

eccee 2019

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Behind closed windows

An actor-centred analysis of barriers for the diffusion of energy efficient ventilation systems in residential buildings

Results from the research project

Ventilation innovations: from niche to mainstream

Presentation & paper: Thomas Adisorn, Florin Vondung

Funded by:

FORSCHUNGSINITIATIVE
ZukunftBAU

› Policy context

Climate-neutral building stock by 2050 through i.e. increase of energy efficiency

› Technology relevance

Reduction of heat energy losses due to conventional ventilation techniques; Reduction of health risks

› Deployment rate by building type

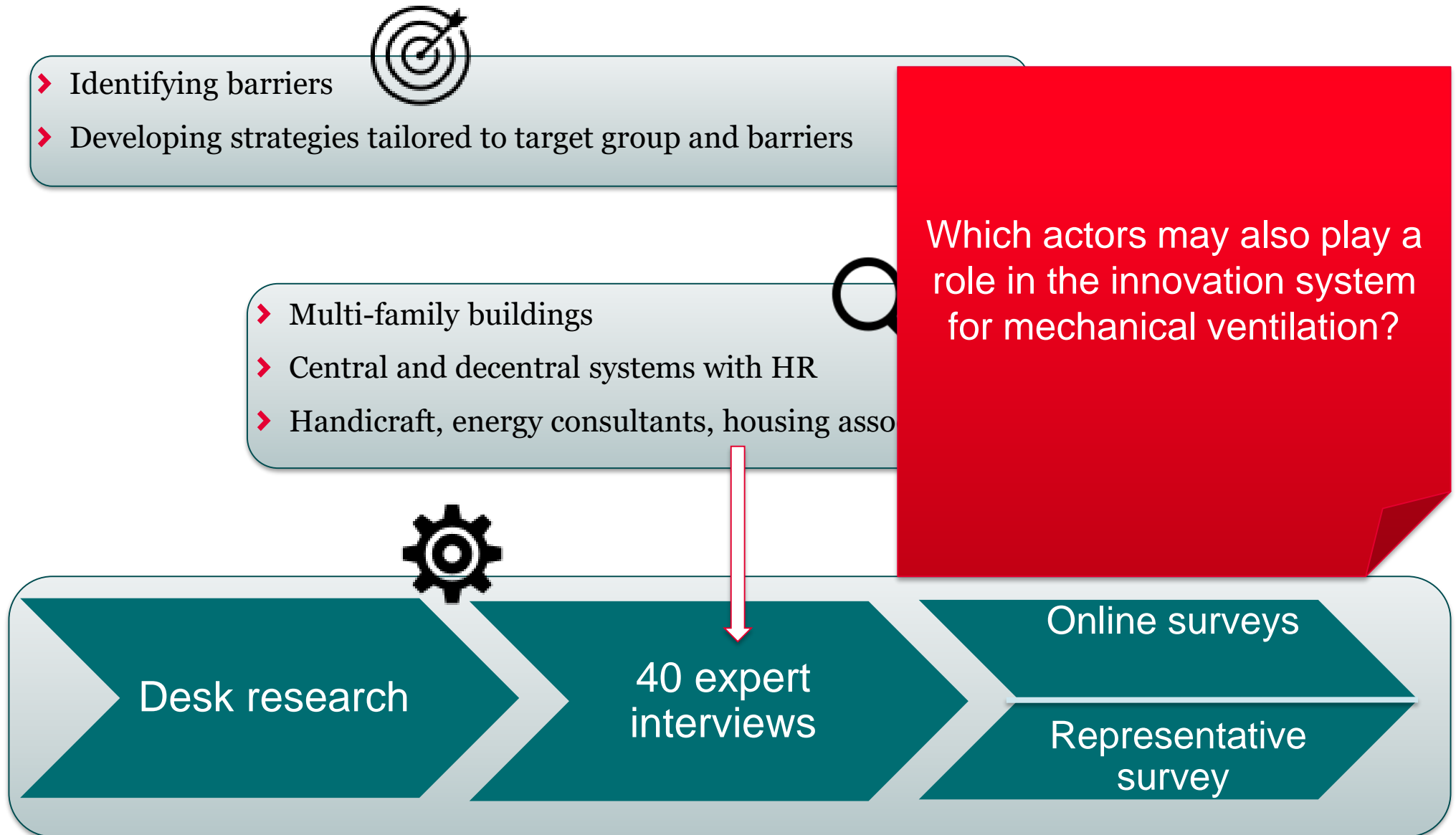
Deployment	All (SFH/TFH + MFH)	SFH/TFH	MFH
W/out Ventilation system	96,0 %	96,2 %	94,6 %
Ventilation system w/out HR	1,4 %	0,9 %	4,2 %
Ventilation system w/ HR	2,6 %	2,8 %	1,2 %

› Deployment rate by year of building construction

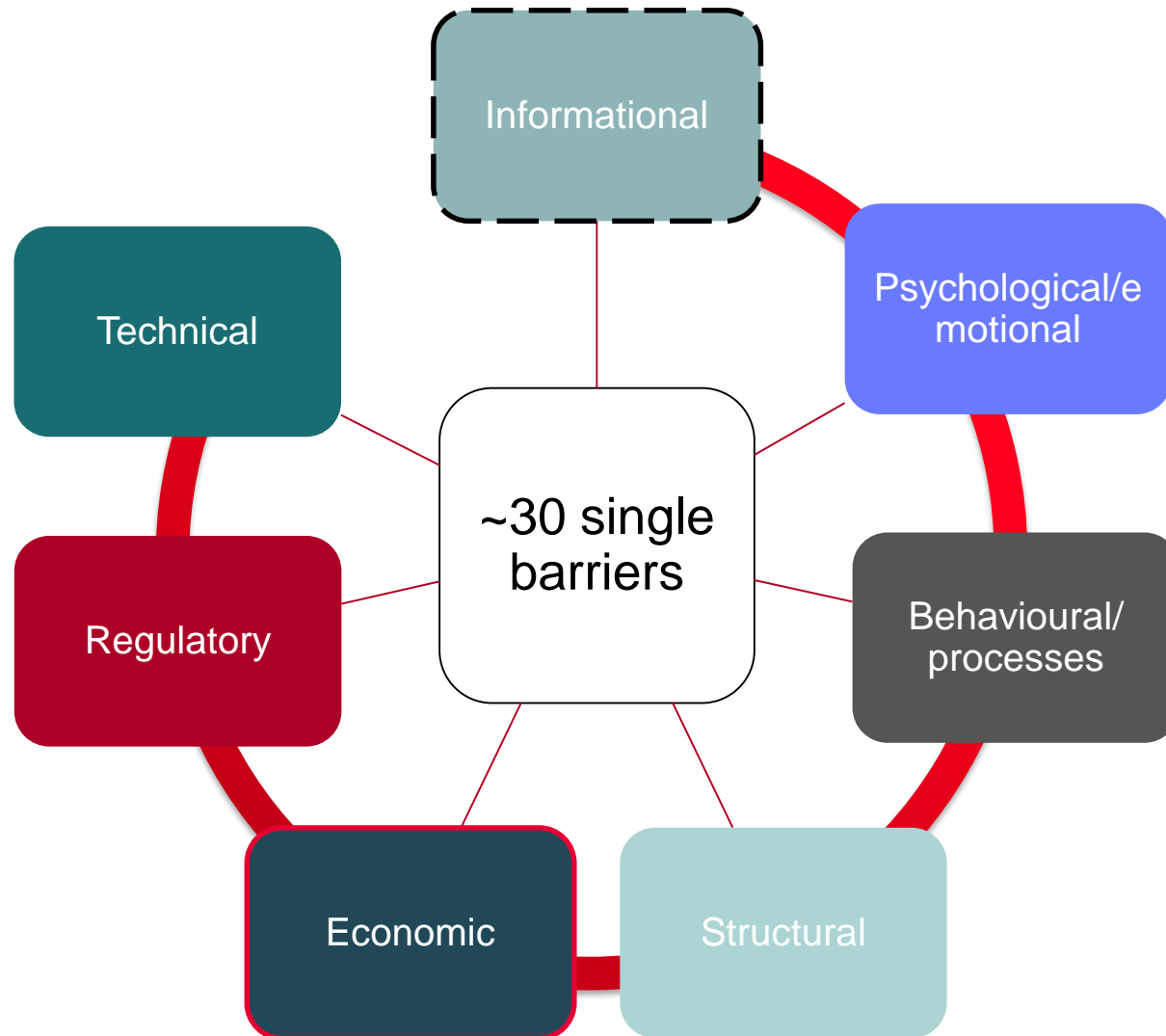
Year of construction	Until 1978	1979–2009	Since 2010
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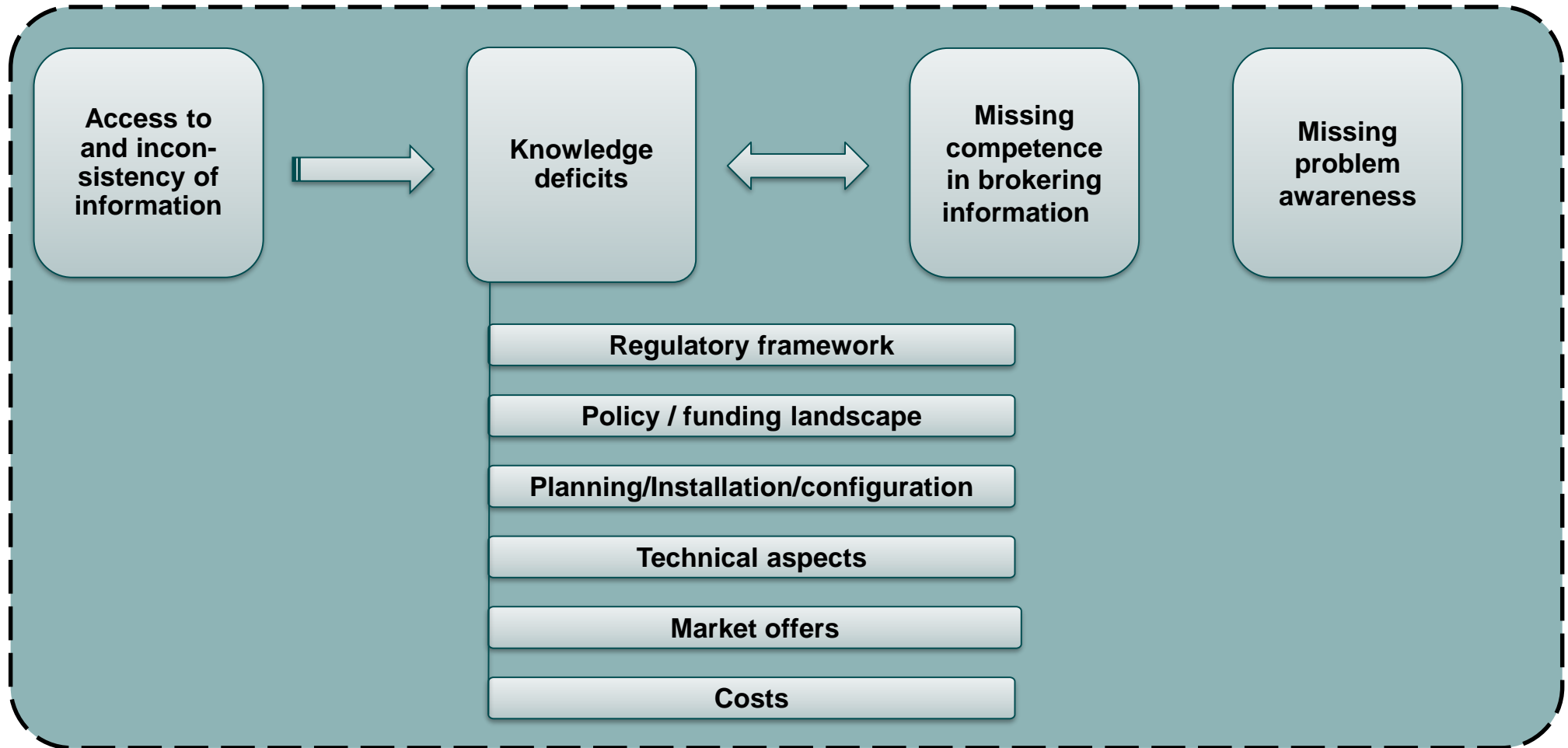
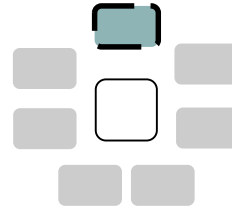
„Ventilation innovation“

The research project's objectives, focus and approach



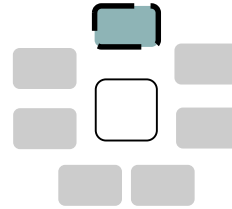
Sources: Dena (2016): Der Dena-Gebäudereport 2016. Dena, Berlin. • Icons from: <https://icons8.de/icons/>





Results

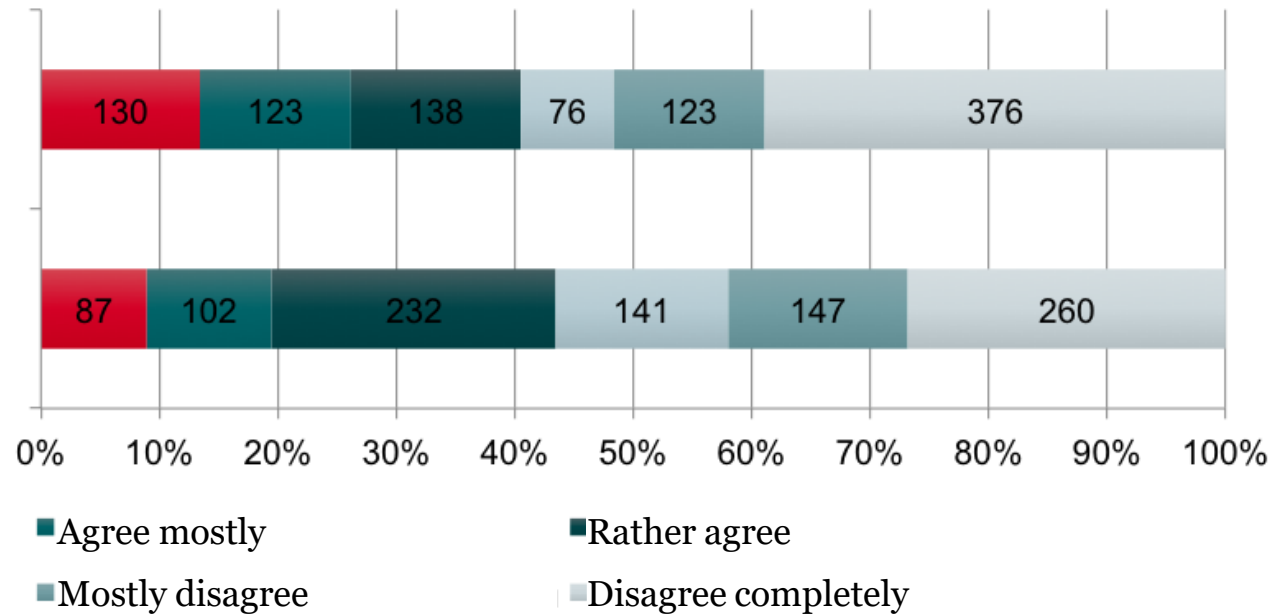
Informational barriers



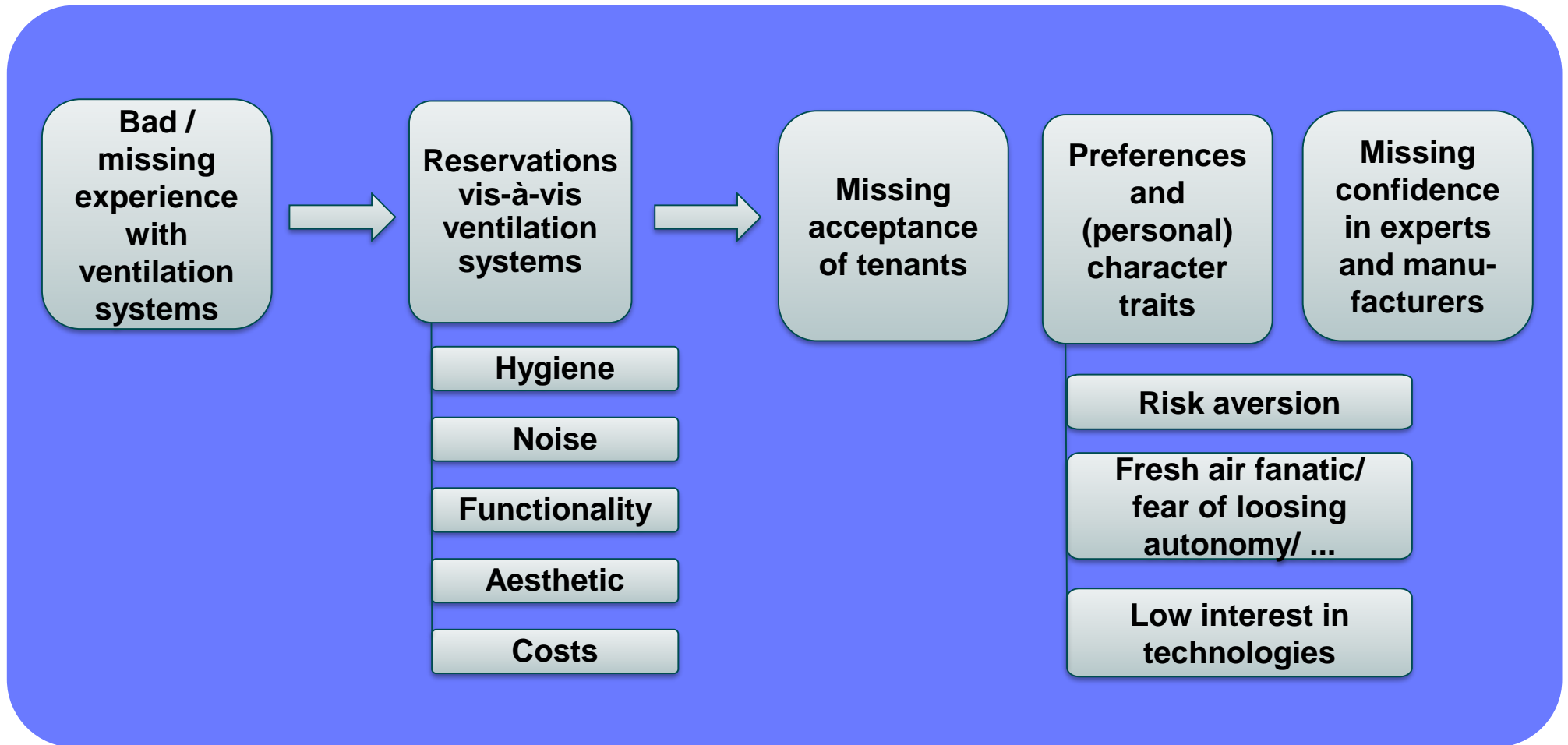
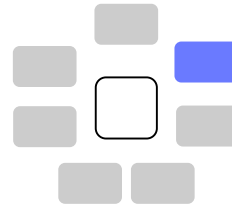
“Ventilations systems are in no ones minds. That’s the way it is. [...] there is no information.”
(Private investor)

In modern flats w/out ventilation system its
better to often tilt a window
(n=966)

Health risks due to air pollution exist mainly
outdoors.
(n=968)

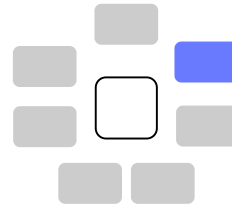


Source: Based on representative survey (n=1.008)



Results

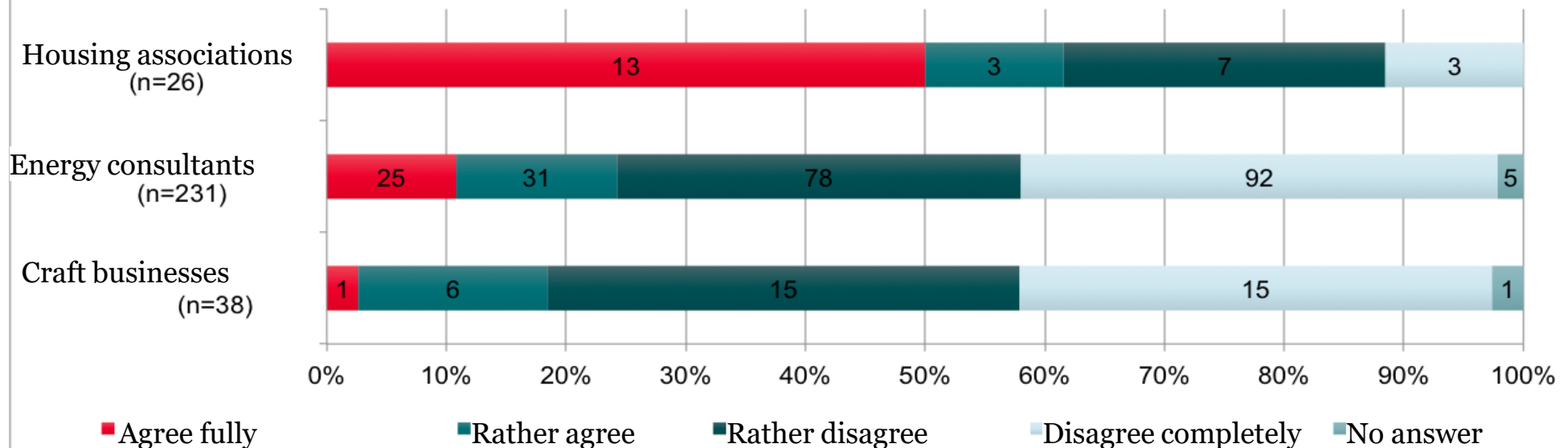
Psychological / emotional barriers



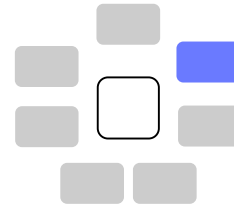
“Do we have to re-educate tenants on how to live? Because technology determines our lives... I’m rather someone who says: people should determine how to live. We have to speak about CO₂ – out of question – but the question is how.“

(CEO of a housing association)

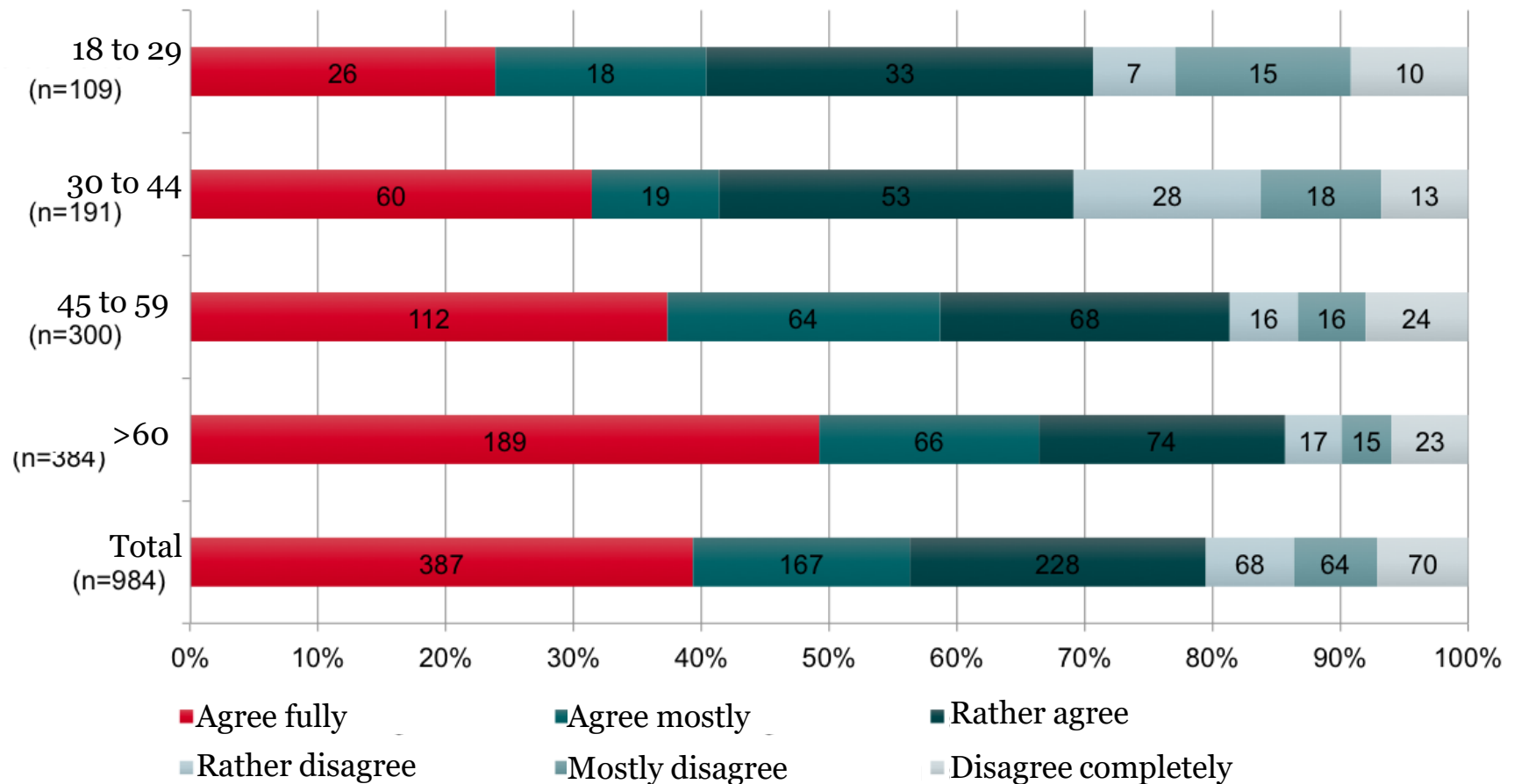
In case of doubt I would always give manual ventilation priority over technical solutions.

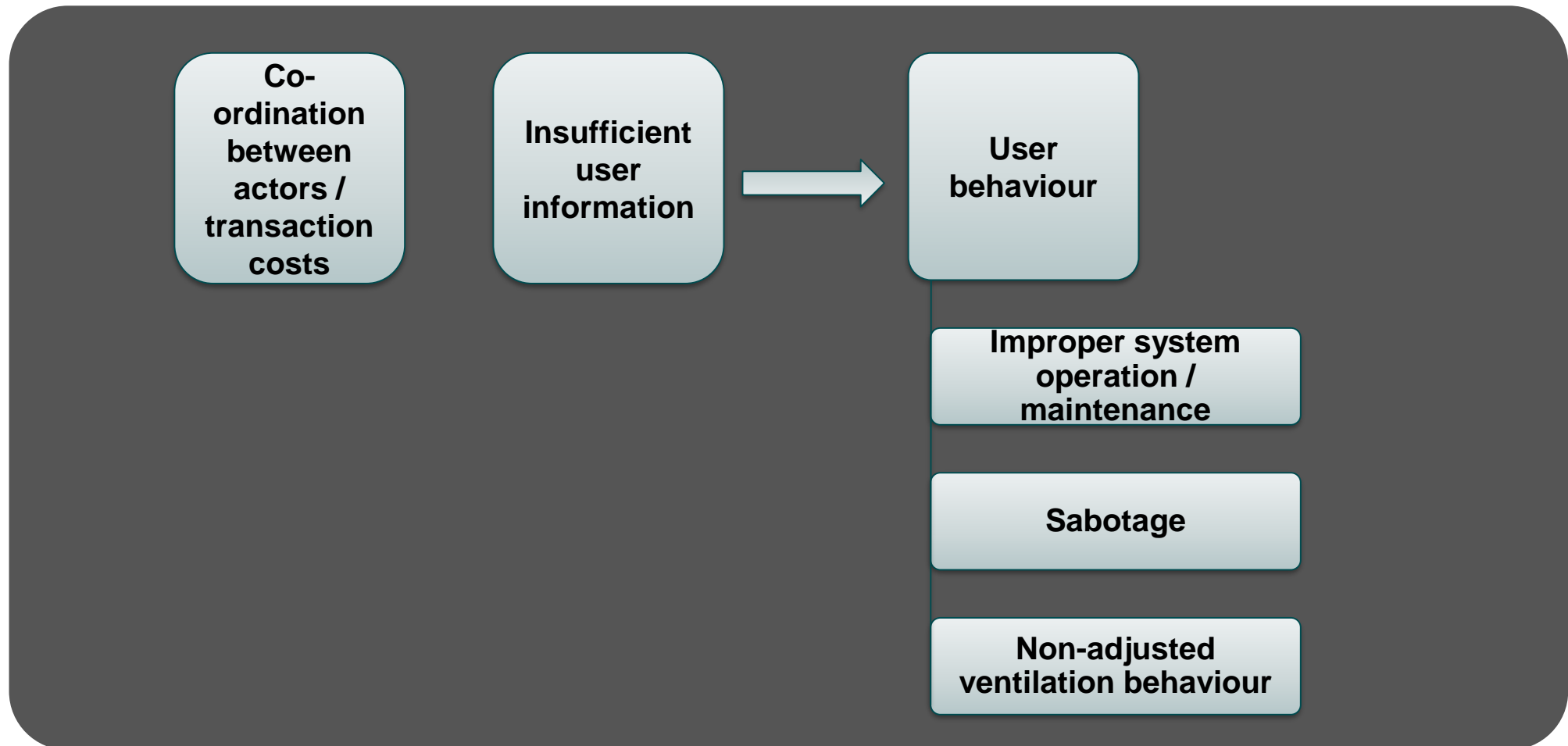
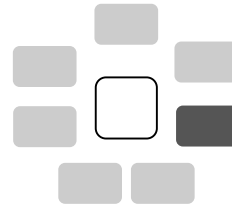


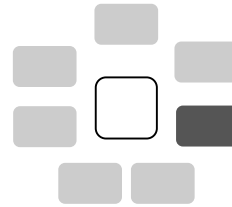
Source: Based on online survey among housing associations, energy consultants and craft businesses



In case of doubt I would always give manual ventilation priority over technical solutions.



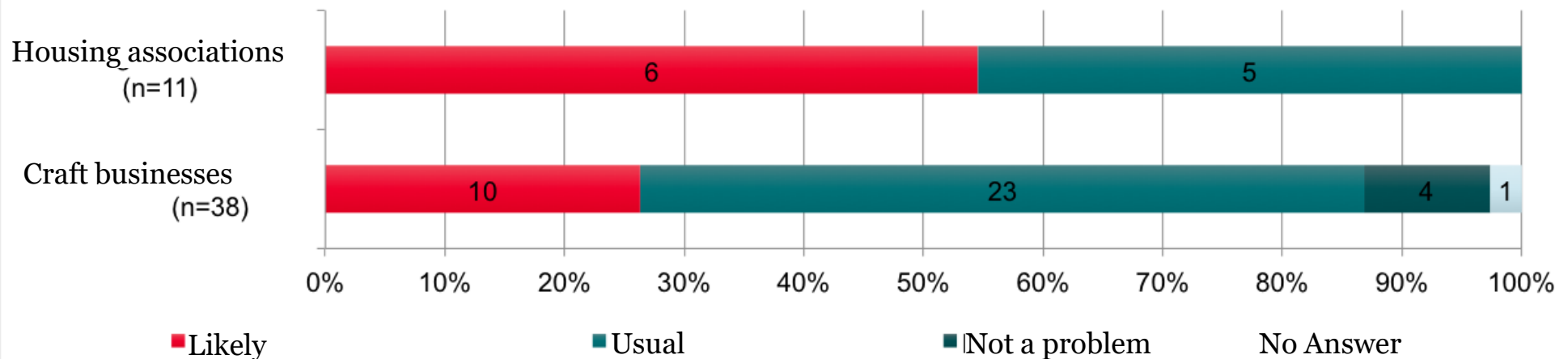




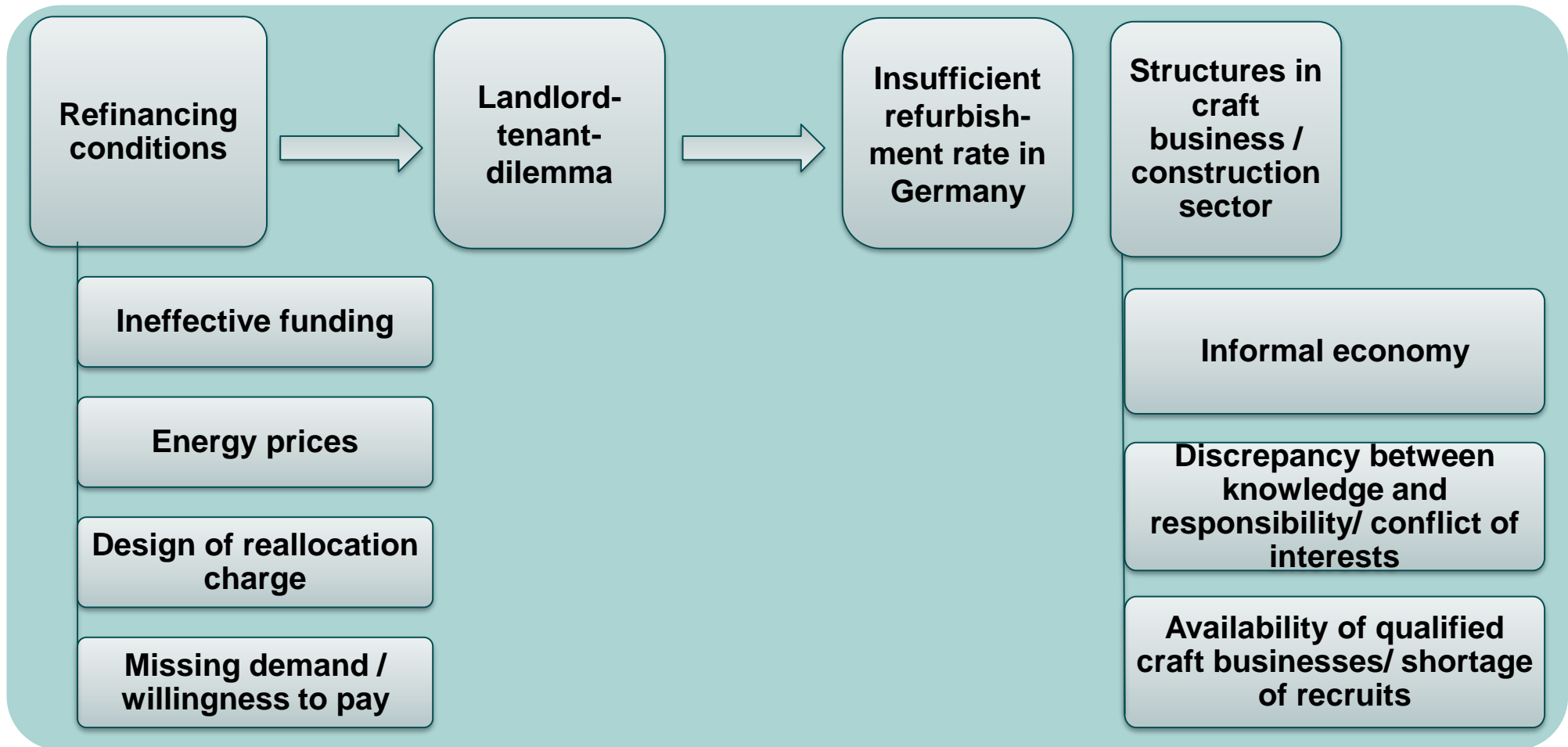
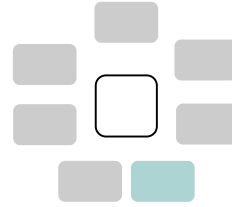
“If the system is maintained properly, if it is configured according to the manufacturer [...] then they do work; however, we cannot board up windows to make the ventilation system function.”

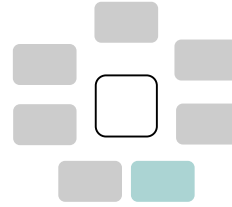
(CEO of a housing association)

**If problems occur with retrofitted ventilations systems with HR:
what are the most common causes?
[Tenants do not adjust their ventilation behaviour]**



Source: Based on online surveys among housing associations and craft businesses





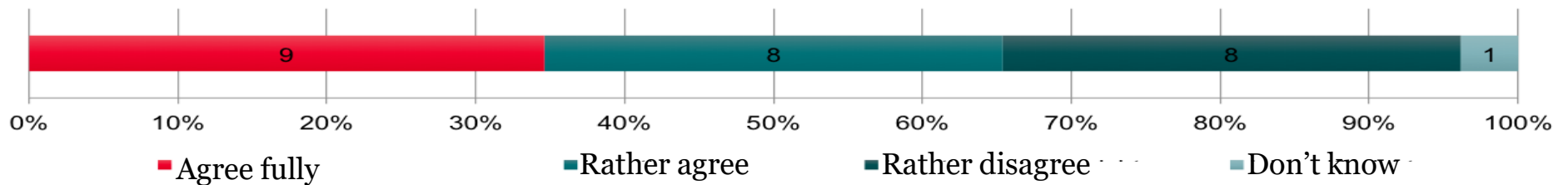
“[...] in our region, there was not a single one [qualified craft business]. And those doing ventilation, they do it for the commercial sector [...].“

(Private investor)

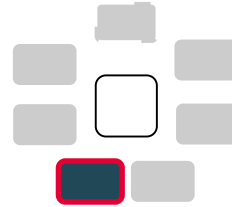
„At the moment it’s hard to find qualified craft businesses.“

(CEO of a housing association)

There is a lack of qualified craft businesses for the proper realisation of ventilation systems with HR.



Source: Based on online survey among housing associations.



Availability
of low cost
alternatives

Other
investment
priorities

Costs /
economic
viability

Planning and installation
costs

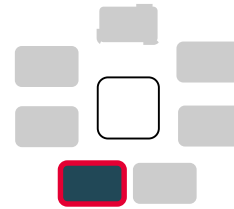
Operating costs

Investment costs

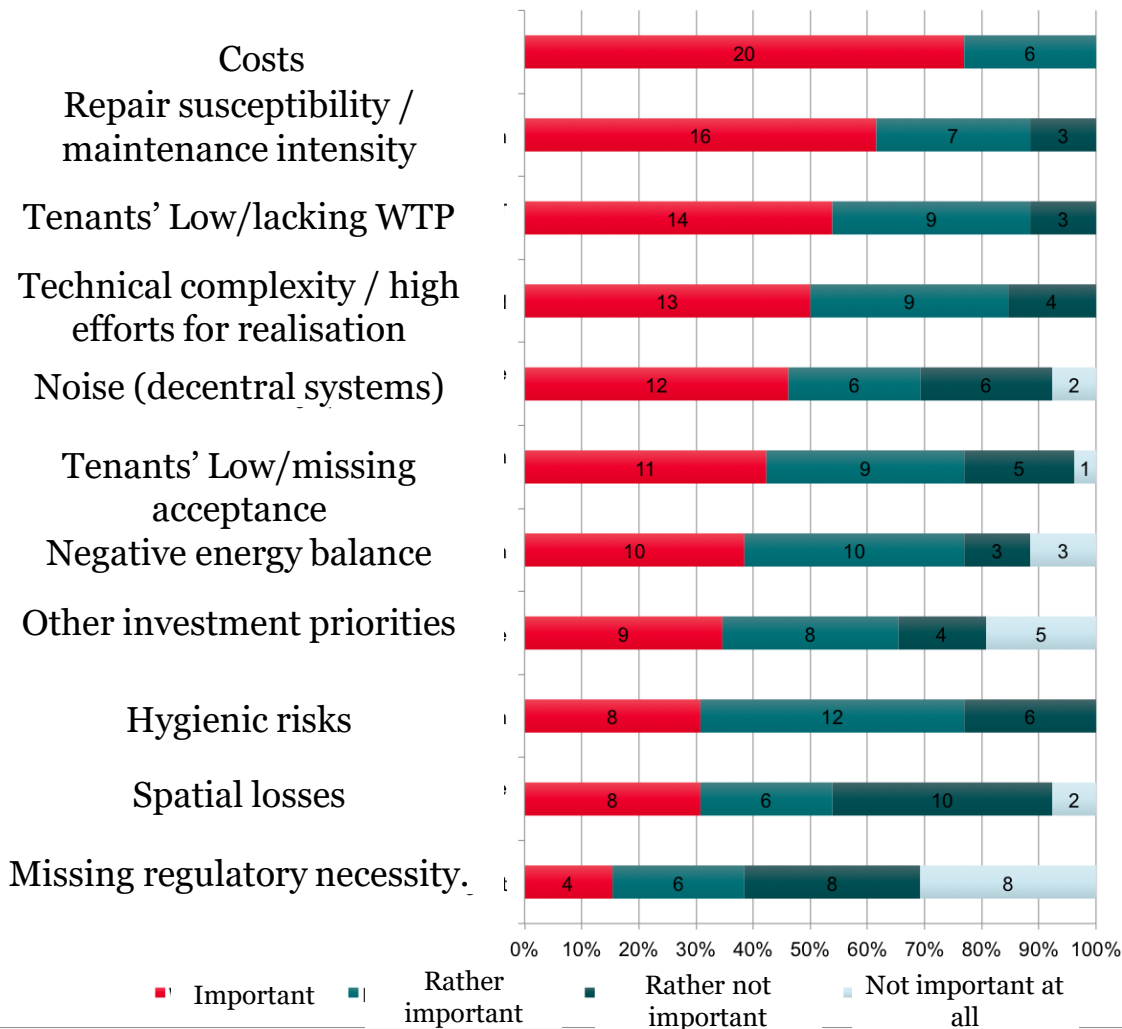
How can the attractiveness for
handicraft businesses be
improved?

Results

Economic barriers



What reasons speak against a retrofit with a ventilation systems with HR?



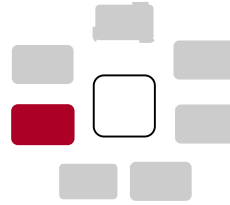
“It’s a matter of costs, of course.”

(Private investor)

“It’s not done with an (upfront) investment [...]. You have relevant maintenance costs.”

(Technical representative of a housing association)

Source: Based on online survey among housing associations



**Regulation
for heritage
protected
buildings**

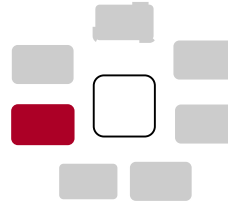
**Fire safety
regulation**

**Building
standard
(EnEV)**

**Design of
DIN 1946-6**

Results

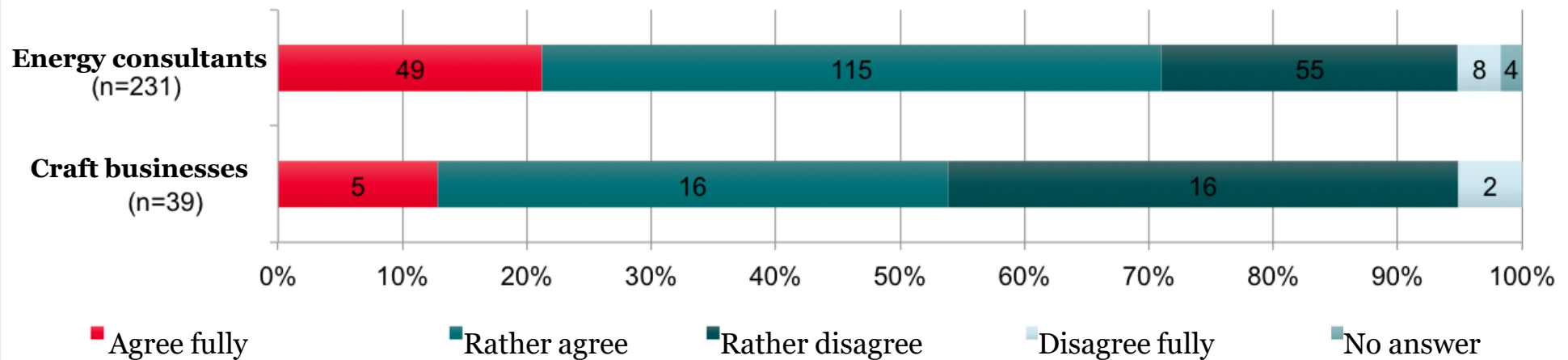
Regulatory barriers



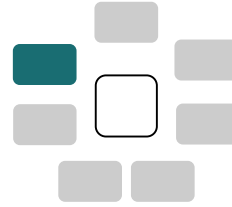
“Did you read this thing [DIN 1946-6]? That’s a monument of German norms. I think it’s 124 pages plus [...]. A normal craft business can’t deal with it. It took me three, four weeks to get through this thing.”

(Technical representative of a housing association)

The application of DIN 1946-6 does not pose any major problems for me.



Source: Based on online survey among energy consultants and craft businesses

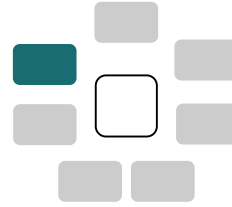


**Building
character-
istics (e.g.
height)**

**Complexity
of system
planning**

**High effort
for
installation**

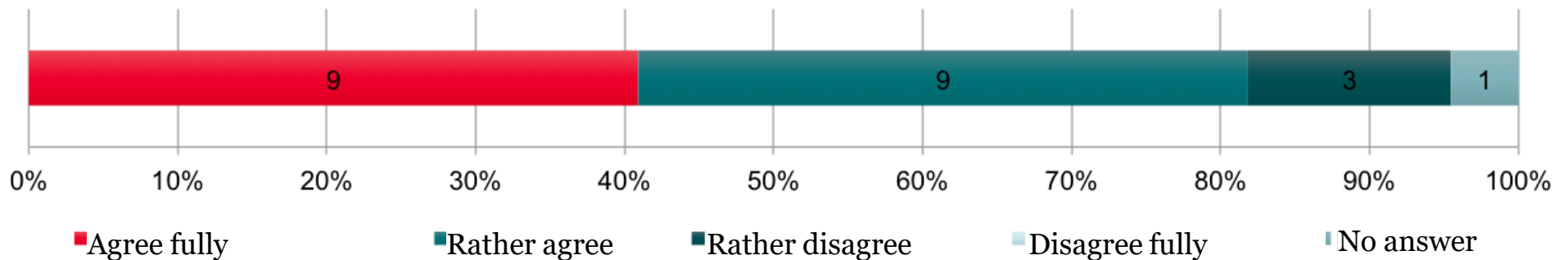
**Adequate
techn./perf
ormance
(noise/air
exchange)**



“These are installation cross-sections and restrictions on usable space that result in a reduction in living space on the client's side.”

(Energy consultant)

The market does not provide solutions, which are necessary for nationwide retrofit with ventilation systems with HR.



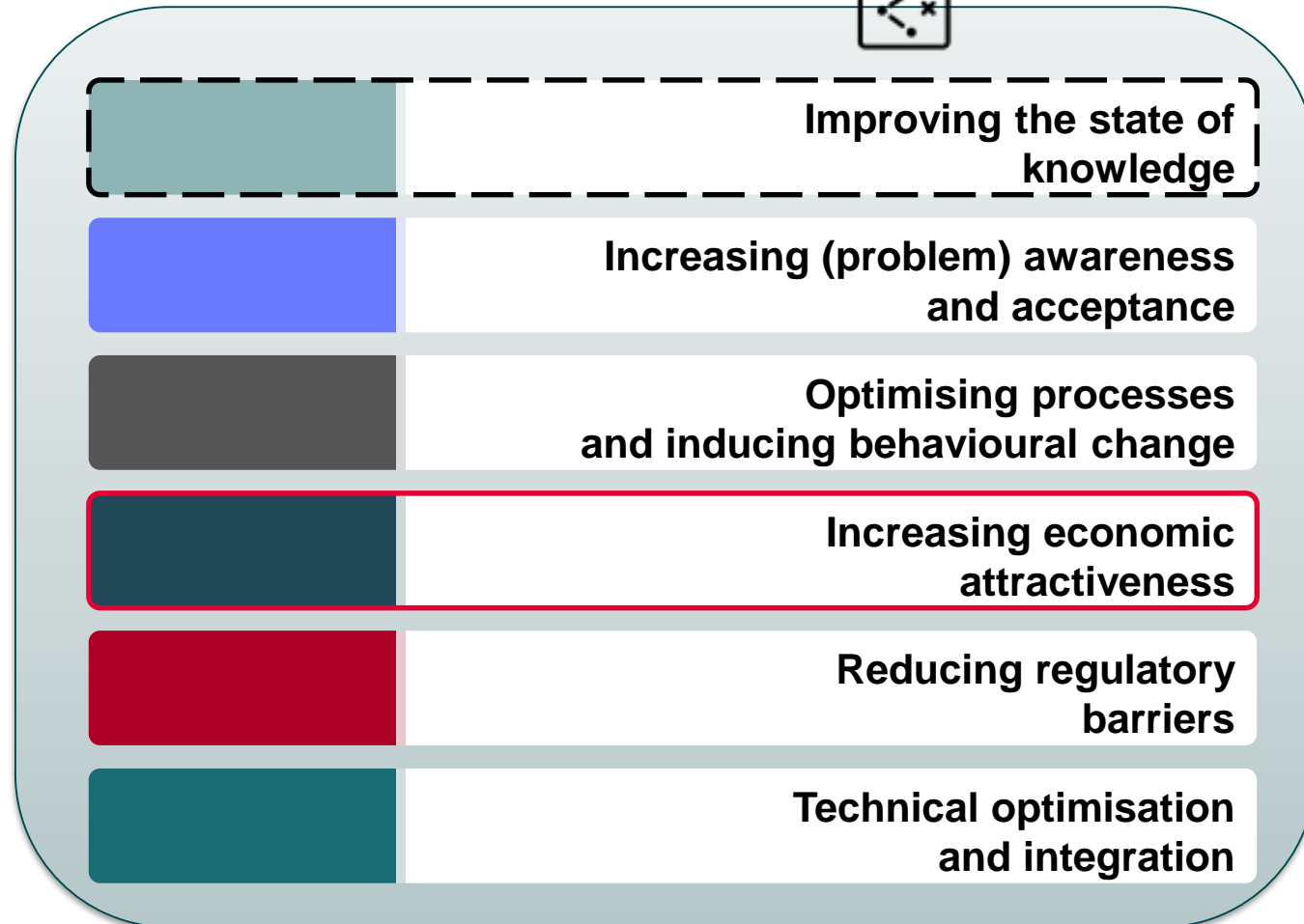
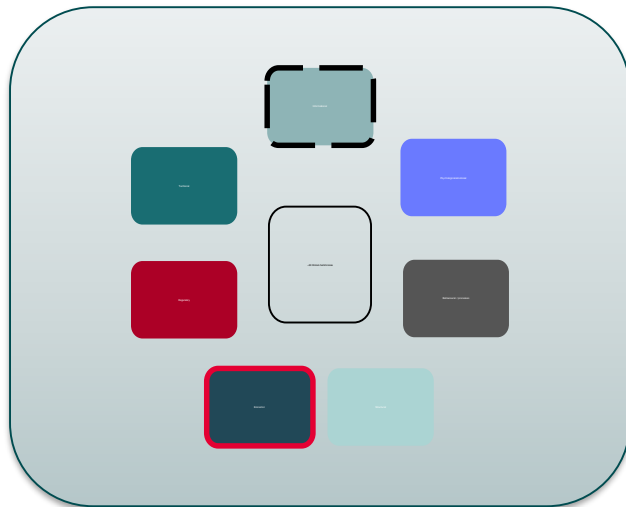
Source: Based on online survey among housing associations

Overall results

Key takeaways



- Reservations
- Negative cost-benefits-assessment
- Missing requirements



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**Thank you very much
for your attention**

Report available (in German): <https://wupperinst.org/p/wi/p/s/pd/651/>

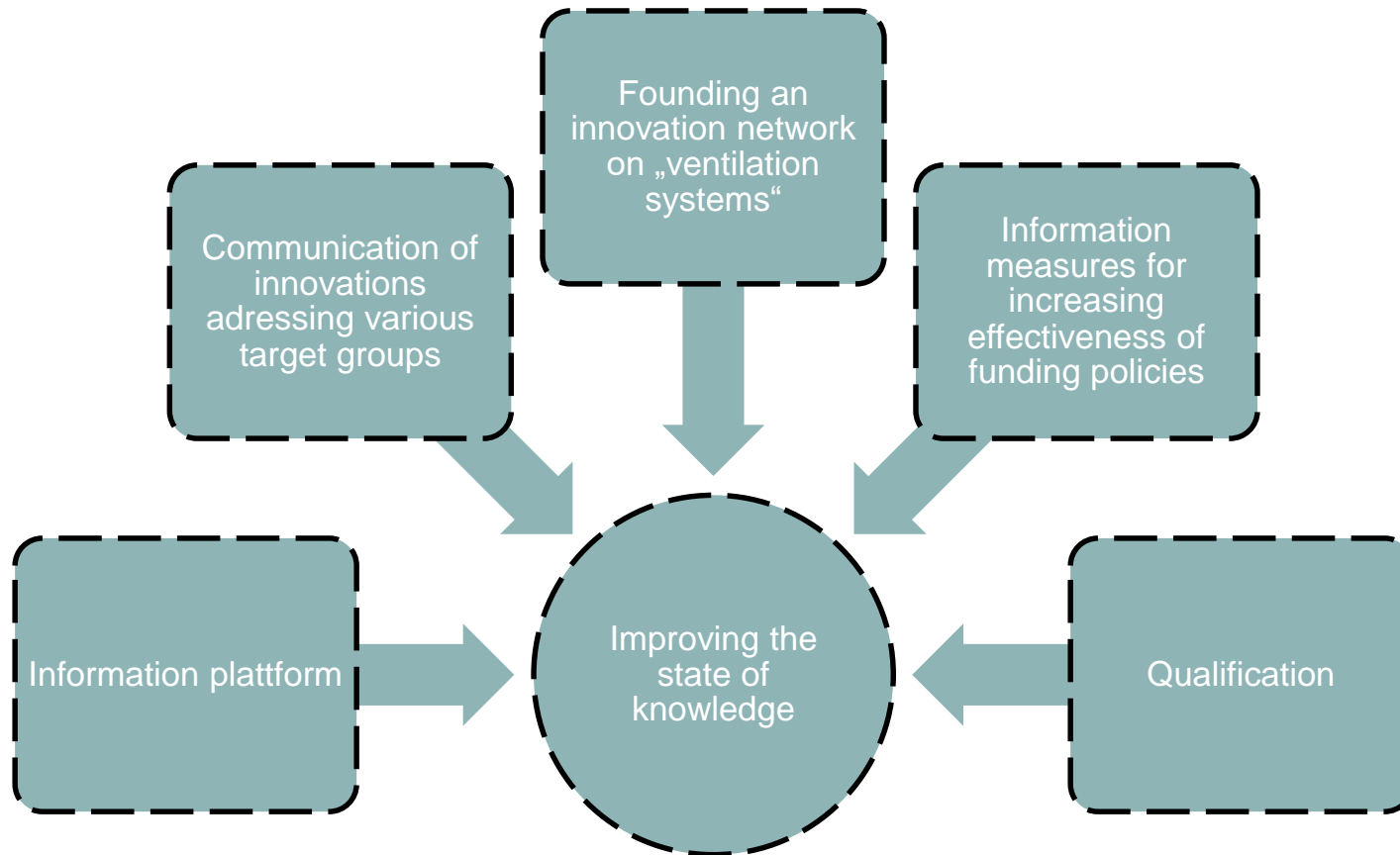
Which actors may also play a role in the innovation system for mechanical ventilation?

How can the attractiveness for handicraft businesses be improved?

Experience from your country to integrate innovative buildings technologies...

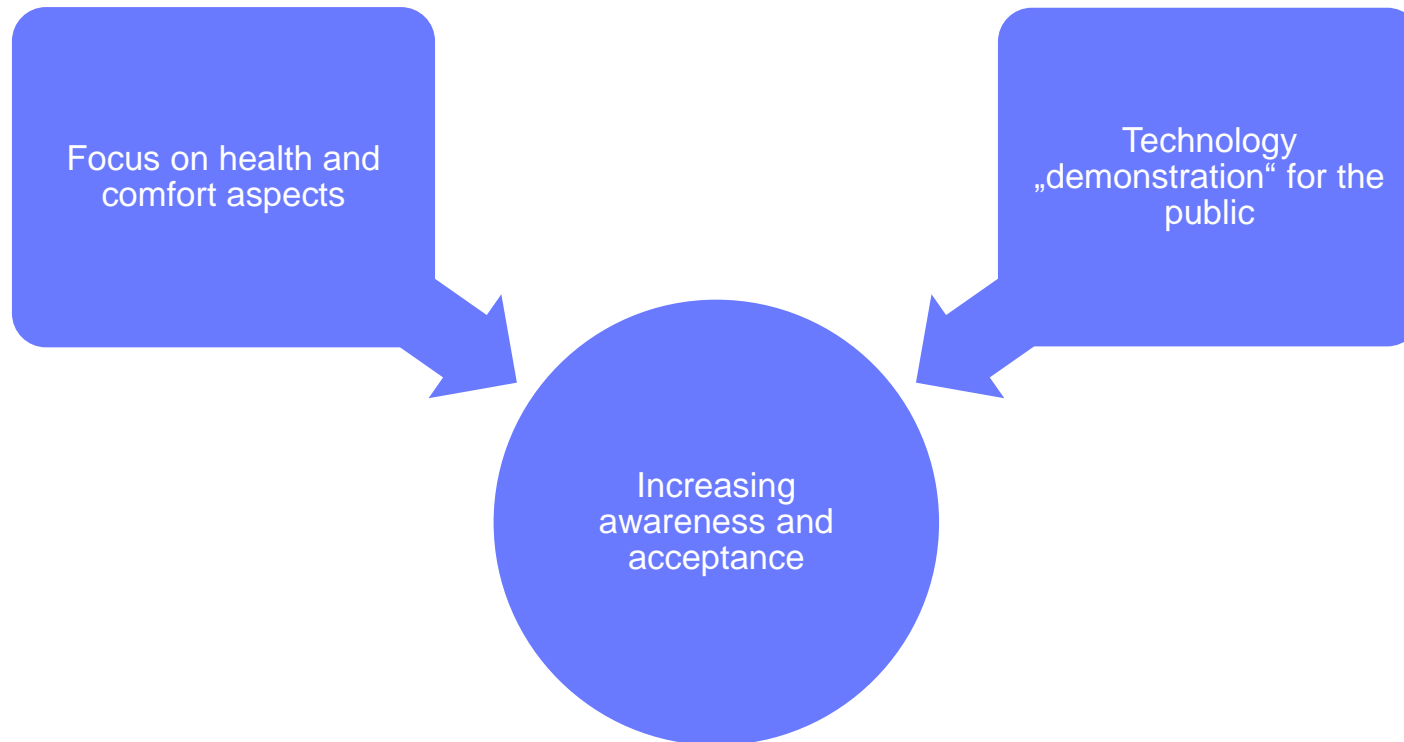
Handlungsempfehlungen

Verbesserung des Informationsstandes



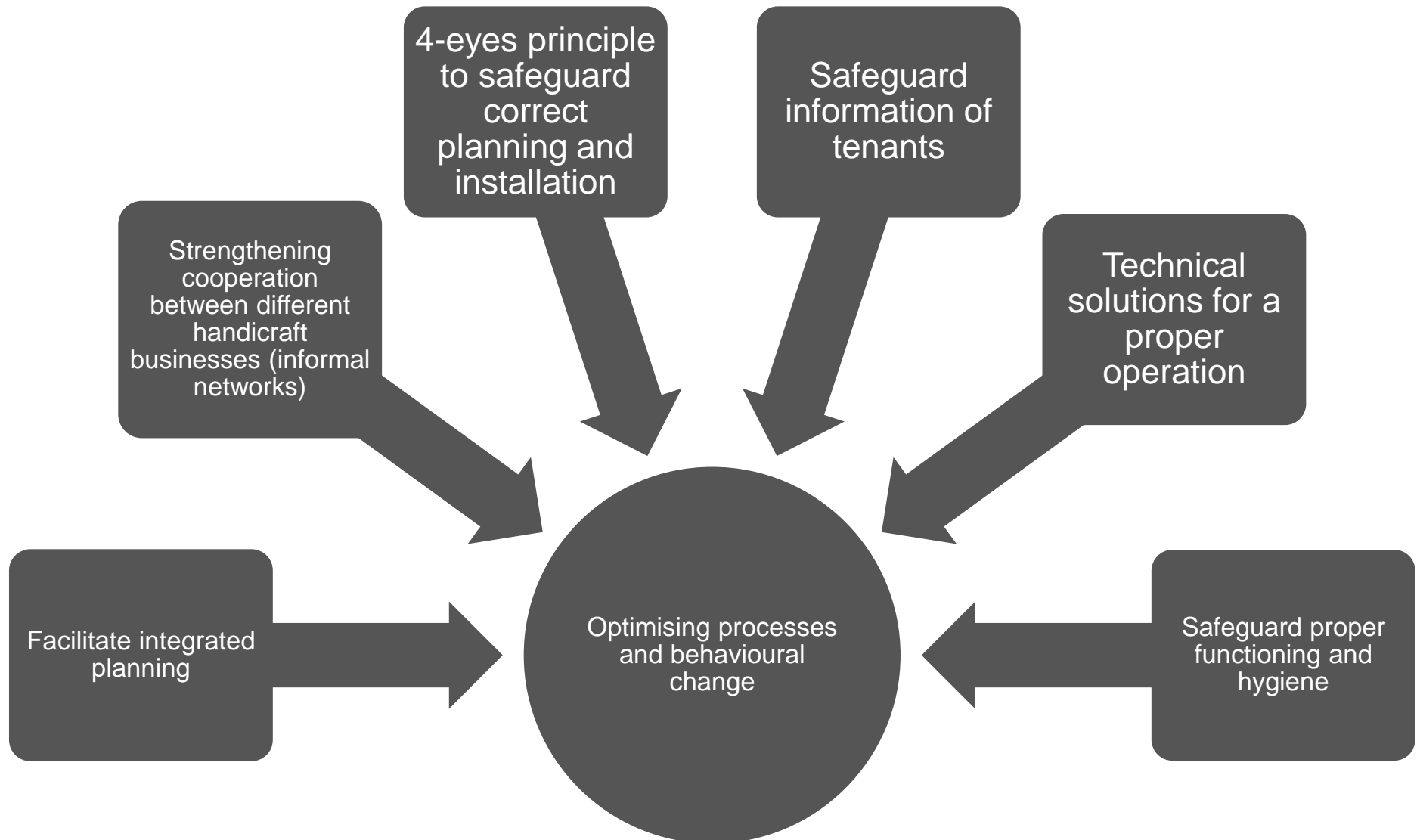
Handlungsempfehlungen

Schärfung des Problembewusstseins und Steigerung der Akzeptanz für KWL



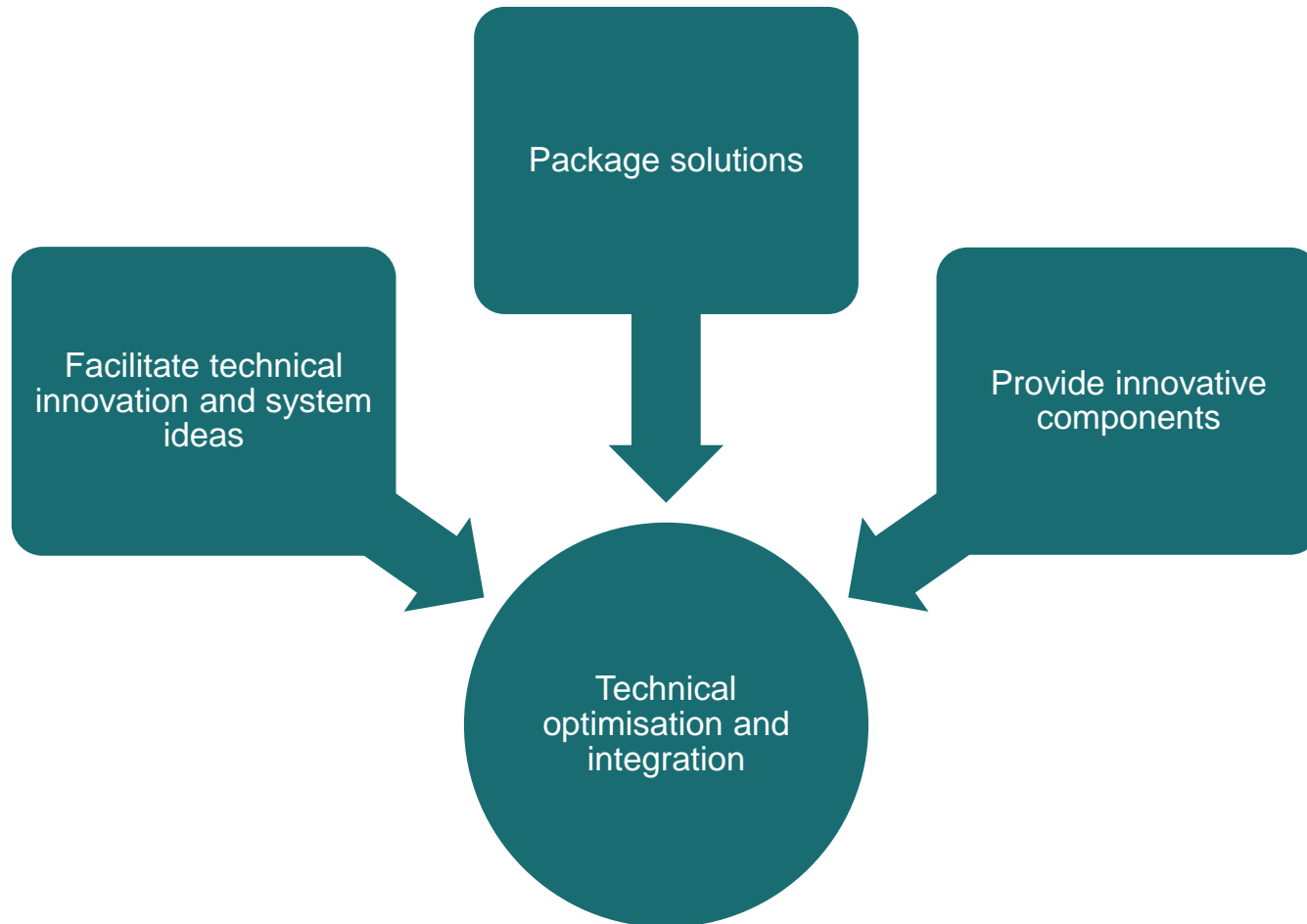
Handlungsempfehlungen

Prozessoptimierung und Verhaltensanpassung



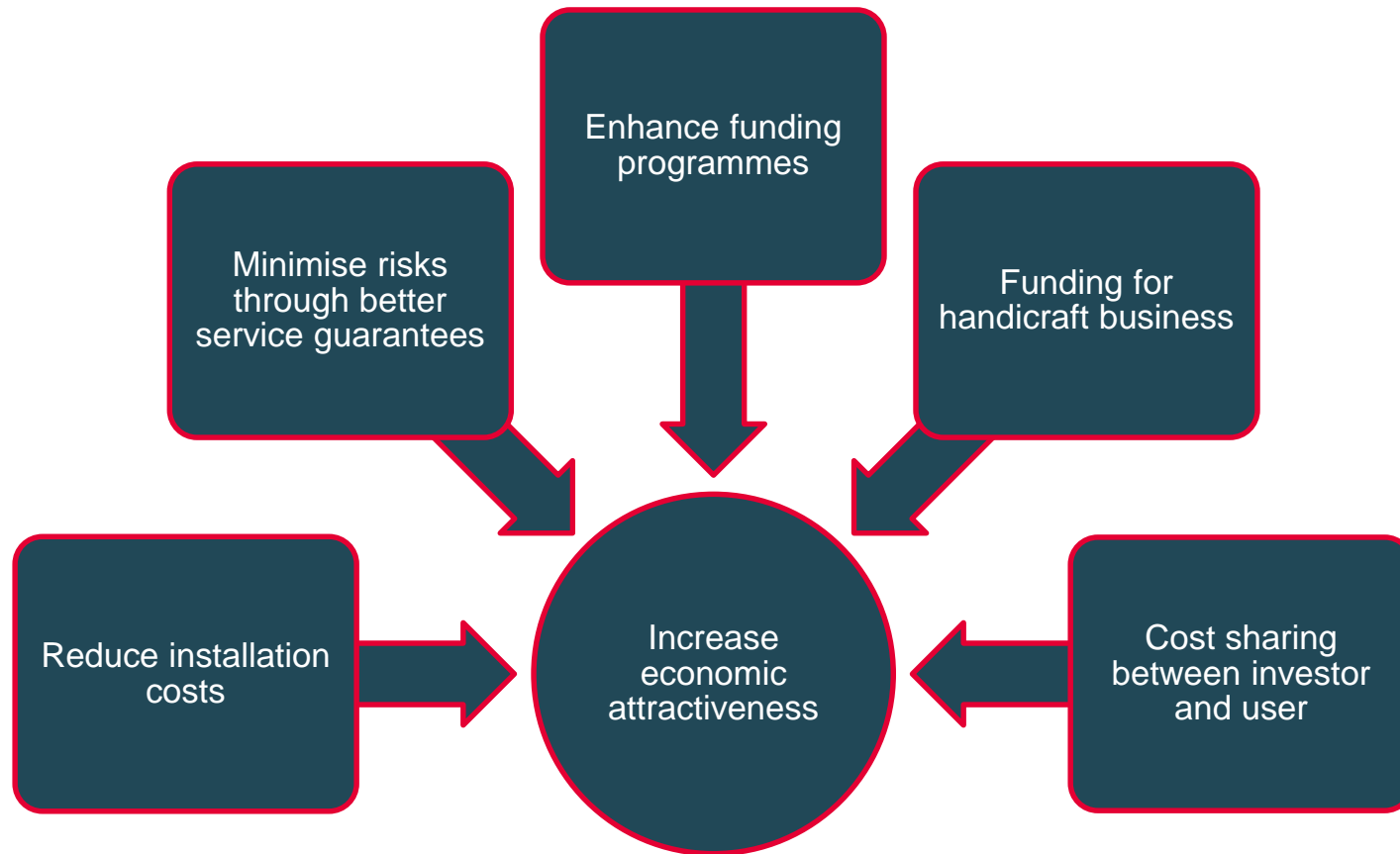
Handlungsempfehlungen

Technische Verbesserungen und Integration



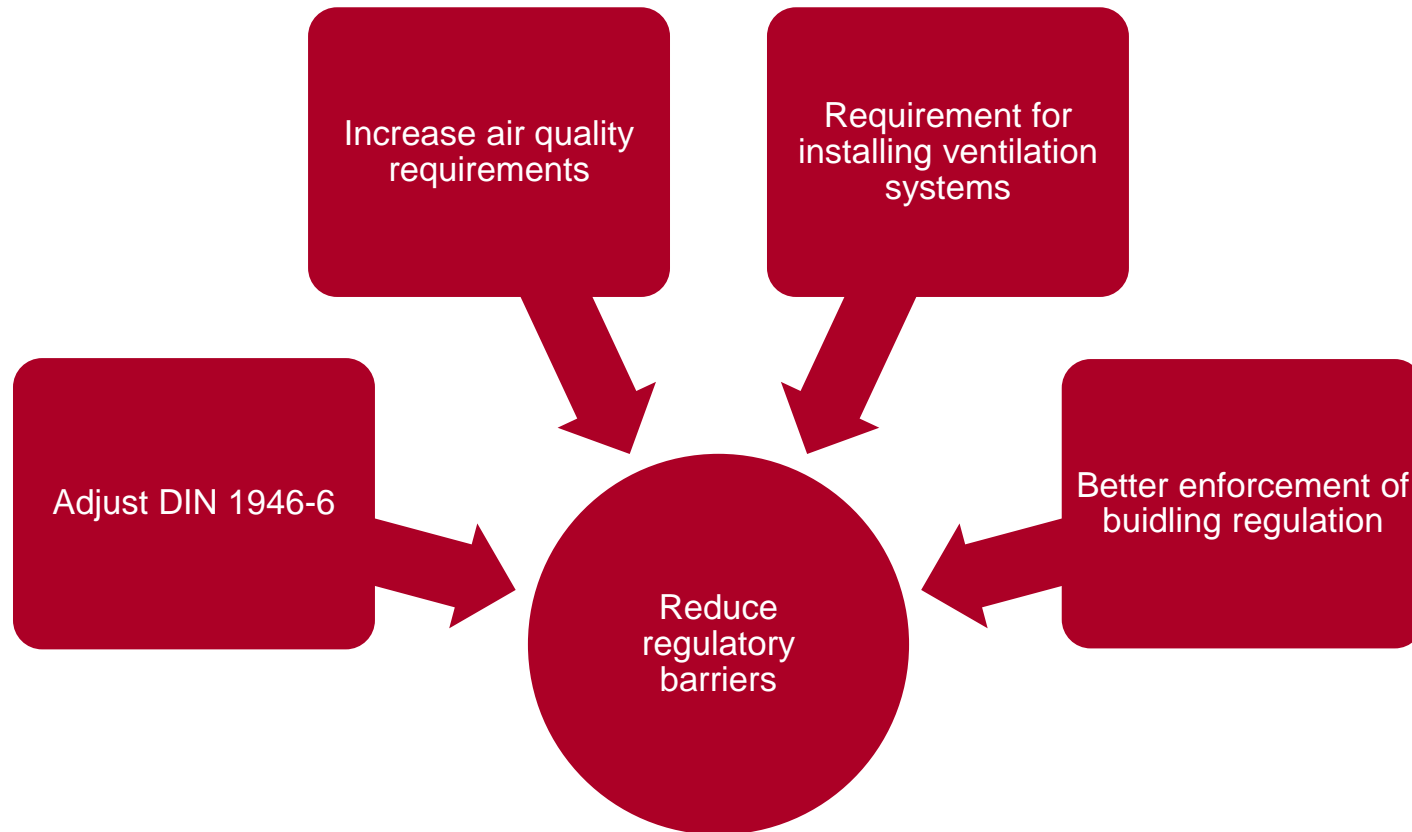
Handlungsempfehlungen

Steigerung der ökonomischen Attraktivität



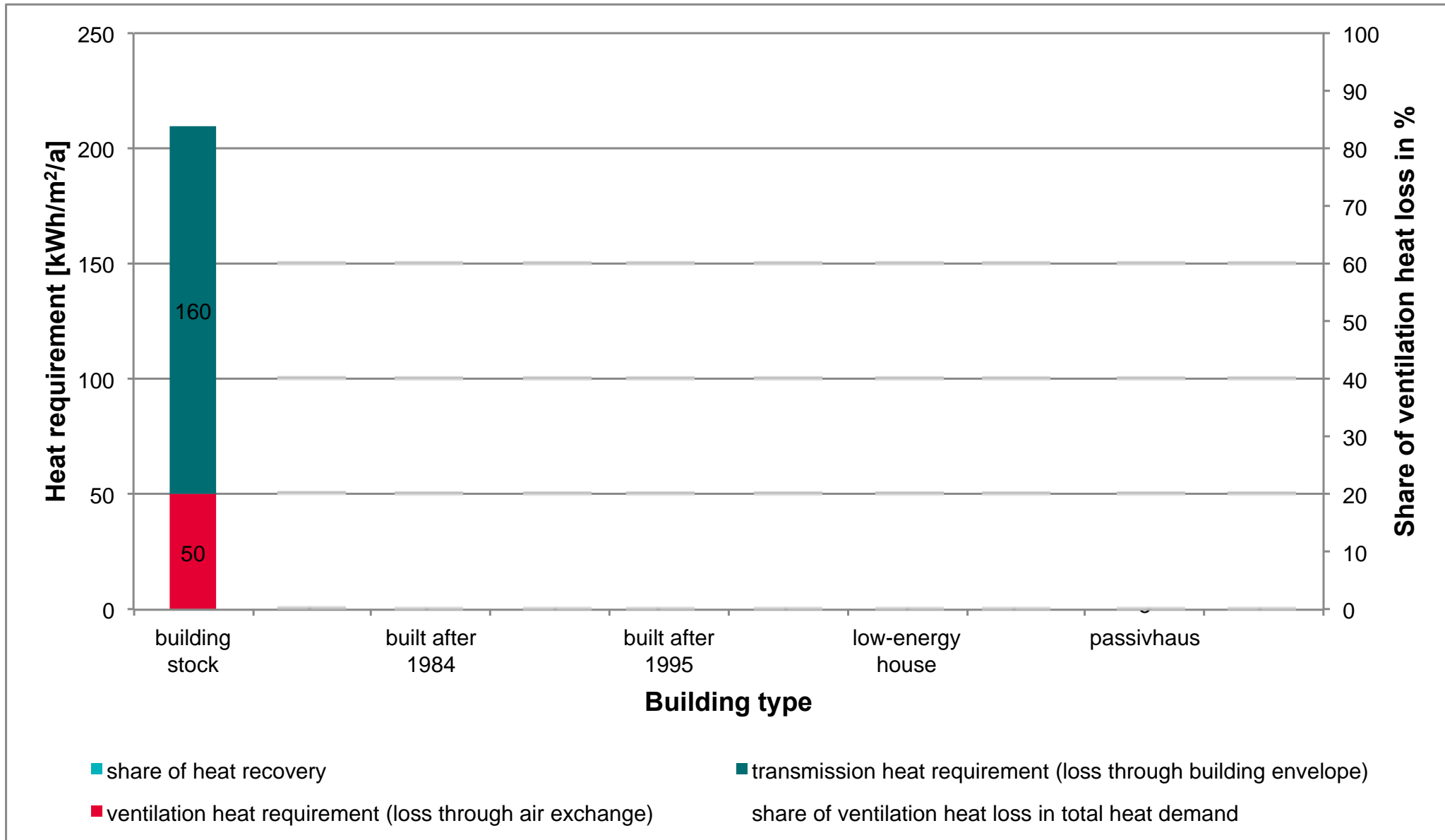
Handlungsempfehlungen

Abbau regulatorischer Barrieren



Background – Relevance

Ventilation heat loss by building standard



Source: based on Händel (2011): Ventilation with heat recovery is a necessity in “nearly zero” energy buildings. In: The REHVA European HVAC Journal, 03/2011: pp. 18–22.

Background – Deployment rate

Ventilation systems in Germany's building stock

...by building type (single- and two-family houses vs. multi-family houses)

Deployment	All (SFH/TFH + MFH)	SFH/TFH	MFH
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...by year of construction

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Source: Cischinsky/Diefenbach (2018): Datenerhebung Wohngebäudebestand 2016 – Datenerhebung zu den energetischen Merkmalen und Modernisierungsraten im deutschen und hessischen Wohngebäudebestand. Institut Wohnen und Umwelt, 2018. Online: https://www.iwu.de/fileadmin/user_upload/dateien/energie/Endbericht_Datenerhebung_Wohngeb%C3%A4udebestand_2016.pdf