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School of Business

Role of users and communities in energy transitions

Energy Business and Innovation (21E16100)

Jouni K Juntunen



Outline

1. **Users shaping energy transitions**
2. **“Energy Prosumers”**
3. **Energy Communities**

1. Users sharpening energy transitions (according Schot et al)

A Typology of users (Schot et al. 2016)

- 1. User-producers**
- 2. User-legitimizers**
- 3. User-intermediaries**
- 4. User-citizens**
- 5. User-consumers**



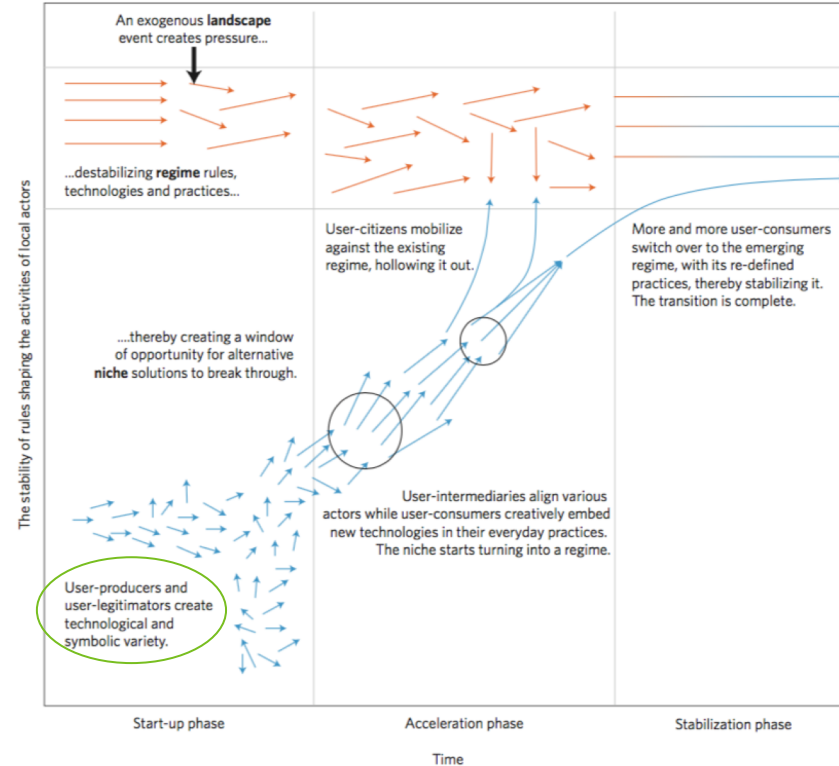
1 User-Producers

User-producers (or users-turned-entrepreneurs) invent, experiment and tinker with radical technologies

- **Create new technical and organizational solution**
- **Articulating new user preferences**
- **Enable new routines to emerge.**

Are the pioneers and develop local energy systems using small-scale renewable technologies.

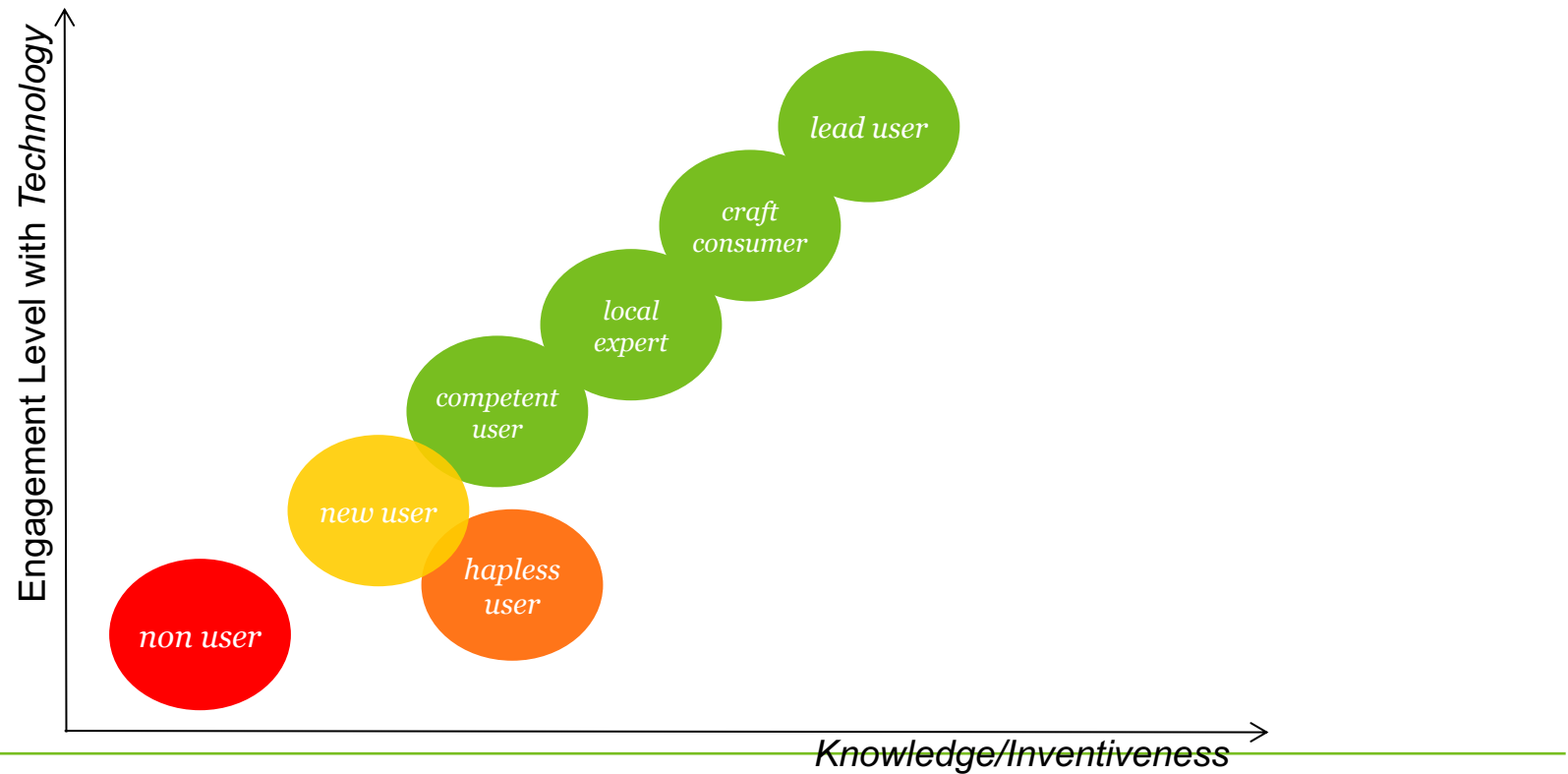
- **User-producers play a pivotal role in the emergence of niches, and often act on their own.**
- **Also might obtain support from other actors such as governments, who provide subsidies, tax credits or other benefits.**



Design issues

- **Manufacturers are often well aware of the limitations of products meeting the requirements of all customers.**
 - Too costly to design, produce, and advertise products that fulfil all market segments and use cases
 - Segmentation and focus to few
- **Solutions:**
 - Design for modularity in general
 - Extendibility and hybridization of the system -> multipurposing
 - Open platform for add-ons
 - Removal of lock ins (to one or few energy sources)
 - “open pre-configuration”
- **Trust that active users also support each other**

Engagement and inventiveness



Local expert

- User actively seeks advice and educates him/herself
- The user does not actively seek to gain ultimate technical potential of local energy technology.
- Due to a little perseverance, good advice, learning-by-using and some good luck, user is satisfied with the performance of the system.
- User is also fairly well off and do not have to settle with the cheapest solution and can afford to get professional help if problems arise.

Craft consumer

- Hacking of software and computers in general are the most well known examples of active consumers who make significant modifications, additions, or create new product design.
- 'Subversive customization' and 'craft consumer' (Campbell)
 - Explain active engagement with technology and products.
 - In subversive customization, standardized products are adapted or employed in ways other than those intended by the manufacturers.
- A craft consumer typically takes off-the-self products and uses these as raw materials for creating a new product for own use.
- Campbell asserts that in the postmodern model a consumer has an overwhelming concern with image, lifestyle or identity, but according this 'active view' a contemporary consumer is not simply the helpless puppet of external forces.
- We can rather assume that individuals consume principally out of a desire to engage in creative acts of self-expression.

1. User-Producers

Users as innovators



1. User-Producers

Users as innovators

- **Innovation literature was for a long time very supply-side centered**
- **Users are not passive recipients of technologies**
- **Eric von Hippel 1976 – User Innovation**
 - Emphasized how users develop new uses and techniques or completely new products and solutions
- **Lead user**
 - Create novel or enhanced product, process, or service
 - Display two key characteristics with respect to it:
 1. *they are ahead of a trend and face needs before the bulk of that marketplace.*
 2. *they expect to get high benefit by obtaining a solution to those needs*



1. User-Producers

User innovation



1. User-Producers



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Searching lead users?

Lead user search methods

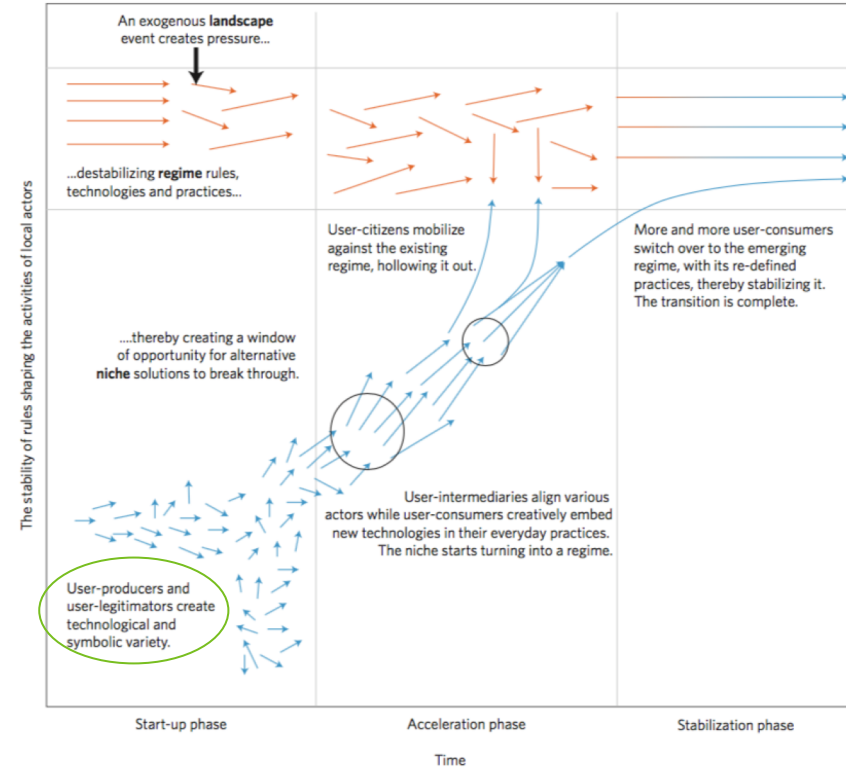
1. **Screening**
2. **Snowballing**
3. **Pyramid sampling**
4. **Investigation of analogous fields**
5. **Domain Experts**
6. **User communities**
7. **Broadcasting**
8. **Seeking out innovative solutions**
9. **Doing netnography**
10. **A virtual stock market**

2 User-legitimimators

From the 1970s the limits-to-growth narrative provided meaning to the development of renewables and helped to shape expectations about their future.

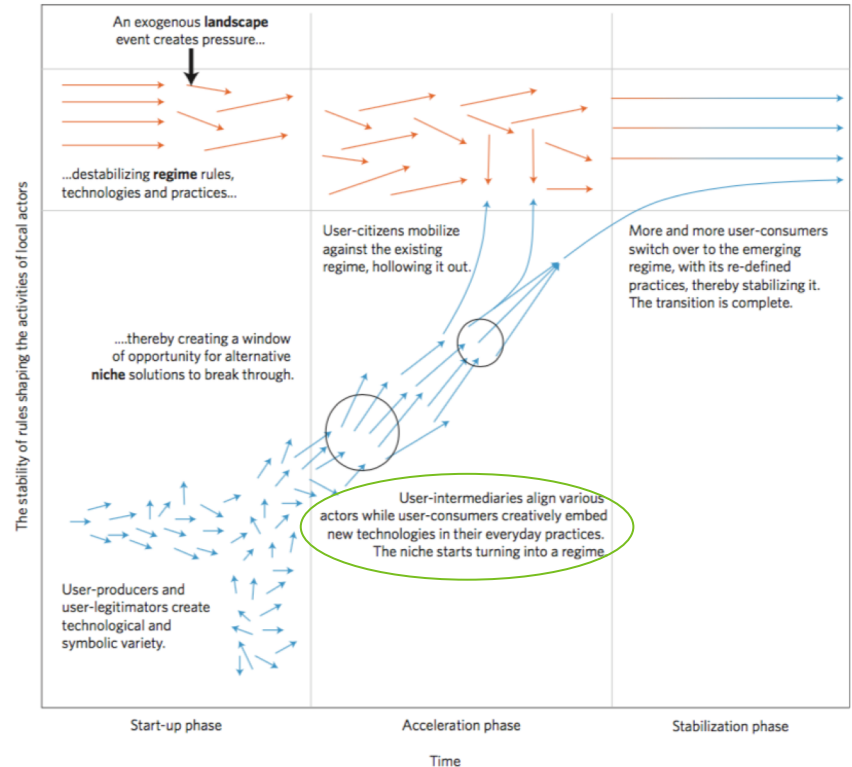
Energy transition needs “User-legitimimators” and they play a salient role in the emergence of niches

- Interact with other actors to get them to share the user-legitimimators’ interpretations of current events and visions of the future.
- User-legitimimators shape the values and worldview of niche actors, providing meaning, purpose and rationale for their activities.



3 User-intermediaries

- **Create spaces for the appropriation, shaping and alignment of the various elements of emerging socio-technical systems**
 - Products, infrastructures and regulatory frameworks.
- **Tinkering with the design of new technologies, setting rules and regulations on use**
- **Voicing expectations and interpretations of new technologies as well as their possible uses.**
 - User-intermediaries also create representations of users, shape user needs and preferences.
- **Examples are national or regional organizations for renewables.**
 - User-intermediaries play an important role in the up-scaling and mainstreaming of niches.
- **Cooperate with governments, non-governmental organizations and individual users.**

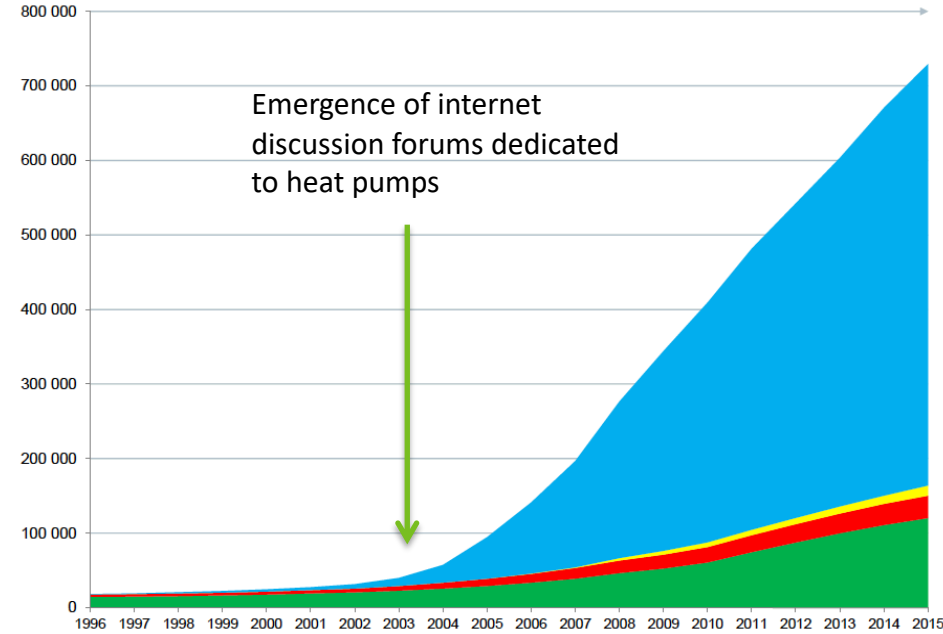


3 User-intermediaries

S-RET peer assistance

Heat pumps in Finland: 750 000 installations, 5-6 TWh annual energy saving

Key actors: citizens and SMEs, little official support or large companies



3 User-intermediaries

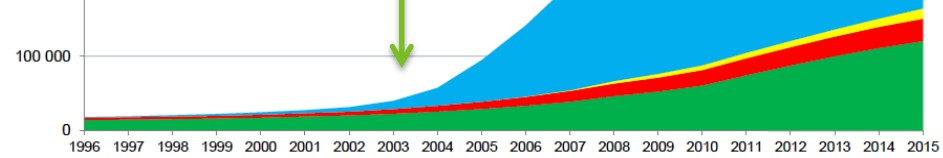
S-RET peer assistance

Specialized Internet discussion forums, in Finland, in a decade, on heat pumps:

150 000 000 reads: high demand for information

500 000 messages: high breath of information available

100 new innovations by users: high depth of knowledge



Foorumi Uusi sisällö Jäsenet Kirjautu sisään Rekisteröidy

ILP mitoitus ja valinta

Keskustelua ilmalämpöpumpujen mitoituksesta ja valinnasta.

1 2 3 ... 21 Seuraava

Suodattimet

Kiinnitetty Keskusteluketjut

ILPon valinnan muistilista. Joppel112 · 15 Toukokuu 2007	Vastauksia: 16 Katsottu: 57K	13 Marraskuu 2015 Rauako
Z Zadah-kokonaisvuosiCOPlaskuri lämpöpumpuille zadah · 20 Helmikuu 2010	Vastauksia: 39 Katsottu: 44K	25 Kesäkuu 2010 zadah
N ILPon tehon arviointi Naria · 25 Syyskuu 2008	Vastauksia: 46 Katsottu: 58K	6 Helmikuu 2010 mar
T Pakkaskelien suorituskyvyn tarve Etelä-Suomessa tet · 10 Marraskuu 2007	Vastauksia: 32 Katsottu: 55K	1 Tammikuu 2010 kotte
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Keskusteluketjut

A Pumpun valinta Anssi79 · 8 Helmikuu 2019	Vastauksia: 49 Katsottu: 3K	tänään klo 10:09 Jerme
K ILP viilennykseen kolibri · 26 Heinäkuu 2018	Vastauksia: 16 Katsottu: 2K	perjantaina klo 16:21 kotte
S Uusi hiljainen ILPpi edellisen Gree amber 35 tilalle, mikä? samulisatunen · 15 Tammikuu 2019	Vastauksia: 45 Katsottu: 2K	torstaina klo 19:10 slipoy
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Puurakenteinen paritalo 100 neliötä kahdessa kerroksessa. Millä jäähdytetään? Sakarilahtinen · 31 Maaliskuu 2019	Vastauksia: 2 Katsottu: 201	keskiviikona klo 13:13 teemiku

3 User-intermediaries



S-RET peer assistance

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New type of energy communities

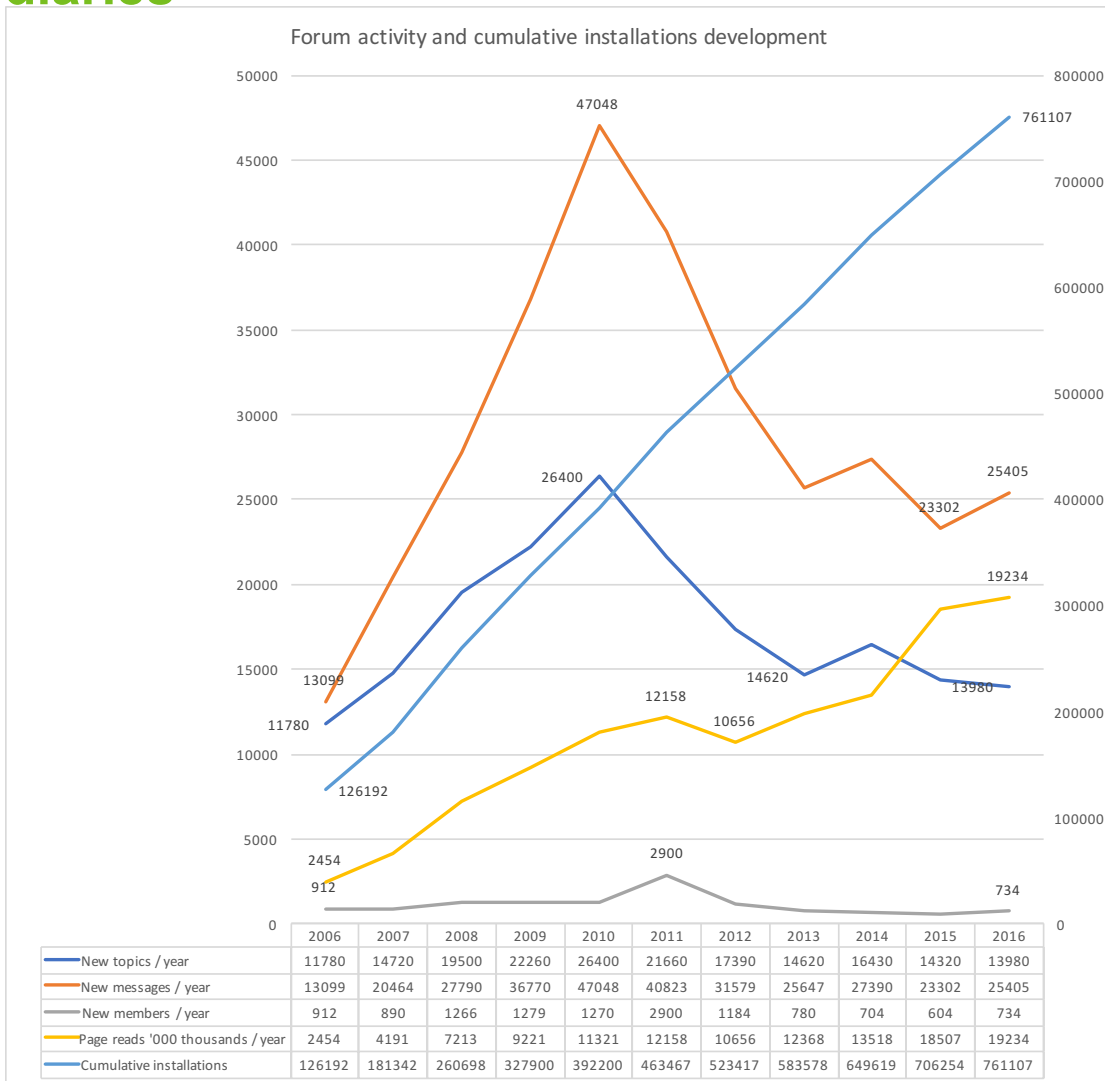
Non-local, do not share the energy produced or finance

Share *technology* and *mediating digital infrastructure*

Peer created knowledge infrastructure that supports renewables purchase, maintenance, optimization etc.

Helps the overall diffusion of renewable home heating tech.

3 User-intermediaries



3 User-intermediaries










Users as local configurers & advisors

Heat pumps an expanding market and relatively mature technology

... there is still lots of work for users to put together functioning systems

- Scope their heating system need
- Chose a suited system for their needs
- Select reliable products, suppliers, installers, maintenance
- Learn to use the system and adapt practices at home
- Some amount of troubleshooting

In 2006 a 9 month project in Valkeakoski joint purchase,
9% of max diffusion

<p>ALE 20%</p> <p>JUURI NYTTI KAMPANJA</p>  <p>1199 € 1499.00 €</p> <p>MITSUBISHI Ilmalämpöpumppu Mitsubishi Electric FH25 VEHZ 635</p> <p>★★★★★</p>	 <p>1249 €</p> <p>PANASONIC Ilmalämpöpumppu Panasonic NZ35-TKE</p>	<p>ALE 1271€</p>  <p>5759 € 7030.00 €</p> <p>NILAN Poistoilmalämpöpumppu Nilan EC jähdytyskellä ja aurinkolämmöllä</p>
<p>ALE 10%</p> <p>30.04. ASTI KAMPANJA</p>  <p>87.30 € 97 €</p> <p>KOSKEN METALLI Katos lämpöpumpulle lipallinen malli</p> <p>★★★★★</p>	<p>ALE 20%</p>  <p>799 € 999.00 €</p> <p>COOPER & HUNTER Ilmalämpöpumppu Cooper & Hunter Arctic NG inverter 12 Wi-Fi</p>	<p>ALE 1136€</p>  <p>6439 € 7575.00 €</p> <p>JÄSPI Ilma-vesilämpöpumppu Jäspi Tehowatti Air Split 8 kW</p>
<p>ALE 980€</p>  <p>8795 € 9775.00 €</p> <p>NIBE Invertteri- maalämpöpumppu Nibe F1255 3-12</p>	 <p>229 €</p> <p>AIRPATROL Ilmalämpöpumpun ohjain AirPatrol Nordic GSM</p>	 <p>969 €</p> <p>PANASONIC Ilmalämpöpumppu Panasonic CZ25-TKE</p>

3 User-intermediaries

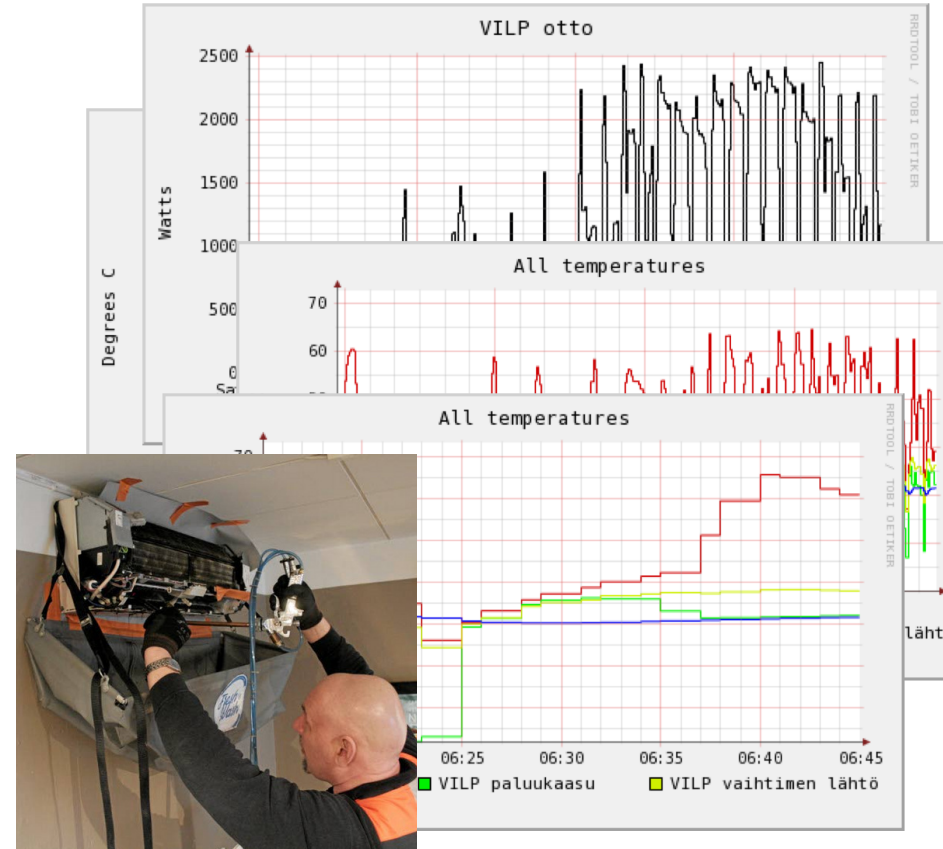
Energy user (online) community as transition intermediary

Intermediating market formation for new S-RET

- Providing qualifying information missing among the market mechanisms
 - Directing other actors in the market: Acting as a back channel against commercial claims and substandard service
 - Providing evidence of value against counter claims
- ## Re-contextualizing the standard technology to national specifics
- Facilitating learning about new technology and its use
 - Contributing to demand articulation and technical improvement

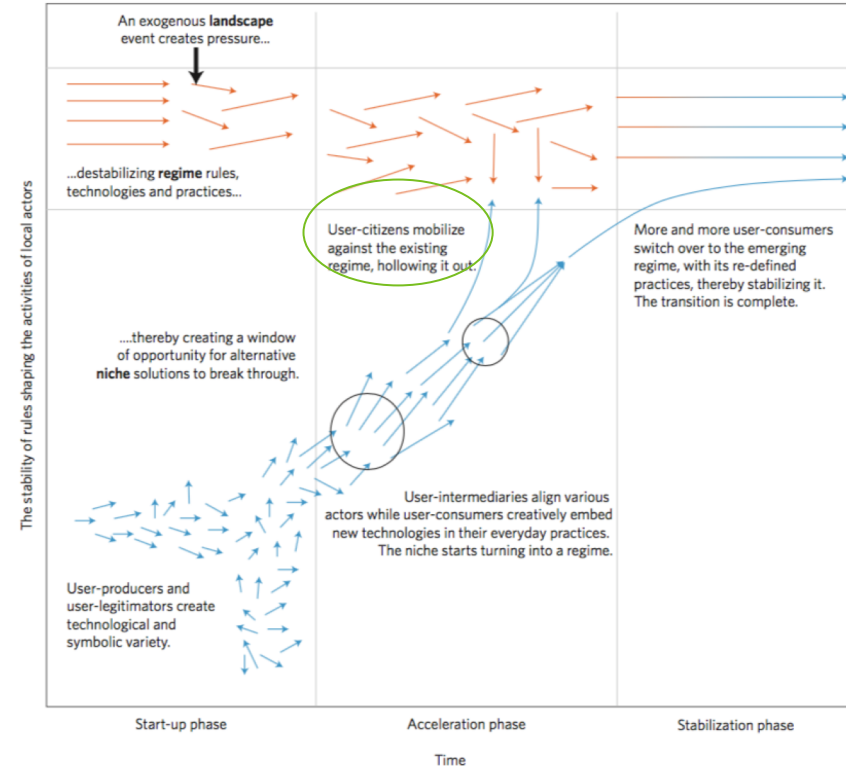
Acceleration phase user intermediation

- Fostering *appreciatively critical* discourse of technology
- From local communities to *distributed Internet communities* of millions of people (not hundreds)
- User intermediaries operate *within an evolving ecology of intermediation*



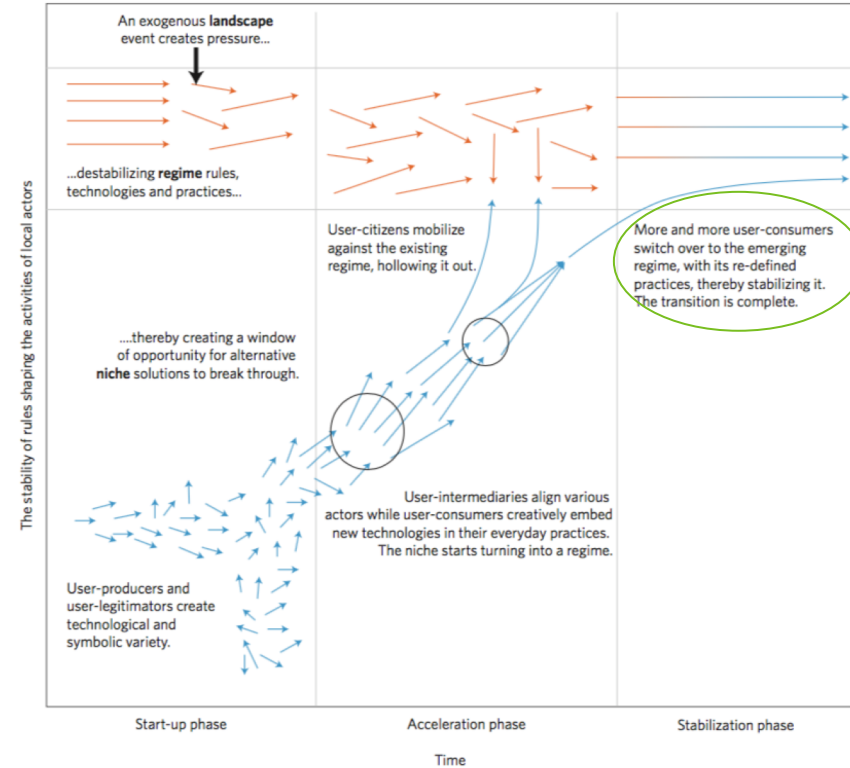
4. User-citizens

- Engage in regime-shift politics, lobbying for a particular niche and against the regime (or other niches)
- Aim to transmit niche-derived lessons about needed regulatory reform into a regime-shift process.
- Work together and tap into wider social movements and elites that are interested in sustainability-oriented reform.
- Are involved in a struggle to overcome the defensive strategies of regime actors in government and businesses.
- Examples are individuals who are participating in green parties, environmental activists, grassroots movements and non-governmental organizations such as Greenpeace.
- User-citizens also play an important role in the up-scaling and mainstreaming of niches by confronting the incumbent regimes.



4. User-consumers

- Buy products but also embed them in their daily practices,
- Create new practices.
- Express their status and identity by attributing symbolic meanings to new technologies.
- Might work together with other users in consumer organizations to test products and systems and share product- and service-related information.
- User- consumers play a crucial role in enabling the stabilization of new socio-technical regimes.



2. “Energy prosumers”

What is prosumption in general?

- Alvin Toffler first introduced the term 'prosumer' in his book *The Third Wave* (1980)
- Consumer roles in the third wave are changing radically. Toffler's notion of prosumer emphasizes citizens' shift from the passive consumer to active prosumer. (<https://www.youtube.com/watch?v=lqsGfF7iLSw>)
- Prosumption is a set of value creation activities consumers perform in order to contribute to the production of products and services they eventually consume.
- Ritzer theorizes prosumption and points out that prosumption is not a single process, but rather a wide range of processes existing along a continuum
- The poles of the continuum involve production redefined 'prosumption-as-production' and consumption as 'prosumption-as-consumption' (Ritzer <https://www.youtube.com/watch?v=EYf8rnMGHpE> (8:00-12:55))
 - Factory worker vs Ikea furniture or McDonalds vs MOOC
- Production and consumption processes always interpenetrate and there is no such thing as either pure production or pure consumption



Energy prosumer

- In technology oriented energy research, prosumption is an established term for small-scale producers in a smart-grid environment
- A prosumer is a consumer that becomes resonant with the energy market through systematic actions and reactions that aim to increase personal or collective benefits
- Both in grid-connected and in off-grid situations.
- Personal and collective benefits in this definition should be understood to include more than financial aspects

**Consumer roles stay
limited without free and
active civic society and
liberal energy market**

Case Finland: Liberalization of the energy markets

- **Liberalization started globally early 1990s**
- **In Finland new electricity market law 1995 opened the market renewal.**
 - Step by step removal of restrictions in production, sales, export, clear rules for use of networks (although distribution monopoly is kept).
 - Some electricity users have freedom to choose their provider (not distributor, forbidden to build competing networks). All users in 1997.
- **Nordic electricity markets opened year 1996 (Sweden-Norway)**
- **Finland's electricity market opened up to competition in 1997.**
- **Finland joins Nord Pool ASA 1998.**
- **Fluctuating electricity price (SPOT market)**
- **Electricity generation, distribution and sales forced to separate companies 2005.**
- **Cumulative heat pump installations over 100k in 2006.**
- **Wind power FIT schemes start 2011.**
- **Households can sell their (over)production to electricity companies 2013.**
- **Smart meters forced to be installed by end of 2013. (1h metering frequency).**
- **The Nordic electricity market was connected to the common wholesale market covering Western Europe in 2013.**



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**What is still needed? How
to make energy system
more open and equal for
all parties?**

Case Finland: Liberalization yet to come

- **Heat networks are not opened.**
- **Heat production, distribution and sales under the same company.**
- **Smart meters out of date: 1h measurement frequency too infrequent. Netting not working properly in prosumption case. Phases measured sometimes separately.**
- **Easy peer to peer sales not possible. Producer sells to electricity sales company who resales further to customers.**



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**What about elsewhere,
outside of Finland? What
is possible for users /
what's still a struggle.**

3. Community Energy

Community Energy

- **Emphasis on community ownership, leadership or control where the community benefits**
- **Community energy can aim to:**
 - Energy Efficiency: reduce energy use
 - Generating energy together: distributed generation
 - Manage energy better: demand response, distributed storage
 - Purchasing energy or technology
 - Financing innovations or scaling up
- **Not just local communities in geographic terms**

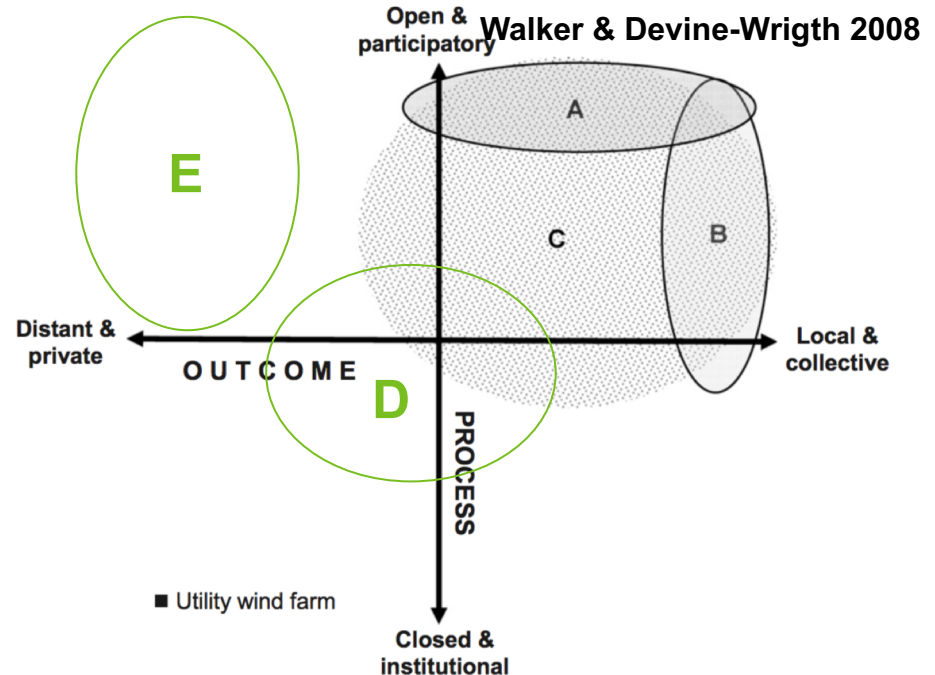
Community renewable energy in relation to project process and outcome dimension

A Focus on process dimension projects are needed to involve locals

See community projects as necessarily needing a high degree of involvement of local people in the planning, setting up and, potentially, the running of the project.

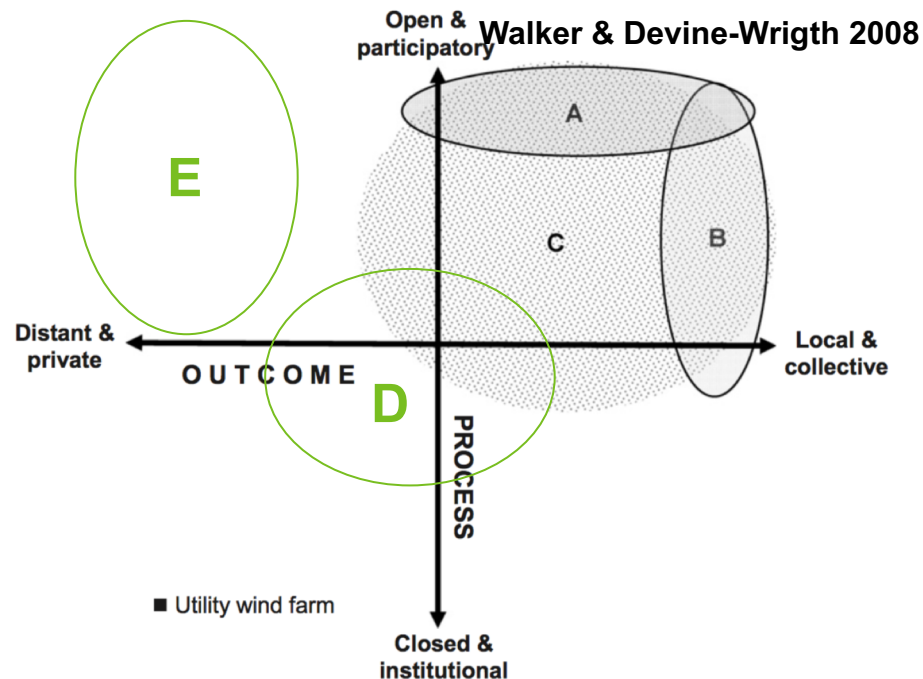
People typically having alternative technology and community development backgrounds

People strongly driven by normative principles of empowerment, participation and capacity building.



Community renewable energy in relation to project process and outcome dimension

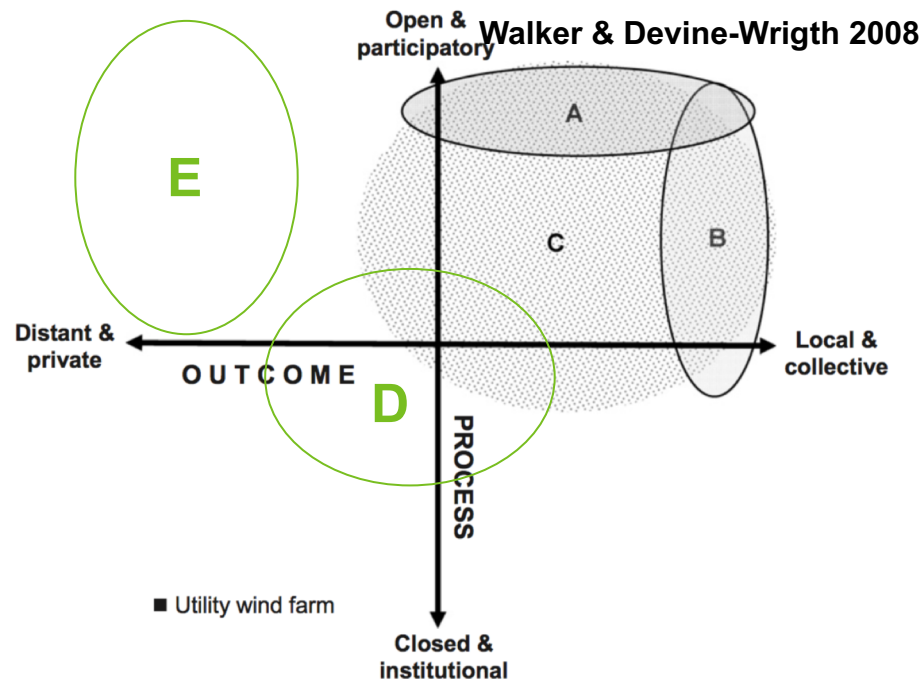
B Focus on outcome, no concerns on who is participating. Project can be run by local institutions but should benefit community (jobs)



Community renewable energy in relation to project process and outcome dimension

C More expansive space, open to many different forms of project being given a community label.

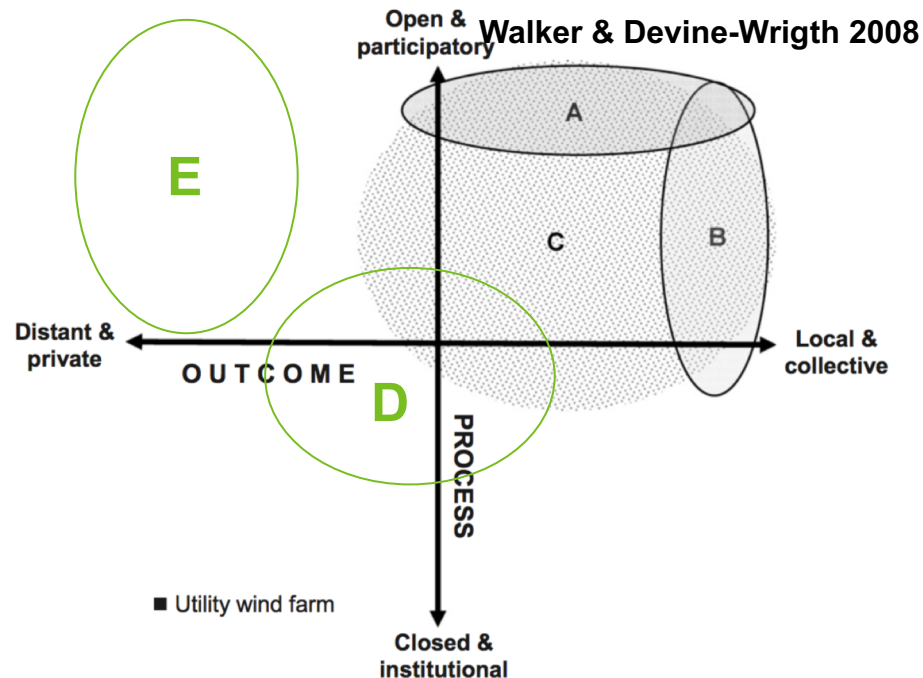
People are less concerned with whether or not a proposed project ticked the right 'community' boxes, but that it was actually going ahead and would lead to something productive and useful happening. Many different possible combinations of process and outcome are therefore deemed acceptable.



Community renewable energy in relation to project process and outcome dimension

D Distributed energy community that features distributed output, such as a wind cooperative.

E Dispersed energy communities such as the Internet discussion forums



Aggregation of knowledge

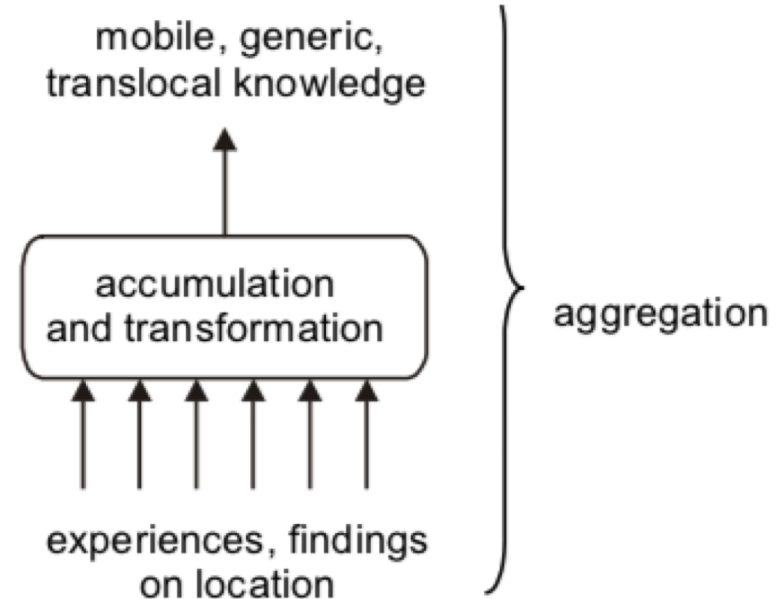
Local practices form the place of origin of novelty and new technical knowledge

Starting point is a local problem and its' solution

But knowledge does not simply flow to other locations: needs to be sufficiently context free

Aggregation is the process of transforming local knowledge into robust knowledge which is sufficiently general

- **Standardization**
- **Model building**
- **Writing handbooks**
- **Formulation of best practices**



Phases in the development of shared technological knowledge

Local Practices

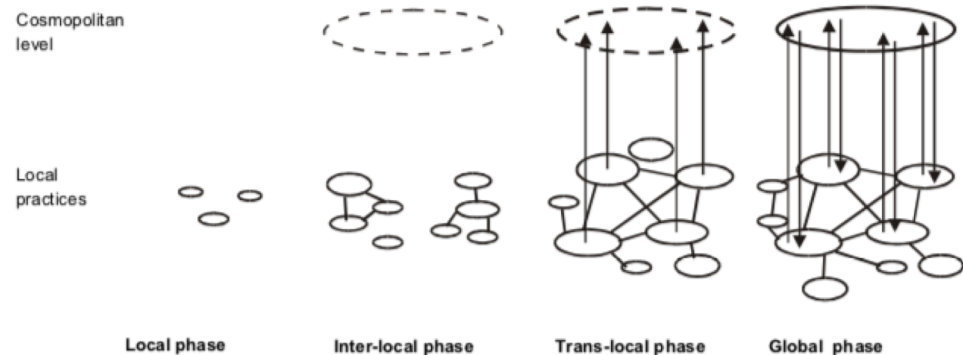
This is where concrete, individual projects start.

An example of this would be a project developing novel renewable energy technology, an innovative community project or ways of installing an existing technology in a new setting.

Cosmopolitan level

This is a space shared between actors in a specific field or community.

An example of this would be a new field of renewable energy technology where projects share learning, best practice guidelines and networks.

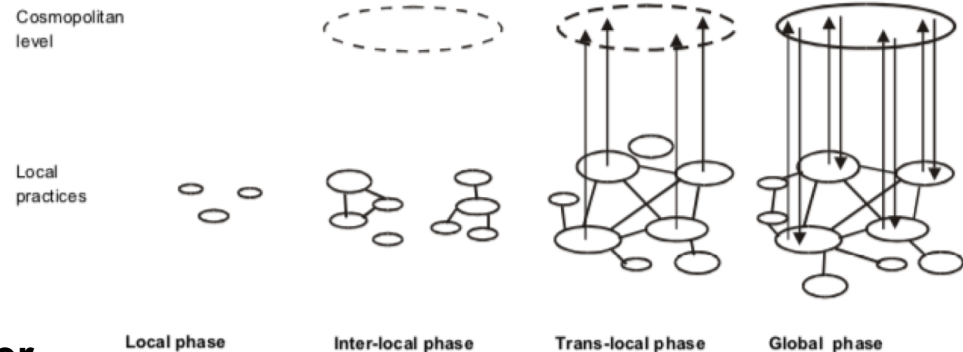


Phases in the development of shared technological knowledge

At the beginning of a new emerging field, or niche, only a small amount of projects exist.

In this local phase, individual projects are developed, mainly separate from each other.

For example at the start of a community energy niche, community energy projects are developed in separation from other projects and there is little project-to-project communication, and this practical work is more about projects 'learning by doing'.



Phases in the development of shared technological knowledge

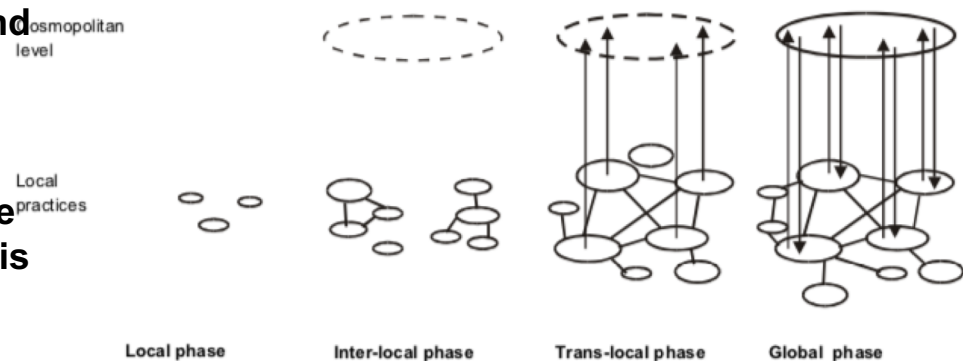
Gradually, as more projects enter the field, the interaction between projects also increases.

Once projects start to communicate and share experience, an *inter-local* phase emerges.

In the inter-local phase, circulation of knowledge initially starts as knowledge flows between individual projects and is undertaken by people who are directly involved in the local projects

No dedicated infrastructure for circulation at this phase

Circulation in the inter-local phase aids the creation of knowledge infrastructure for future projects



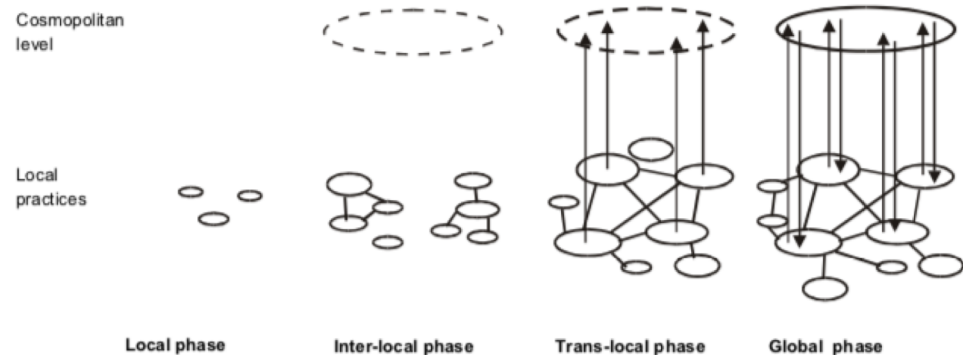
Phases in the development of shared technological knowledge

The *trans-local* phase sees knowledge being translated from local projects to the cosmopolitan level

The model predicts that in the trans-local phase, dedicated aggregation activities start to emerge, conducted by intermediary actors such as professional organisations and standardisation committees

Aggregation takes place when general lessons are abstracted from individual projects

These local lessons are then translated into best practice, standards, rules and guidelines

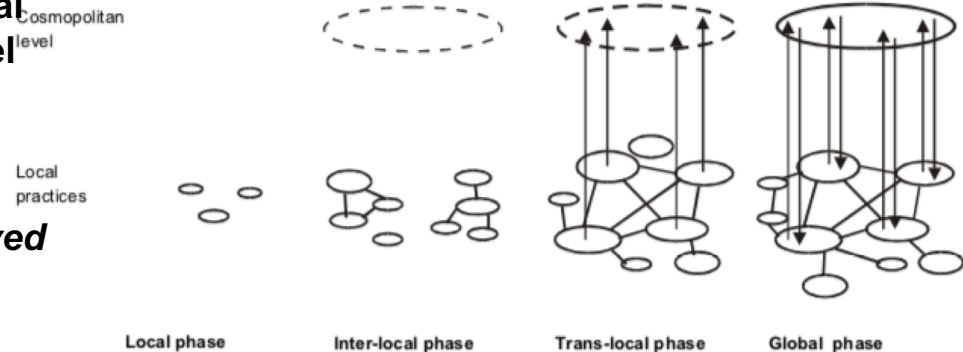


Phases in the development of shared technological knowledge

In the final, *global* phase, the knowledge flow is a two-way process, with knowledge from local projects flowing to the cosmopolitan level as well as global knowledge from the cosmopolitan level flowing back to local projects.

Both levels also have their own dedicated networks: “*Local networks* refers to actors who are directly involved in projects, while the *global network* refers to an emerging field or community”

Niche protection becomes important e.g. subsidies and capital investment aimed at projects within emerging niches.



Local, distributed and dispersed energy community

Table 19.1 Case Examples of Community Energy: Local Community Energy Project and Dispersed Structure Community

	Locality-Centered Community Energy Project (e.g., Wind, Solar)	Distributed Energy Community Through Output Sharing	Dispersed Energy Community Through Knowledge Sharing
Scale of the production unit	Small or medium scale	Medium or large scale	Decentralized small scale
Ownership of the production unit	Community owned	Community owned	Owned by households
Daily operation	By active group inside community (or outsourced)	By active group inside community (or outsourced)	By user, user responsibility
Knowledge sharing and community learning	Social learning when working together locally for common goal	Social learning among those in community who engage beyond mere output sharing	Individual operational work supported by online community. Characterized by common interest.
Scale of community knowledge pool	The participants in the locally owned and run community energy project and their personal networks	The engaged participants in the energy project and their personal networks	Thousands of users with similar equipment and broad range of competences
Governance characteristics	Organized; requires governance structure, community control	Organized; requires governance structure, community control	Household control and autonomy
Distribution of energy production	Microgrid or grid-connected, primarily for a group	Microgrid or grid-connected, primarily for a group	Primarily for own use, mostly grid-connected

Summary

Users take various roles in energy transition. According to Schot et al. there are user-producers, user-legitimizers, user-intermediaries, user-citizens and user-consumers

Community renewable energy projects can be understood in relation to project process and outcome dimension.

Development of knowledge sharing in energy communities can be divided to four phases: local, inter local, trans-local and global

Energy markets and utilities have gone through liberalization but there change is not over.