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Open
COLlaboration for
POLicy MOdelling



Open collaboration in policy modelling: OCOPOMO

**Public lecture organised by Centre of Methods and Policy
Application in the Social Sciences (COMPASS)**

**Tuesday 19 March, 6.30pm, Conference Centre Lecture Theatre
22 Symonds Street, The University of Auckland**

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UNIVERSITÄT
KOBLENZ · LANDAU

Fast moving world with ever new demands and changes in different policy domains ...



More knowledgeable and responsive citizens

Crime and terrorism

Demographic change

Globalization / Mobility / Individualism

Financial and/or economic crisis

Renewable energy

New technological innovations

Climate change

New ...



Challenges ahead: How to ...



- ❖ ... master societal transitions and drastic changes in economy, climate and demography currently affecting societies and social behavior around the globe
- ❖ ... master longer-term transformation well ahead in time
- ❖ ... exploit ICT in a useful way to
 - support open governance
 - foster disciplinary integration and multi-disciplinary problem solving
 - engage stakeholders and wider constituencies in policy development
 - master complexity

European Commission funding key research in ICT for governance and policy modelling



2009: Quoting objectives in call 7, work programme of call 7 in FP 7):

- development of advanced development of new governance
- innovative ICT solutions (including the following):
 - o Modeling new policies
 - o Performing societal measures.
 - o Development of the environment using reflexivity.
 - o Modeling and validating systems, particularly
- advancing research in simulation mixed reality technologies and dynamics methodology
- Resulting tools should exploit knowledge resources and including those at urban and
- Examples of fields of application public consultations has been administrations and policies

2011: Quoting objectives in call 4, priority 7.3 programme of call 4 in FP 7):

- a) **Governance and Participation Toolbox**
 - Advanced tools embodying structural,
 - o empower and engage all types
 - o enable them to utilize mass cooperation
 - o allow governments to incorporate
 - Tools enabling the creation, learning, sharing language and cultural interpretation.
 - Tools facilitating transparency and traceability
 - Toolbox must include security, identity appropriate, the delineation of constituent government applications.
- b) **Policy Modeling, Simulation and Visualization**
 - Real-time opinion visualization and simulation visualization and mixed reality technologies
 - Novel instruments which allow consideration wishes of individuals, groups or communities understand the possible outcomes of government
 - Tools and techniques help to understand public services as complex service systems collaborative society, including the new
 - Advanced tools and technologies to process variables, parameters, interferences, and impacts of proposed policy measures.
 - Tools should exploit the vast reserves resources which are also developing data translation, process modeling, data mining gaming-based simulation, forecasting techniques.
 - Solutions to take into account, but not methodology to analyse and model complex "cloud" computing applications resources

Expected Impact

- Improved empowerment and engaged making processes. Increased trust of their contributions.
- More efficient collection of feedback of impacts of policy measures, with in communities, and based on intelligent resources.
- Strengthened communication

Call 10 in 2013 again with similar objectives:

Objective ICT-2013.5.4 ICT for Governance and Policy Modeling

The public sector has a significant role in stimulating economic growth as has been evident from the current economic and financial crisis. At the same time, citizens and in particular younger generations are becoming more vocal in monitoring and influencing policy decisions. Current ICT tools for collaborative governance and policy modeling show great opportunities for empowerment of citizens and increased transparency in decision-making. In addition, there is a growing need for research and innovation for future public services that will be a catalyst for growth and sustainability.

Target Outcomes

- a) Research will focus on policy modeling and simulation for achieving productivity gains and innovation in public service provision through innovative use of ICT. Such modeling, simulation and prediction should also enable public administrations to develop policies for growth and investment strategies for next generation ICT for public services. This research will also address innovative ICT solutions that build on Web2.0/Web3.0 and social networking, crowd-sourcing and collaborative technologies.

The tools shall include innovative data mining functionalities to identify the emerging societal trends as a result of the economic environment, and should further advance crowd-sourcing techniques to engage citizens in sharing knowledge and expertise to collectively solve complex, large-scale problems in a distributed fashion. The work in this area should also exploit the vast reserves of Europe's public sector collective and open data and knowledge resources, for new services.
- b) **Coordination and Support Actions.**
 - b1) **Road-mapping of research on ICT for innovative public services and governance.** Apart from addressing Coordination & Support actions should specifically address road mapping of the use of ICT for innovative public services and their governance, in particular cross border services. Another relevant topic that should be addressed is the empowerment of the younger generations through ICT tools. These roadmaps shall point to implementation under Horizon 2020.
 - b2) **Increased collaboration, on Electronic Identification and Authentication,** in particular with the USA and Asia, that could be a leverage for European solutions worldwide, while ensuring data protection for the citizens. The action is expected to enhance dialogue with countries that have activities on eID and authentication, and to exchange good practices so as to spearhead European solutions for mutual benefit.

Expected Impact

- Improved take up of policy making tools by decision makers in public administrations
- Improved validation of the potential impacts of policies through evidence
- Stronger evidence of productivity gains and reduction of costs in the provision of public services
- Evidence of the younger generation contributing to policy formation/development through social media
- Increased take up of



Open
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OCOPOMO – open collaboration in policy modelling

A CONTRIBUTION TO OPEN COLLABORATION IN POLICY DEVELOPMENT



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Open
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POLicy MOdelling



Project co-funded in FP 7 of EC, call 7 in 2009

Duration: 1/1/2010 – 30/04/2013

Budget: 3,2 Mio €, Funding 2,5 Mio €

Project Partners:



UNIVERSITÄT
KOBLENZ · LANDAU

(Coordinator:
Prof. Maria A. Wimmer)



KSR



REGIONE CAMPANIA

Aims of OCOPOMO Project

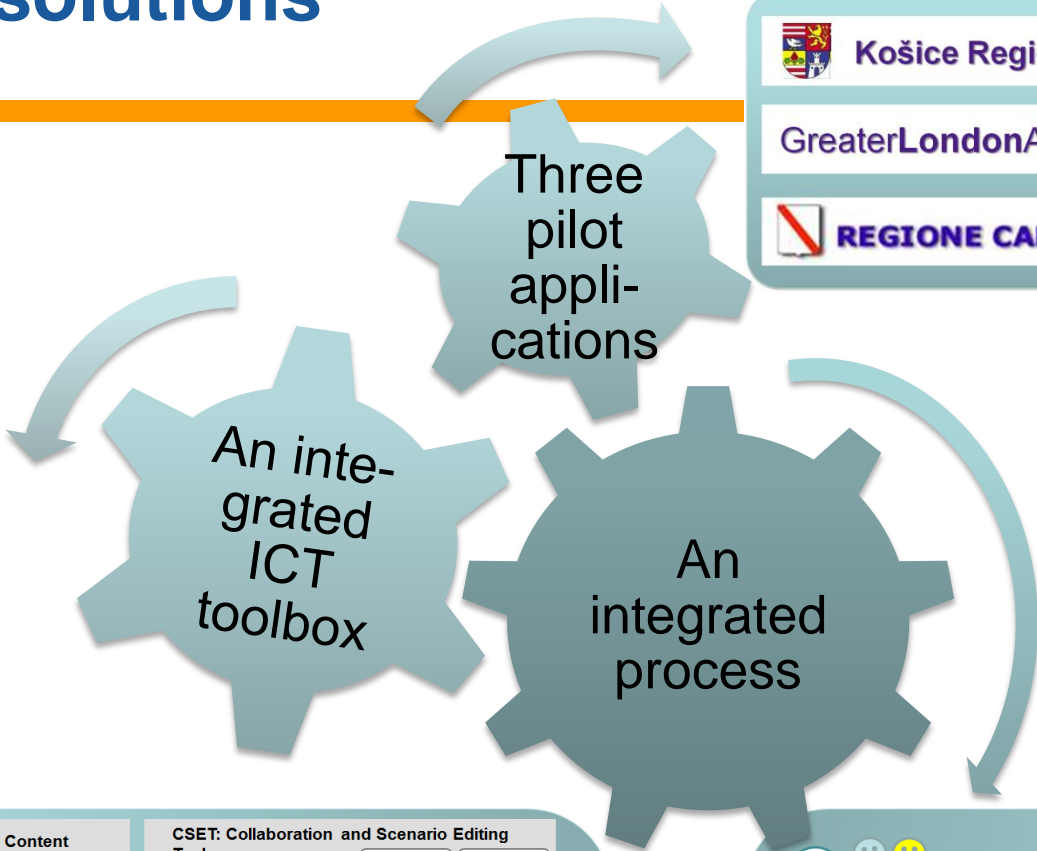


- ❖ Support key stakeholders to participate in the processes of policy formulation
 - Policy analysts, policy operators, wider stakeholder groups of specific policy domains
- ❖ Integrate methods and tools of scenario-based policy formation with formal policy modelling
- ❖ Develop an integrated ICT platform for efficient policy making
 - Mechanisms of open collaboration along the policy process
 - Supporting engagement of wide stakeholder groups

The solutions



 **Košice Region**
GreaterLondonAuthority
 **REGIONE CAMPANIA**



Alfresco CMS: Content Management Serve

Version Content
User Search
Process Notification

Repository

scenarios, documents, ...

CSET: Collaboration and Scenario Editing Tools

Discussion Calendar
Document Chat
Polling and Rating Collaboration Space

eclipse CCD Tool

Annotation Link
Concept Action

- CCD models
- text annotations (txt, pdf, html)
- CCD2DRAMS transformation

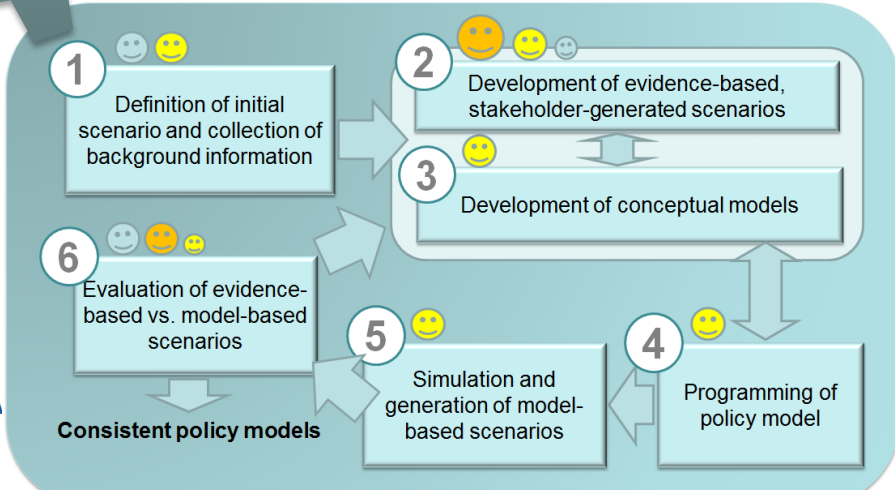
SE: Simulation Environment

Simulation Rule

- DRAMS Rules
- running simulations

simulation outputs

by COM



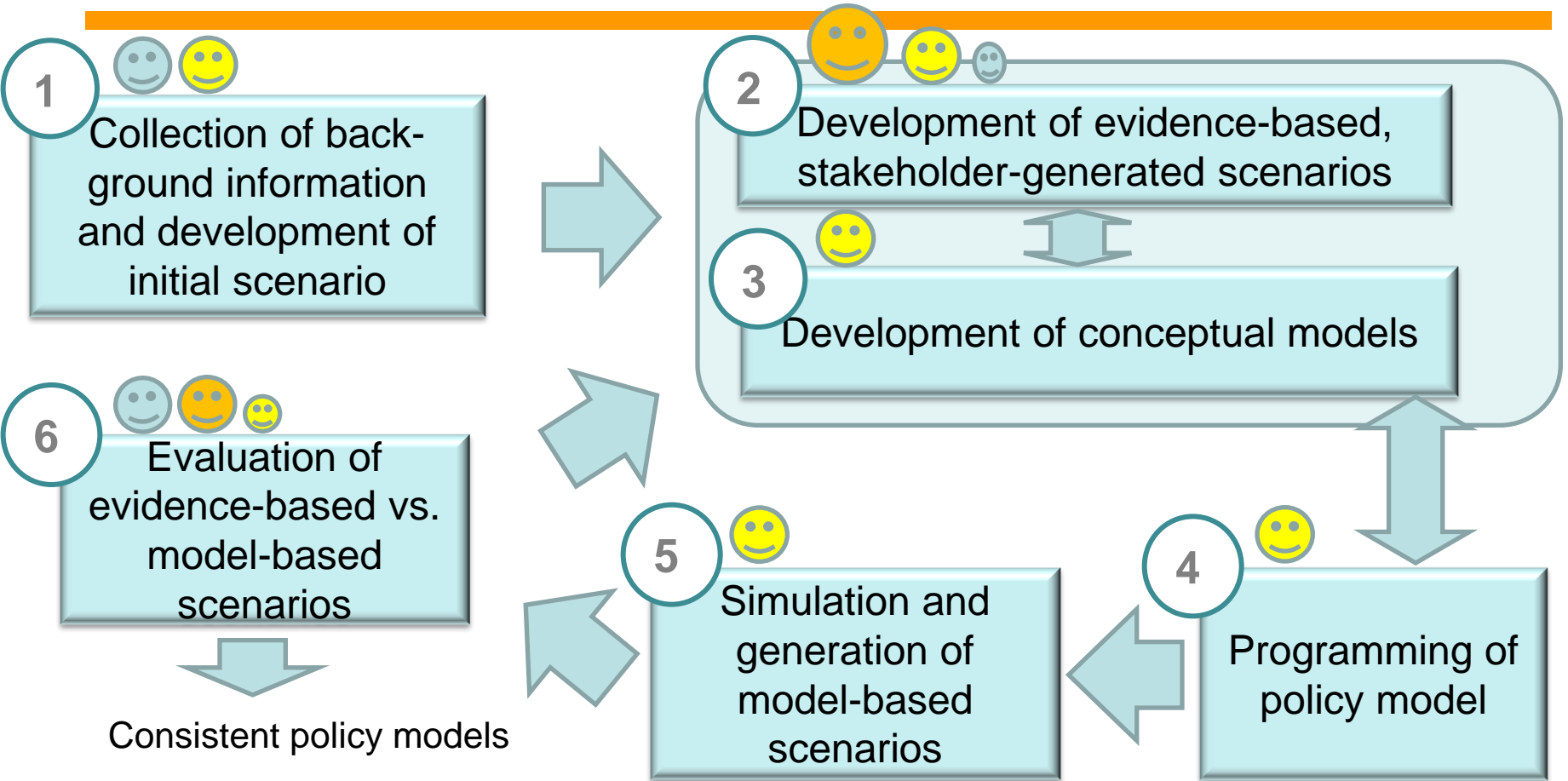
- ❖ OCOPOMO policy development process: integrated approach from narrative scenario development to formal policy modelling
- ❖ Consistent conceptual description (CCD): Conceptual modelling of policy domain and incorporating traceability in the iterative policy development process
- ❖ Open collaboration in policy development through web 2.0 based e-participation platform and integrated ICT toolbox



The solutions in detail

ITERATIVE POLICY DEVELOPMENT PROCESS WITH STAKEHOLDER ENGAGEMENT

OCOPOMO's Integrated Policy Process and Involved Actors



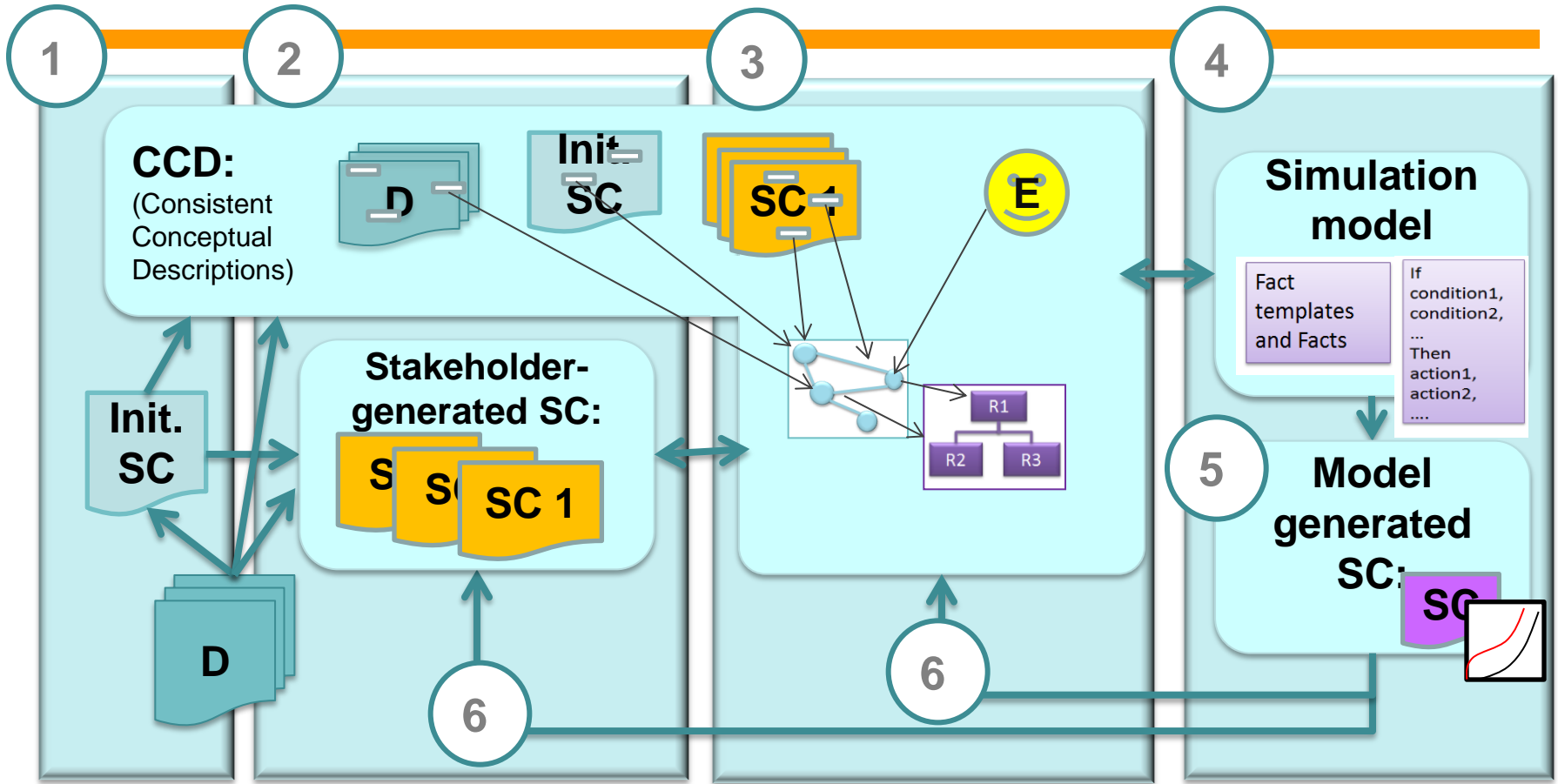
Legend: # Process phase

→ Transition to next phase

Actors:

- Domain Experts (Policy Planner / Strategic Decision Maker)
- Stakeholders involved
- Experts for Policy Analysis / Policy Modelling

Artefacts along the Process Phases



Legend:



Process phase



Information flow



Information flow detailed steps



Expert knowledge



Documents



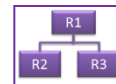
Scenarios



Relevant aspect



Network of social relationships



Rule-Dependency-Graph

Integrating Scenarios and Formal Policy Models



- ❖ Goals, scope and social processes specified by participating stakeholders
- ❖ Stakeholder-generated scenarios inform formal policy model design
- ❖ Models produce simulations, which result in model-based scenarios
- ❖ Participating stakeholders evaluate model-generated scenarios
 - Surprises involve further investigation of model & scenarios
 - Iterations in developing formal policy models

- ❖ Scenarios as textual descriptions of a perceived view or understanding of a topic under discussion
 - Cover existing world status or mental model of stakeholders
- ❖ Alternative scenarios for different aspects and /or alternatives
- ❖ Different sets of scenarios from different stakeholder groups
 - Scenarios may be conflicting among stakeholder groups
- ❖ Extending existing scenarios as understanding and viewpoints grow

- ❖ Foresight processes, IPCC (Intergovernmental Panel on Climate Change) scenarios
 - Usually Top-down: specifying social characteristics and group behaviour
 - Some research projects bottom-up: eGovRTD2020
- ❖ OCOPOMO process
 - Bottom-up
 - Issues identified by stakeholders
 - Scenarios generated without constraints by stakeholders
 - Using integrated ICT-based participation platform

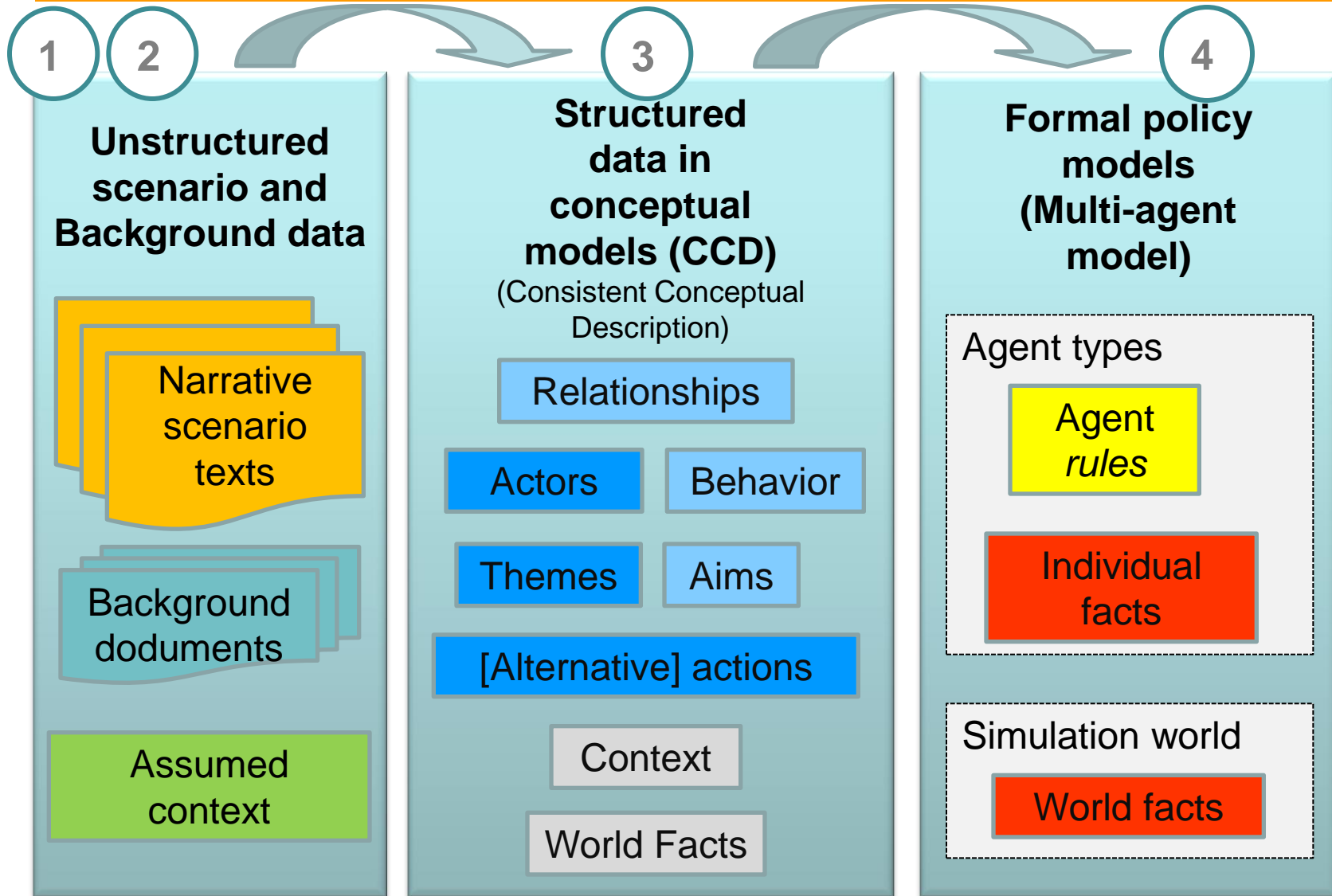
Scenario development in action: methodical basis

| Phases | 1: Definition of initial scenario and collection of background information | 2: Development of evidence-based, stakeholder-generated scenarios |
|-------------------------|---|--|
| Main objectives | Analysis of policy area and Identification of stakeholders | Development of alternative scenarios |
| Actors | Persons in charge of the policy area, policy analysts and modellers | Persons in charge of the policy area, affected stakeholders, policy analysts and modellers |
| Process steps | <ol style="list-style-type: none"> 1) Identify relevant material (e.g. background information, draft policy statement, existing policy, etc.) 2) Review relevant material and systematically analyse the potential policy area 3) Generate initial scenario 4) Identify relevant stakeholders | <ol style="list-style-type: none"> 1) Invite relevant stakeholder groups to review scenario provided and engage in generation of their „view“ on the policy case 2) Generate alternative scenario descriptions and add relevant background information to substantiate and evidence alternative scenarios 3) Prioritize views and scenarios by stakeholders |
| Methods used | Desk research, workshops, common virtual workspace, e-participation platform with content management support | Online and offline communication channels for contacting stakeholder groups; common virtual workspace, e-participation platform with content management support (potentially supported with physical workshops) |
| Expected results | Basic understanding of policy case, identification of relevant stakeholders | Alternative scenarios of the policy case reflecting different positions and views of stakeholder groups; Supporting background material to relevant stakeholders; Interaction and discussion among stakeholders on potential policy; Prioritised scenario features; |

Transforming narrative stakeholder-generated scenarios into conceptual and formal models

| Phases | 3: Development of conceptual models | 4.1: Transforming conceptual to formal mod. |
|------------------|---|--|
| Main objectives | Analysis of scenarios and background documents; design conceptual mod. | Transformation into semi-formal statements |
| Actors | Policy analysts and modellers; Interested expert stakeholders | Policy analysts and modellers, interested expert stakeholders |
| Process steps | <ol style="list-style-type: none"> 1) Identify, tag and extract relevant phrases in evidence-base (scenarios, background documents) 2) Categorize and group phrases (reformulate, group, categorize in actor description, relation, behaviour, belief, environment, rule, condition, endorsement statement, ect.) 3) Build conceptual models to visualise policy aspects | <ol style="list-style-type: none"> 1) Transform conceptual model contents into semi-formal statements therewith mapping <ol style="list-style-type: none"> a) specific characteristics of actors, actions, world facts, etc. b) if-then-else rules c) conditions d) endorsement statements 2) Export transformation content for import in simulation software |
| Methods used | Document analysis tool; Tools for conceptual modelling such as ontology editor | Transformation table to describe facts, actors, rules, etc. Standard XML-exportable descriptions of rules, facts/actor/ect. descriptions |
| Expected results | Transform narrative evidence-based scenario documents of policy case into consistent conceptual models, therewith ensuring traces from original information source in text to the conceptual models | Transformation table Tool to generate and export pseudocode statements in standard format such as XML |

Transformation Steps from Narrative Texts to Formal Models



- ❖ Agents capture descriptions by stakeholders of own and other stakeholders' behaviour and social interaction
- ❖ Cross-validation at micro and macro levels
- ❖ Descriptive accuracy of agents constitute conditions of application
- ❖ Models are not claimed to be predictive – though they might be
- ❖ Purpose of models
 - For identification of problems and opportunities
 - For argument in dissent
 - For exploring and perhaps achieving consensus
 - For monitoring and managing policy

❖ Approach

- Scenarios generated by stakeholders
 - Using integrated ICT-based participation platform
- Model designs driven by information from scenarios
 - Stakeholder concerns and expectations
- Interactive, parallel development of models and scenarios

❖ Type of model

- Evidence-driven
- Agent-based

❖ Role of modelling

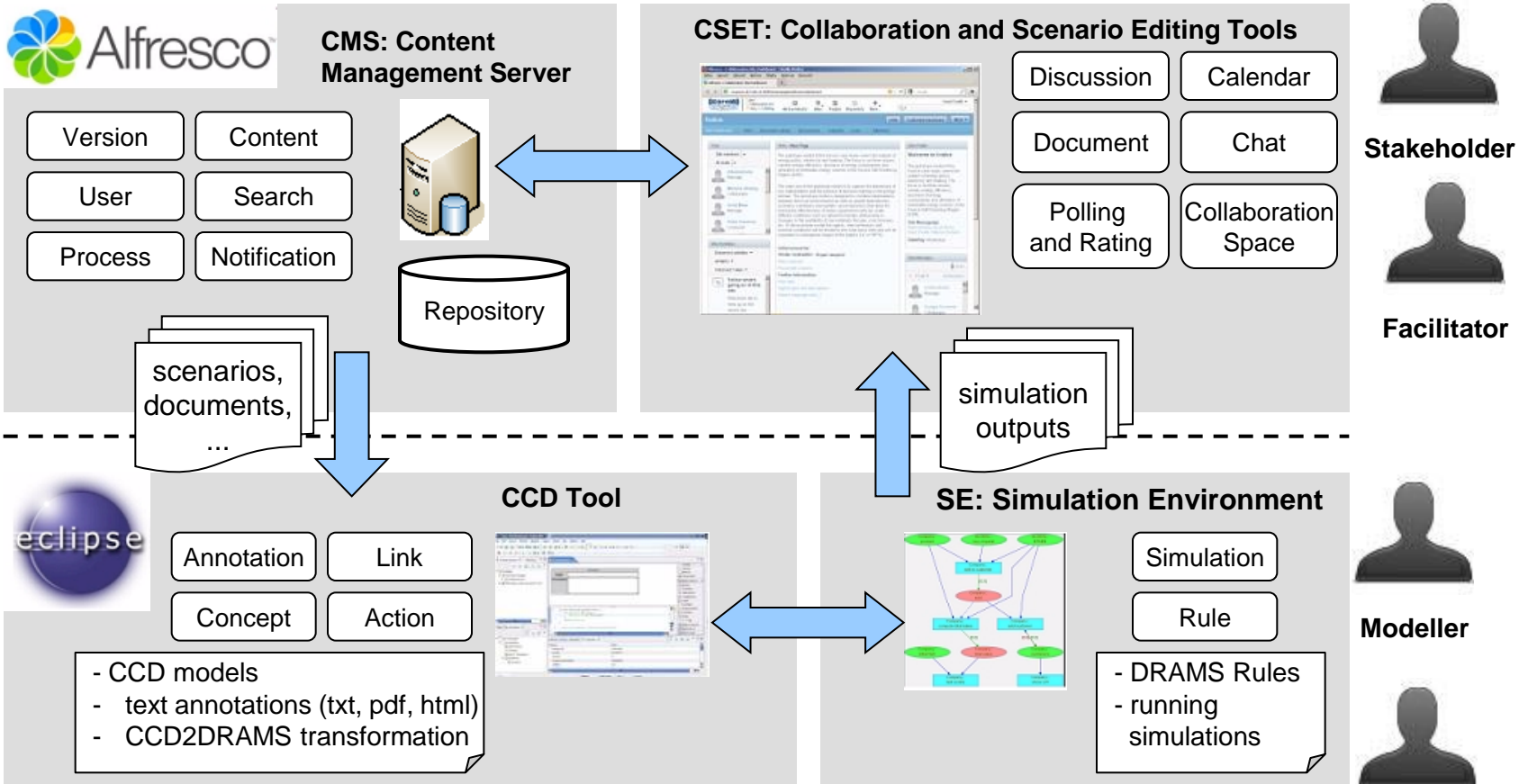
- Precision
- Exploitation
- Exploration



The solutions in detail

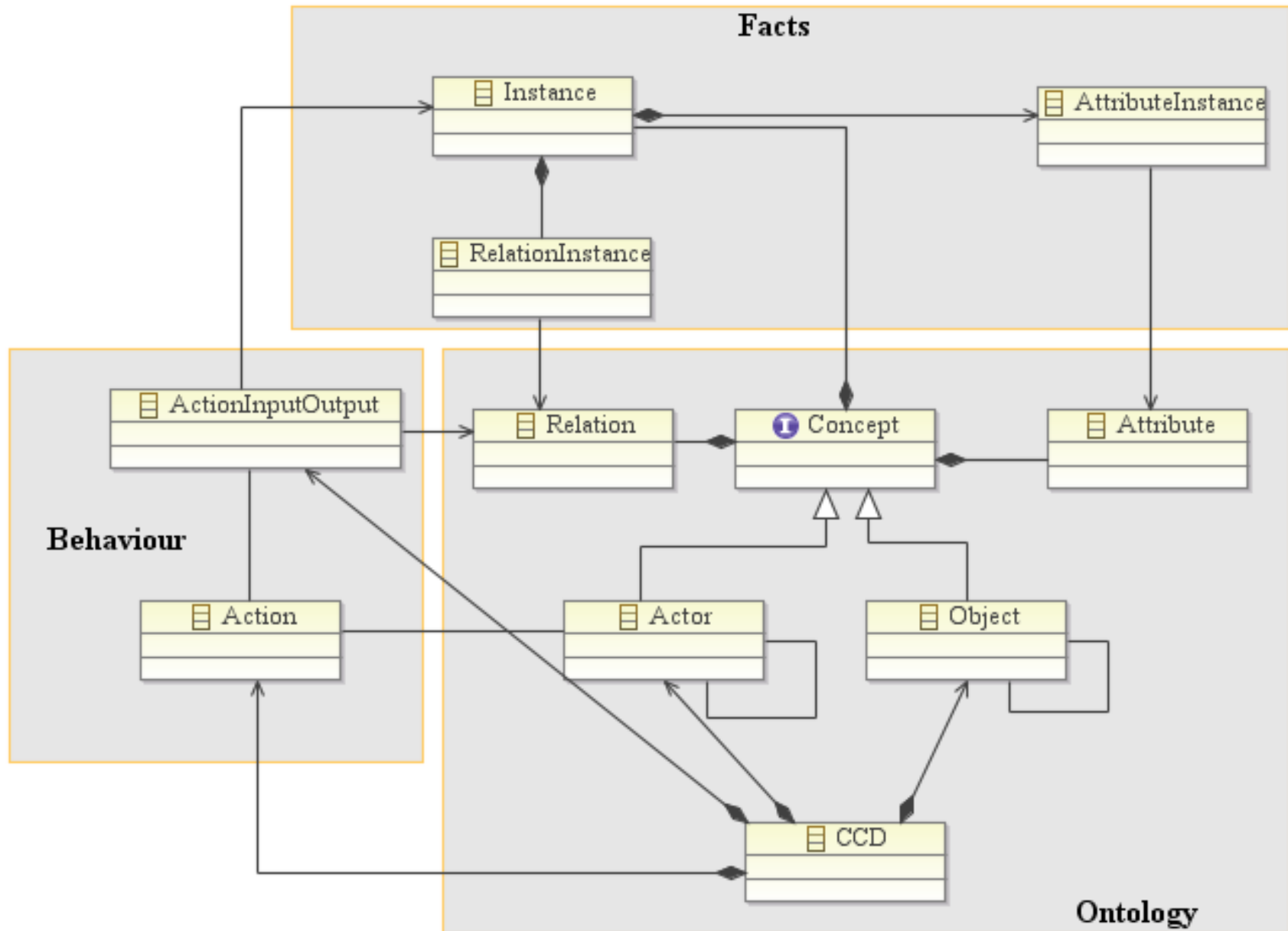
INTEGRATED ICT TOOLBOX TO SUPPORT THE POLICY DEVELOPMENT PROCESS

Tool-support along the OCOPOMO process



Legend Modules: Produced or exchanged artifacts:
 : Managers: Integration data flow:

CCD Metamodel (Vocabulary)

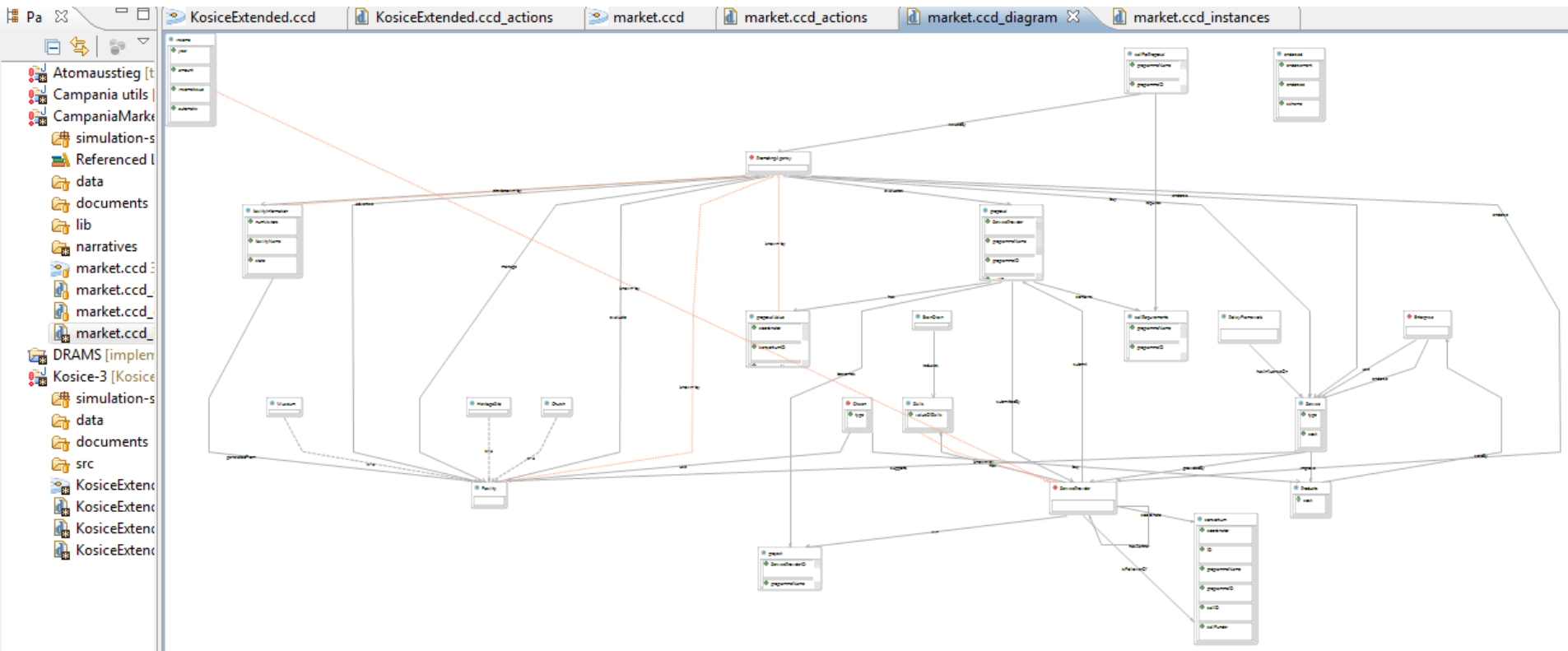


CCD Tool – Annotation of Scenarios

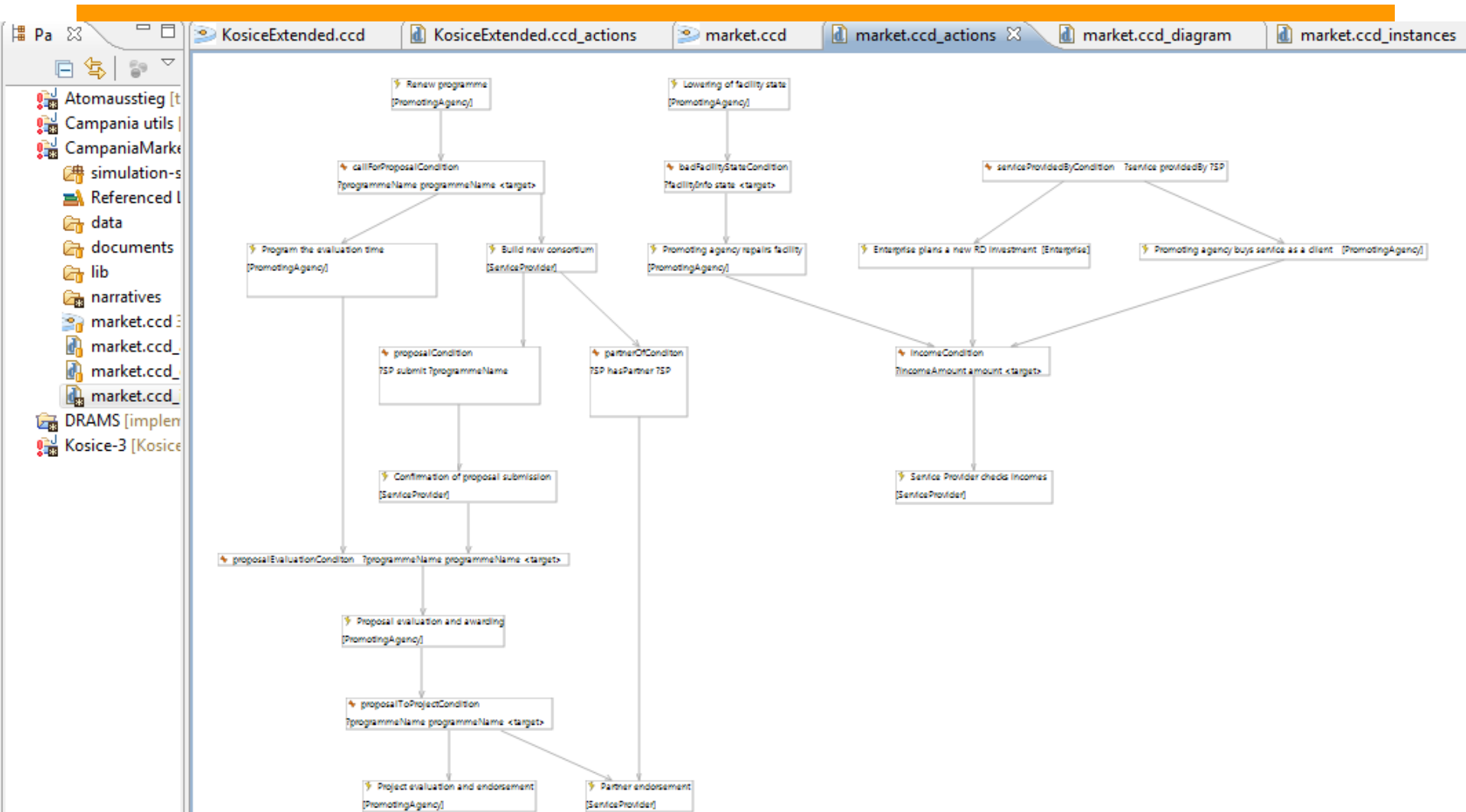


A screenshot of the Eclipse IDE interface. The main editor window displays a text file named "KosiceExtended.ccd_a" with several paragraphs of text. The text is annotated with colored boxes: blue for actors (e.g., "The Ministry of heritage valorization", "The European Commission"), green for attributes (e.g., "percentage of funded/granted activities", "total funds"), and yellow for other elements. A tooltip is visible over a blue box, showing "Actor (name: ServiceProvider, description: null)". The left sidebar shows a project tree with folders like "Atomausstieg", "Campania utils", and "market.ccd". The right sidebar shows the "CCD Annotation View" with a tree structure of "Actors" and "Objects". The "Actors" list includes "Actor: ServiceProvider" with sub-items like "Instance of ServiceProvider: Benecon" and "Instance of ServiceProvider: Innova". The "Objects" list includes "Object: Service" with sub-items like "Instance of Service: BeneconServices" and "Instance of Service: InnovaServices". The bottom status bar shows "Selection | Campania Market.txt | Public funding in the heritage sector .txt | services.txt".

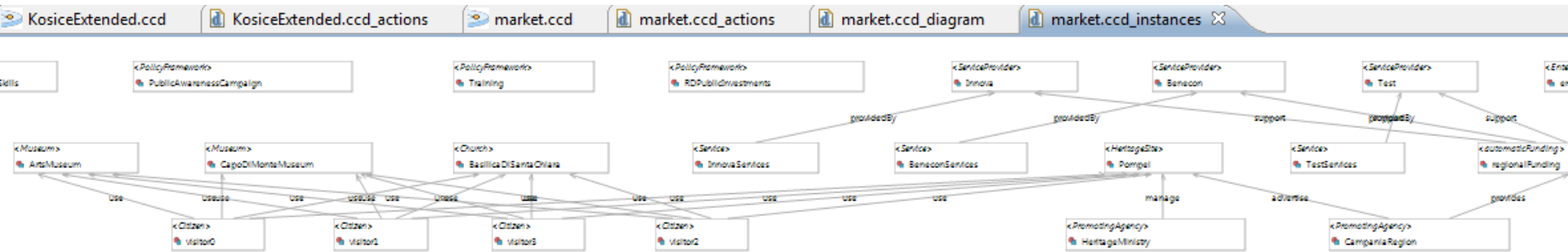
CCD Tool – Visualisation Ontology: Actors and Objects diagram



CCD Tool – Visualisation of Actions



CCD Tool – Visualisation Ontology: Instances diagram



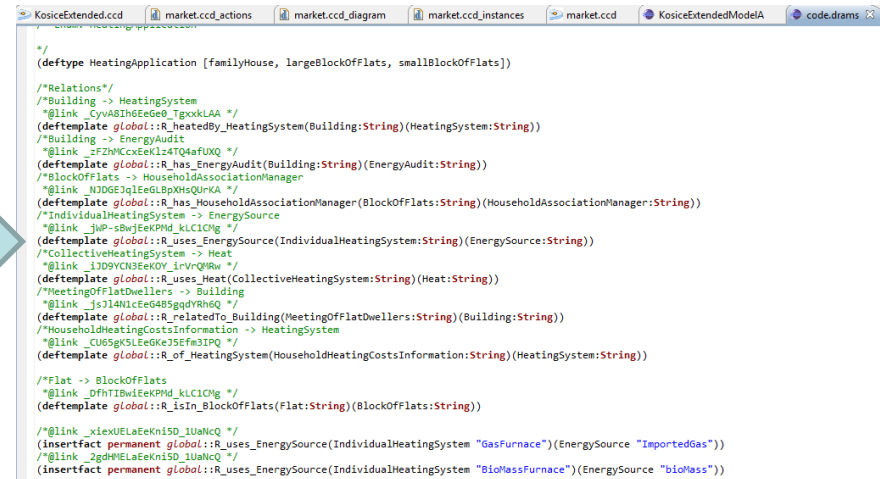
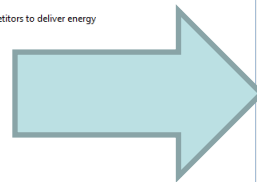
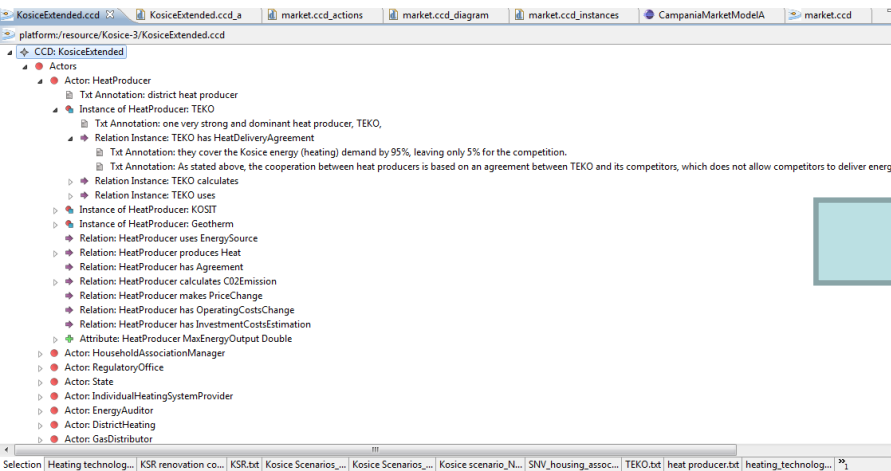
CCD2DRAMS Transformation in Eclipse Environment



1. Conceptual Description (CD) Tool

2. Transformation Tool (CCD2DRAMS)

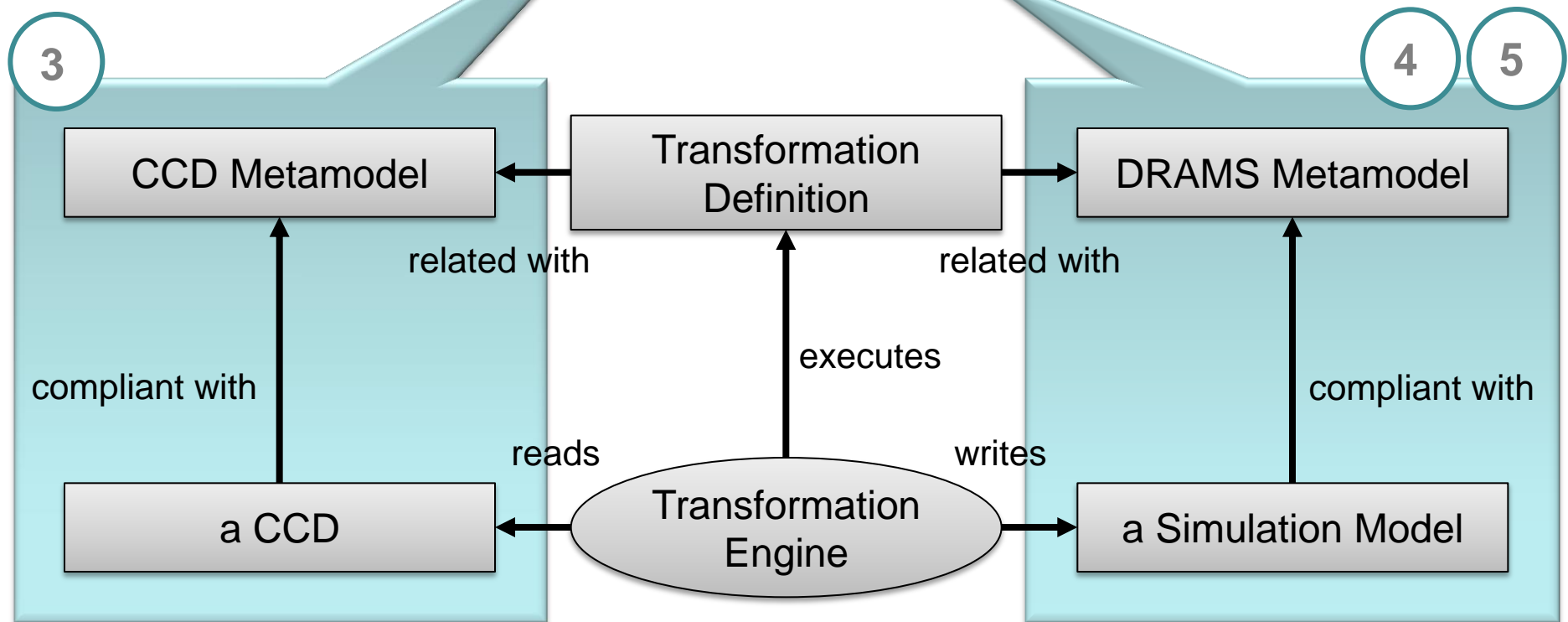
3. Simulation Tool (DRAMS)



CCD2DRAMS: Model Driven Development (MDD) of Simulation Models



Transformation from the conceptual policy model (a ccd) into a formal agent based simulation model (a simulation)



Concept and support tools to establish traceability from scenarios to simulation models



DRAMS Model Explorer - trace test

Scenarios and Background Documents

Kosice Scenarios_Expert_v0.1.txt
D1.1_29_30.txt endorsement.txt
Statistics_2010.txt
Kosice Semi_Structured_Scenario_NGO_v5.txt
Kosice Scenarios_household.txt

governments. One of the responsibilities of associations is to provide energy certificates to flat owners. The certificate can be used for financing a renovation or a special energy audit is needed for financial audit is needed. If a house or flat is to be sold, it is needed as well. The association of flat owners, my flat belongs to, hopefully performs an energy audit, which proves in how far the house is insulated and what changes are most needed (i.e., if walls are not well insulated, then a renovation is needed to better insulate the walls, or if windows are badly insulated, then they shall be replaced through windows with high-insulation). If the house is not well insulated, the auditor provides suggestions[m5] on where to start renovation for improving energy efficiency. Besides, the association of flat owners provides energy audit services of renewable energy sources which are available, in order to eventually switch from current energy system to a new one. This is only possible when the energy audit shows that the house is well insulated and meets the required standards. [m6]In my case, the house, in which I live, owns a gas heating system and two years ago, we had problems with an energy interruption because Russia stopped the delivery of gas. This is one reason why I would like to substitute the gas heating system by wood heating system (i.e., pellets).[m7] [m1]What is an average size of the flat (square

Linked CCD Elements

CCD: KosiceExtended

- actors: Household
- actors: HeatProducer
- actors: HouseholdAssociation
- actors: Distributor
- actors: RegulatoryOffice
- actors: Government
- objects: City
- objects: Building
- objects: HeatingSystem
- objects: Heaters
- objects: Region
- objects: BuildingComponent
- objects: Resource
- objects: Energy
- objects: Agreement
- objects: ResourceConsumer
- objects: CO2Emission
- objects: HouseholdHeatingSystem
- objects: State
- objects: MeetingOfHousehold
- objects: HouseholdVote
- actions: calculate the residential energy efficiency
- actions: set the willingness to pay for energy efficiency
- actions: invest into the renovation
- actions: check the availability of energy efficiency measures
- actions: check the availability of energy efficiency measures
- actions: calculate the residential energy efficiency
- actions: calculate the residential energy efficiency
- actions: calculate the household energy efficiency
- conditions: heating price
- conditions: more than a year
- conditions: renovation in progress
- conditions: renovation in progress
- conditions: renovation in progress
- conditions: possible solution
- conditions: partial energy efficiency
- conditions: energy information

Trace Graph Visualisation

orig. from tick: -1 to tick: 1 Apply Reset CCD: KosiceExtended.ccd

Zoom and Filter Control

Derived Fact with Template Trace Tag

Rule with Trace Tag

Initial Fact with Template and Instance Trace Tag

Simulation Log

```

1.0:0 [H_RB1_12.calculate the income
1.0:0 [H_RB2_12.calculate the income
1.0:0 [H_RB2_9.calculate the income
1.0:0 [H_RB2_8.calculate the income
1.0:0 [H_RB1_4.calculate the income
1.0:0 [H_RB1_10.calculate the income
1.0:0 [H_RB1_11.calculate the income
1.0:0 [H_RB3_5.calculate the income
1.0:0 [H_RB1_5.calculate the income
1.0:0 [H_RB1_8.calculate the income
1.0:0 [H_RB3_10.calculate the income
1.0:0 [H_RB2_1.calculate the income
1.0:0 [H_RB2_6.calculate the income
1.0:0 [H_RB1_1.calculate the income
1.0:0 [H_RB1_3.calculate the household energy efficiency
1.0:0 [H_RB1_3.calculate the household energy efficiency
1.0:0 [H_RB3_7.calculate the household energy efficiency
1.0:0 [H_RB3_7.calculate the household energy efficiency
1.0:0 [H_OFH2_1.calculate the household energy efficiency
1.0:0 [H_OFH2_1.calculate the household energy efficiency
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1.0:0 [H_RB1_14.calculate the household energy efficiency
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1.0:0 [H_RB3_4.calculate the household energy efficiency
1.0:0 [H_RB2_13.calculate the household energy efficiency

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Selected Log Entry



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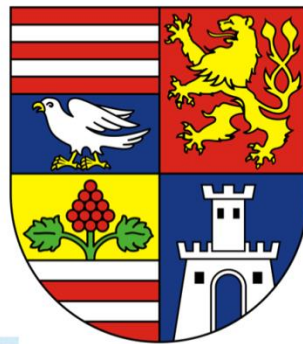
The solutions in detail

THREE PILOT CASES PRODUCING MODELS

Košice Self-Governing Region (Slovakia)



❖ Strategy for the use of renewable energy sources



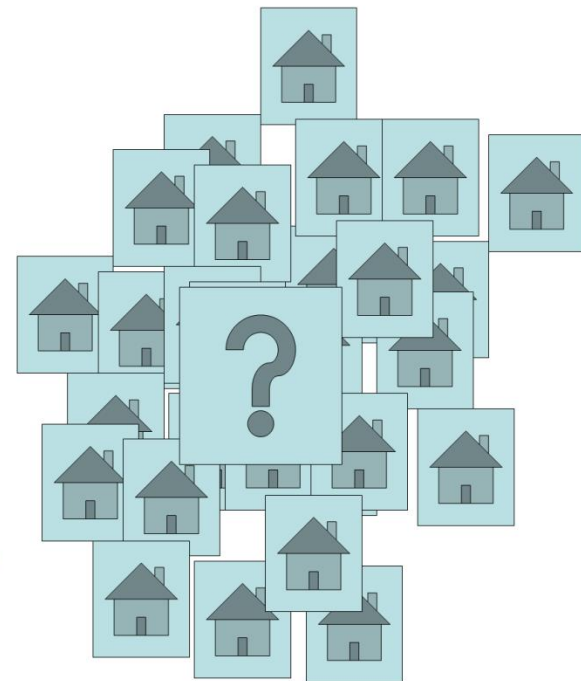
Campania Region (Italy)



- ❖ Supporting the monitoring of the policy on technology transfer funded by EU structural funds



- ❖ Housing policy - ensuring sufficient affordable houses in the City of London (UK)





WHY COMBINING SCENARIO DEVELOPMENT AND FORMAL POLICY MODELLING?

Why integrating Scenario and Formal Model?



- ❖ Stakeholder participation and collaboration enables different views in the development of a policy context
- ❖ Scenario development is bottom-up and evidence-based
- ❖ Comparison of model-generated scenarios with evidence-based narrative scenarios generated by stakeholders
- ❖ Deployment of integrated ICT-based participation platform enabling stakeholders to engage without particular competency in policy modelling concepts

Why integrating Scenario and Formal Model?



- ❖ Stakeholder-generated scenarios inform formal policy model design
 - Goals, scope and social processes specified by participating stakeholders
 - Stakeholders see natural-language pseudo code
- ❖ Formal policy models produce simulations, which result in model-based scenarios
 - Enforces precision in use of language, expectations, goals
 - Key in model design is a set of if-then rules
- ❖ Participating stakeholders evaluate model-generated scenarios
 - Surprises involve further investigation of model & scenarios
 - Iterations in developing formal policy models

Complementarity of Scenario and Policy Models



❖ Chaining in OCOPOMO

- Scenarios built with goal in mind (backward chaining)
- Models built from behavioural and contextual evidence – using forward chaining rules

❖ Richness and precision

- Scenarios developed using rich, natural language
- Rule-bases in models are precise, formal statements

❖ Exploration and exploitation

- Scenario exercises seem naturally to encourage exploration – ideas generation
- Models facilitate exploitation and understanding of prevailing context

Expected impact



- ❖ Contribution to strategic policies and to implement open government
- ❖ Contribution to transform government and administration to an open, effective and efficient participative governance
 - applying good governance principles
- ❖ Providing new opportunities for open discourse among stakeholders of the policy domain and the policy experts
 - in stakeholder-oriented scenario generation
 - in evaluation of formal policy models
- ❖ Improving transparency and traceability in strategic decision making by involving different stakeholders in the participative process via the open collaboration platform



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CONCLUDING REMARKS

- ❖ Traceability along the transformation steps
 - To increase trust and understanding of stakeholders in policy models
 - To support policy modellers in the conceptualisation of a policy domain
- ❖ CCD an important intermediary between scenarios and simulation models
 - Annotation of text and pdf / html documents (set of scenarios and background documents)
 - Storing the links to annotation
 - Conceptualisation of policy domain in iterative steps

Challenges of such approaches



- ❖ Complexity
- ❖ Multidisciplinarity
- ❖ Engaging stakeholders
- ❖ How much to show/visualise to users?
 - hiding complexity
 - ensuring comprehensibility and understanding
- ❖ Will the political level want to engage stakeholders?
 - Dialogue is costly
 - Maybe not in line with the political aims
- ❖ Such approaches yet not widespread

Three levels of scientific and technological innovation (1/2)



❖ Socio-political

- Formulation, modelling and evaluation of social and economic strategies for governments, and monitoring over time
- Open participation in parts of the process via Web 2.0 based e-participation platform

❖ Methodical

- Integrated approach of complexity management for ensuring traceability of strategic decisions
- Integration of stakeholder-generated scenario development and formal agent-based social simulation through integrated approach of qualitative data analysis

Three levels of scientific and technological innovation (2/2)



- ❖ Technological: Comprehensive support of policy development process through open collaboration platform
 - E-participation via web 2.0
 - Collaborative scenario generation
 - Conceptual model development
 - Semi-automatic transformation of conceptual model into simulation model (applying MDD)
 - Formal policy modelling and simulation
 - Ensuring transparency and traceability through the integrated approach from scenario-generation to formal policy simulation

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Many thanks for your attention!

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