

SEFIRA



SEFIRA IS A EU FP7 COORDINATION ACTION ON
Socio Economic Implications
For Individual Responses to
Air Pollution policies in EU +27



Progress of the SEFIRA Project: Focus on the Discrete Choice Analysis Pilot

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Structure

- 1 Quick overview of the SEFIRA project
- 2 Frames the role of acceptability, socio-economic environment and individual behaviour
- 3 Shows how *Discrete Choice Models* (DCMs) can constrain the role of individual acceptability in air quality improvement.



The first part provides a...

- 1 quick overview of the SEFIRA project
- 2 Frames the role of acceptability, socio-economic environment and individual behaviour
- 3 Description of discrete choice models (DCM) use in the study of the role of acceptability in individual choices concerning air quality improvement



Why SEFIRA?

Because...

...the cost-benefit analysis, although a valuable tool, is of limited value in assessing the wider acceptability of policies, particularly in relation to the impact on individual behaviour.

Indeed...

“We have learned that public awareness is of key importance for the implementation of existing air policy, as well as for the success of any future air pollution strategy”

Janez Potočnik

European Commissioner for Environment

(Final speech at Brussels EU Green Week 2013 - 07/06/2013)

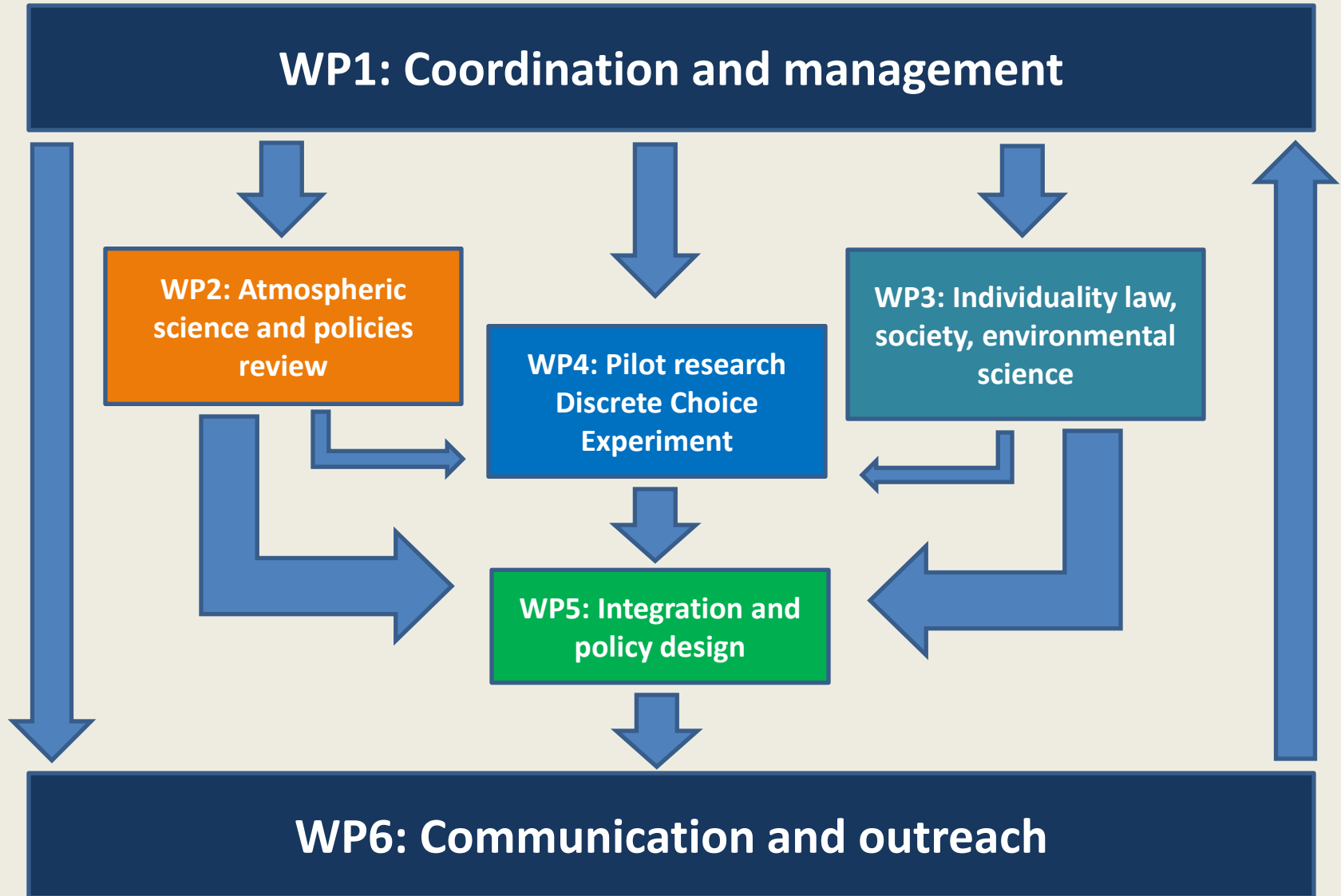


SEFIRA's objectives

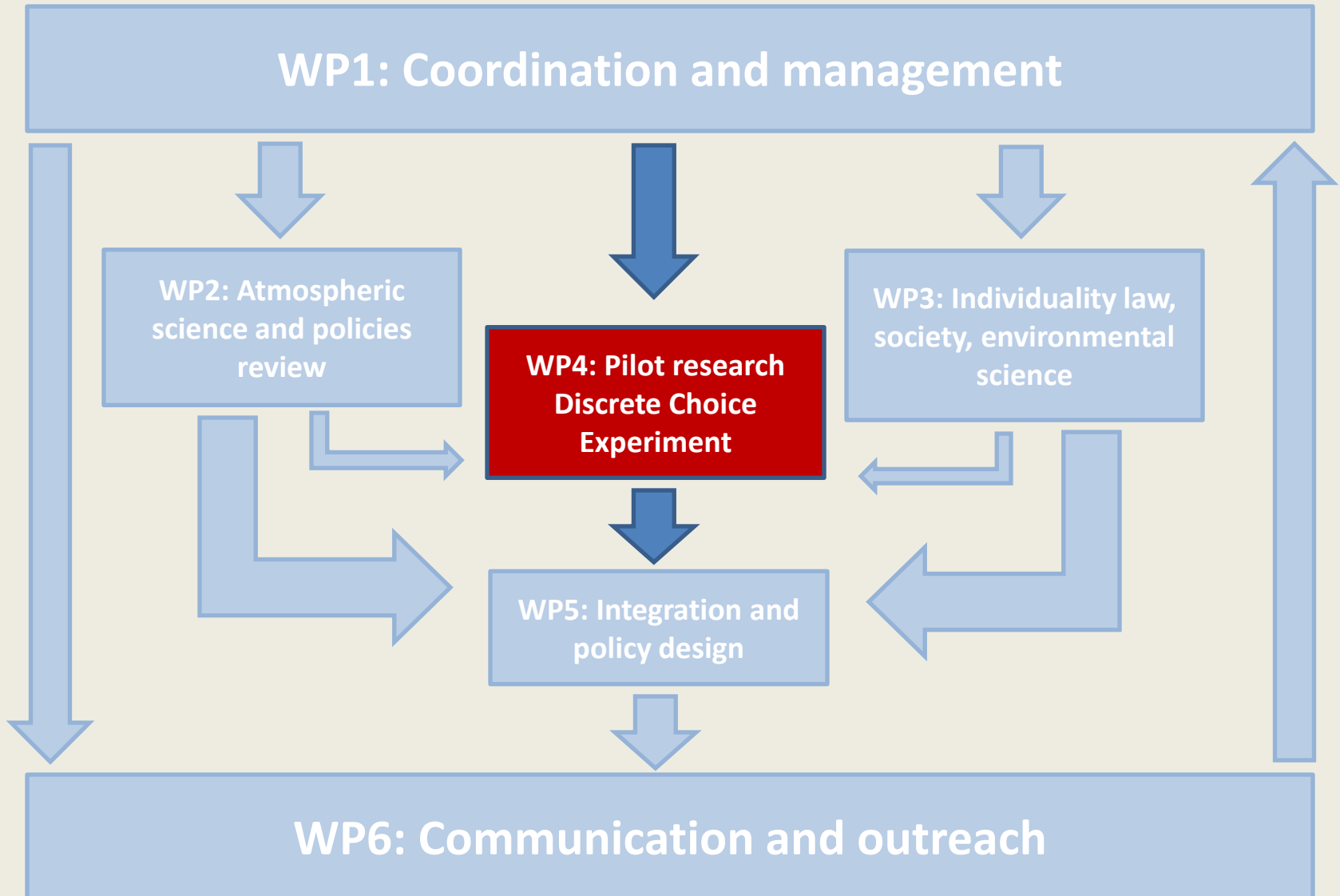
- ⊙ To integrate scientific and technical knowledge on air quality with socio-economic aspects of air pollution policies (multidisciplinary approach);
- ⊙ To study socio-economic implications of individual responses to air pollution policies;
- ⊙ To apply *Discrete Choice Models* (DCMs) to the study of the role of individual acceptability in air quality improvement;
- ⊙ To provide specific interdisciplinary reports in support of the implementation of the EU air policy through dissemination among key stakeholders.



The SEFIRA workplan



The SEFIRA workplan



The second part shows...

- 1 Presents an overview of the SEFIRA project
- 2 How do we frame the role of acceptability, socio-economic environment, and individual behaviour in air quality policies?
- 3 Shows how we apply discrete choice models (DCM) to the study of the role of acceptability in individual choices concerning air quality improvement;



The DCM Pilot Project

WP4 goal

Understanding how individuals value different acceptability drivers/attributes related to air quality policies;

WP4 methodology

Discrete Choice Models (Ben Akiva, Lerman 1985, McFadden 1973-1978, Manski, McFadden, 1981);

WP4 challenge

Verifying if it is possible to integrate *Discrete Choice Experiment* results in the GAINS model.



The role of Acceptability (1)

- © **Acceptability** is crucial for the implementation and effectiveness of policies.
- © There are different **drivers** affecting the individual acceptability: problem perception, social norms, knowledge about options, perceived effectiveness and efficiency, equity and fairness, socio-economic and system characteristics, etc.
- © It is important to understand the existing **links** among acceptability drivers and policies, but also the **trade-offs** among the different drivers.



The role of Acceptability (2)

- © **Discrete Choice Models** focus on identifying the underlying influences on an individual's choice behaviour, estimating the attributes' trade-offs (e.g. efficiency vs. fairness; budget constraints vs. policy efficacy).
- © For environmental policies requiring **people's willingness to change** their behaviour, the role of policy acceptability is particularly relevant (e.g. it is the individual who decide to change the own heating system).
- © **Discrete Choice Experiments** in SEFIRA are used to understand the role of selected acceptability drivers/attributes concerning air quality policies.



The role of Individual Behaviour

- © The standard environmental literature makes a distinction between **technical** and **non-technical** measures to improve air quality.
- © SEFIRA focuses on the role of **individual behaviour** for successful policies.
- © An option for the future could be to distinguish between behavioural and non-behavioural measures (or the extent to which the measure is behavioural)



The third part shows...

- 1 Presents an overview of the SEFIRA project
- 2 Frames the role of acceptability, socio-economic environment and individual behaviour
- 3 How *Discrete Choice Models* (DCMs) can constrain the role of individual acceptability in air quality improvement.



What are DCMs ? (1)

- © DCMs are statistical and econometric models used to describe, explain, and predict **choices** between two or more discrete alternatives;
- © The aim is to analyse **people's preferences**, and which variables (characteristics) affect their choices;
- © The focus is on the **choice behaviour** of a single individual as described by specific variables.



What are DCMs? (2)

- © DCMs are based on the **economic theory of the consumer** and the principle of random utility maximization;
- © The models estimate the **probability** that a person chooses a particular alternative.
- © The output might be **used** for:
 - © Forecasting, scenario analysis, valuation (WTP/WTA), understanding of the role of particular attributes on the choice.

$$P_{in} = \frac{e^{V_{in}}}{\sum_{j \in C_n} e^{V_{jn}}}$$



Glossary for the DCE survey

List of terms	Summary description	Examples
Policy package	it is a bundle of measures	A set of air quality measures
Measure	It is a single policy intervention	Photovoltaic, energy efficiency building, road traffic restriction
Attribute [1, 2, .. n]	It describes a measure	Fairness, mortality
Attribute-level [a, b, .. m]	It describes the attribute range/wideness	Measure cost: 30€, 60€, 90€ Mortality: 10% death reduction, 20% death reduction,
Alternative	It is a choice option characterized by a mixed bundle of attributes-levels	Alternative X: 1a, 2b, .. 3n Alternative Y: 1c, 2b, .. 3m Alternative Z:
Choice experiment	It is a choice exercise (scenario) including more alternatives	

How Choice Experiments work

In a DCE survey, respondents are asked to:

- **Choose** among at least two **alternatives**, that alternative with the highest utility.

$$U_i = V_i + \varepsilon_i \quad P_{in} = P(U_i \geq U_j \forall J \in j = 1, \dots, J; i \neq j)$$

In the SEFIRA-WP4 pilot project, the alternatives will be two air quality policies that are characterized by a short list of **attributes**, each having different **attribute-levels**.

- **Repeat the choice** for several scenarios/choice experiments (with different attribute-levels).



An example of DCE

Choice Experiment n. 1:

Attributes:	wood pellet boiler	solid wood fired boiler	district heat	electricity	ground heat pump	oil boiler
Investment cost	13,000	10,000	10,000	9,000	10,000	5,000
Operating cost (euro/year)	1,500	950	1,400	3,100	1,150	3,150
CO2 emissions	1,300	600	3,300	1,100	400	9,000
Fine particle emissions	1,400	1,100	1,100	120	220	40
Requirement own work	2 hours/month	20 hours/month	None	None	None	15 min/month
I CHOOSE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Choice Experiment n. 2:

Attributes:	wood pellet boiler	solid wood fired boiler	district heat	electricity	ground heat pump	oil boiler
Investment cost	10,000	9,000	13,000	5,000	9,000	13,000
Operating cost (euro/year)	2,500	1,950	400	1,100	1,000	2,100
CO2 emissions	600	1,500	2,300	1,000	9,000	400
Fine particle emissions	1,300	11,200	11,200	210	40	220
Requirement own work	None	20 hours/month	15 min/month	None	None	15hours/month
I CHOOSE:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: Rouvinen and Matero (2013), *Stated preferences of Finnish private homeowners for residential heating systems: A discrete choice experiment.*



The structure of DCEs

Experimental Design Structure

Present work

Alternatives,
attribute,
attributes-levels
and range

Labelled and
unlabelled
choice
experiment

Type of
respondent
answers: choice,
ranking, rating

Questionnaire structure

Next June

Socio-demo-economic
questions: age, gender

Stated Preference
choice experiments

Post-choice
experiment

Data collection and sampling strategy

Winter 2014

5 Countries:
DE, DK, IT, PL, UK

2/3 cities for
each Country

5.000 # CATI
interviews

Model estimation and interpretation (validity tests)

Spring 2015



Acceptability weights

Experimental Design Structure

Definition of...

Alternatives,
attribute,
attributes-levels
and range

- ⊙ Two alternatives showing generic measures able to improve air quality.
- ⊙ A limited subset of attributes extracted from a full list elaborated with IIASA will be included in the SEFIRA choice experiment. Some of there are:
 - ⊙ the **individual monetary cost of the measure** (€),
 - ⊙ **level of personal engagement/lifestyle** (using frequently public transport, cycling or walking instead of using a car; replace the use of equipment with newer ones more energy efficient; change the heating system from higher-emitting to lower-emitting),
 - ⊙ **Time horizon of the measure** (the measure will produce its environmental benefits by: 1 year, 2 years, 4 years).



The Challenge: DCM <-> GAINS

Our understanding of how people evaluate different acceptability attributes related to air quality policies will be used to verify the possible integration GAINS with DCMs.

How?

We aim at using the policy acceptability weights identified through our DCE in the optimization process of GAINS in order to rank air quality measures using acceptability criteria.



Final remarks

- © Individual acceptability of an environmental policy should be considered in policy implementation process.
- © DCMs are a promising methodology to analyse individual choices in the environmental field.
- © Integration with GAINS is a promising opportunity to help local and national decision making process.





Thank you for your attention
Kiitos huomiota

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SEFIRA

Socio Economic implications For Individual
Responses to Air pollution policies in EU+27

EU FP7 Coordinated action

Start date June 2013, duration 36 months



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LONDON

