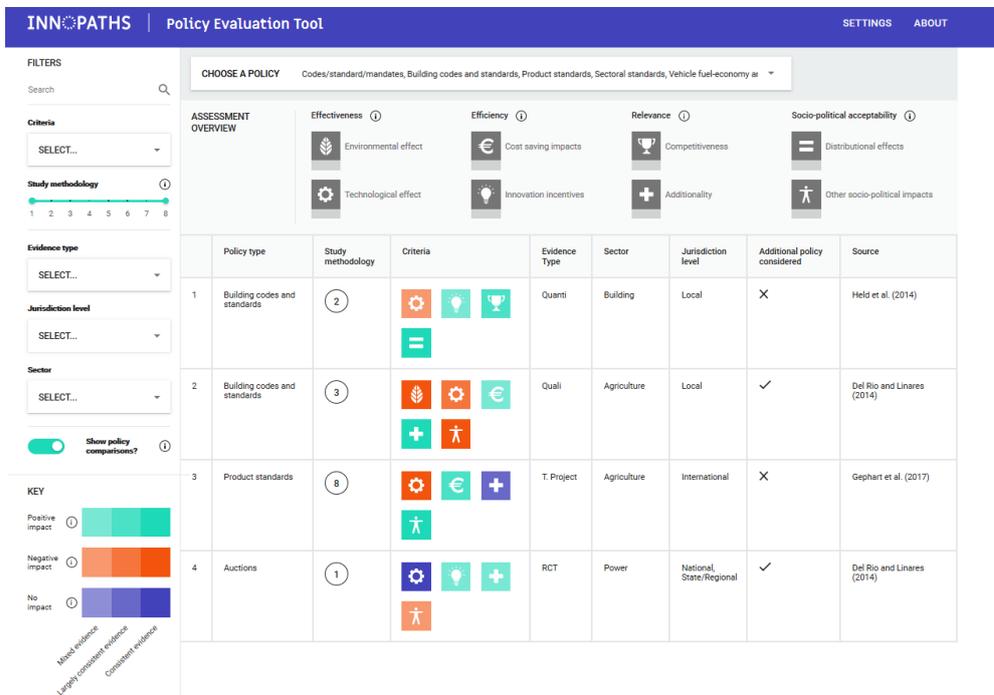
The interface is a user-friendly online application which allows the user to choose a set of policy instruments together or a policy instrument individually (Fig. 4 and 5)

Fig. 4. “Choose a policy” bar search functionality



When the user selects a specific number of policy instruments, the output in the interface show the number of papers that study those specific policy instruments. The user can directly visualize the policy type, the study methodology, the criteria analysed in each paper, the evidence type, the sector, the jurisdiction level, if the papers analyse any additional policy instrument and the source. The left-hand bar allows the user to delimit the search by criteria, study methodology, evidence type, jurisdiction, sector and to decide if the user wants to include papers that analyse more than one policy instruments.

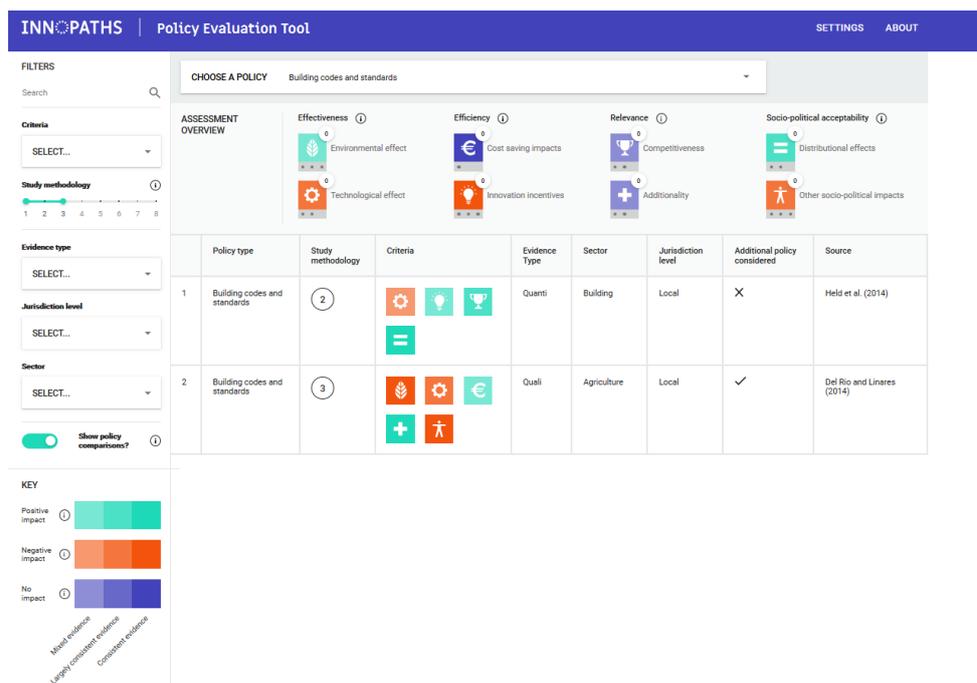
Fig. 5. Interface when the user selects more than one policy instruments at once



To see the assessment overview by policy instrument based on the review of papers for each policy, the user needs to select in the “choose a policy” bar, only one policy instrument. The selection allows to see the performance of each policy instrument in an aggregated way by “sub-criteria”. This view facilitates to look at how many papers the

evaluation by sub-criteria is based on; if the impact is positive, negative or there is no impact; the level of agreement among papers in the provided results and the final calculation of the strength of the evidence depending on the methodology used (Fig. 6)

Fig. 6. Interactive Tool: One policy view.



The user may be interested in look at one specific paper individually. The interactive tool includes individual information by paper in different screens. In addition to the information in rows in the “policy view”, the “paper view” included a higher level of detail about the geographical scope and time frame, the technology field, the type of data used in the analysis and some highlights (Fig.7).

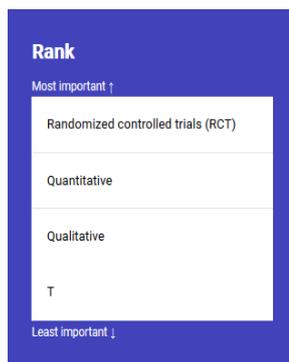
Fig. 7. Interactive tool: Paper view

The screenshot displays the 'Policy Evaluation Tool' interface. At the top, there is a navigation bar with 'INN PATHS | Policy Evaluation Tool' on the left and 'SETTINGS ABOUT' on the right. Below the navigation bar, the main content area is titled 'Del Rio and Linares (2014)' with a 'Study methodology: 1' indicator. The interface is divided into several sections:

- KEY:** A legend for impact types: Positive impact (green), Negative impact (orange), and No impact (blue). It also includes a scale for 'Global strength of evidence on a scale of 0-100' with a value of 64.
- POLICY INSTRUMENT:** 'Auctions'.
- CRITERIA:** A list of criteria with corresponding icons: Effectiveness (Technological effect, Efficiency, Innovation incentives), Relevance (Additionality), and Socio-political acceptability (Other socio-political impacts).
- METHODOLOGY:** 'Analysis of the performance of ACT auction data.'
- GEOGRAPHICAL SCOPE:** 'Analysis of the performance of ACT auction data.'
- JURISDICTION LEVEL:** 'National, State/Regional'.
- SECTOR:** 'Power'.
- TECHNOLOGY FIELD:** 'Large-scale solar'.
- TYPE OF DATA:** 'Large-scale solar'.
- TYPE OF EVALUATION:** 'Large-scale solar'.
- HIGHLIGHTS:** A list of key findings and design elements of the auction, including prequalification details, cost reductions, and the importance of stable frameworks.
- REFERENCE:** A section for the source of the paper.

In the “setting” option that the user can find in the upper bar, there is a very relevant functionality. The assessment by policy is based on the proposed scale designed by the researchers in the WP2.5. team. However, we are aware that this scale can be different for different users, i.e. users may want to prioritize and give more importance to ex-ante modelling papers than to quantitative papers using panel data models. The rationale of the scale for the strength of the evidence that by default the user is finding in the interactive tool is clearly explain in the “about” section of the tool, but the user will be able to modify this following their own scale for strength (Fig.8).

Fig. 8. Functionality to change the level of importance of different type of study methodologies



Out of the 130 papers analysed so far, the breakdown by policy is:

- R&D funding: 15
- Taxes and tax exemptions: 16
- FITs: 16
- RPS & Low carbon fuel standards: 10
- TGCs: 7
- ETS: 26
- White certificates: 7
- Building codes: 14
- Auctions: 10
- Government procurements: 16

5 Next Steps

The Prototype of the PET has been designed to provide academics and policy makers with an integrated tool analysing and synthesizing what we know regarding the policy instruments that can be used to support the transition to a low-carbon system. Within the framework of INNOPATHS, the in-depth understanding of how the EU and national innovation systems and current policy framework influences the decarbonisation will be incorporated in the final version of the PET. The online tool will include the results and insights of European experiences of climate and energy policies, and their evaluations, and which applies these insights to deriving a comprehensive set of policies and measures that will be necessary to realise the low-carbon pathways and trajectories in practice.

The prototype PET can be found at the following link: <http://innopaths-pet.niceandserious.com/#/>

The development of the PET will continue until month 36 when the final tool will be made available.

Additional features will be developed in the forthcoming months:

- Add a “download results” functionality into .xls or .csv file
- Add case studies derived from T2.1. to the Online tool

- Increase the number of papers up to at least 250 in total
- Expand the database
- Work in the aggregation of policy impacts
- Work in the best names and concepts in the Online tool in order to avoid misinterpretations.
- Include the glossary and design a document of instructions
- Introduce the last changes in the strength of the evidence scale
- Test the tool with a broader audience, preferably well-known researchers in the field and policy makers.

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