

Research on waste reduction technologies in Europe - an analysis of FP7-funded projects and networks

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Overview

1. Policy and research background

2. Methodology

3. Results

- a. Types of projects and key indicators
- b. Countries leading and involved in EU waste research
- c. Social Network Analysis of FP7 waste related research
- d. Key approaches in EU research on waste technologies

4. Conclusions and outlook

Policy background

- “**Thematic Strategy on Waste Prevention and Recycling**” under the 6th Environment Action Programme: **Waste Hierarchy** and the Life Cycle Approach
- “**Resource Efficiency Flagship Initiative**” under the Europe 2020 Strategy: aims at a resource-efficient, low-carbon economy to achieve sustainable growth by improved productivity, cost savings and increased competitiveness.
- need to **shift from treatment of waste** (output orientation, cradle-to-grave approach) **to resource management** (input orientation, cradle-to-cradle approach)

Research background

- As many different technologies, communities and markets are involved in waste reduction, there is **currently no overarching “waste research agenda” on European level**, national strategies and programs in UK, IR and IT, future waste related research:
- On the **collection and treatment of the main waste streams** such as household waste and industrial waste.
- To improve waste collection and treatment processes, with a particular reference to anaerobic digestion, **conversion of bio-waste into valuable products** and improvement of the sorting system.
- To **test the usability** of materials from recycling and reuse processes **for other production purposes** and to assess their impacts on environment and health.
- On **reuse practices** which are profitable from the point of view of the company producing the material as a by-product and of the company reusing it.

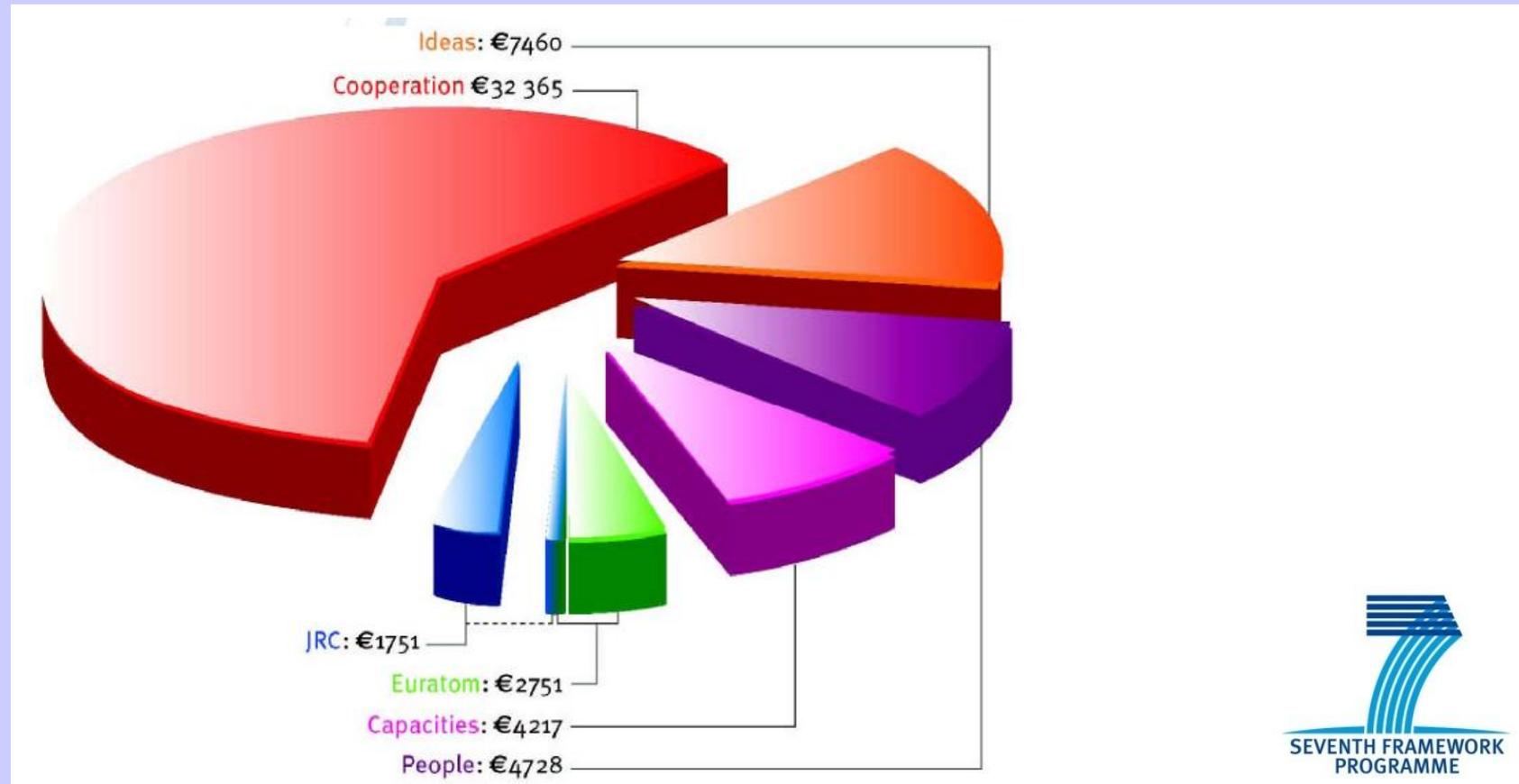
The 7th EU Framework Programme for R&D

- EU's main programme for funding research across Europe
- duration: 2007-2013
- total budget: € 53 billion
- Aim: jobs, competitiveness, knowledge economy
- Projects: technological development and demonstration
- participants from different European (and other) countries

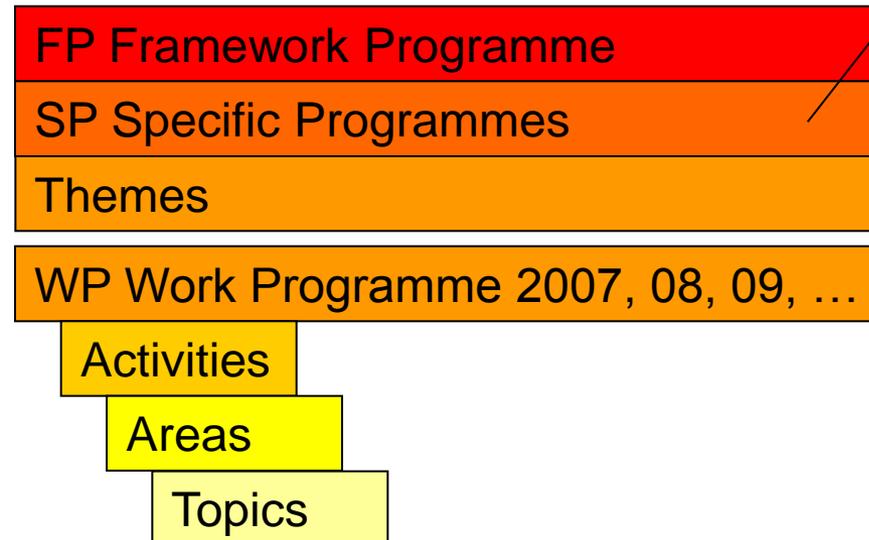




The 7th EU Framework Programme for R&D



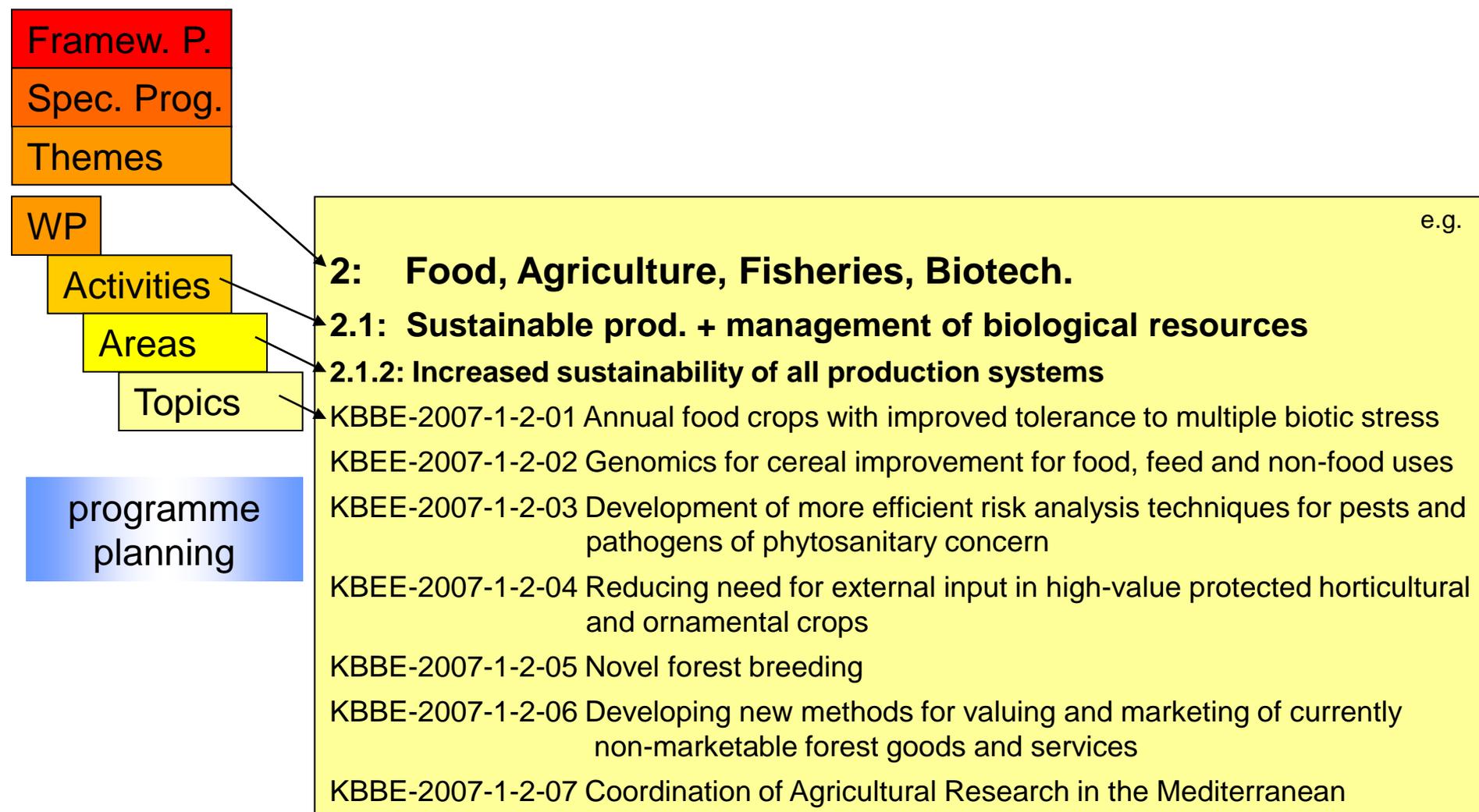
Methodology



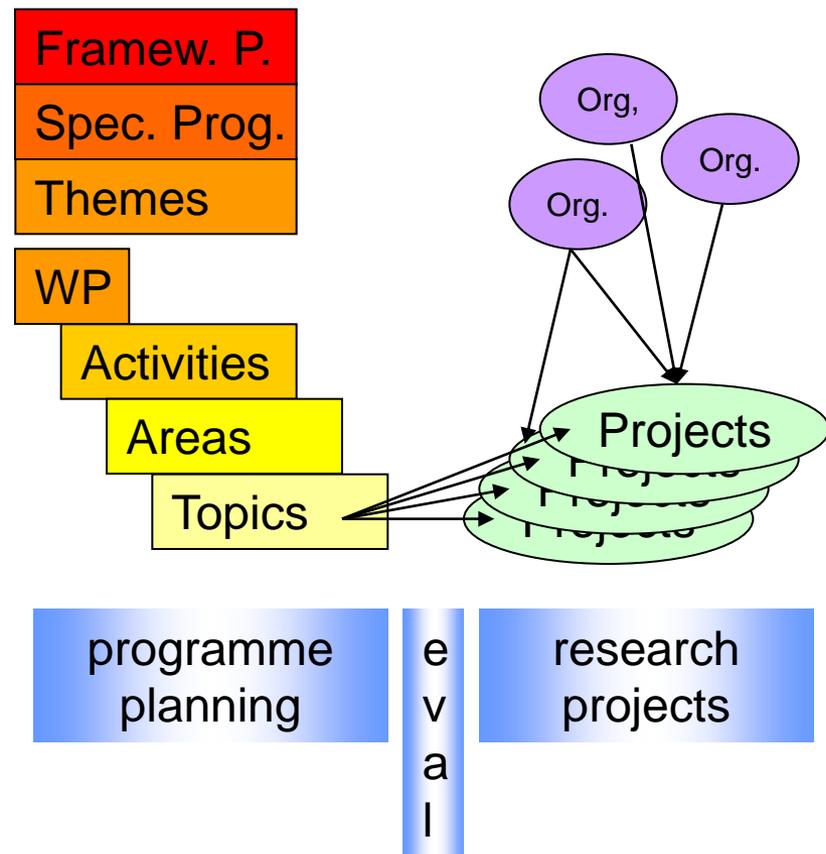
- Ideas
- People
- Capacities
- Cooperation

- Health
- Food, Agriculture, Fisheries, Biotechnologies
- Information & communication technologies
- Nanosciences & new production technologies
- Energy
- Environment (incl. Climate Change)
- Transport
- Socio-economic Sciences and the Humanities
- Space
- Security

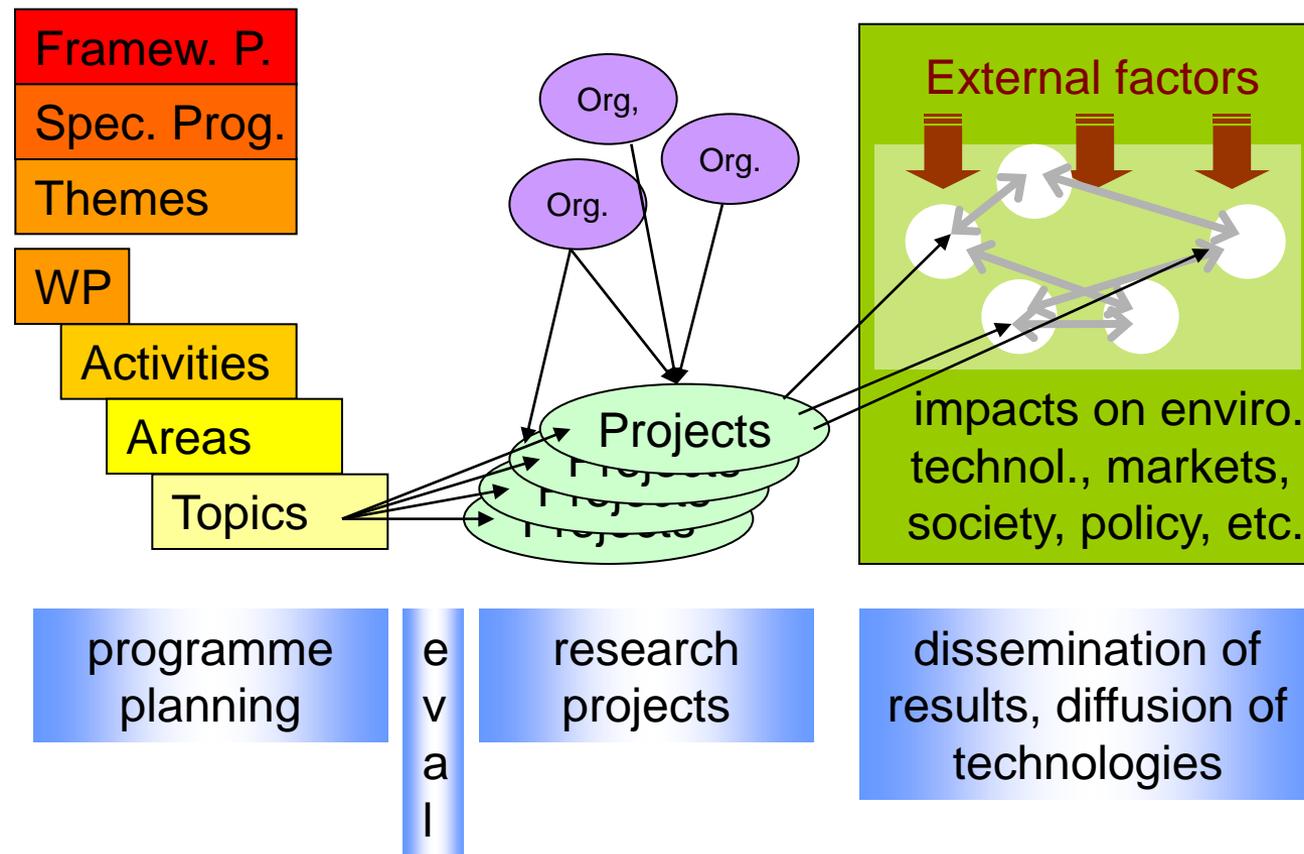
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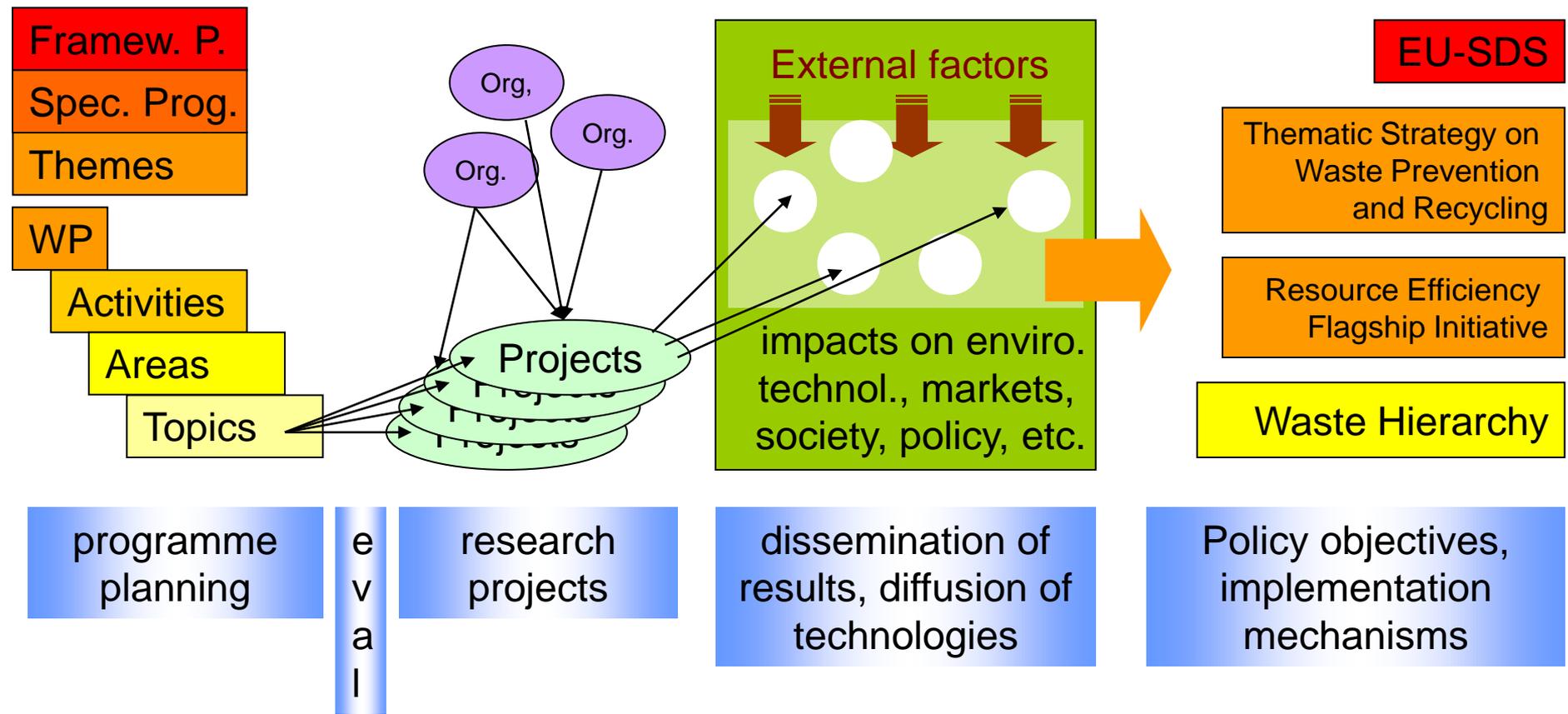
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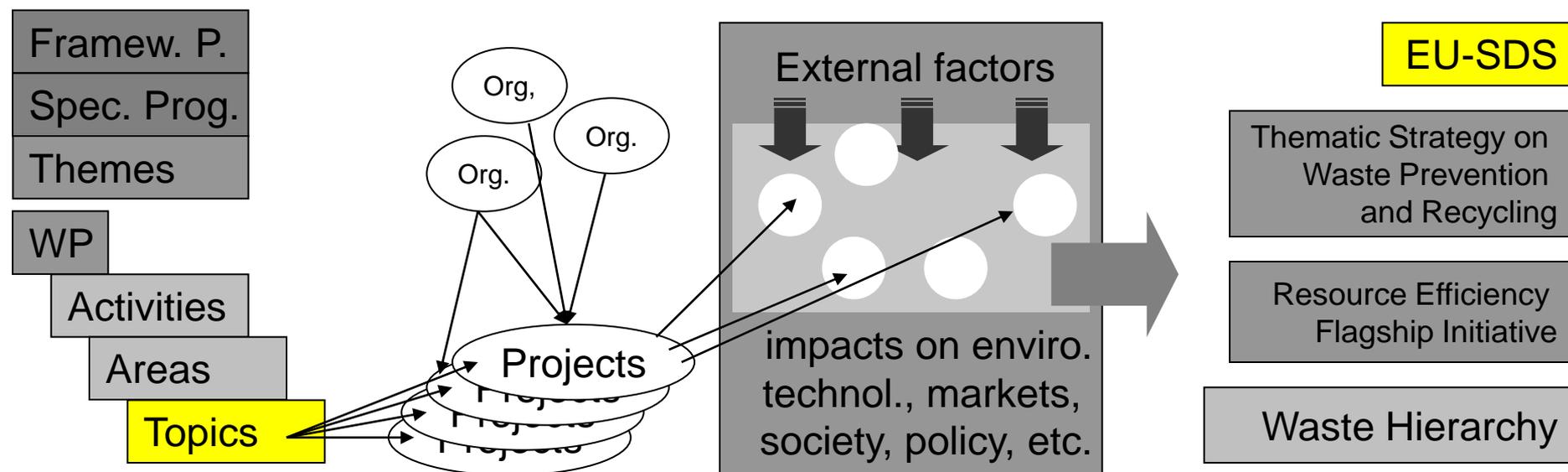
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Methodology



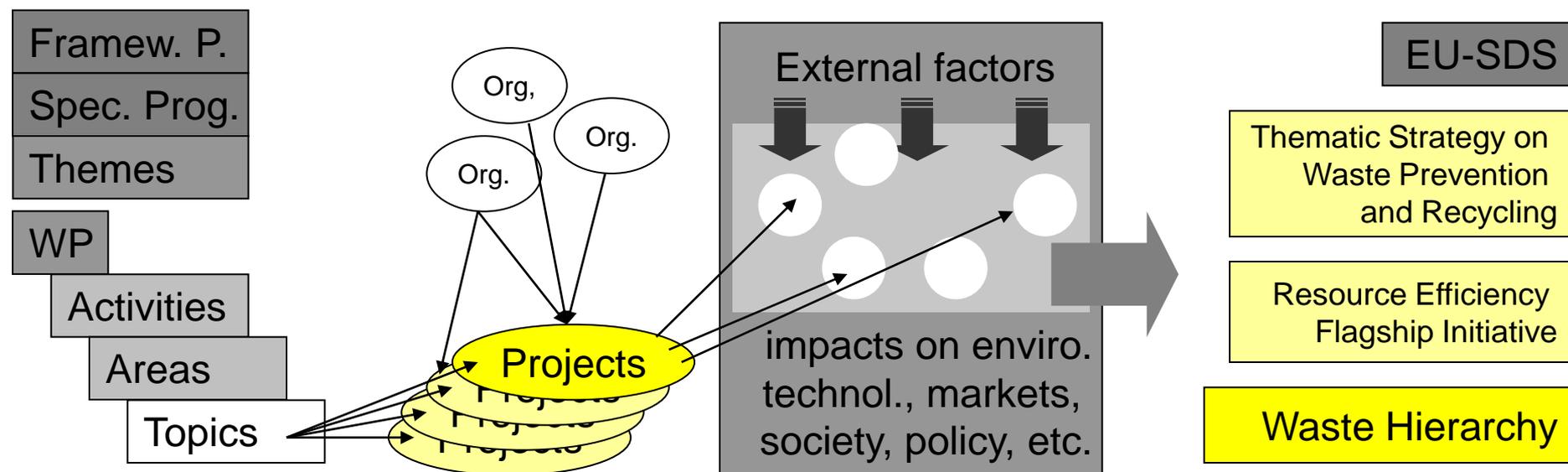
Methodology



1. The **FP7 monitoring system** (www.FP7-4-SD.eu) allowed us to identify 35 research topics with expected positive impacts on two policy objectives:

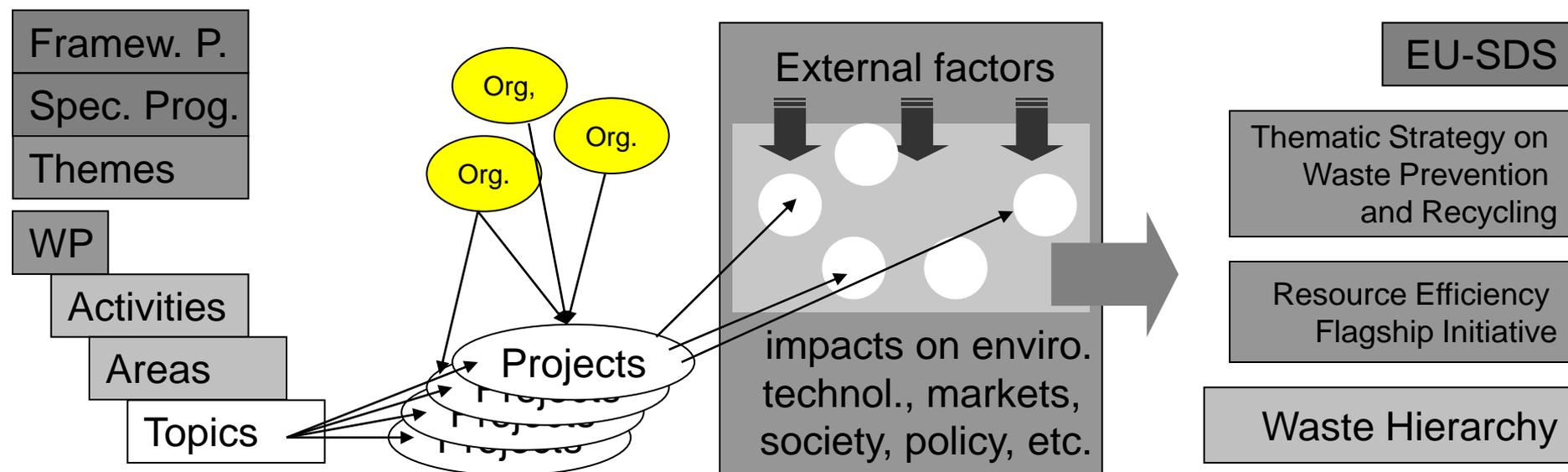
- avoid generation of waste by applying the concept of life-cycle thinking
- avoid generation of waste by promoting reuse and recycling

Methodology



2. qualitative and quantitative analysis based on the descriptions of 50 research projects which are linked to the topics we identified in the first step

Methodology



3. Social network analysis of partners and countries involved in the 50 projects identified in the previous step

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Types of projects and key indicators

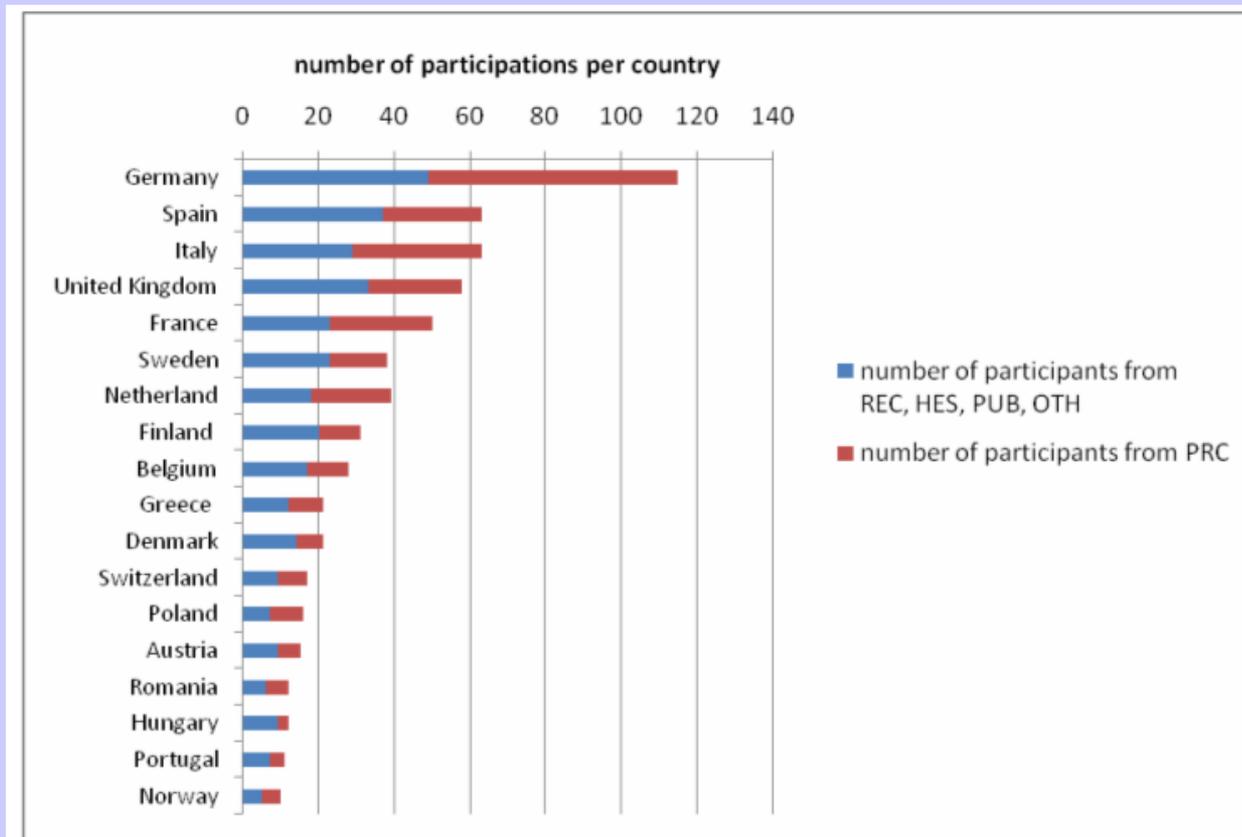
- 50 FP7-funded projects dealing with life-cycle thinking, reuse, recycling and waste prevention
- Total research budget of 340 million euros, FP7-funding in total 229 million euros (about 67% of the project budget)
- Average duration about 3 years (half of them 2-3 years, half 3-4 years)

Types of projects and key indicators

FP7 theme	Number of projects	Number of participants	Average number of partners	Average project budget (mil €)	Average EC contribution (mil €)
Environment	13	199	15.3	4.6	3.4
Agriculture	8	110	13.7	5.5	4.0
Materials	12	173	14.4	7.7	5.2
Energy	8	113	14.0	12.0	7.6
ICT	2	26	13.0	12.7	7.7
Transport	7	93	13.2	3.4	2.4

- None of the FP7 themes is targeted specifically towards waste related research

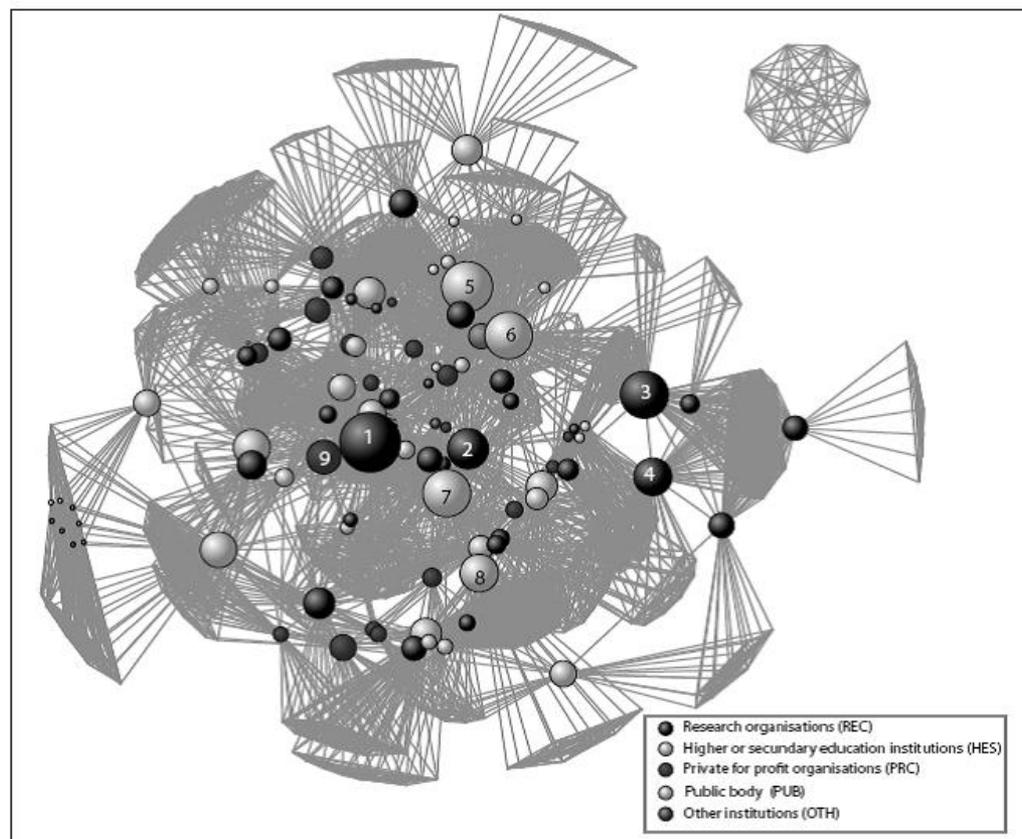
Countries leading and involved in EU waste research



Countries leading and involved in EU waste research

- Germany is by far the most active country in FP7 waste related research followed by Spain, Italy, the United Kingdom and France (all more than 50 participations each)
- While in Germany, Italy, France, the Netherlands and Poland the number of participants from private-for-profit organizations is higher than 50% of the participations from the respective country, in all other countries research partners have a higher share
- Partners from outside the EU play a minor role in waste related research '(12%)

Social Network Analysis of FP7 waste related research

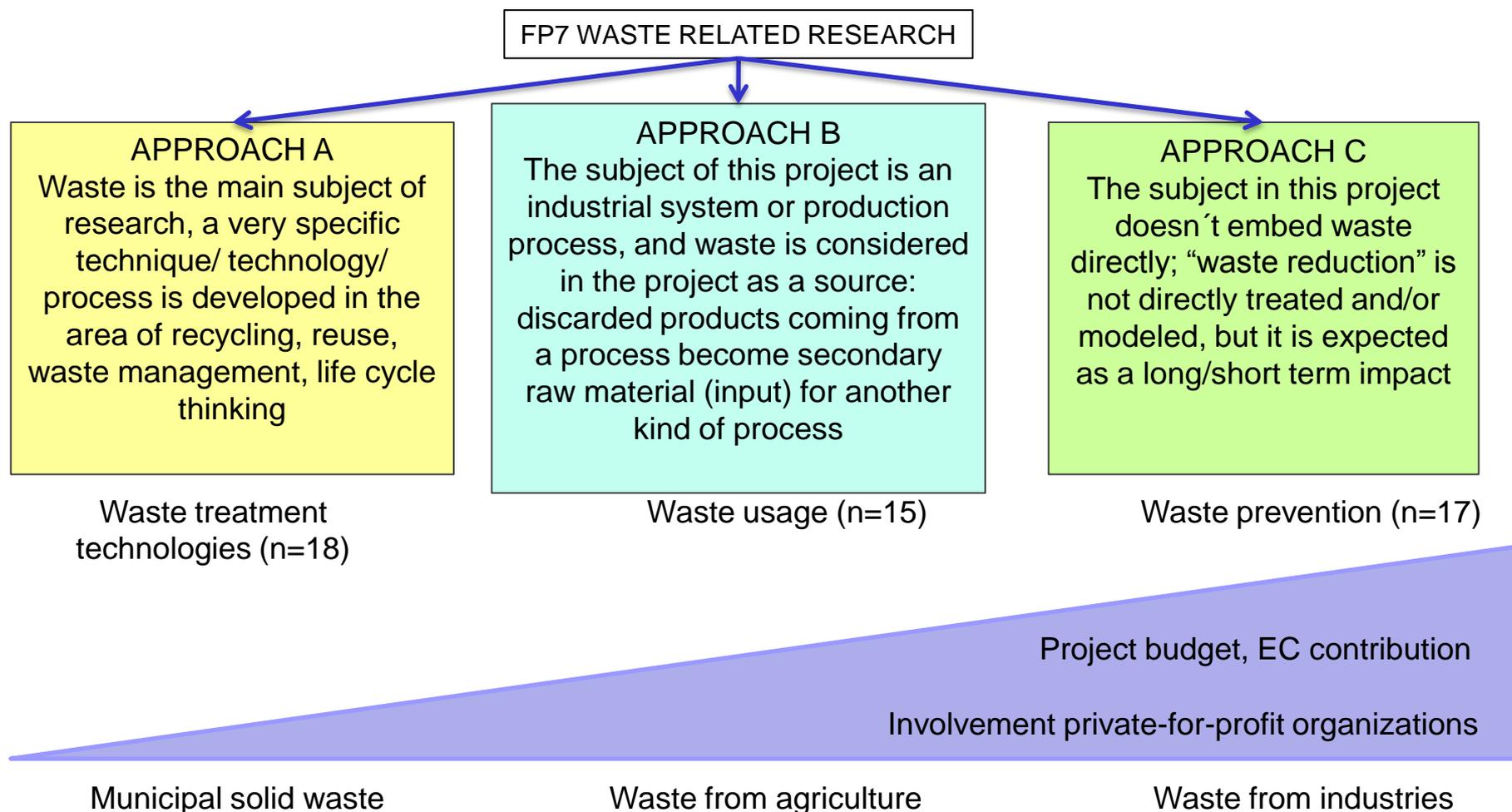


- (1) Valtion Teknillinen Tutkimuskeskus (Research, DK)
- (2) Fraunhofer-Gesellschaft (Research, DE)
- (3) AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE (Research, IT)
- (4) PAPIERTECHNISCHE STIFTUNG (Research, DE)
- (5) Rheinisch-Westfaelische Technische Hochschule Aachen (Research, DE)
- (6) Danmarks Tekniske Universitet (University, DK)
- (7) Universitaet Stuttgart (University, DE)
- (8) UNIVERSITY OF SOUTHAMPTON (University, UK)
- (9) Acciona Infraestructura (private-for-profit organisation, ES)

Social Network Analysis of FP7 waste related research

- Nine organizations represent the backbone of the FP7 waste related research network (maintain the highest number of collaborations, connect a large number of organizations and therefore enable the flow of information within network).
- Research organizations (REC) form the most important group concerning knowledge brokerage, followed by higher or secondary education institutions (HES), while private-for-profit organizations (PRC) only play a minor role

Key approaches in EU research on waste technologies



APPROACH A

Waste is the main subject of research, a very specific technique/ technology/ process is developed in the area of recycling, reuse, waste management, life cycle thinking

Waste streams :

- Household activities
- Construction & demolition
- Urban waste streams

Number of projects	Participants	% of private-for-profit organisations	EC contribution total (mil €)	Average EC contribution per project (mil €)
17	223	34	43.6	2.6

- Development of sorting techniques (paper, plastic)
- **Assure recyclability of new materials**(construction materials, packaging)
- Development of database and guidelines intent to create knowledge-exchange platforms (for dismantling of big units)
- Assessing different urban development scenarios
- Establish waste management systems in Asia and Africa

APPROACH B

The subject of this project is an industrial system or production process, and waste is considered in the project as a source: discarded products coming from a process become secondary raw material (input) for another kind of process

Waste streams :

- Agricultural activities
- Household waste
- Forestry, food industry

Number of projects	Participants	% of private-for-profit organisations	EC contribution total (mil €)	Average EC contribution per project (mil €)
15	186	46	65.6	4.4

- Bio-energy production employing bio-waste
- Efficiency improvement of conversion technology (e.g. anaerobic digestion).
- Implementation of biorefineries completely fed with biowaste
- Research on collection and conversion of waste and by-products into new valuable substances
- Positive impacts is expected on raw material extraction (especially fossil fuels)
- **High representation of companies that use waste (e.g. as a source of energy or as a raw material) and a rather low representation of sectors which cause the waste**

APPROACH

C

The subject in this project doesn't embed waste directly; "waste reduction" is not directly treated and/or modeled, but it is expected as a long/short term impact

Waste streams :

- Industrial

Number of projects	Participants	% of private-for-profit organisations	EC contribution total (mil €)	Average EC contribution per project (mil €)
18	305	55	120.3	6.7

- Improvement of production processes and machinery on industrial level, in order to reduce by-products and scraps generated during manufacturing
- **Waste streams coming from industrial activities**, mainly from thermal, mechanical and chemical process of metal, plastic, electronic parts and rinse water
- **Improvement of product life-time**

Conclusions and outlook (1)

FP7 already supports the shift to a cradle-to-cradle society and is (at least partly) in line with the aims of the new Flagship Initiative “A resource-efficient Europe”

- 28% of the projects deal with waste prevention, which is on top of the waste hierarchy
- Further approaches are waste treatment, waste recovery into energy and valuable products (not a single project in the area of land filling)

Conclusions and outlook (2)

Among the organizations participating in FP7 a **waste related research a network has already emerged**

- 8 of 9 core organizations are research institutions and universities - their rationalities shape their role as knowledge brokers
- Further integration of private-for-profit organizations as knowledge brokers or the strengthening of their collaboration with the core organizations within the network could lead to an increased dissemination of waste technologies

Conclusions and outlook (3)

During the next months we will

- integrate newly-funded FP7 projects into our dataset
- conduct a series of interviews with the co-ordinators of FP7 waste related projects to gain insights into networking mechanisms, to highlight the dissemination of waste technologies and to identify future research needs

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