SMALL COMMUNITIES

IN THE SET (SUSTAINABLE ENERGY TRANSITION) FOCUS

PEKKA PEURA

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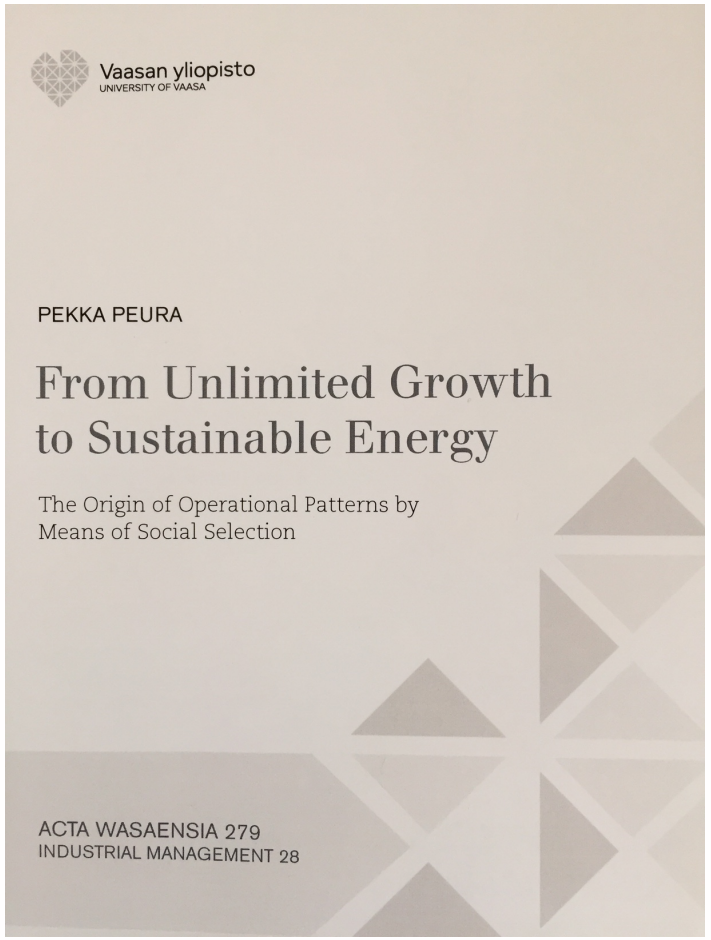
Pekka Peura

- Senior Adviser; VEBIC 6.2020 –
- Director 2.2015–6.2020
- UVA, Levón Institute 2002–
- JyU: MSc 1982, Hydrobiology
  Phil. licentiate 1997, Ecology
- PhD 2013



Pekka Peura

- 30.3.1956
- Water District Administration 1982-1987
- Väkipyörä Oy/ARGES Ltd. 1987-2001

Small communities matter

RESources: more than enough!

Economy

- Single solutions – fairly good, some excellent
- Systemic solutions – unproven but coming
- Regional (national) economy: huge potential

Other **drivers** = Force majeur

- End of C – peak oil – peak fossils
- Climate
- Attitudes

From fossil to RES
From global to regional
Smaller scales
From single to systems
All vectors
(electricity, heating, transport, cooling, etc.)

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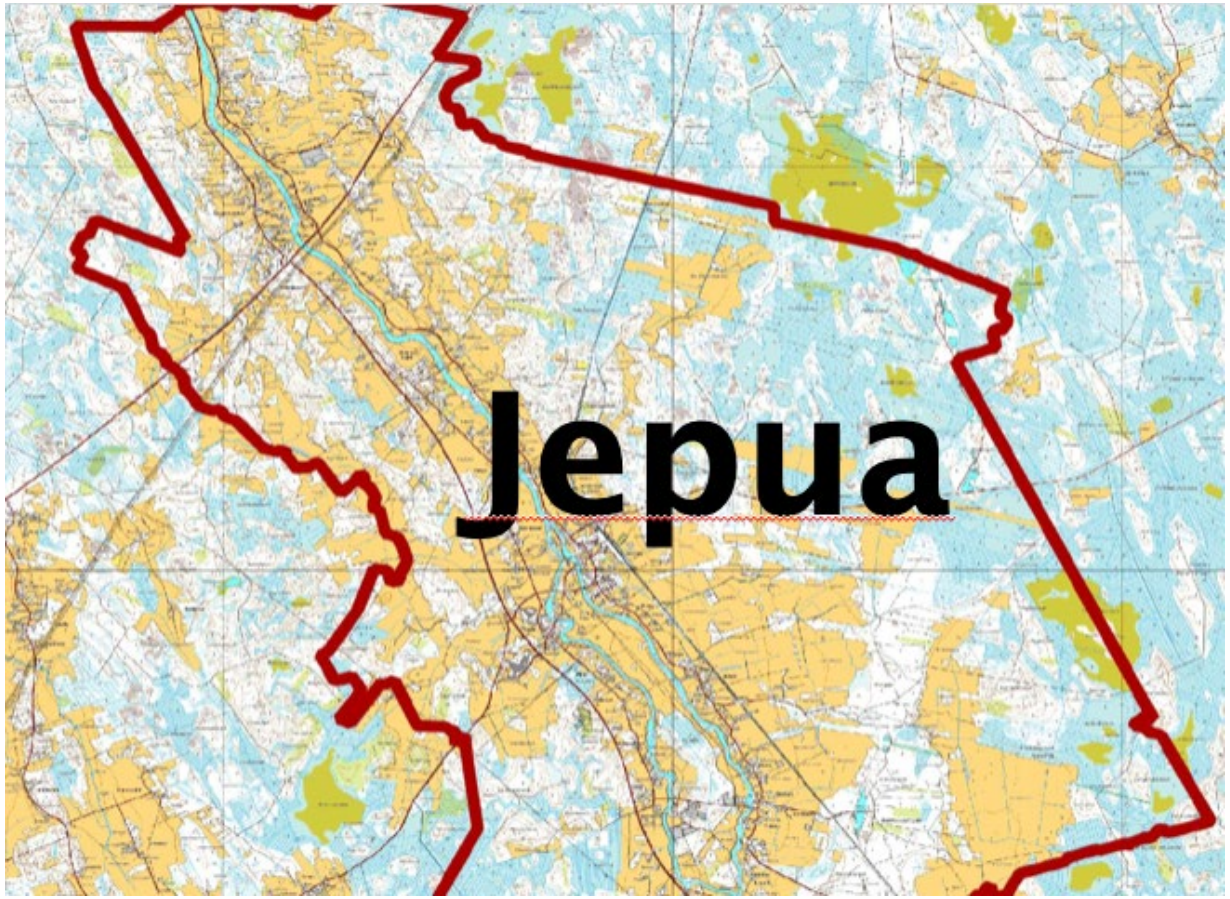
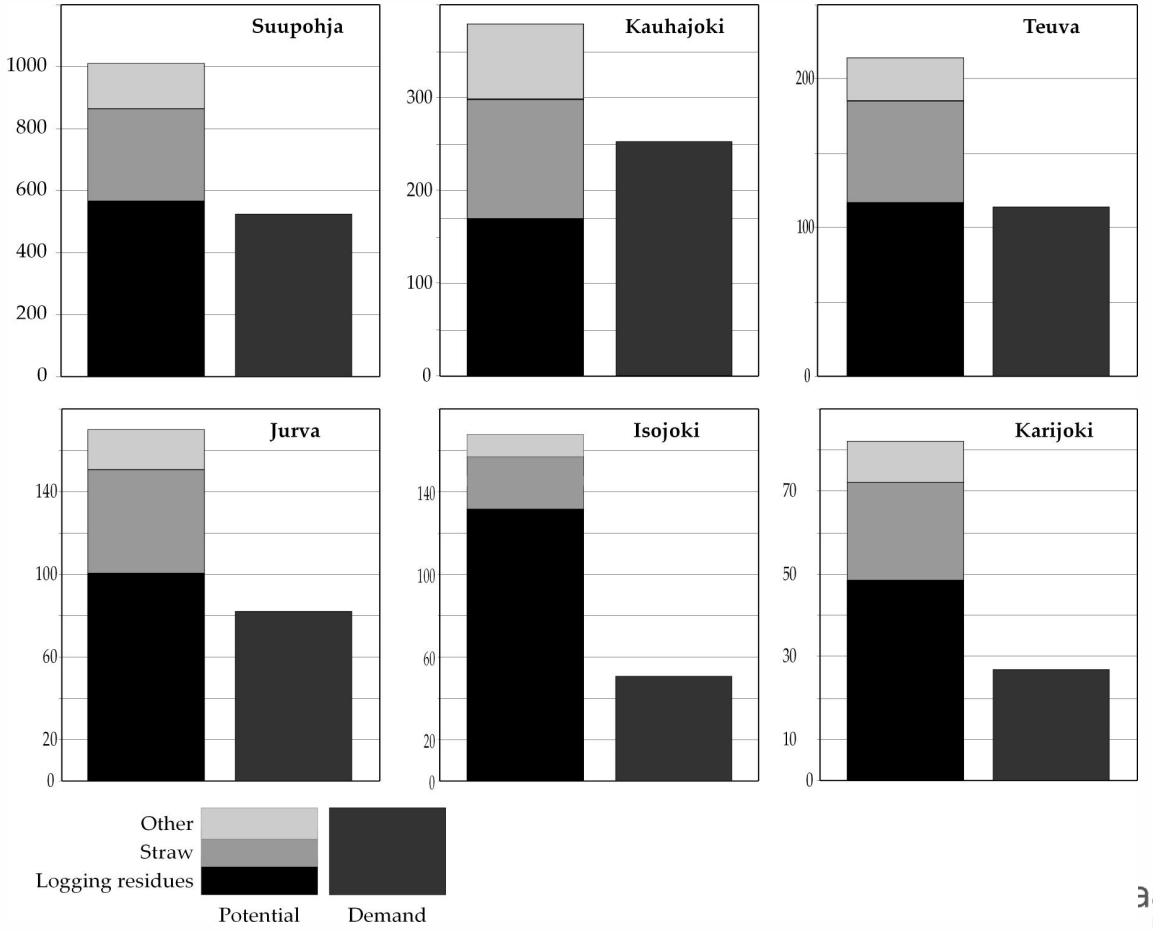
Small Community ≈ Energy Village

- **Small region**
  with an impact area
- **100+% self-sufficient**
  in all energy vectors
- **All energy from the own area**
- **Potential for selling** energy
  serving others



Typical case

RESource potenetial: 100+%



How about Regional Economy?

"IF THE MONEY STAYED AT HOME …"

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They spend

4000 – 5000 €/A

ELECTRICITY

HEATING

TRAFFIC

MACHINES

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1 Village

- 0,5 M€/a - 100 persons
- 5 M€/a - 1000 persons

500 Villages

- 2,5 Bn€

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100% RES
- 7,5 M€
- <50 jobs

150% RES
- 10 M€
- 90 jobs

IN JEPUA
1200 PEOPLE

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Money flow by branch M€

Region Municipality *Village*	Agric. Forestry	Other industry	Trans-port	Financing	Other	Labour	Capital	TOTAL M€
Kaustinen	**19,0**	**11,0**	**4,0**	**5,5**	**3,6**	**9,0**	**22,2**	**74,4**
Kaustinen	[illegible]	1,9	0,81	1,0	0,70	1,7	3,5	[illegible]
Halsua	1,6	0,83	0,34	0,43	0,32	0,76	1,5	5,7
Lestijarvi	1,2	0,60	0,26	0,33	0,22	0,54	1,1	4,2
Toholampi	4,4	2,4	1,0	1,2	0,92	2,2	4,2	16,2
Veteli	4,4	2,2	0,95	1,2	0,80	2,0	4,0	15,5
Perho	3,7	3,1	0,71	1,3	0,69	1,9	8,0	19,3
Perho	*0,73*	*1,0*	*0,13*	*0,32*	*0,19*	*0,50*	*2,8*	*5,7*
Jakobstad	**31,7**	**39,0**	**5,1**	**14,5**	**4,4**	**15,7**	**119,4**	**229,8**
Jakobstad	1,7	2,0	0,25	0,78	0,15	0,71	6,5	12,0
Pedersore	9,4	9,5	1,7	3,8	1,4	4,5	27,5	57,7
Kronoby	6,7	3,8	1,4	2,0	1,1	2,9	8,3	26,1
Larsmo	1,2	0,47	0,23	0,34	0,09	0,34	1,1	3,7
Nykarleby	12,9	23,2	1,6	7,6	1,7	7,3	76,0	130,2
Jepua	*1,7*	*1,4*	*0,33*	*0,58*	*0,34*	*0,88*	*3,5*	*8,6*
Pensala	*0,13*	*0,30*	*0,05*	*0,03*	*0,20*	*0,34*	*0,40*	*1,5*
Vörå	7,5	3,6	1,6	2,1	1,2	3,2	6,7	25,9
Komossa	*0,09*	*0,10*	*0,03*	*0,02*	*0,06*	*0,10*	*0,15*	*0,5*
Karijoki	1,7	1,2	0,41	0,47	0,58	1,2	2,0	7,6
Karijoki	*1,0*	*0,60*	*0,18*	*0,33*	*0,08*	*0,33*	*1,6*	*4,1*
Jalasjärvi	6,2	5,4	1,1	2,3	0,86	2,7	15,1	33,7
Ilvesjoki	*0,71*	*0,35*	*0,15*	*0,20*	*0,12*	*0,31*	*0,64*	*2,5*

RES ≈ Rural

What could be more beneficial for Rural than RES?

RENEWAL ENERGY SOURCES

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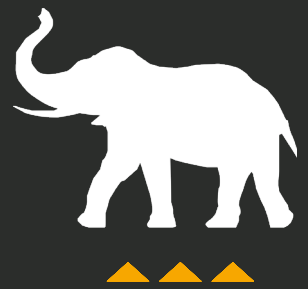
How to eat the elephant?



CONSIDER:
THE RELATIONSHIP TO THE EXISTING SYSTEM(S)

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The Energy Village concept and product portfolio

OUR SOLUTION

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“… that’s a brilliant idea

We should immediately put 500 of these up in Finland”

KAI SIPILÄ

GENERAL MANAGER, VTT 11.2.2014

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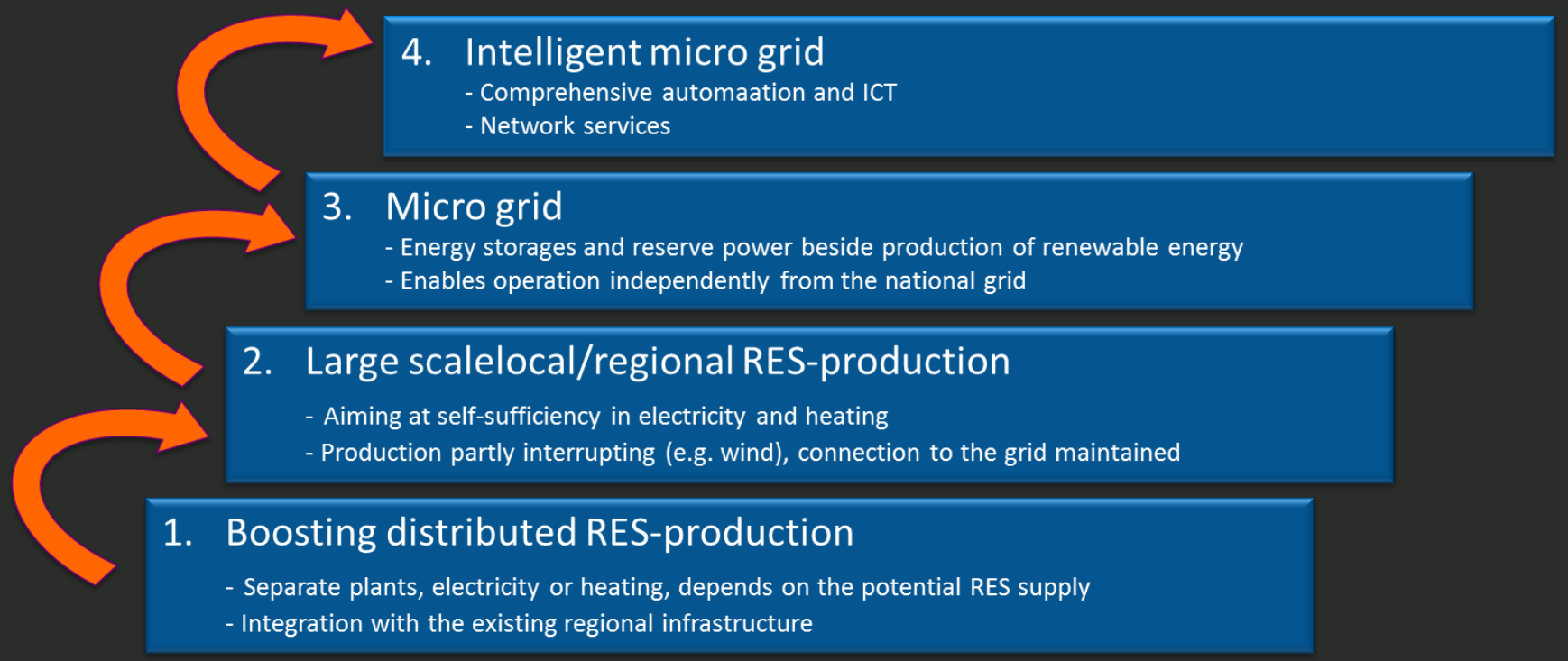
To practice ...



FROM 1 TO SYSTEMS

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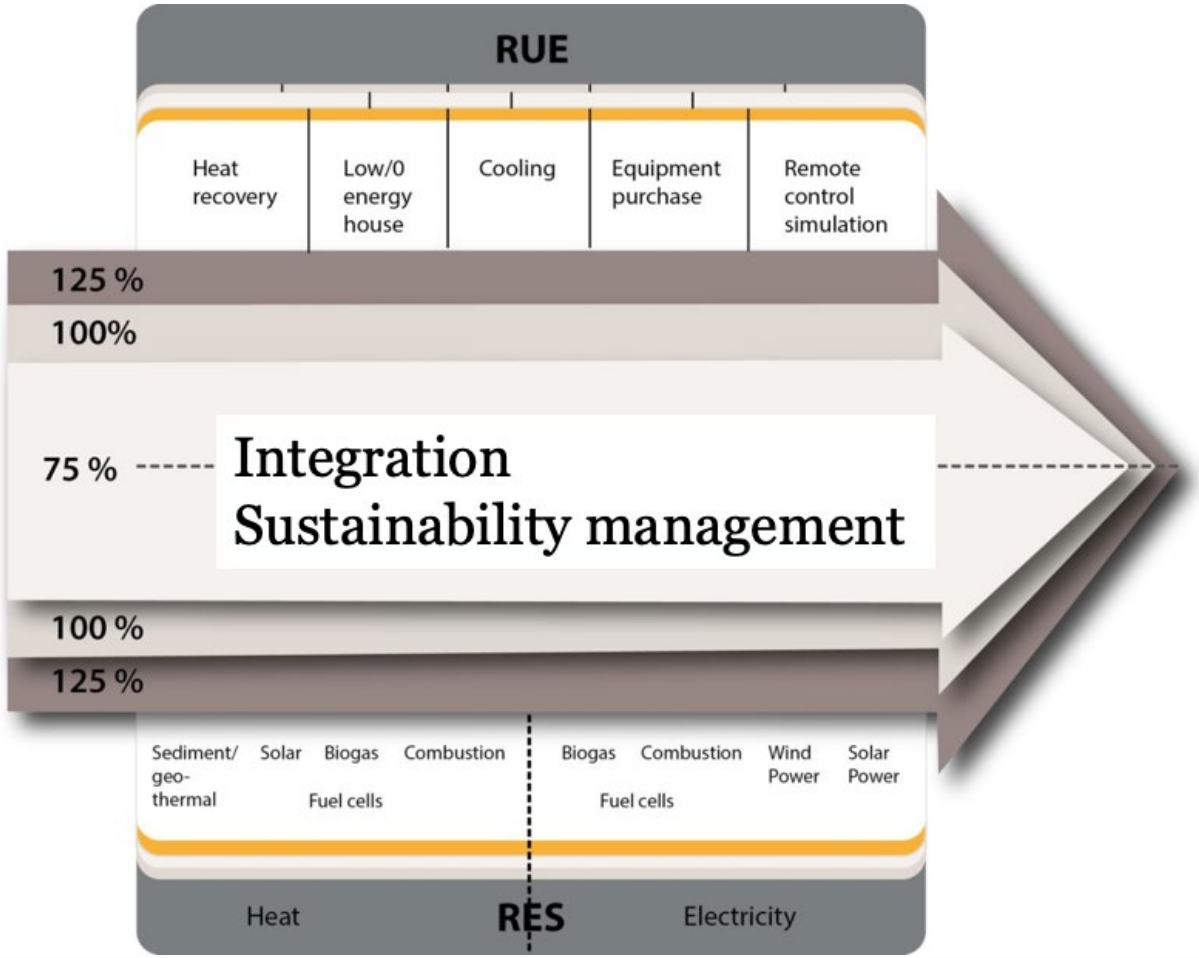
Sustainable Energy



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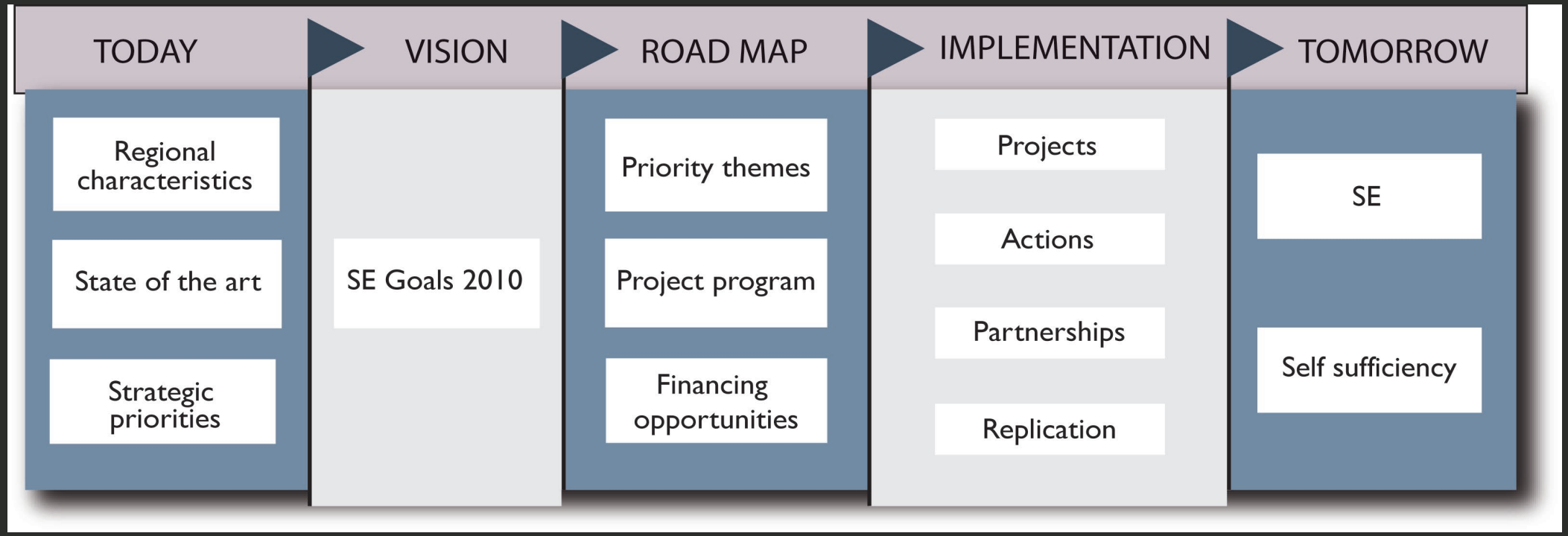
Vision and Roadmap



THE PROCEDURE:
FROM COMMITMENT TO ACTION PROGRAM

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Concluding remarks

- **State of the world's environment**:
  Humankind in danger!
- **The process towards sustainability**:
  - Necessary
  - Long societal process
  - Practical needs: real actions
  - Scientific needs: better understanding
- **The role of the energy sector**
  - among core issues concerning human environmental impacts
  - key role in the process of change

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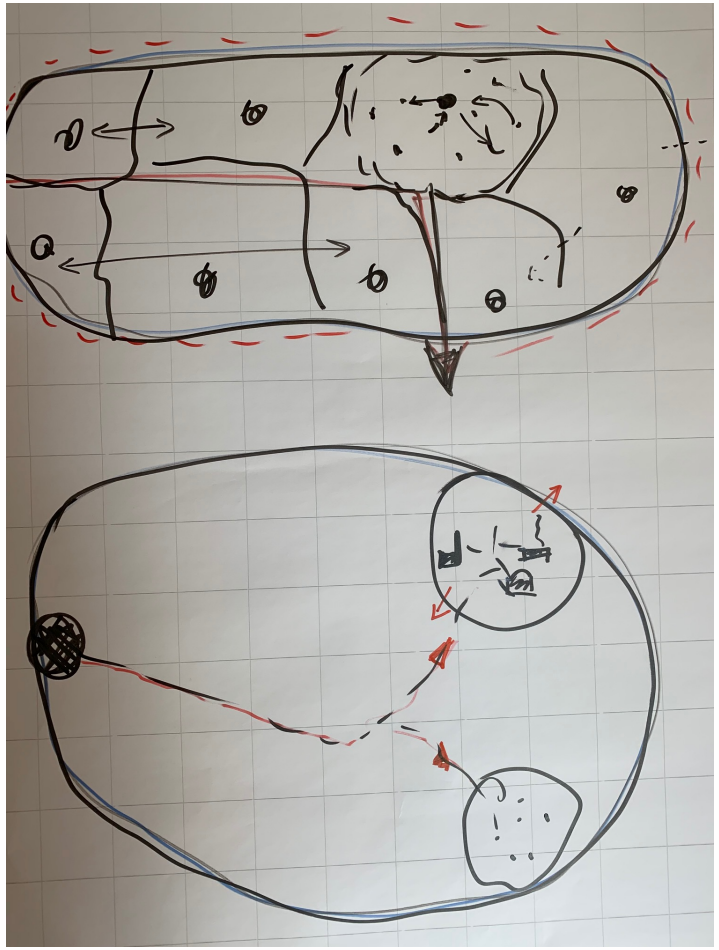
Business Models in Turbulence

WHAT IS THE FUTURE ROLE OF ENERGY UTILITIES?

- **Production** more regional & local
  - Electricity
  - Heating
  - Transport etc.
- **Distribution** …
  - Electricity; Micro and Smart Grids
  - Heating
  - Traffic
- **Where is the utility?**



The Vision: Dichotomy

”Division into two”

- **Distributed**
  - Beside centralised
  - Finland: 90 % areal coverage
- **Division of roles**
  - Centralised:

  Large population centres

  Energy intensive industries
  - Distributed:

  All others + serve centralised

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Some first results

Pietarsaari region

	Pietarsaari Region	Finland	Kaustinen Region
GDP/pers, 1000 €	33,8	33,3	18,9
GDP/pers, index	101,3	100	56,7
GDP, M€	1670	178796	309
Economic structure, %			
Primary production	9,4	4,9	29,8
Industry	35,8	24,1	22,1
Service	54,8	71,0	48,1
Population, 1000 pers	49,5	5363,4	16,4

Kaustinen region

Energy consumption

GWh/a

Region Municipality *Village*	Electricity	Heat	Transport			TOTAL
			Heavy	Light	Agri-culture	
Kaustinen	**169**	**193**	**145**	**124**	**43**	**674**
Kaustinen	52	56	38	34	8,6	189
Halsua	11	16	9,7	11	4,6	52
Lestijarvi	12	11	7,0	5,9	2,8	38
Toholampi	40	43	31	24	9,5	147
Veteli	31	40	33	28	9,5	141
Perho	23	29	26	21	8,1	107
Perho	*14*	*11*	*13*	*10*	*1,3*	*49*
Jakobstad	**1252**	**530**	**281**	**321**	**51**	**2436**
Jakobstad	887	241	84	123	1,2	1336
Pedersore	107	102	74	72	20	374
Kronoby	121	80	50	46	15	312
Larsmo	30	30	14	29	1,0	104
Nykarleby	107	78	59	51	14	308
Jepua	*25*	*23*	*22*	*10*	*1,2*	*81*
Pensala	*3,8*	*3,6*	*2,0*	*2,8*	*1,2*	*13*
Vörå	70	44	49	45	22	230
Komossa	*1,0*	*1,2*	*0,9*	*0,9*	*0,9*	*4,9*
Karijoki	15	20	16	10	8,1	69
Karijoki	*6,5*	*10*	*10*	*7,1*	*1,5*	*35*
Jalasjärvi	81	99	70	53	8,6	311
Ilvesjoki	*4,6*	*6,7*	*4,6*	*4,9*	*1,4*	*22*

RES energy potential

GWh/a

Region Municipality *Village*	Biogas	CHP	Wind	TOTAL
Kaustinen	**195**	**538**	**1573**	**2306**
Kaustinen	38	83		121
Halsua	18	50		67
Lestijarvi	12	82	736	830
Toholampi	51	113	721	885
Veteli	43	101		144
Perho	35	108	115	258
Perho	*9,6*	*11*	*57*	*78*
Jakobstad	**200**	**654**	**2027**	**2881**
Jakobstad	3,8	35	89	128
Pedersore	70	210	332	612
Kronoby	64	171	41	276
Larsmo	3,4	32	3,2	39
Nykarleby	59	205	1562	1826
Jepua	*18*	*35*	*28*	*81*
Pensala	*15*	*3,7*	*270*	*288*
Vörå	63	194	52	309
Komossa	*3,5*	*10*	*1,6*	*15*
Karijoki	35	55	114	204
Karijoki	*1,8*	*15*	*8,5*	*25*
Jalasjärvi	38	127	172	336
Ilvesjoki	*6,4*	*19*	*172*	*197*

Energy balance

Region Municipality *Village*	Consumption GWh/a	RES potential GWh/a	BALANCE GWh/a	%
Kaustinen	**674**	**2306**	**1631**	**342**
Kaustinen	189	121	-68	64
Halsua	52	67	15	129
Lestijarvi	38	830	792	1596
Toholampi	147	885	738	2328
Veteli	141	144	3,6	102
Perho	107	258	151	241
Perho	*49*	*78*	*29*	*159*
Jakobstad	**2436**	**2881**	**445**	**118**
Jakobstad	1336	128	-1209	10
Pedersore	374	612	238	163
Kronoby	312	276	-36	88
Larsmo	104	39	-65	38
Nykarleby	308	1826	1518	593
Jepua	*81*	*81*	*0*	*100*
Pensala	*13*	*288*	*275*	*2215*
Vörå	230	309	79	134
Komossa	*4,9*	*15*	*10*	*306*
Karijoki	69	204	135	296
Karijoki	*35*	*25*	*-10*	*71*
Jalasjärvi	311	336	25	108
Ilvesjoki	*22*	*197*	*175*	*895*

Allocation of RES for 100% regional self-sufficiency

Region Municipality *Village*	Consumption	Biogas	CHP	Wind	Total RES use	Balance with RES
Kaustinen	**674**	**195**	**411**	**68**	**674**	**0**
Kaustinen	189	38	83		121	-68
Halsua	52	18	34		52	0
Lestijarvi	38	11	27		38	0
Toholampi	147	51	96		147	0
Veteli	141	43	98		141	0
Perho	107	35	72	68	175	68
Perho	*49*	*9,6*	*11*	*28*	*49*	*0*
Jakobstad	**2436**	**200**	**654**	**1582**	**2436**	**0**
Jakobstad	1336	3,8	35	89	128	-1209
Pedersore	374	70	210	332	612	238
Kronoby	312	64	171	41	276	-36
Larsmo	104	3,4	32	3,2	39	-66
Nykarleby	308	59	205	1116	1380	1072
Jepua	*81*	*18*	*35*	*28*	*81*	*0*
Pensala	*13*	*14*	*0*		*14*	*1,1*
Vörå	230	63	167		230	0
Komossa	*4,9*	*3,5*	*1,4*		*4,9*	*0*
Karijoki	69	35	34		69	0
Karijoki	*35*	*1,8*	*15*	*8,5*	*25*	*-10*
Jalasjärvi	311	38	126	147	311	0
Ilvesjoki	*22*	*6,4*	*15*	*0*	*22*	*0*

Money flow by branch M€

Region Municipality *Village*	Agric. Forestry	Other industry	Trans-port	Financing	Other	Labour	Capital	TOTAL M€
Kaustinen	**19,0**	**11,0**	**4,0**	**5,5**	**3,6**	**9,0**	**22,2**	**74,4**
Kaustinen	3,8	1,9	0,81	1,0	0,70	1,7	3,5	13,4
Halsua	1,6	0,83	0,34	0,43	0,32	0,76	1,5	5,7
Lestijarvi	1,2	0,60	0,26	0,33	0,22	0,54	1,1	4,2
Toholampi	4,4	2,4	1,0	1,2	0,92	2,2	4,2	16,2
Veteli	4,4	2,2	0,95	1,2	0,80	2,0	4,0	15,5
Perho	3,7	3,1	0,71	1,3	0,69	1,9	8,0	19,3
Perho	*0,73*	*1,0*	*0,13*	*0,32*	*0,19*	*0,50*	*2,8*	*5,7*
Jakobstad	**31,7**	**39,0**	**5,1**	**14,5**	**4,4**	**15,7**	**119,4**	**229,8**
Jakobstad	1,7	2,0	0,25	0,78	0,15	0,71	6,5	12,0
Pedersore	9,4	9,5	1,7	3,8	1,4	4,5	27,5	57,7
Kronoby	6,7	3,8	1,4	2,0	1,1	2,9	8,3	26,1
Larsmo	1,2	0,47	0,23	0,34	0,09	0,34	1,1	3,7
Nykarleby	12,9	23,2	1,6	7,6	1,7	7,3	76,0	130,2
Jepua	*1,7*	*1,4*	*0,33*	*0,58*	*0,34*	*0,88*	*3,5*	*8,6*
Pensala	*0,13*	*0,30*	*0,05*	*0,03*	*0,20*	*0,34*	*0,40*	*1,5*
Vörå	7,5	3,6	1,6	2,1	1,2	3,2	6,7	25,9
Komossa	*0,09*	*0,10*	*0,03*	*0,02*	*0,06*	*0,10*	*0,15*	*0,5*
Karijoki	1,7	1,2	0,41	0,47	0,58	1,2	2,0	7,6
Karijoki	*1,0*	*0,60*	*0,18*	*0,33*	*0,08*	*0,33*	*1,6*	*4,1*
Jalasjärvi	6,2	5,4	1,1	2,3	0,86	2,7	15,1	33,7
Ilvesjoki	*0,71*	*0,35*	*0,15*	*0,20*	*0,12*	*0,31*	*0,64*	*2,5*

The impact of Jepua Village on Jakobstad Region

	CHP	Wind Power	Biogas	TOTAL
Production, M€ (direct effect)	4,9	1,1	1,5	7,5
Partly self-sufficing				
Regional GDP (total effect)				
Change, % points	0,3	0,1	0,1	0,5
Change, M€	3,8	1,4	1,9	7,1
Multiplier effect	-0,2	0,2	0,3	-0,1
Regional employment effect				
Change, % points	0,1	0,02	0,03	0,1
Change, person years	21,3	2,5	3,9	27,7
Totally self-sufficing				
Regional GDP (total effect)				
Change, % points	0,5	0,2	0,2	0,9
Change, M€	8,6	2,5	3,3	14,3
Multiplier effect	0,8	1,2	1,1	0,9
Regional employment effect				
Change, % points	0,2	0,02	0,04	0,3
Change, person years	40,9	3,5	9,2	53,6

	CHP	Wind Power	Biogas	TOTAL
Production, M€ (direct effect)	4,9	1,1	1,5	7,5
125%				
Regional GDP (total effect)				
Change, % points	0,6	0,1	0,1	0,8
Change, M€	10,2	0,7	1,8	12,7
Multiplier effect	1,1	-0,4	0,2	0,9
Regional employment effect				
Change, % points	0,2	0,02	0,05	0,3
Change, person years	53,7	5,1	12,2	71,0
150%				
Regional GDP (total effect)				
Change, % points	0,7	0,1	0,2	1,0
Change, M€	12,7	0,9	2,3	15,9
Multiplier effect	1,6	-0,2	0,5	1,9
Regional employment effect				
Change, % points	0,3	0,03	0,1	0,4
Change, person years	66,5	6,8	15,3	88,6

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CHANGE?

… GRADUAL SOCIETAL … SCIENTIFIC PARADIGMS … DISRUPTION

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Disruption …

Easter morning 1900: 5th Ave, New York City. Spot the automobile.

Source: US National Archives.

Easter morning 1913: 5th Ave, New York City. Spot the horse.

Source: George Grantham Bain Collection.

”Every [social] reform
was once
a private opinion”

RALPH WALDO EMERSON, 1841

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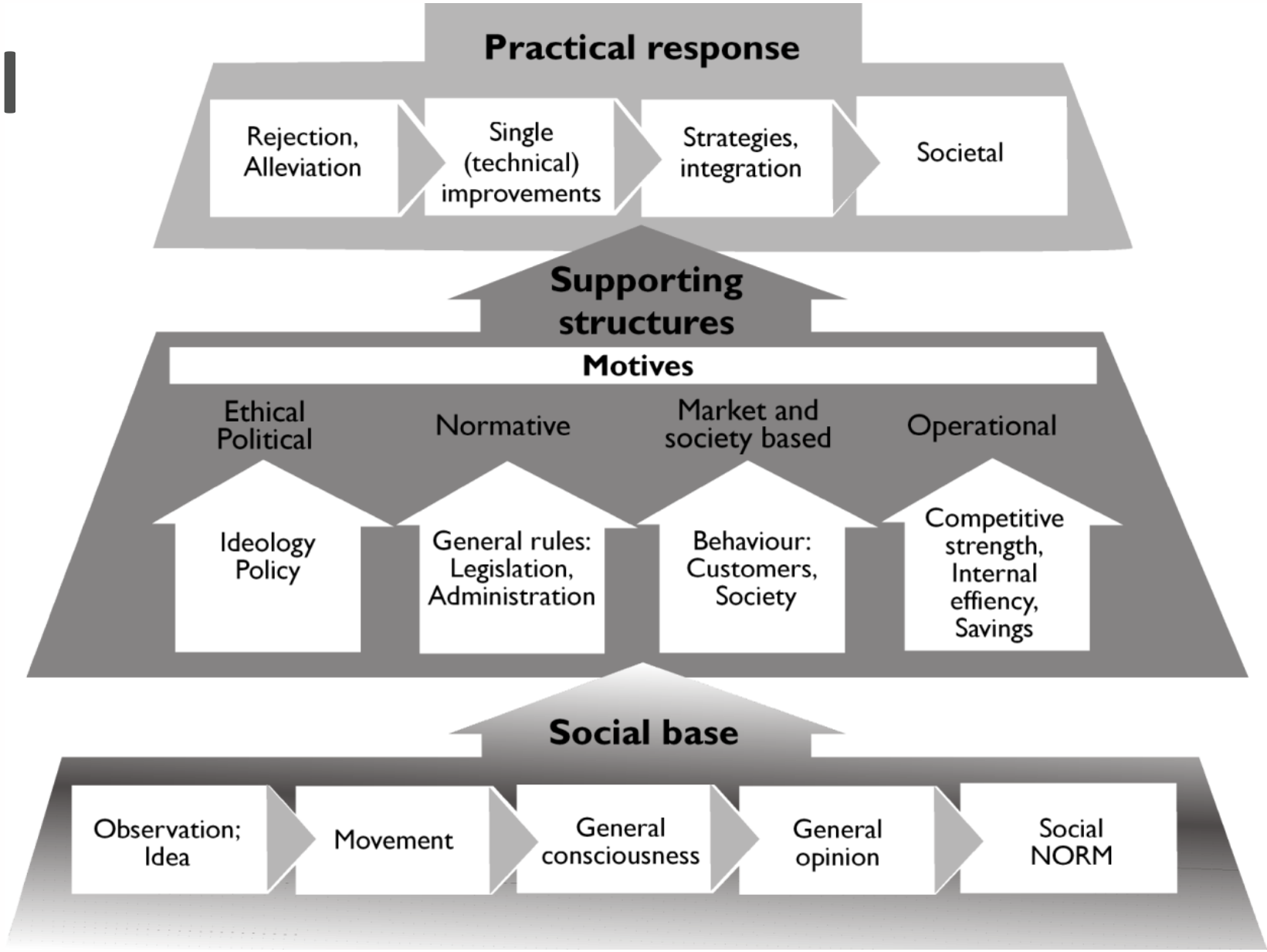
The 3L Model

Understanding societal change



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THANK YOU!

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