

# More than money: Local impact is why individuals participate in citizen-financed solar projects

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January 2023

# Agenda

## 1. Citizen-financed PV in Switzerland

Phenomenon

Overview of CiFi PV in the Swiss market

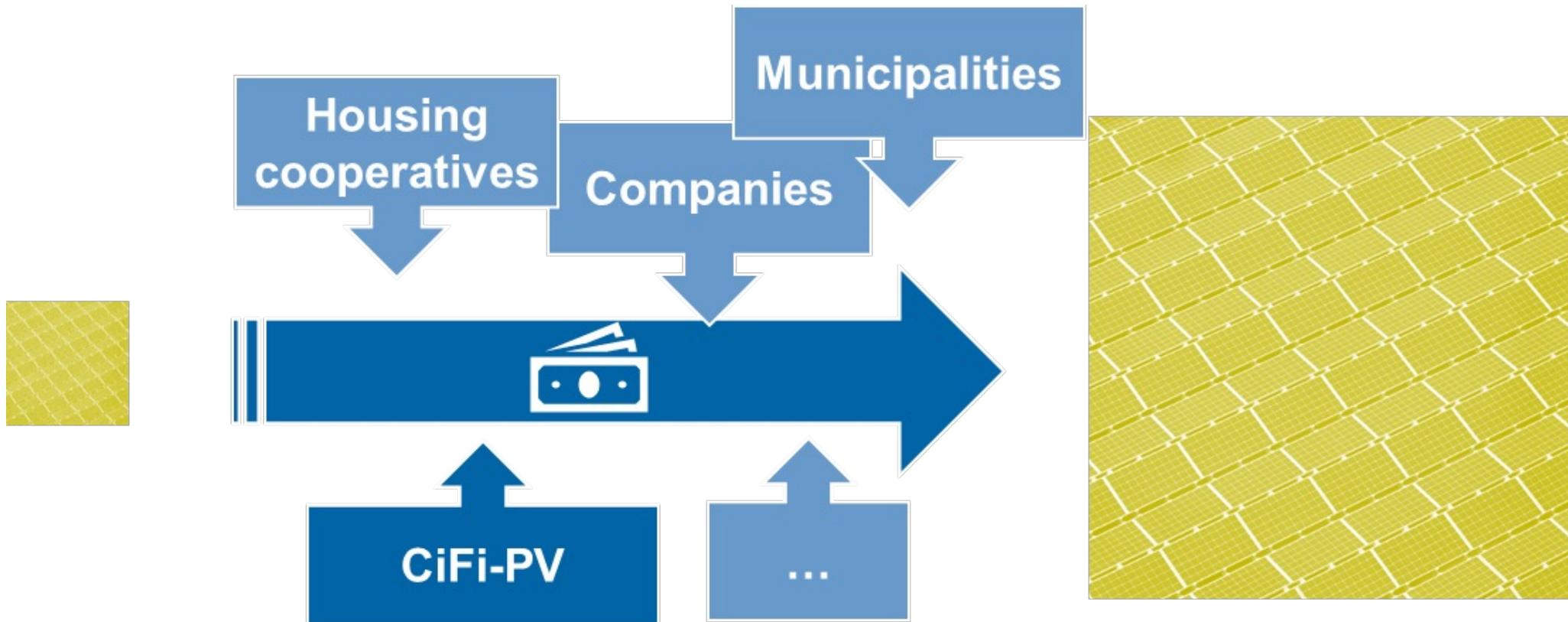
Research project

## 2. Deep-dive into survey study with early adopters

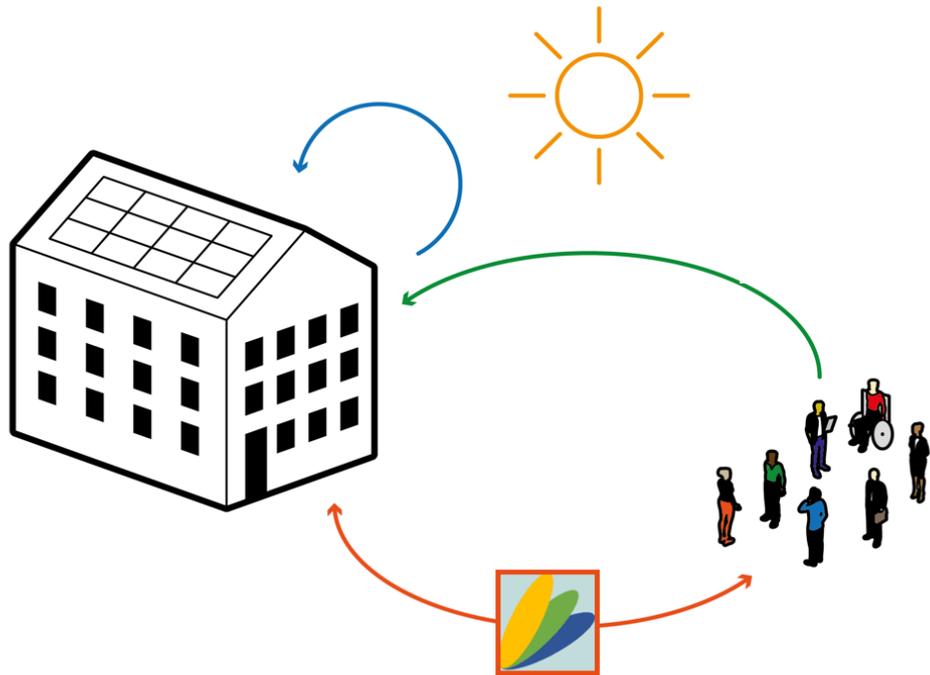
Work in progress for publication

## 3. Discussion

# How to finance a more than tenfold increase in PV production?



# What is a citizen-financed photovoltaics (CiFi-PV) project?



- Opportunity for citizens to invest into solar panels not located on their premises
- Crowdfunding of new PV installations
- Various pay-out models: equity, lending, reward
- Various providers: municipalities, cooperatives, energy providers, companies, etc.

# Why is CiFi PV promising?



Large pool of potential investors



Low barriers to invest

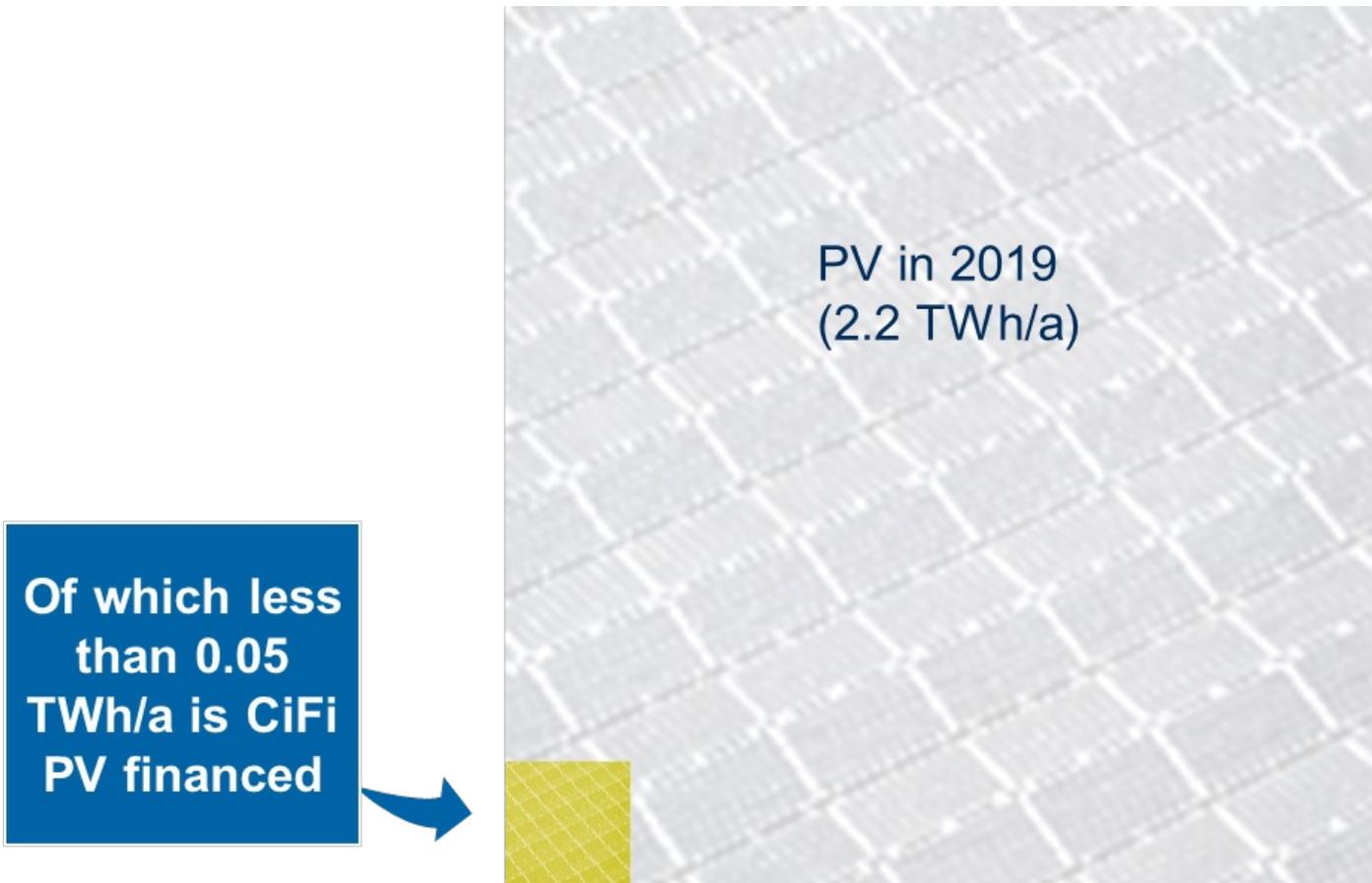


(Potentially) attractive investment



Participation in energy transition

# How to upscale CiFi PV projects?



# UNLOCK-PV Research project

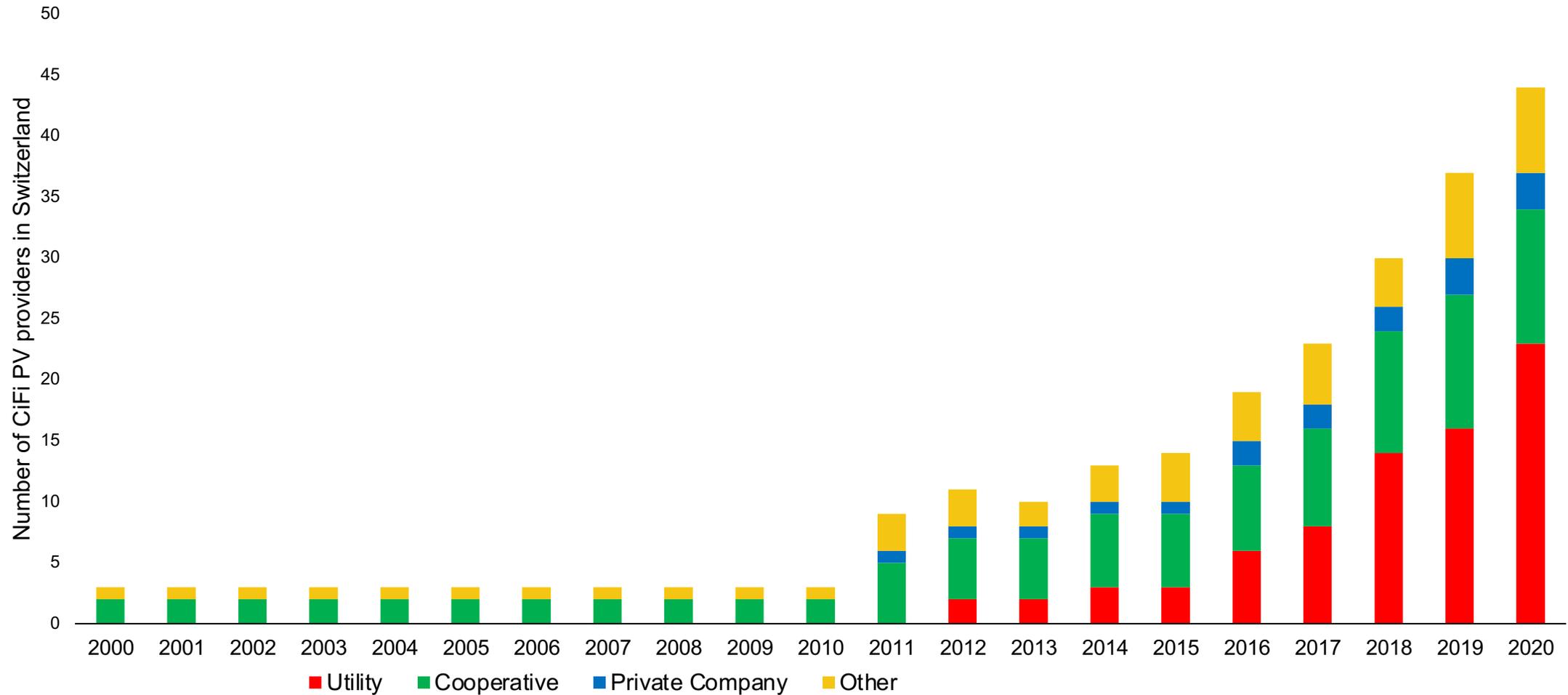
## Unlock the potential of CiFi PV to accelerate the energy transition

- Expansion potential, barriers & drivers, participation motivations
- Multi-perspective: providers, early adopters and potential adopters
- From 2020 to 2023, EWG project financed by SFOE
- ZHAW & Econcept

# Why is the Swiss case interesting?

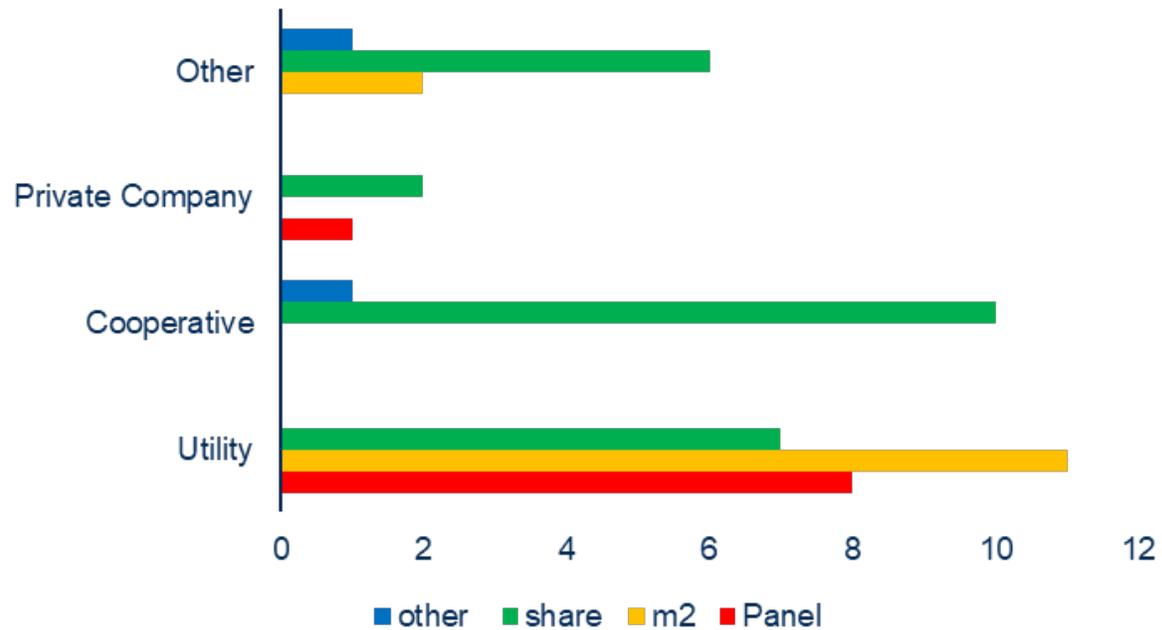
- Affluent population
- Niche market with expanding offers
- Various types of CiFi PV offers
- Participatory democracy

# Swiss CiFi-Market is growing...

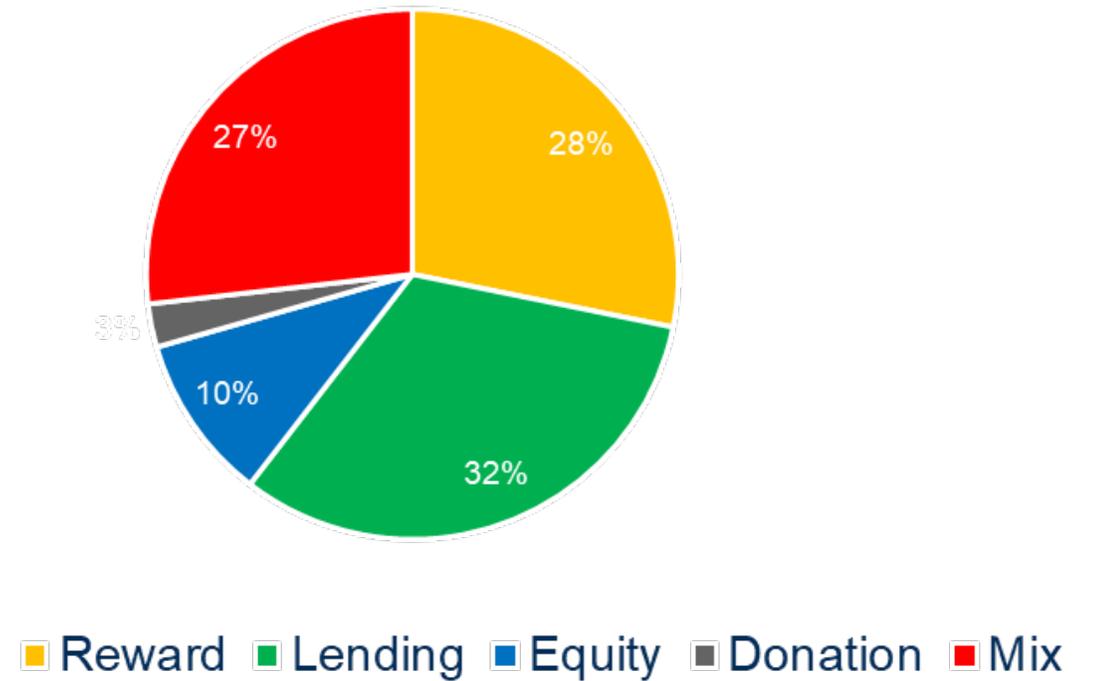


# ...and becoming more and more diverse

### Unit of offer by provider type



### Market share of each payout model



# Beyond market potential

- Expanding solar power
  - Decentralized and economically viable renewable
  - Important pillar of the energy transition
- Shift of citizens' role from mere consumers to energy citizens
- Material participation in the energy transition: impact-oriented and object-centered
- Improving social acceptance of new projects
  - Alpine PV projects
  - Large-scale PV projects

## Potential to accelerate the energy transition

# Understanding drivers of participation

	<b>Market-based</b> <i>Fleiss et al., 2017; Braitto et al., 2017; Reinsberger &amp; Posch, 2014; Bourcet &amp; Bovari, 2022</i>	<b>Grassroot</b> <i>Dóci et al., 2015; Kalkbrenner &amp; Roosen, 2016; Radtke, 2014; Bauwens &amp; Devine-Wright, 2018</i>
Provider	Energy provider; private venture	Cooperative; municipality
Orientation	Market economy	Social economy / Public sector
Drivers of participation	<ul style="list-style-type: none"> <li>• Finance</li> <li>• Environment</li> </ul>	<ul style="list-style-type: none"> <li>• Trust</li> <li>• Environmental concern</li> <li>• Social norms</li> <li>• Community identity</li> <li>• Co-ownership</li> </ul>

**Fragmented understanding of motivations underlying crowdfunded RE projects**

# Deep-dive: Survey study with Swiss early adopters

# Motivational drivers of early adopters

**Who are CiFi PV early adopters?**

**What motivates their participation?**

**What can we conclude regarding CiFi PV expansion potential?**

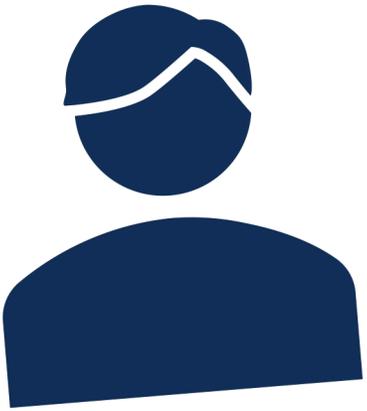
# Method



- Prior interviews with early adopters (N=19) on participation process
- Data collection from November to January 2022
- Descriptive analysis, PCA, multiple regression

# Who are the CiFi PV early adopters?

# Highly civically engaged and educated male citizens



Male (75%), university degree (60%), high income (30%)

Owner/tenant (50/50%)

Active voter (80%), member of an association or club (72%)

Politically slightly left-leaning (but entire political spectrum is represented)

# What motivates early adopters to participate?

# CiFi PV an impact-oriented participation

## Material participation, an STS approach

*“An ‘object-oriented’ or ‘device-centered’ perspective that focuses on the role of technologies and material objects for (mundane) participation in political matters of concern.” (Ryghaug et al., 2018, p. 285.).*

- Action- and impact-oriented perspective
- Mundane participation in the energy transition
- Every-day life examples: smart meters, electric car, solar panels

## Prior **interview study** on motivational drivers related to **impact**:

- Financial
- Symbolic
- Environmental
- Local

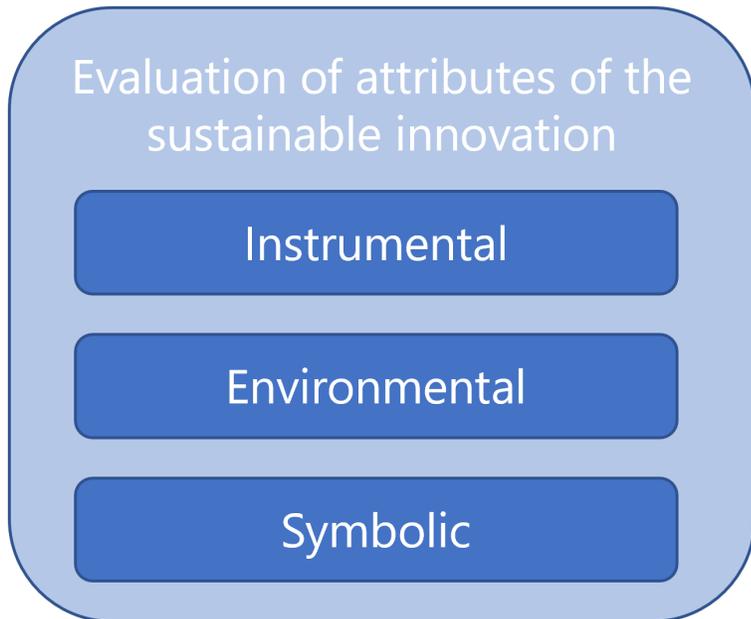
# Impact-oriented motivations: local attributes

**Drawing upon material participation perspective** (*Marres, 2012; Ryghaug et al., 2018*)

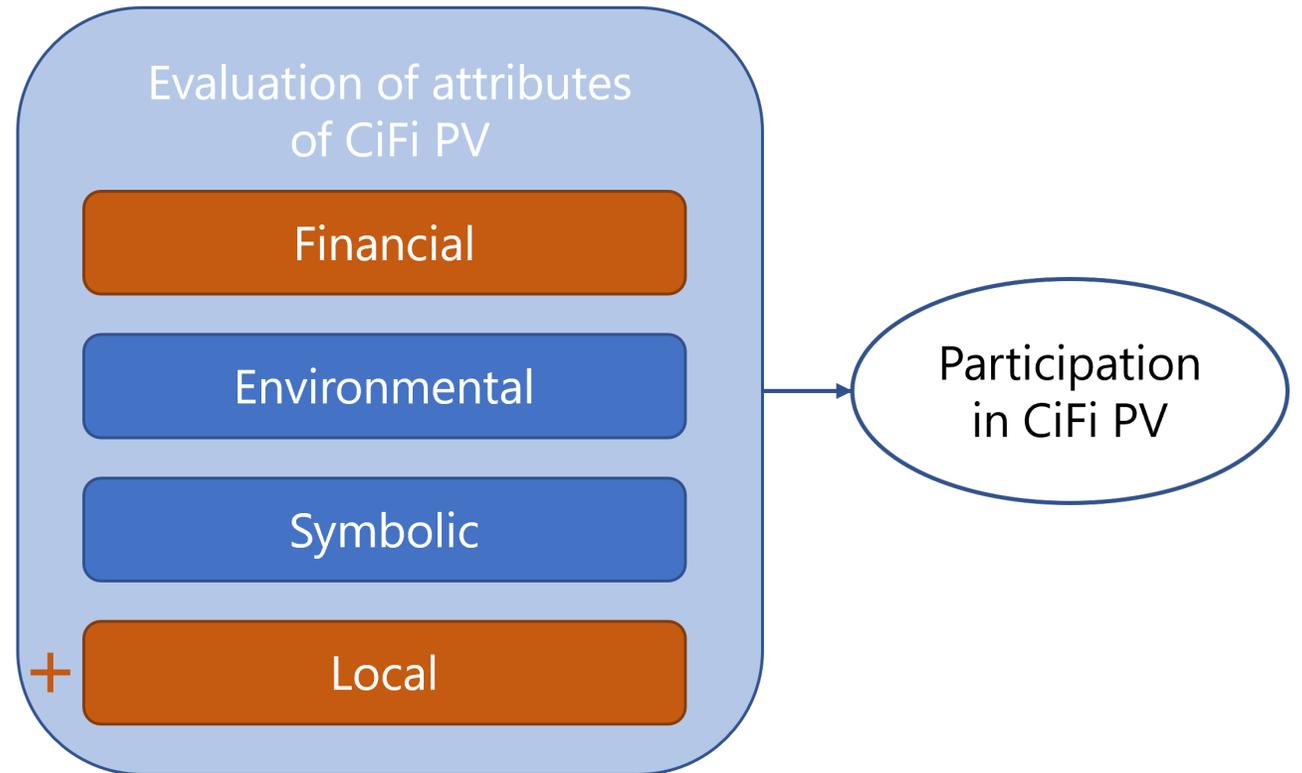
- Missing out on tangible impact at the local level
- Impact is common to market-based and grassroots projects
- Explanatory?

# Motivational attributes scale

Original scale by Noppers et al., 2016



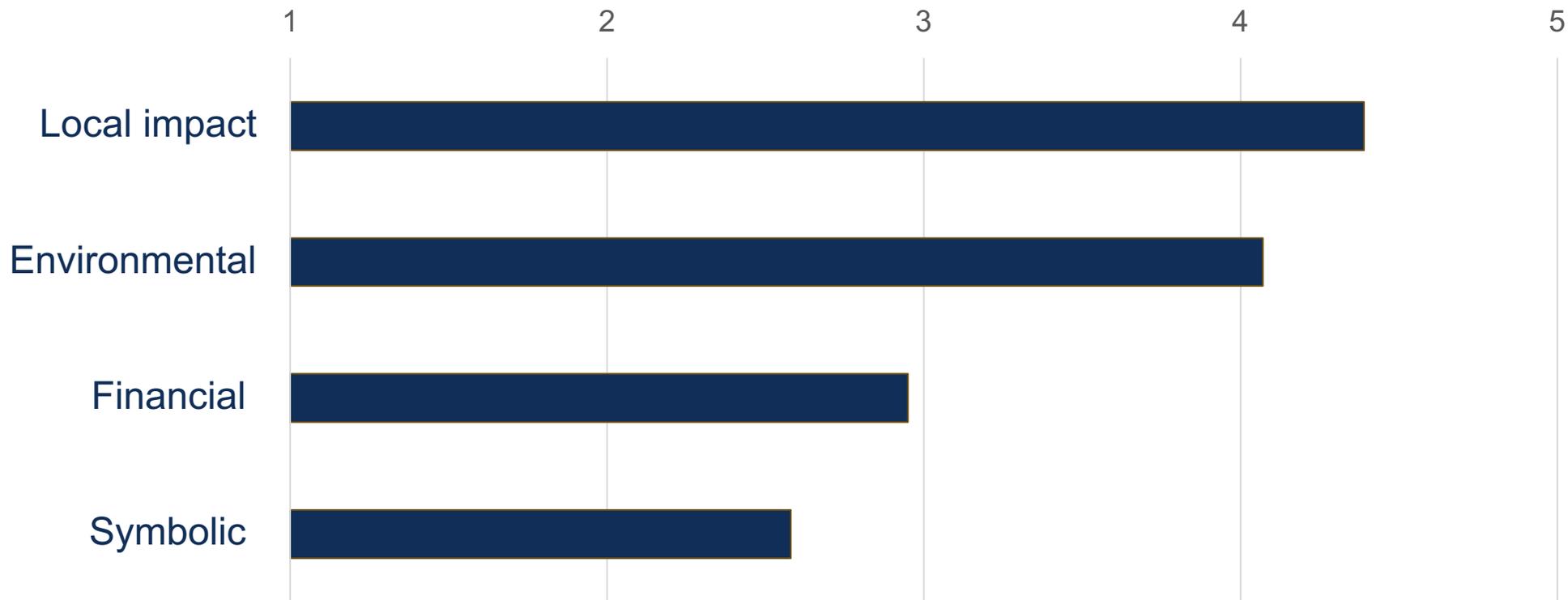
Adapted and extended scale by authors



Confirmatory PCA, Cronbach's alpha = 0.82

# More than money: local & environmental impact

## Motivations related to CiFi PV participation



Example: «Through my CiFi PV participation, I support local actors.» - 1 Completely disagree to 5 Completely agree

# Local impact drives willingness to re-invest

Variables	Step I			Step II		
	B	SE	$\beta$	B	SE	$\beta$
Constant	3.871	0.514	***	1.290	0.591	***
Age	-0.007	0.004	-0.098	-0.005	0.004	-0.068
Civic Engagement <sup>a</sup>	0.041	0.060	0.032	0.026	0.020	0.020
Education <sup>b</sup>	0.089	0.126	0.035	0.041	0.126	0.016
Male <sup>c</sup>	0.027	0.124	0.010	0.059	0.023	0.023
Income <sup>b</sup>	0.035	0.085	0.035 *	0.181	0.085	0.109 *
Tenant	0.143	0.113	0.067	0.073	0.020	0.034
Housing cooperative	-0.647	0.247	-0.125 ***	-0.656	0.023	-0.126 ***
Political orientation	-0.076	0.032	-0.112 *	-0.063	0.031	-0.093 *
Environmental attributes				0.136	0.063	0.108 *
Financial attributes				0.130	0.053	0.123 *
<u>Local attributes</u>				0.337	0.080	<u>0.207 ***</u>
Symbolic attributes				0.056	0.048	0.060
Model statistics	Model 1			Model 2		
R <sup>2</sup>	0.064***			0.181***		
R <sup>2</sup> change	0.064			0.117		
Fchange (df1, df2)	4.34 (7,445)			12.620 (5,440)		

Note: B = unstandardized regression coefficient, SE = standard error;  $\beta$  = standardized regression coefficient; \* p < 0.05; \*\* p < 0.01; \*\*\* p < 0.001; <sup>a</sup> Coding: 1 = Never, 2 = Sometimes, 3 = Frequently; <sup>b</sup> Coding: 1 = Low, 2 = Medium, 3 = High; <sup>c</sup> Coding: 0 = female, 1 = male; the political orientation scale is a continuous variable with higher values corresponding to stronger right-wing orientation (1 = left; 8 = right); Dependent variable: Willingness to re-participate in CiFi PV projects

# Conclusions on CiFi PV expansion potential

# CiFi PV expansion sounds plausible and promising!

## Expansion potential

- Adopters from the entire political spectrum
- High willingness to re-participate: continuous target group
- Not only tenants, but also homeowners

## Motivational drivers

- Heterogeneous offers for heterogeneous motivations
- Beyond money and environment: local impact as driver of participation
- Link to social acceptance

## Impact-oriented participation

- Energy citizenship through material participation
- Individual perspective

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Thank  
You

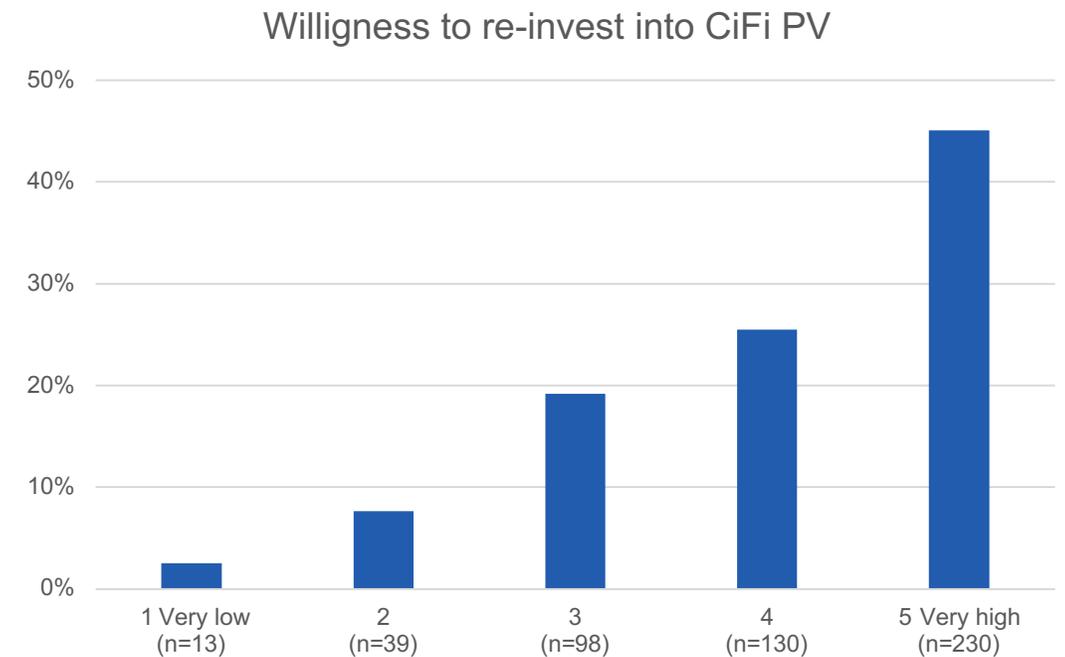
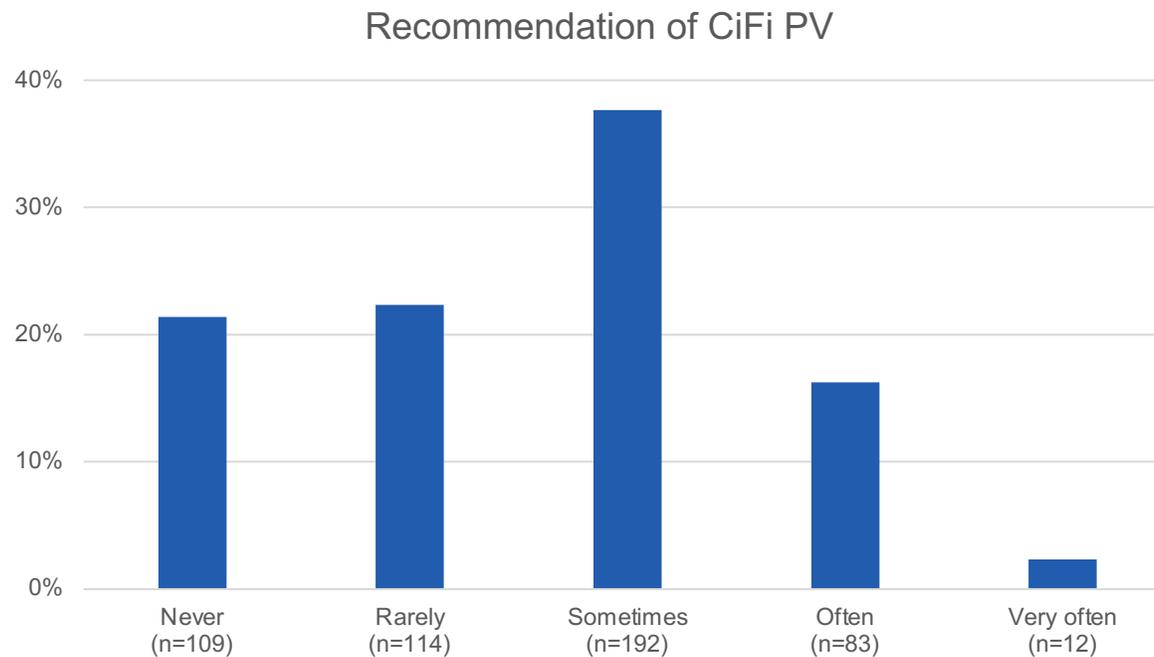
Questions, comments, thoughts?

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# Limited dissemination by early adopters

- Investment behaviour is a private matter
- Stereotypically “left-ish”, but early adopters form the entire political spectrum
- Few recommendations, but high willingness to re-invest

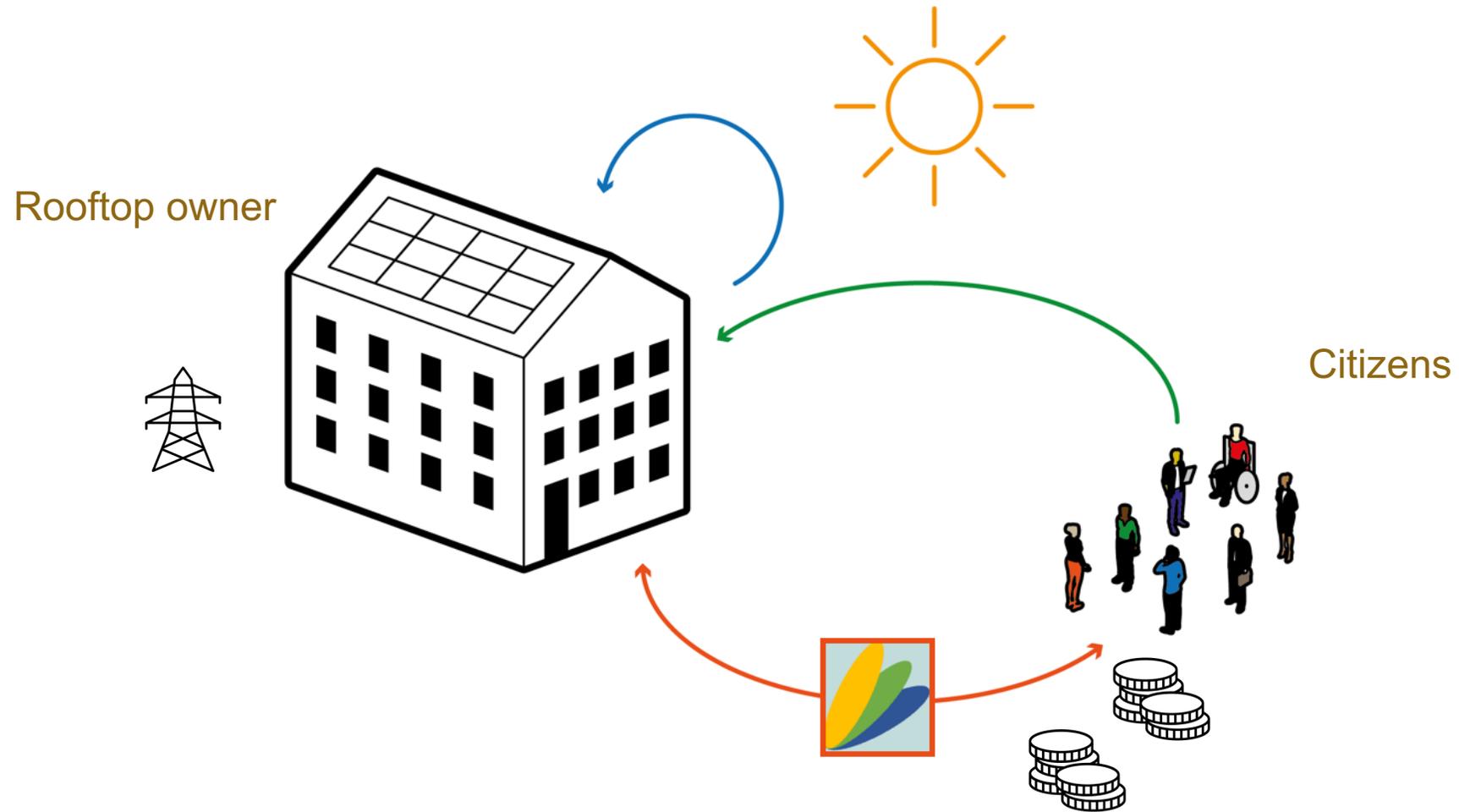


# Comparison with Swiss Household Energy Demand Survey data

In comparison with the Swiss average citizen (SHEDS 2018/2021), early adopters are:

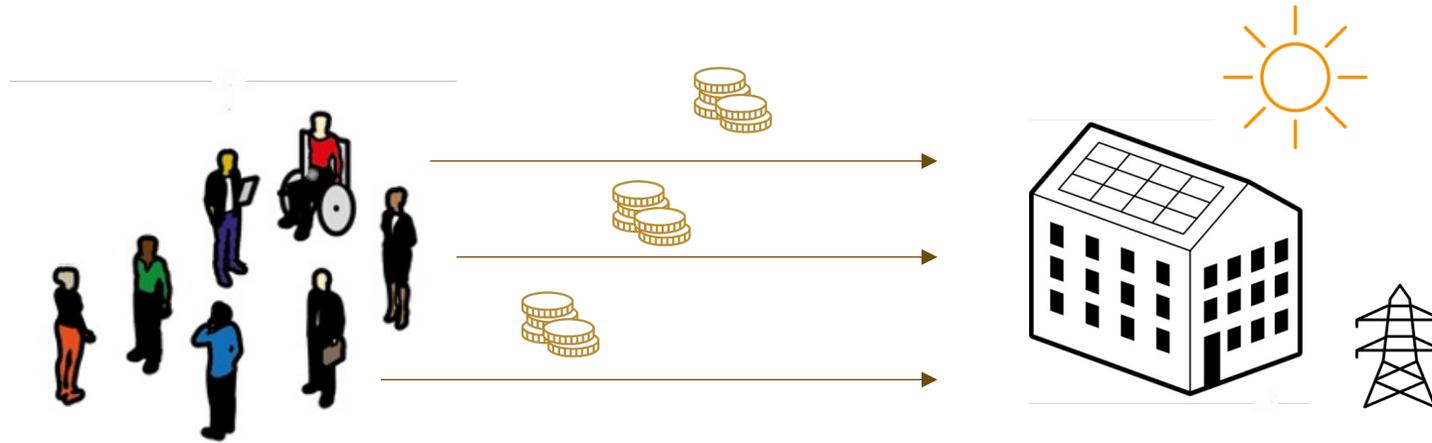
- + politically slightly more left-leaning
- + higher biospheric and lower hedonic values
- + above average income
- + more engaged in associations
- + ... specifically in environmental, local or political associations

# What are citizen-financed solar projects (CiFi PV)?



# What are citizen-financed solar projects (CiFi PV)?

Citizens financing a solar project located elsewhere than their own rooftop



# Three types of early adopters

	<b>The local ecologists</b> n = 184	<b>The indifferent</b> n = 105	<b>The allround fans</b> n = 221	
Age	58.6 b	55.2 b	47.7 a	30.8 (2,503) ***
Male°	72.3 a	77.7 ab	81.3 b	$\chi^2 (2) = 4.6$
Cooperative°	4.9 a	5.7 a	6.3 a	$\chi^2 (2) = 0.4$
Tenant°	39.7 a	36.2 a	50.2 b	$\chi^2 (2) = 7.4 *$
Owner°	55.4 a	58.1 a	43.4 b	$\chi^2 (2) = 8.6 *$
Monthly income	4.5 a	4.6 a	4.6 a	0.5 (2, 464)
Level of education	6.1 ab	5.8 a	6.2 b	3.7 (2,498) *
Political orientation	3.3 a	3.8 b	3.6 ab	3.6 (2, 501) *
Recommendation of offer	2.5 b	2.3 b	2.8 a	8.7 (2, 507) ***
Readiness to reinvest	4.1 a	3.4 b	4.3 c	24.2 (2, 507) ***
Altruistic	4.2 b	3.9 a	4.2 b	14.0 (2, 507) ***
Egoistic	2.3 b	2.4 b	2.7 a	19.5 (2, 507) ***
Biospheric	4.6 a	4.1 b	4.5 c	24.5 (2, 507) ***
Hedonic	3.4 b	3.4 b	3.7 a	11.7 (2, 507) ***

# Theoretical background

## Material participation and energy citizenship

- Role of citizens in the energy transition is changing (Devine-Wright, 2007)
- Material objects as vessel for civic engagement in political matters (Marres, 2015)
- Electric cars as example for civic engagement (Ryghaug et al, 2018)

Does CiFi PV function as a material participation in the energy transition?  
What implications could there be for the energy citizenship concept?

# Study I – Study design & data collection

## Study design

- Qualitative, semi-structured interview study
- Interview guideline:
  - a. Narrative account on participation decision-making process
  - b. Perceived added-value through participation
  - c. Personal level of civic and political engagement

## Data collection

- $n = 19$
- Data collection between July and September 2021



Adapted and extended scale by authors

