FRESCO – the Future of RES COmmunities

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October 22nd 2019

Paris – Fondation Tuck

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I) Introduction

- The FRESCO project tries to say something about the close future (ten years is our indicative horizon) of RES(-E) communities in Europe – a partially new multi-faceted socio-technical phenomenon that has been gaining increasing relevance.
- For RES communities in Europe, the recent EU Clean Energy Package (CEP) (2018) represents a landmark, giving those EU-wide legal recognition of their existence and roles. FRESCO happened to take place at this critical time.
- Our contribution: literature review, case studies, elaboration of our own taxonomy and scenarios for RES communities.

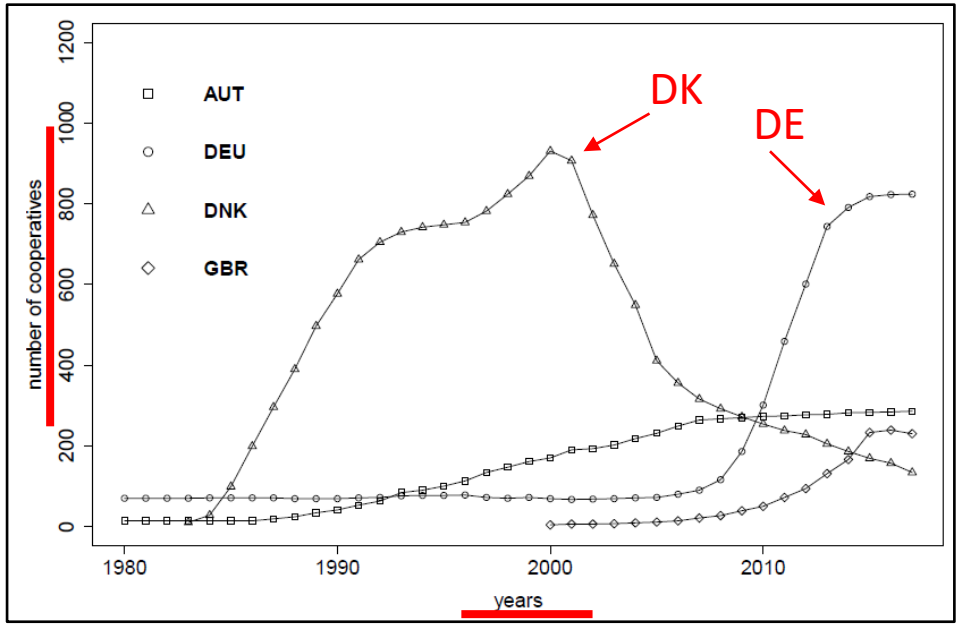
I) Statistics on RES communities

- There is a shortage of good statistics, i.e. comprehensive and directly comparable, on RES communities. So far, the absence of formal common definitions explains the problem.
- Information received from *REScoop.eu*, the European federation of RES coops:

-There are about 3,500 European REScoops, mainly based in Western Europe.
-Only half of the European REScoops are currently represented in REScoop.eu.
-REScoop.eu represents >1M EU citizens in the energy transition.
-Our members jointly invested €2 billion in RES production installations.
-Our members have a joint production capacity of about 1,000 MW.
-Our members jointly produce 1,500 million kWh per year.
-Our members jointly raised €534 million in the past three years.
-Our members account for 1,100 employees.
-Our members have an annual turnover of €750 million.

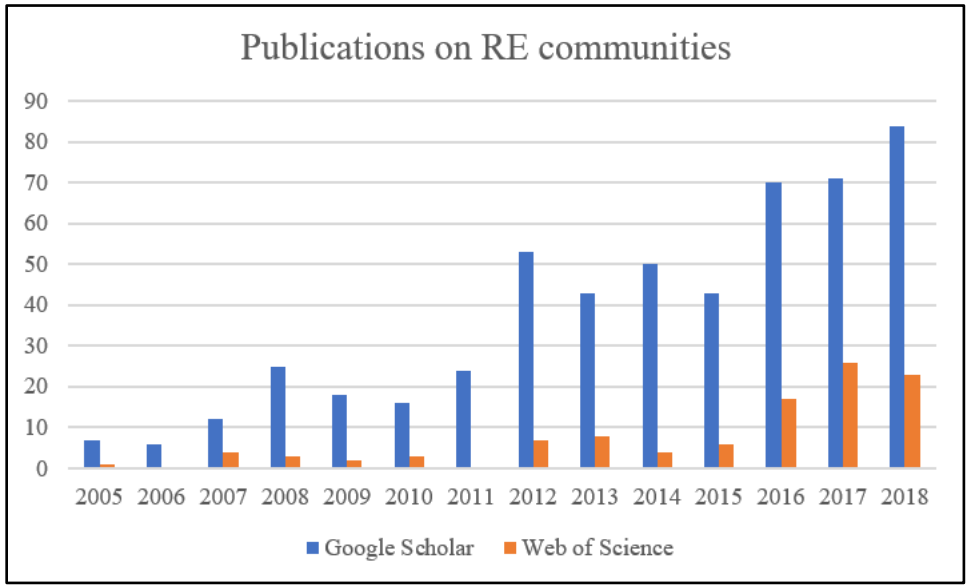
Lack of good statistics makes RES communities a phenomenon difficult to map.

In general, significant but still not very large numbers in the energy system.



Source: Wierling *et al.*(2018)

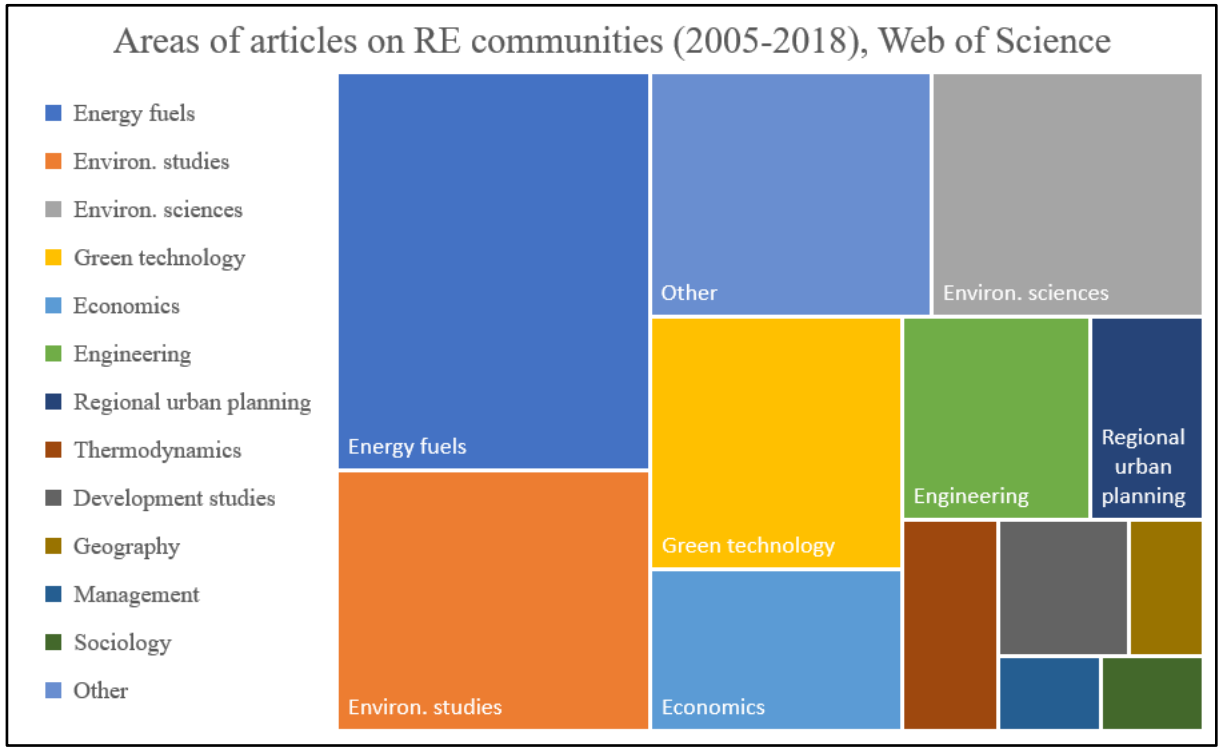
II) Literature distribution



Source: Our elaboration

→ A burgeoning literature; ≈100 peer-reviewed articles in the past ten years or so

Many different perspectives on the topic ←



Source: Our elaboration

Also:

- Geographically concentrated
- Concentrated across academic journals
- Socio-economic literature methodologically quite homogenous

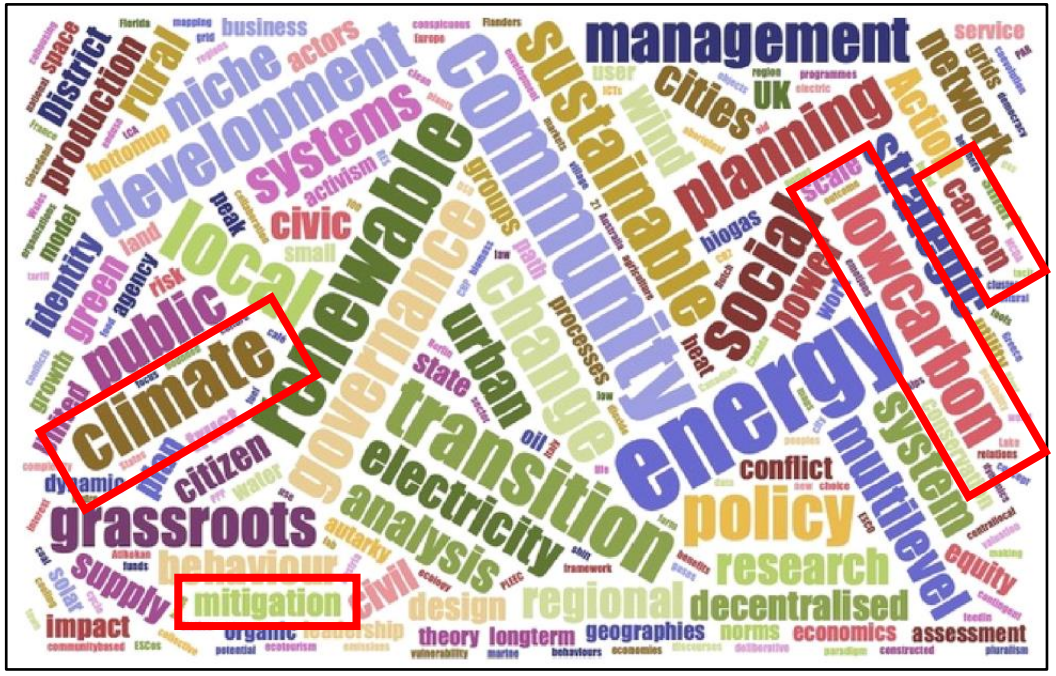
II) Literature keywords

Many keywords, many specific to the perspective on the topic

Typical keywords used in theoretical approaches

Approach	Typical keywords
1. Transition studies	Energy transition, grassroots innovation, niches, regime, path dependence, energy innovation systems, socio-technical transitions, multilevel perspective, strategic niche management, innovation
2. Science and Technology	Socio-technical configurations, socio-technical change, constructive technology assessment, user-led innovations
3. Economic	Economics, markets, neoliberalism, economic development, impact, utilities, companies, ownership
4. Acceptance	Social acceptance, engagement, environmental awareness, public opinion, resistance, justice
5. Sociology	Social capital, participation, processual analysis, social resilience, behaviour change, environmental awareness, agency and capacity, organization
6. Governance	Governance, institutional arrangements, environmental citizenship, local authorities, local government, collaborative planning, interactive governance
7. Planning	Energy planning, energy strategy, public participation, energy management, energy policy, community energy planning, municipal energy plans
8. Spatial	Spatial planning, landscape architecture, urban planning, eco-urbanism, resilience, regional development, sustainable urban development, geography
9. Norms	Justice, equity, public values, public sphere, procedural and distributive justice, trust, risk, social impacts

Source: van der Schoor and Scholtens (2019)

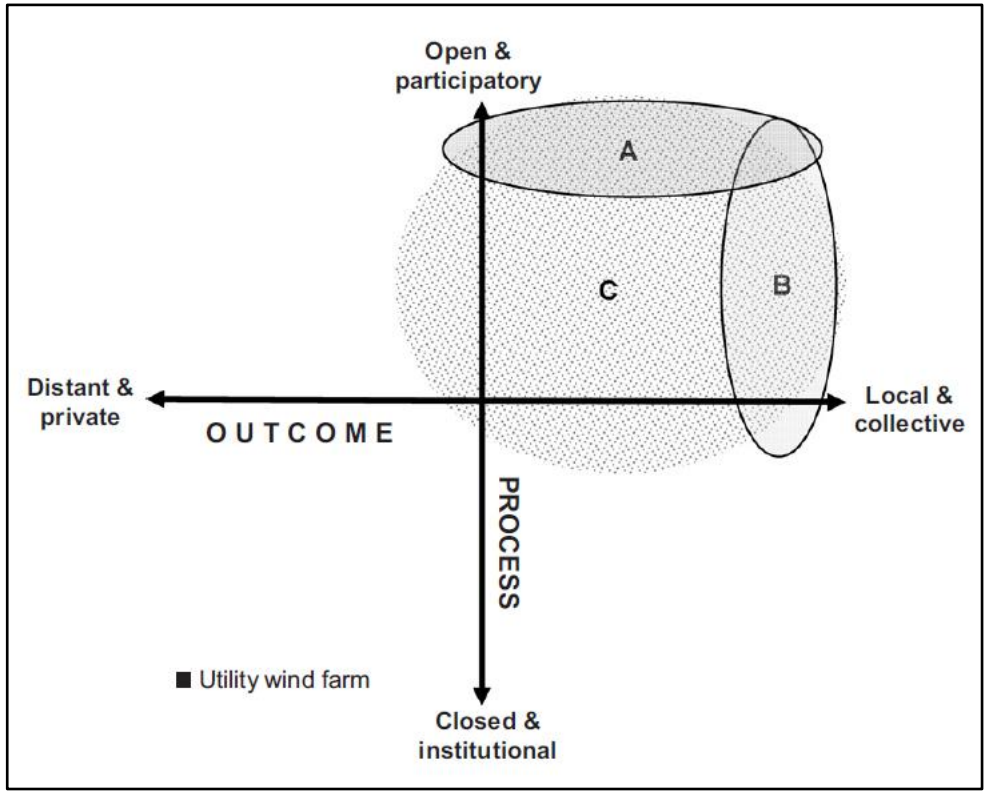


Source: van der Schoor and Scholtens (2019)

Climate issue much more present than local environmental issues

II) What defines RES communities?

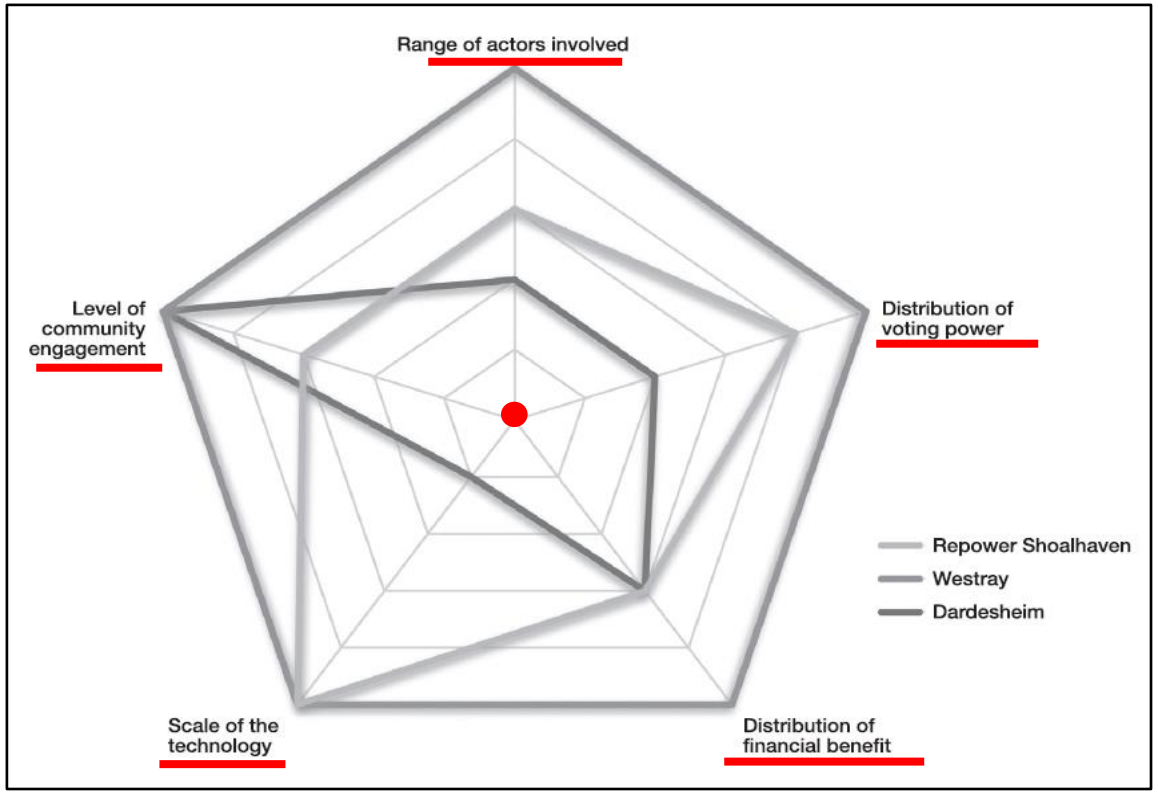
- Community of place vs Community of interest
- Multi-dimensional frameworks to identify RES communities



Source: Walker and Devine-Wright (2008)

A grey area remains

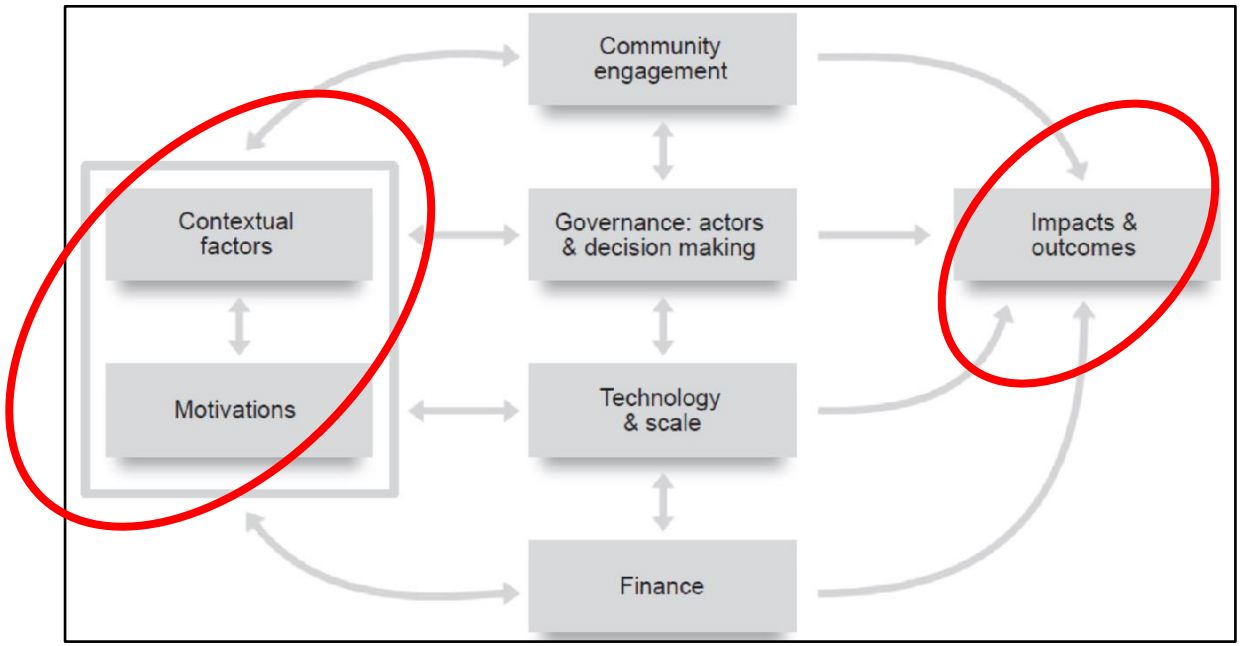
The CEP has introduced legal definitions



Source: Hicks and Ison (2018)

II) How do RES communities develop?

- Individuals' motivations and contextual factors (physical, technological, institutional and community-related) shape the form and the outcomes of a RES community.



Source: Hicks and Ison (2018)

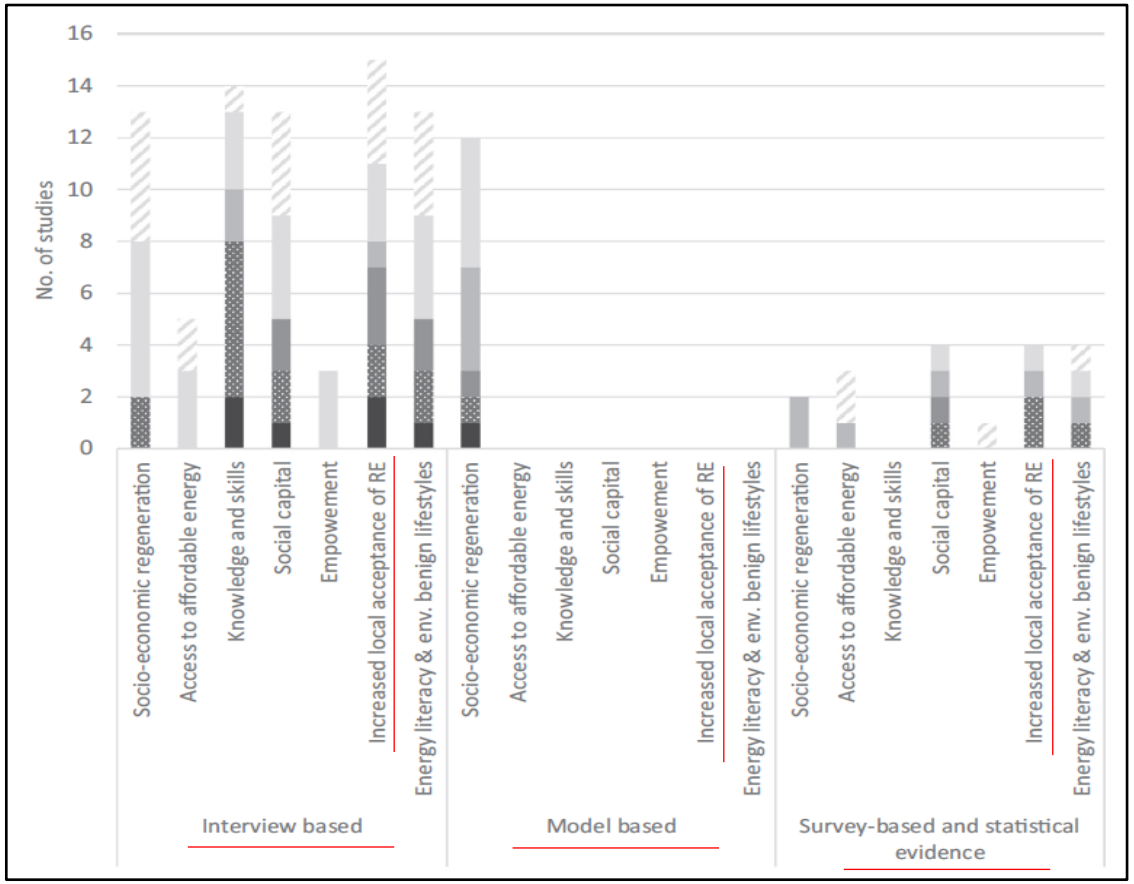
- Vulnerabilities: initial inexperience, initial dependence on policy support, limited access to finance, ...
- Scaling strategies: breadth scaling (business growth or replication) Vs depth scaling (enhanced services) (Bauwens *et al.,* 2019)

II) Motivations of RES community members

- The literature stresses environmental, social and - to a lesser extent - economic motivations of individuals for establishing or joining a RES community. Present are also political and technology-related motivations.
- Environmental climate-related motivations dominate, especially in more recent RES communities.
- Social motivations typically relate to relational goods and group identity. They are usually stronger in communities of place given the higher frequency of social interactions between the members.
- Economic motivations are sometimes present, mostly for profit-oriented communities.
- Prevailing motivations can change with the evolution of a RES community. If a community significantly expands in the number of members, thus becoming a more substantial market player, the relevance of economic motives is more likely to increase.

II) Local impacts of RES communities

- Seven types of local impacts (Berka and Creamer, 2018):
  - Knowledge and skills development
  - Social capital
  - Affordable energy access
  - Increased support for renewable energy
  - Energy literacy and environmental benign lifestyles
  - Socio-economic regeneration
  - Empowerment
- Key question, but literature is underdeveloped.
- In general, evidence is fragmented and based on anecdotal observations.
- Exception: unequivocal evidence of RES communities (inclusive project management) increasing local acceptance of RES projects.



Source: Berka and Creamer (2018)

III) Case studies

- Three case studies:

1) *ènostra*: Main Italian RES coop (producer and supplier), representative of the RES coop model that has proved particularly successful across Europe (*Ecopower*, *SomEnergia*, *Enercoop*, …).

2) Collective self-consumption in France: Rich public debate over this new potentially disruptive community-based model (note: beginning of 2019, ≈15 collective self-consumption projects in France, end of 2019 expected around 100).

3) *WiseGRID*: EU-funded Horizon 2020 project, 2016-2020, €17M budget, 21 partners (8 countries) including various coops, technology providers, DSOs, research institutes, legal advisors. The Ghent (Belgium) pilot site illustrates the potential of RES communities in the future energy system.

- Method: Desk research and semi-structured interviews with experts.

III) *ènostra* (1)

- Established in 2014, *ènostra* is a coop aiming to increase global RES(-E) production and consumption as well as energy efficiency. It is the first and largest not-for-profit (NFP) and democratic RES supplier in Italy.
- In 2016, ènostra started supplying electricity to households and SMEs, with special tariffs for NFP organisations. For households, sale prices are aligned to regulated retail prices.
- Main activities: 1) Supply; 2) Production (≈20% of members' consumption); 3) Energy efficiency services; 4) Energy training of members and technicians; 5) Energy education for community awareness; 6) Participation in research and innovation projects.

	2015	2016	2017	2018
Members	324	819	1662	4372
Supply contracts	-	890	1963	3271
Energy sold (MWh)	-	1271	4270	8642

2019
> 5000

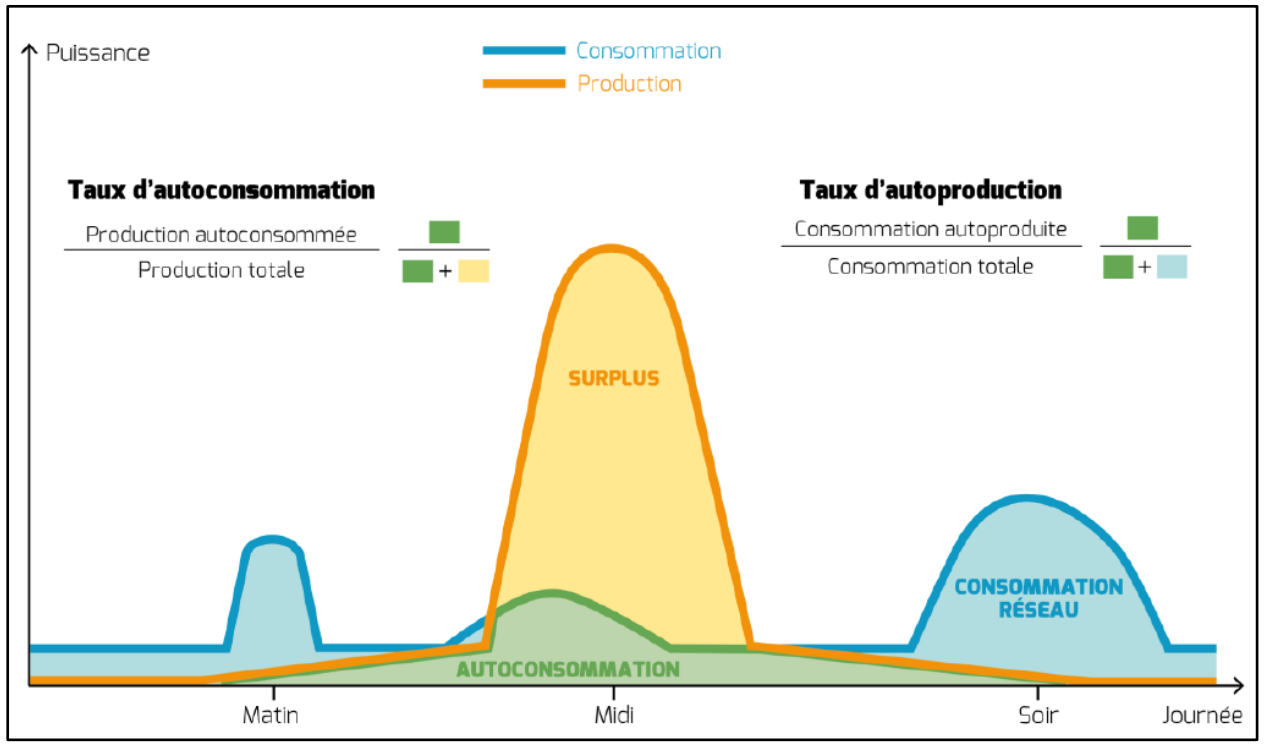
- Capital provided by members: >€3M. Electricity is still supplied at a loss. The break even is estimated to be around 6500 contracts. Significant expansion, both in supply and production, is being pursued – and likely to be achieved.

III) *ènostra* (2)

- Environmental motivation clearly prevalent among the coop founders and other members. Members also interested by social innovation (democratic governance) and RES/EE technology.
- No information on members' income, but perceived prevalence of middle class. Also, important their role in the coop's development.
- In 2014, the end of much of RES-E support triggered the breakthrough from "only production" to supply: a negative contextual factor turned out beneficial. In the near future, again opportunities and risks, largely related to the CEP's transposition.
- Challenges: initial lack of professional expertise and capital, regulatory uncertainty, bureaucratic requirements. In future, keeping the right balance between democratic decision-making and efficient action by the board.
- Strategy for the future: focus is on facilitating the birth of local RES communities (e.g., collective self-consumption operations, experimented in the Piemonte region) and collaborate with them as supplier.

III) Collective self-consumption in France (1)

- Self-consumption (SC) is the act of consuming on the spot all or part of the energy produced. It can occur at different levels: a) at a single site of production and consumption or b) at larger scales, such as multi-apartment building, a set of buildings or a neighborhood. The second case is referred to as collective self-consumption (CSC).



Source: CRE (2017)

For a consumer, key parameters of SC profitability:
1) Cost of producing electricity (≈investment cost)
2) Remuneration of excess electricity
3) Tax-inclusive price of purchased electricity
4) Rate of self-consumption
With CSC, 4) can be increased

For the electricity system, potential benefits of CSC are 1) reducing network efficiency losses and 2) reducing peak demand and hence investment network costs.

For society more generally, CSC can favour the energy transition.

III) Collective self-consumption in France (2)

- Consensus on the good potential of CSC. But, also on the fact that under current French regulation it is not economically convenient for the participants.
- Consensus on the principles of having cost-reflective and fair network tariffs.
- CRE (interviewee) prefers forms of direct support, e.g. tenders or FITs, to indirect support, notably special tax treatment, the first being more controllable and economically efficient.
- Enercoop (interviewee) supports exemptions from local excise taxes. Plus, considers exemption of CSPE (as for individual SC) and a revision of the CSC-specific TURPE (lower rate on withdrawn energy).
- So far, the specific TURPE rate for CSC has not been chosen by anyone (lower component for flows produced locally and higher component for flows that systematically come from higher voltage levels). People seem to struggle understanding the difference between the two tariff components.
- So far, majority of CSC projects launched by local authorities: better equipped to take on administrative obligations. But, increasingly private-led projects (real estate and social housing operators) are tailoring big CSC projects, attracted by the new larger CSC perimeter.

III) *WiseGRID* (1)

- *WiseGRID* provides technologies and solutions increasing the smartness, stability and security of an open, consumer-centric energy grid and provide cleaner and more affordable energy for citizens, through enhanced use of storage technologies and electro-mobility and a highly increased share of RES.
- Technologies and solutions are tested under real-life conditions in four large-scale demonstration sites across Europe, including Ghent.
- The demonstration site is in the Sint-Amandsberg district. The area counts 1456 households. Ecopower leads the project together with EnerGent (energy coop that financed the installation of PV panels under a previous project) and partners Energie-ID and Partago.
- Sint-Amandsberg gets a smart electricity network with PV panels, batteries, smart meters and electric cars - an “energy district of the future”.

III) *WiseGRID* (2)

- *WiseGRID* tests nine apps that, on the one hand, will offer participants an overview of their consumption both individually and collectively and, on the other, will monitor the production of renewable energy in the neighborhood. With this information local residents and SMEs can maintain a good net balance, for example, by consuming when local energy generation is high. The electricity not consumed immediately is used to recharge electric cars or stored in batteries.
- Six apps are tested at the Ghent pilot site: WiseCoop, WiseCorp, WiseHome, WiseEVP, WGSTAAS/VPP, WG RESCO.
- E.g., *WISECOOP* is built for energy retailers, aggregators, local communities and cooperatives of consumers and prosumers to help domestic and small businesses, consumers and prosumers achieve better energy deals while relieving them from administrative procedures and research. By means of the aggregation and cooperation between citizens, better services and prices will be offered to the final consumers/prosumers. This includes aggregation models such as Virtual Power Plants where the energy aggregator gathers a portfolio of smaller generators and operates them as a unified and flexible resource on the energy market or sells their power as system reserve.

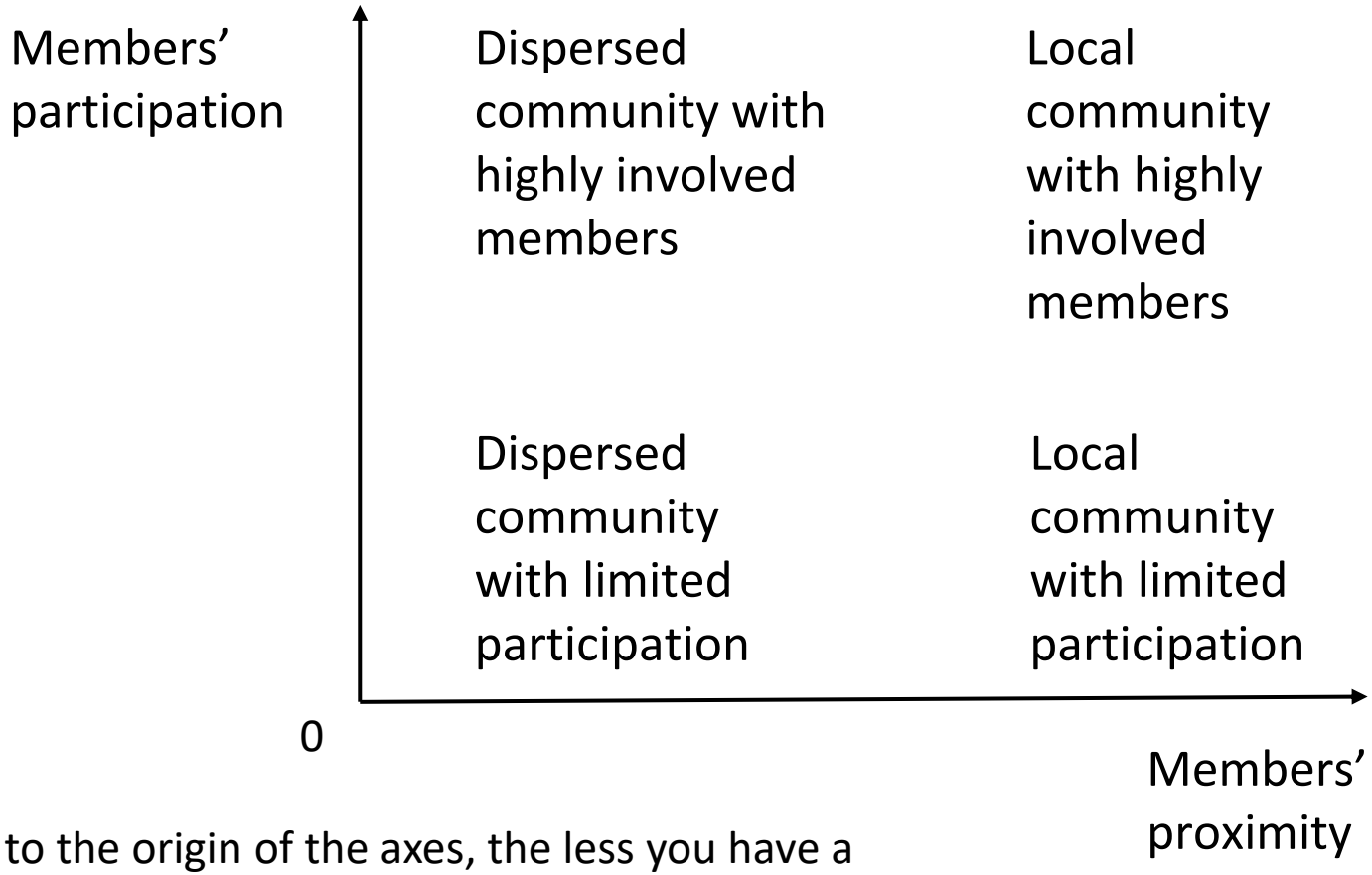
III) *WiseGRID* (3)

- Too early to tell about behavioural effect. Need to wait for the project to end (next April).
- Issues encountered/expected?
  - Sometimes data connection problems;
  - Individuals' motivation is important. As they won't check the app (*WiseHome*) 100 times per day, when should automatic notifications be sent? Engaging more with people before the start of the project might turn out to be a lesson at the end.
- Desirable market design changes for consumer empowerment?
  - Technical: A company participating in the flexibility market is remunerated by the TSO. By contrast, flexibility offered by households would not be remunerated by the DSO. If this was possible, perhaps some households would coordinate and take the opportunity.
  - Philosophical/political: A good market design – an interviewee argued – would not result in private concentration of political power as much as we observe it today.

IV) Analytical framework (1)

- Need to clarify the terminology
- A community is:
  - A collective entity
  - Whose members share a specific space or interest/ideology
  - And that perform jointly certain activities based on participatory governance
- Different types of communities are detectable based on:
  - Members' (geographical) proximity
  - Level of participation in the decision-making and implementation processes
- An energy community performs one or more energy-related activities (e.g., production)

IV) Analytical framework (2)



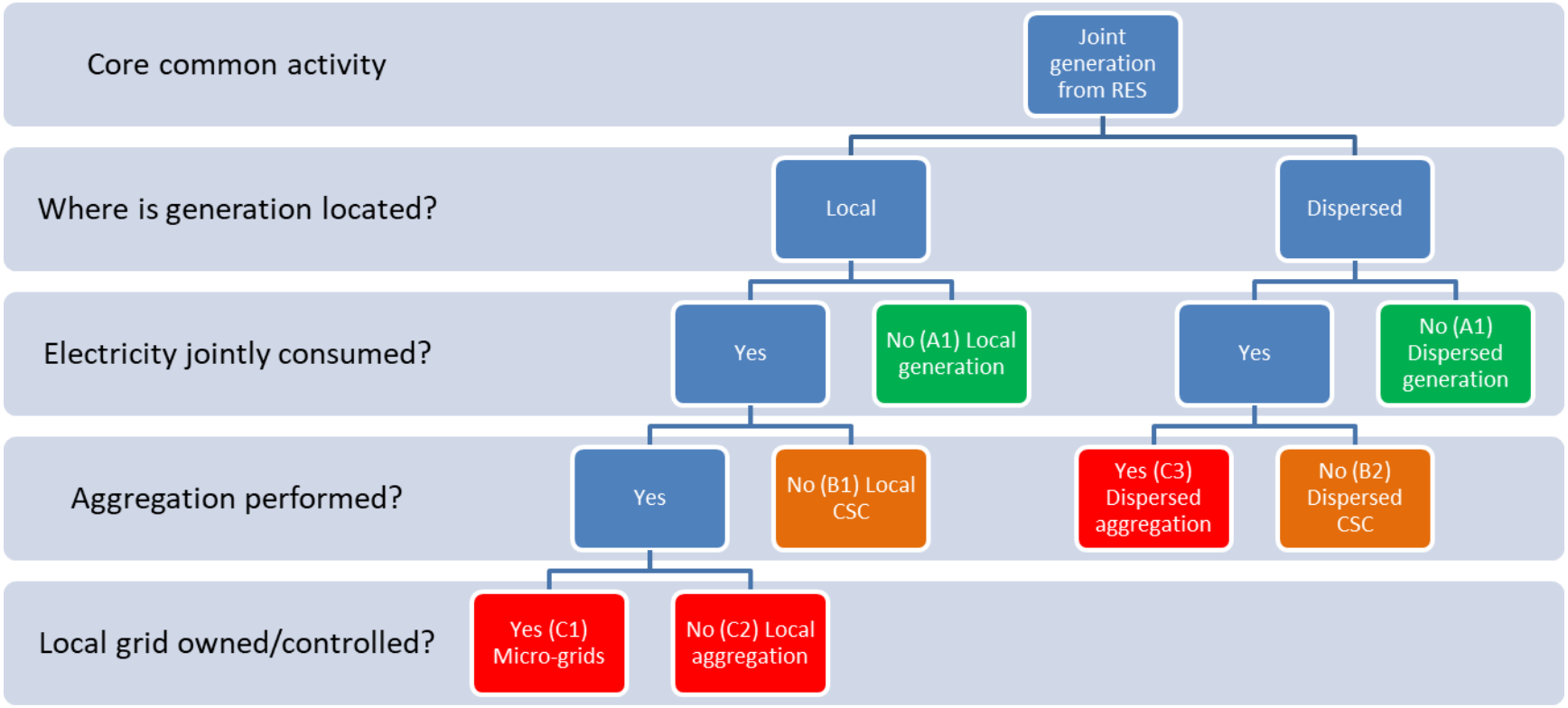
NB: the closer to the origin of the axes, the less you have a community in the traditional sense

IV) RESCOs' taxonomy (1)

- RESCOs can:
  - take several forms
  - perform several different activities

  => Play different roles in the system
- Need for a taxonomy reflecting the energy system point of view and its regulation
- Core common activity:
  - Energy production from RES
- Reminder: our focus is on electricity

IV) RESCOs' taxonomy (2)



NB: RESCOs can perform additional activities for and through their members, like energy efficiency services or initiatives against energy poverty

IV) Comparison with legal definitions in the CEP (1)

- Clean Energy Package introduces specific legal definitions that can be RESCOs according to our taxonomy
- Jointly acting renewable self-consumers (artt. 2.15, 21.2 RED II)
  - Local Collective Self-Consumption (B1) if located in the same building or multi-apartment block
- Renewable Energy Community (artt. 2.16, 22.2 RED II)
  - Local Generation (A1)
  - Local Collective Self-Consumption (B1)
  - Local aggregation (C2) [the legal text is implicit here]
  - Member states to define proximity requirement for REC -> Could a REC be a RESCO of types A2, B2 and C3?
  - No explicit reference to distribution with regard to REC

IV) Comparison with legal definitions in the CEP (2)

- Citizens Energy Community (artt. 2.11, 16.2, 16.3 recast EMD)
  - Local Generation (A1)
  - Disperse Generation (A2)
  - Local Collective Self-Consumption (B1)
  - Disperse Collective Self-Consumption (B2)
  - Micro-grid (C1)
  - Local Aggregation (C2)
  - Disperse Aggregation (C3)

=> CEC is a broad definitions that can overlaps all the different types of (electric) RESCOs, while REC is not

IV) Critical factors to RESCOs' development

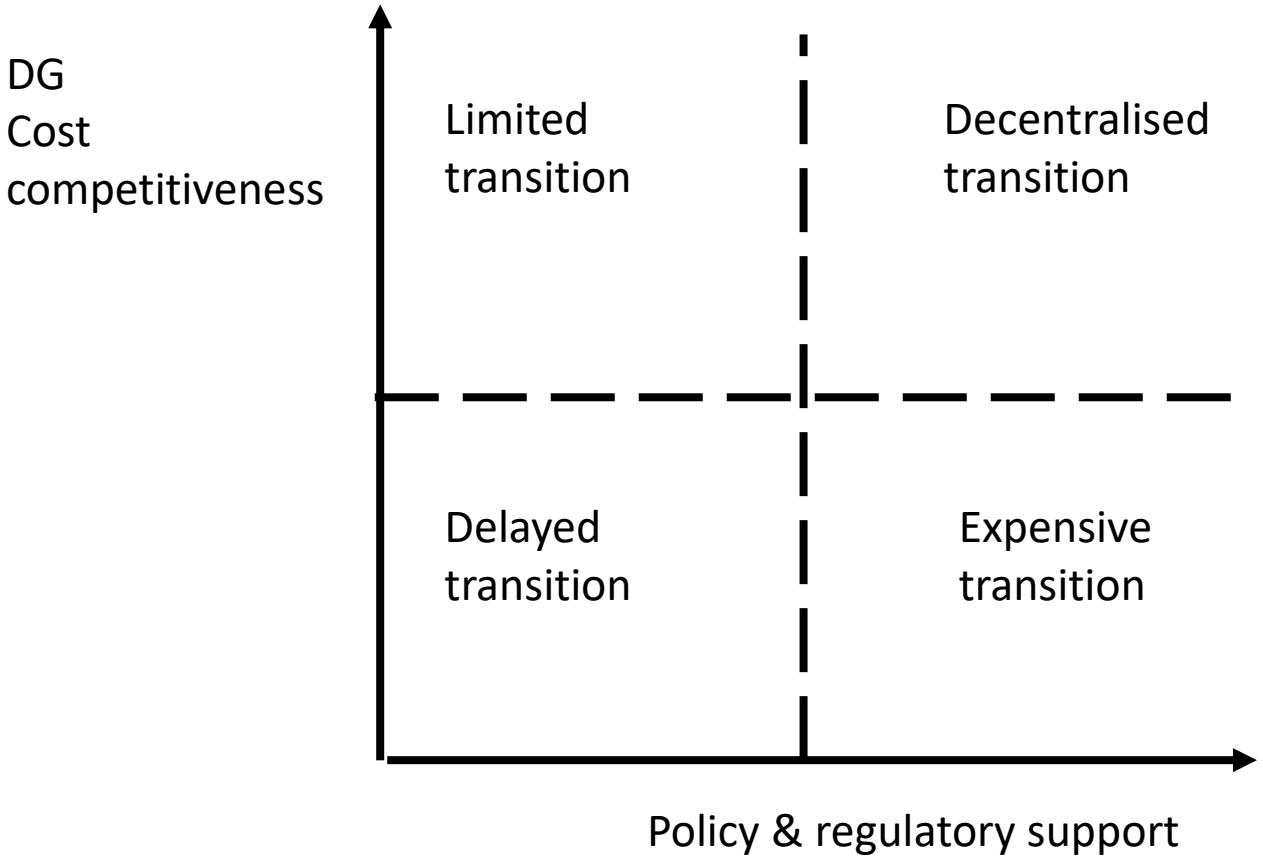
- Very few studies on the future of RESCOs (e.g., CE Delft 2016)
- Quantitative assessment beyond our reach due to:
  - Multiplicity and complexity of the variables involved
  - Limited amount of statistical data on the current situation
- Existing literature and case studies suggest a few critical factors to RESCOs development
  - Relevant variables, likely to change in the near future
- Critical factors not the same for all types of RESCOs
- Focus on local and disperse CSC (B1 and B2)
  - Local and disperse generation (A1 and A2) are the past and present of RESCOs but less the future
  - Micro-grids and community aggregators (C1, C2 and C3) still a niche

Local Collective Self-Consumption (B1)		
Critical factor	**Impact**	**Expected change**
Supply side factors		
Electricity retail prices	Positive	+
Cost of small scale RES-E generation technologies (e.g., PV panels)	Negative	-
Cost of small scale electricity storage (e.g., batteries)	Negative	-
Demand side factors		
Individuals' preference for direct, collective and highly localised climate action	Positive	+
Action of local authorities in climate mitigation	Positive	+
Policy and regulatory factors		
Allowed perimeter for local CSC operation	Positive	+ (?)
Network tariffs, taxes and levies	Negative	+ (?)
Net metering	Positive	-
Remuneration of excess generation	Positive	- (?)
Administrative requirements	Negative	+

Dispersed Collective Self-Consumption (B2)		
Critical factor	**Impact**	**Expected change**
Supply side factors		
Electricity retail prices	Positive	+
Cost of small and medium scale RES-E generation technologies (e.g., PV panels)	Negative	-
Cost of small and medium scale electricity storage (e.g., batteries)	Negative	-
Demand side factors		
Individuals' preference for direct and collective climate action	Positive	+
Action of local authorities in climate mitigation	Positive	+
Policy and regulatory factors		
Support schemes for green generation	Positive	- (?)
End of regulated electricity retail prices	Positive	+ (?)
Generation-related obligations	Negative	+
Supply-related obligations	Negative	+

IV) Four scenarios for 2030 (1)

- Assumption: strong and growing demand for RESCOs
- Key relevant but uncertain dimensions:
  - Supply side factors
  - Policy and regulatory support
- Four different scenarios possible



IV) Four scenarios for 2030 (2)

- Decentralised transition:
  - Flourishing of individual and collective initiatives in green energy
  - Acceptability of RES projects increases, leading to an accelerated RES deployment
- Delayed transition:
  - Only a few RESCOs are established thanks to a bunch of willing
  - Electricity system still largely centralised
  - Due to the NYMBY syndrome the decarbonisation of the generation mix is delayed (unless strong development of offshore wind)
- Limited transition:
  - The lack of support prevent the blossoming of RESCOs and slow down the decarbonisation and decentralisation of the system
- Expensive transition:
  - The new RESCOs need support to be viable
  - The extra-costs for the system may lead to a backlash and the failure to achieve the decarbonisation targets

V) Conclusions

- The CEP fully recognises RES communities as a new actor of the energy system, and one that merits support.
- The current phase in which MSs need to transpose the CEP into national legislation is crucial. Overly cautious regulation would preclude possible benefits of RES communities' development for the energy system and the wider society.
- Based on existing evidence, the most likely benefit of RES communities' development for society is increased local acceptance of new RES projects – relevant for the energy transition. For the energy system, it is the reduction of the network's expansion.
- Given observed favourable demand-side factors and prospective business strategies, we can expect – conditional on policy/regulation – RES communities to significantly grow in the next decade (serving households, SMEs, public sector).
- Limits to the future expansion of RES communities may come from the competition of large RES companies able to achieve scale efficiencies and offering customers similar services.