

A knowledge diffusion and decision platform for renaturing cities

Agent Based Analysis Approaches

sustainabilitu -e- ekodenge engineering

Agent Based Modelling

T3.2 Conceptual Development to Testing Models for assessing people's interactions with Nature Based Solutions



Agent Based Modelling uses if-then type rules

Time Clock Rule Event Triggering Rule



- Ten Conceptual Scenarios for NBS Developed
- 1. People's Activities in NBS spaces
- 2. Building utilisation impacts with NBS
- 3. Demographic neighbourhood changes with NBS influence
- 4. Property value changes caused by NBS
- 5. Water runoff improvement by NBS promotion in household gardens (implemented)
- 6. Climate extreme events rescue improvement through NBS
- 7. Inclusive neighbourhood planning using NBS interventions
- 8. Socio-economic and commercial development resulting from NBS changes (implemented)
- 9. Motorway transformation to underground transport and green park areas
- **10.** Urban heat mortality impacts reduction through NBS (implemented)



If 6h to 9h \rightarrow roll probability \rightarrow activate Rule A If event \rightarrow Variable Y of Agent 1 is "Awake" \rightarrow activate Rule B Rule A: Change Agent 1 Variable Y to "awake" Rule B: Change Agent 2 Variable Y "Awake"

City Spatial Data Mapped for Simulations by Land Type







Developed Simulation Models



Mortality Results for citizens 65+ years of age

- 2016, 2030, 2050, 2070, 2090 (climate change scenarios)
- With/without Green Roofs (% and 1.5 °C or 3 °C cooling impact •



Water Runoff Reduction from Green Gardens





Revenues and Profits café's/food places from retail to sustain Emerging new retail in parks attractive locations

City Pilot Results

Green Garden Transformation and Water Runoff Results

- Different profiles for citizens (motivation/abilities/willingness)
- Availability of municipal subsidies and social support for

Urban Parks Impacts on Retail Businesses

- Number of retail shops after five years of simulation
- Difference between availability of green spaces

Run set	Household mix	No gardening knowledge workshop influencers	No gardening Group Organiser influencers	No financial subsidies per year for garden transformatio n	No. Paved Gardens		No. Partially Green Gardens		No. Green Gardens		Cumulati
					Start	End	Start	End	Start	End	year (m
1	100% proud gardeners	0	0	0	354	216	165	207	119	215	25,725,0
2	100% proud gardeners	0	0	0	383	230	184	243	91	185	26,220,0
3	100% backyard barbeques	0	0	0	380	353	162	181	104	112	27,860,0
4	100% backyard barbeques	0	0	0	359	338	174	187	104	112	27,943,0
5	100% proud gardeners	80	0	0	367	219	172	200	92	212	24,567,0
6	100% proud gardeners	0	100	0	367	188	168	193	91	245	25,100,9
7	100% proud gardeners	0	0	1000	385	94	178	65	97	501	24,769,0
8	100% proud gardeners	80	100	1000	367	47	170	53	94	531	22,750,0
9	100% backyard barbeques	80	0	0	368	346	155	161	106	122	28,460,0
10	100% backyard barbeques	0	100	0	405	369	150	168	108	126	28,630,0
11	100% backyard barbeques	0	0	1000	388	365	173	184	91	103	28,310,0
12	100% backyard barbeques	80	100	1000	366	304	198	198	97	159	27,810,0
		Resul	ts Exa	imple fo	r Sa	zeg	ed				
	1.05E7	1	Total Surface	Runoff from All Pr	ivate G	ardens			1		



Parks

Urban

	Popul ation that walks in parks	Number of retail shops					Popul	Number of retail shops			
Pop ulati on		At start of mode I run	At end of model run	Average across model run	Run set	Popu latio n	ation that walks in parks	At start of mode I run	At end of model run	Average across model run	
2868	1559	1	8	9	1	3000	1569	1	8	9	
2868	1498	1	8	9	2	3000	1596	1	11	8	
2868	1511	5	7	6	3	3000	1545	5	7	7	
2868	1440	5	7	8	4	3000	1553	5	6	8	
2868	1448	10	8	7	5	3000	1608	10	5	8	
2868	1461	10	8	7	6	3000	1610	10	11	8	
	Alca	ia de	e Hena	ares				yank	aya		
	Alca		ber of reta	ares ail firms			Popula	ank _{Num}	(aya ber of retai	il shops	
Pop ulati on	Popul ation that walks in parks	Num At start of mode I run	ber of reta At end of model run	ares ail firms Average across model run	Run set	Popu latio n	Popula tion that walks in parks	Num At start of model run	ber of reta At end of model run	il shops Average across model run	
Pop ulati on 5592	Alca Popul ation that walks in parks 2929	Num At start of mode I run 1	ber of reta At end of model run 14	ares hil firms Average across model run 14	Run set	Popu latio n	Popula tion that walks in parks 827	Num At start of model run	ber of retains At end of model run	il shops Average across model run 6	
Pop ulati on 55592 5592	Alca Popul ation that walks in parks 2929 2950	Num At start of mode I run 1 1	ber of reta At end of model run 14 13	ares ail firms Average across model run 14 12	Run set 1 2	Popu latio n 1583 1583	Popula tion that walks in parks 827 783	Num At start of model run 1	ber of retai	il shops Average across model run 6 5	
Pop ulati on 5592 5592	Alca Popul ation that walks in parks 2929 2950 2919	Num At start of mode I run 1 1 5	ber of reta At end of model run 14 13 14	ares ail firms Average across model run 14 12 13	Run set 1 2 3	Popu latio n 1583 1583 1583	Popula tion that walks in parks 827 783 818	Num At start of model run 1 1 5	aya ber of retai At end of model run 8 3 7	il shops Average across model run 6 5 5 6	
Pop ulati on 5592 5592 5592	Alca Popul ation that walks in parks 2929 2950 2919 2919	Num At start of mode I run 1 1 5 5 5	ber of reta At end of model run 14 13 14 13	Average across model run 14 12 13 13	Run set 1 2 3 4	Popu latio n 1583 1583 1583 1583	Popula tion that walks in parks 827 783 818 818 873	Num At start of model run 1 1 5 5 5	aya ber of retai At end of model run 8 3 7 6	il shops Average across model run 6 5 6 5 6 5	
Pop ulati on 5592 5592 5592 5592	Alca Popul ation that walks in parks 2929 2950 2950 2919 2943 2921	Num At start of mode I run 1 1 5 5 5 10	ber of reta At end of model run 14 13 14 13 14	ares ail firms Average across model run 14 12 13 13 13	Run set 1 2 3 4 5	Popu latio n 1583 1583 1583 1583 1583	Popula tion that walks in parks 827 783 818 818 873 810	Num At start of model run 1 1 5 5 5 10	At end of model run 8 3 7 6 3	il shops Average across model run 6 5 6 5 6 5 5 5	
Pop ulati on 5592 5592 5592 5592 5592 5592	Alca Popul ation that walks in parks 2929 2950 2919 2943 2921 2921	Num At start of mode I run 1 1 5 5 5 10 10	ber of reta At end of model run 14 13 14 13 14 13 14	ares al firms Average across model run 14 12 13 13 13 13 13	Run set 1 2 3 4 5 6	Popu latio n 1583 1583 1583 1583 1583	Popula tion that walks in parks 827 783 818 818 873 810	Num At start of model run 1 1 5 5 5 10	ber of retains At end of model run 8 3 7 6 3	il shops Average across model run 6 5 6 5 6 5 5 5 5	

Nature4Cities consortium

> 6 leading Research and Technology Organizations

NOBATEK/INEF4 (FR) - Coordinator Cerema (FR), Tecnalia (ES), Eurecat (ES), Cartif (ES), Luxembourg Institute of Science & Technology (LU)

> 4 universities

University of Nantes / IFSTTAR (FR), Agrocampus Ouest (FR), University of Szeged (HU), Middle East Technical University (TR)

> 2 leading industrial organizations

Acciona Construction (ES), Acciona Ingeneria (ES), Rina Consulting (IT)



IFSTTAR

acciona

INVESTIGATE DE HARTT

Gardens

Green

from

Reduction

Runoff

Water



acciona

RIN

> 2 clusters of stakeholders

(IT), Grün statt Grau (AT)

Plante & Cité (FR), Hungarian Urban Knowledge Center (HU)

> 9 Small and Medium-sized Enterprises (SMEs)

Green4Cities (AT), Terranis (FR), Colouree (IT), Duneworks (NL),

Argedor (TR), Ekodenge (TR), Innova Integra (UK), R2M Solution

> 4 pilot cities

Alcala de Henares (ES), Città Metropolitana Di Milano (IT), Szeged (HU), Çankaya (TR)





Join the community!

www.nature4cities.eu

----- UST 😂

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 730468

