

ABM4EnergyTransition | Agent-based Simulation of Transition Scenarios for regional Heating and Energy Transformation

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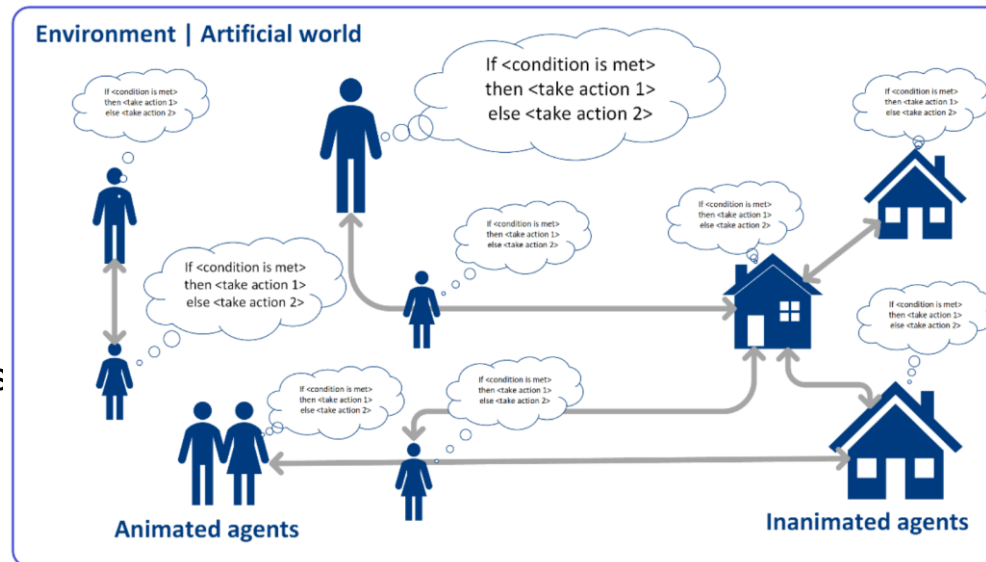
TU Graz, Institute of Geodesy, RG Geoinformation

Motivation & Solution for ABM4ET

Spatial Agent-based modeling and Simulation

- Energy transition is in full swing;
 - Heating of private homes should be carbon neutral in near future
 - 50% of total energy demand necessary for heating purposes.
- Politics would like to stimulate switching to carbon neutral heating systems! But:
 - private home owners decisions are hard to model and simulate
 - no idea which (funding) policy results in which carbon emission reduction?

- approach to simulate the interaction of virtual autonomous agents in a defined environment
- Agents
 - can represent people in a virtual environment
 - imitate human decision making behavior




- ABM simulates behavior between agents as well as agents and the environment.
- ABM can analyze complex systems under different conditions and help to understand complex relationships and patterns in a bottom-up approach
- micro-scale modeling >> evaluate pattern at macro-scale

ABM4ET Goals and Research Questions

- Can spatial Agent-based Modeling and Simulation be applied to Energy Transition Scenarios?
- To which extent can socio-demographics and social induced behaviour of humans be implemented in “intelligent” agents – that simulate human decision making induced by e.g. public policies
- By utilizing data-rich test areas for evaluation purposes – we are interested to apply & evaluate the ABM results in data-scarce environments
 - Which minimal data requirements are necessary for an accurate ABM simulation?
 - Which spatio-temporal level of detail is required for which level of accuracy?
- Are there emerging spatial patterns (also with respect to socio-demographics) when applying different policies concerning energy transition
- Can such an ABM simulation help to “find” and communicate the “best” policy (with respect to greenhouse gas emissions, total energy demand, etc.)?

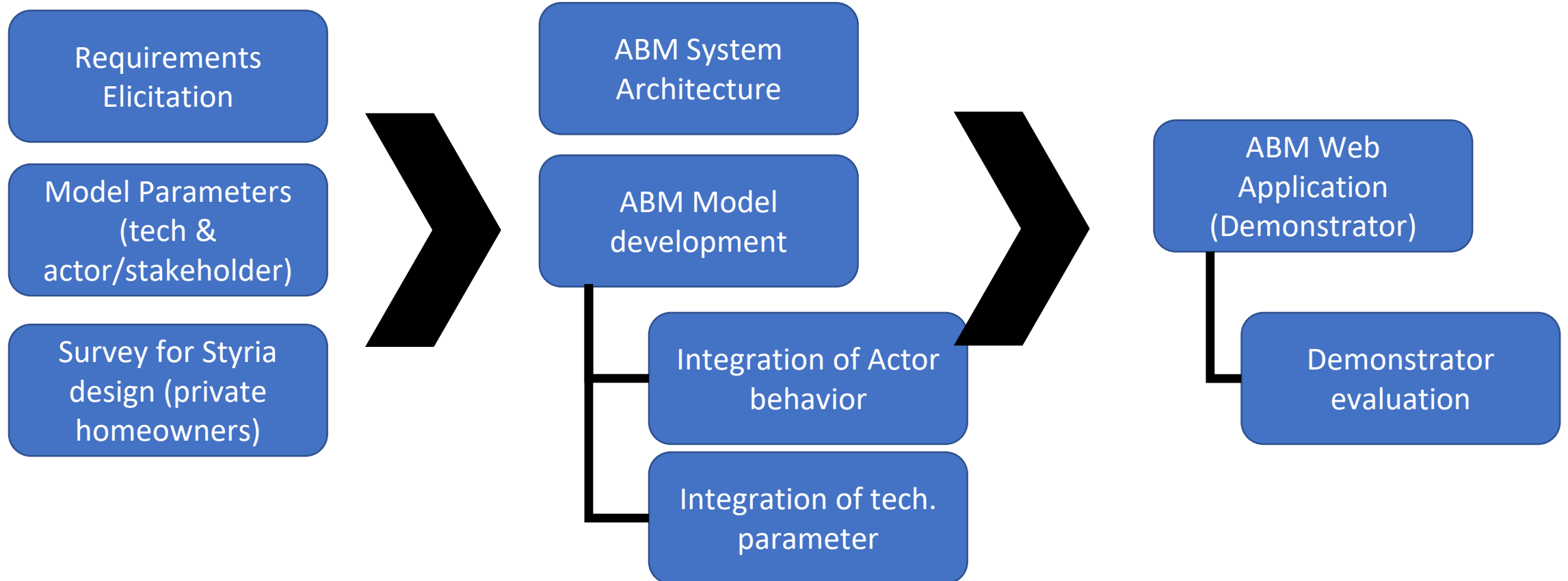
Status of the project

ABM4EnergyTransition Start: 10/2022



WP	WP Name	Year 1												Year 2											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP1	Project Management	[Blue shaded cells]																							
T1.1	Operative Project Management	[Blue shaded cells]																							
T1.2	Project Controlling	[Blue shaded cells]																							
T1.3	Quality Control and Datamanagement	[Blue shaded cells]																							
WP2	Requirements Elicitation and Data Management	[Blue shaded cells]																							
T2.1	Requirements Elicitation for ABM Architecture	[Blue shaded cells]																							
T2.2	Specification of Technical Model Parameters	[Blue shaded cells]																							
T2.3	Collection and Specification of the Model Parameters for Actor/Stakeholder Decisions	[Blue shaded cells]																							
WP3	Agent-based Modeling and Simulation & AI	[Blue shaded cells]																							
T3.1	Development of the ABM System Architecture	[Blue shaded cells]																							
T3.2	Integration of Modeling Parameter in ABM	[Blue shaded cells]																							
T3.3	Integration of Actor Behavior in ABM	[Blue shaded cells]																							
T3.4	ABM Development	[Blue shaded cells]																							
T3.5	Privacy and Data Security	[Blue shaded cells]																							
WP4	Web-Application and ABM Integration	[Blue shaded cells]																							
T4.1	Design of the ABM-Web Application	[Blue shaded cells]																							
T4.2	Development of a Demonstrator	[Blue shaded cells]																							
WP5	Evaluation and Verification	[Blue shaded cells]																							
T5.1	Design of the Evaluation Procedure	[Blue shaded cells]																							
T5.2	Functional Evaluation	[Blue shaded cells]																							
T5.3	User-centered Evaluation	[Blue shaded cells]																							
WP6	Dissemination & Exploitation	[Blue shaded cells]																							
T6.1	Scientific Publication	[Blue shaded cells]																							
T6.2	Dissemination & Marketing	[Blue shaded cells]																							
T6.3	Innovation Management & Exploitation	[Blue shaded cells]																							

Project Plan – Methodological Approach



Status of the project

- Close to finish:
 - Requirements Elicitation
 - Technical Model Parameters
 - Model Parameters for Actors/Stakeholders – Design of survey is in the final steps
- Currently ongoing:
 - ABM System Architecture (very mature at the moment!)
 - ABM Integration of Actor behavior (survey is about to be sent out soon!)
 - ABM Development (started – initial ABM model is already implemented!)

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