Rooftop Extension

A strategic decision-making framework for Housing Associations in the Netherlands

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Questions

Introduction

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Problem Statement

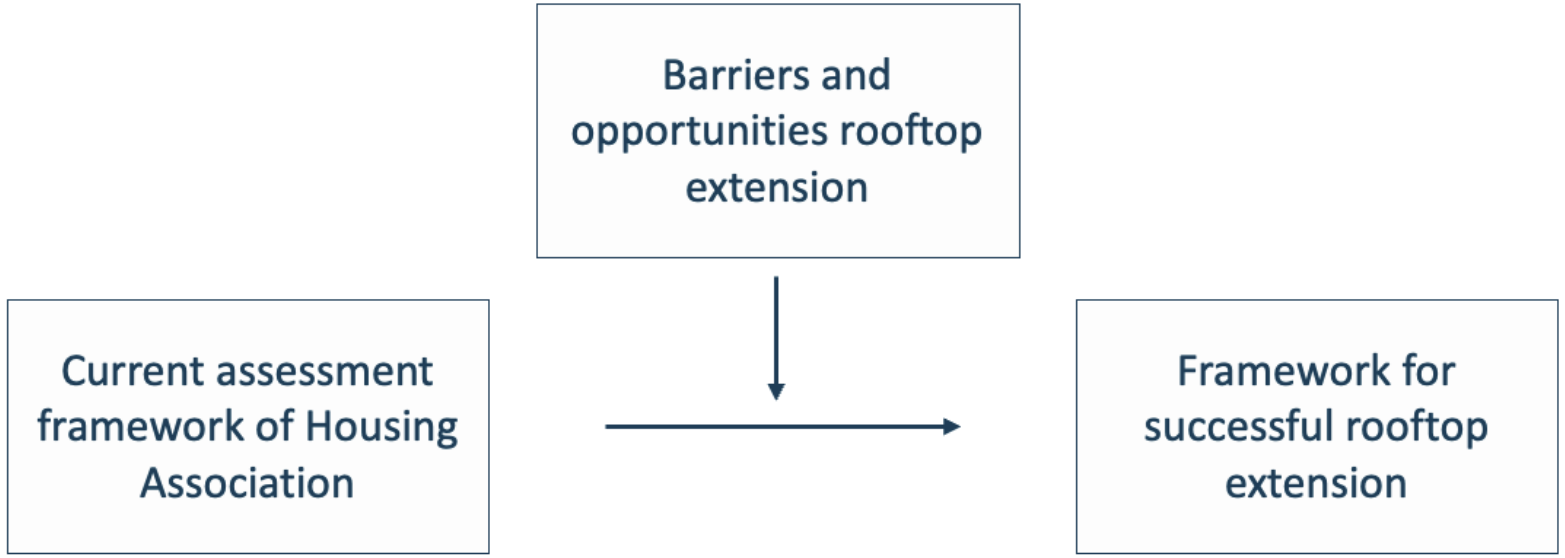
- ☑ Rooftop extensions have theoretical potential to contribute to the housing challenge as a form of adaptive reuse.
- ☑ Studies have examined (technical) complexity by identifying barriers and enablers.
  (Amer et al., 2017, 2019; Floerke et al., 2014; Gillott et al., 2022; Julistiono et al., 2023, 2023; Sundling et al., 2019; Wijnants et al., 2019)
- ☑ The development process and decision-making at municipalities have been studied, as well as the complexity of decision-making at housing associations in general.
  (Sundling, 2018; Amer et al., 2017; Nieboer, 2011)
- ☒ The link to the investment practice of housing associations has not yet been established.

Research Question

How can housing associations **effectively assess the value of rooftop extensions** as a strategy to expand within the existing building stock?

Research Aim

Identifying barriers and opportunities



Understanding the current decision-making

Developing a decision-making framework

Figure 2: Conceptual model (own work)

Sub-questions

[SQ1]: How can rooftop extension contribute to **better utilization** of the existing building stock?

[SQ2]: How do housing associations make **decisions** on projects in general?

[SQ3]: How are rooftop extension projects **currently evaluated** by housing associations?

[SQ4]: What **barriers and opportunities** do housing associations identify for rooftop extension projects?

[SQ5]: How should the **decision-making framework** for housing associations be structured to support well-informed investment decisions on rooftop extension projects?

Research Methods

Theoretical research

[SQ1]: How can rooftop extension contribute to better utilization of the existing building stock?

[SQ2]: How do housing associations make decisions on projects in general?

Empirical research

[SQ3]: How are rooftop extension projects currently evaluated by housing associations?

[SQ4]: What barriers and opportunities do housing associations identify for rooftop extension projects?

[SQ5]: How should the decision-making framework for housing associations be structured to support well-informed investment decisions on rooftop extension projects?

Research Methods

Theoretical research

Literature review

Empirical research

Multiple case studies

Interviews

Expert panel

Literature

02

What does the literature say about rooftop extension?

Rooftop extension = adaptive reuse → extends building lifespan, preserves identity, reduces environmental impact (Holden, 2018)

Circular renovation starts with what's already there → value, flexibility, CO_2 reduction (Van Stijn & Stolker, 2021)

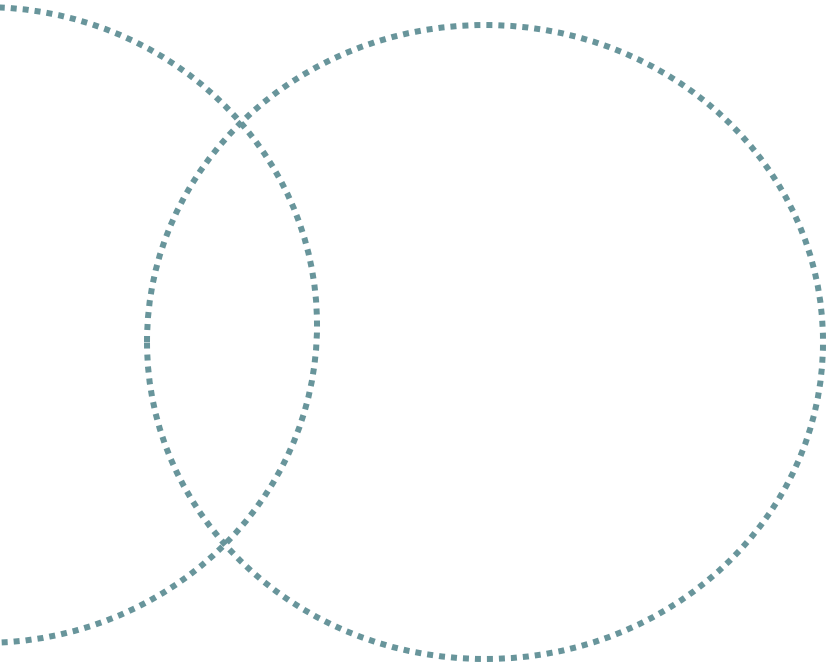
Combine rooftop extension with energy renovation → highest return & lowest impact (Sundling et al.; 2019)

Success depends on early-stage decision-making → sustainability must be integrated from the start (Gohardini, 2015)

Success requires structure → development process, permits, collaboration (Amer, 2017)

High potential… but beware → Technical constraints, legal hurdles & sectoral resistance (Gillot, 2022)

How do housing associations decide?



Strategic asset management (Gruis & Nieboer, 2004; Nieboer, 2011)

→ Since the 1990s: more portfolio-driven decision-making, though practice is often less top-down than the models suggest.

Three hard financial checks (Kornegoor et al., 2024)

- Market-compliant construction costs
- Value ↔ cost ratio
- IRR & direct return

Investment statutes allow room (Hardy & Bruil, 2021)

...for affordability, sustainability & livability.

Deviation is possible, if well justified.

Practical challenges (Overmeeren, 2011)

Fragmentation, risk aversion, limited data, slow processes.

Innovation as a lever (Lambrechts et al., 2021)

Prefab, economies of scale & chain collaboration can accelerate, but require boldness and cross-sector teamwork.

Case Studies

03

CASE A

Building type:
Corridor flat

Amount of dwellings:
34

Project phase:
In Use

CASE B

Building type:
Shopping centre and transformed office

Amount of dwellings:
33

Project phase:
Realisation

CASE C

Building type:
Corridor flat

Amount of dwellings:
20

Project phase:
Procurement

CASE D

Building type:
Gallery flat

Amount of dwellings:
11+

Project phase:
Initiation

CASE E

Building type:
Authentic

Amount of dwellings:
200+

Project phase:
Concept

CASE A

Building type:
Corridor flat

Amount of dwellings:
34

Project phase:
In Use

Motivation

Rooftop extension did not result from policy, but from necessity: to compensate for the loss of housing units

Barriers

Technical - unexpected investments in sewer system replacement

Opportunities

Financial – made the renovation feasible

Social - more variety in dwelling sizes, target groups, and rental segments

Social - adjusting the parking standard meant green space could be preserved

CASE B

Building type:
Shopping centre and transformed office

Amount of dwellings:
33

Project phase:
Realisation

Motivation

Strategic densification in the city centre: office complex transformed into housing + rooftop extension

Barriers

Social - rooftop extension on an occupied building, one-off effort?

Technical: new homes had to be anchored to the existing structure → high risk of leakage problems

Financial - less cost-efficient than expected

Opportunities

Social - expand the middle-rent segment!

Legal - the municipality did not impose a parking requirement

CASE C

Building type:
Corridor flat

Amount of dwellings:
20

Project phase:
Procurement

Motivation Strategic acquisition - an outdated complex with expansion potential

Opportunities Technical – combining renovation with preparing the building for rooftop extension.

Barriers Financial – lack of awareness at the municipality caused delays, price indexation and an uncertain business case led to temporary suspension.

CASE D

Building type:
Gallery flat

Amount of dwellings:
11+

Project phase:
Initiation

Motivation

Pilot project, gaining experience with rooftop extensions as a development strategy.

Barriers

Social - combining rooftop extension with renovation increases nuisance, considered undesirable.

Technical - expensive structural reinforcement required.

Opportunities

Financial - potential for standardization and scaling up

CASE E

Building type:
Authentic

Amount of dwellings:
200+

Project phase:
Concept

Motivation

5,000 new homes in the city — without using extra land? Rooftop extensions.

Opportunities

Financial - over 200 units added via rooftop extensions.

Financial - Target group: students; small units, high occupancy rate.

Social - improved comfort through elevators, bike storage, vibrancy and added functions for both new and existing residents.

Barriers

Financial – Ground leasehold ‘erfpacht’ clauses increase project costs.

Financial - Hard to realize economies of scale due to diversity in building types within the portfolio.

Discussion

04

Discussion

Motivation = pragmatic
→ It’s not circular policies, but housing pressure & livability problems that trigger the project
→ Circular gains are often just a “bycatch”

Municipality? Still searching
→ Policy frameworks are often missing
→ Early alignment and a single point of contact do work well

Development process = iterative & flexible
→ Business cases are recalculated continuously
→ Prefab & turnkey approaches bring speed, but aren't always a good fit
→ Tendering often happens early instead of late

Drivers & Barriers
→ Value creation & sustainability aren’t enough
→ Technical hurdles, ground lease, and permits slow things down
→ Collaboration + standardization = key to success

Decision-making = mix of rationality & reality
→ IRR and direct return are leading
→ Societal value is gaining ground — but not yet embedded in the system

Framework

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Framework

Why? Provide investment committees with a clear go/no-go instrument for rooftop extension projects

Three layers:

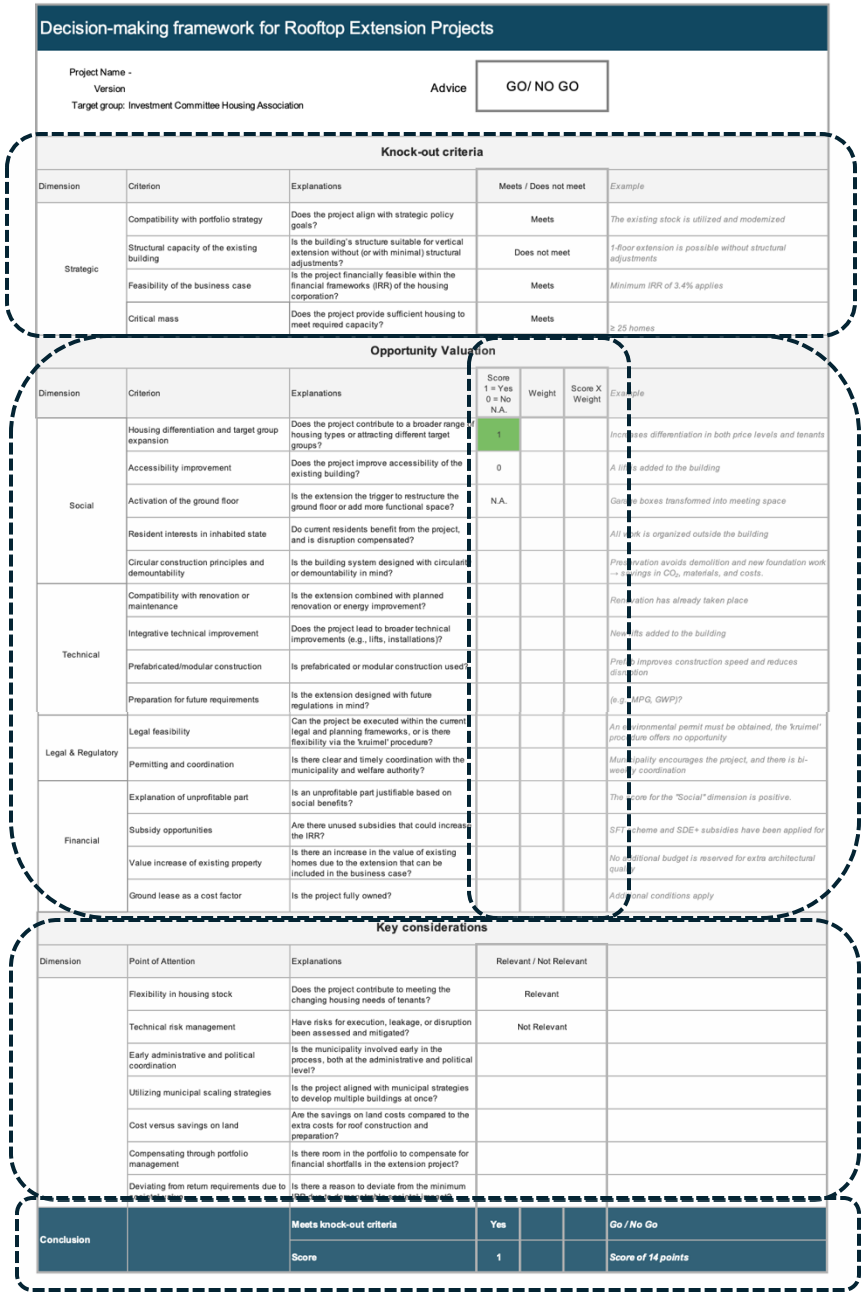
- Knock-out criteria: must be met (e.g. alignment with portfolio strategy, structural capacity, solid business case, critical mass)
- Opportunity score: social · technical · legal · financial advantages (1/0 + own weighting)
- Contextual factors: flexibility, risk management, early alignment with municipality, etc.

Custom weighting → each housing association adapts it to their own priorities

Outcome:

High score = feasible and valuable

Low score = reconsider or investigate further



Decision-making framework for Rooftop Extension Projects

Project Name -
Version
Target group: Investment Committee Housing Association

Advice: GO/ NO GO

Knock-out criteria

Dimension	Criterion	Explanations	Meets / Does not meet	Example
Strategic	Compatibility with portfolio strategy	Does the project align with strategic policy goals?	Meets	The existing stock is utilized and modernized
	Structural capacity of the existing building	Is the building's structure suitable for vertical extension without (or with minimal) structural adjustments?	Does not meet	1-floor extension is possible without structural adjustments
	Feasibility of the business case	Is the project financially feasible within the financial frameworks (IRR) of the housing corporation?	Meets	Minimum IRR of 3.4% applies
	Critical mass	Does the project provide sufficient housing to meet required capacity?	Meets	≥ 25 homes

Opportunity Valuation

Dimension	Criterion	Explanations	Score 1 = Yes 0 = No N.A.	Weight	Score X Weight	Example
Social	Housing differentiation and target group expansion	Does the project contribute to a broader range of housing types or attracting different target groups?	1			Increases differentiation in both price levels and tenants
	Accessibility improvement	Does the project improve accessibility of the existing building?	0			A lift is added to the building
	Activation of the ground floor	Is the extension the trigger to restructure the ground floor or add more functional space?	N.A.			Garage boxes transformed into meeting space
	Resident interests in inhabited state	Do current residents benefit from the project, and is disruption compensated?				All work is organized outside the building
	Circular construction principles and demountability	Is the building system designed with circularity or demountability in mind?				Preservation avoids demolition and new foundation work → savings in CO_2, materials, and costs.
Technical	Compatibility with renovation or maintenance	Is the extension combined with planned renovation or energy improvement?				Renovation has already taken place
	Integrative technical improvement	Does the project lead to broader technical improvements (e.g., lifts, installations)?				New lifts added to the building
	Prefabricated/modular construction	Is prefabricated or modular construction used?				Prefab improves construction speed and reduces disruption
	Preparation for future requirements	Is the extension designed with future regulations in mind?				(e.g. MPG, GWP)?
Legal & Regulatory	Legal feasibility	Can the project be executed within the current legal and planning frameworks, or is there flexibility via the 'kruimel' procedure?				An environmental permit must be obtained, the 'kruimel' procedure offers no opportunity
	Permitting and coordination	Is there clear and timely coordination with the municipality and welfare authority?				Municipality encourages the project, and there is bi-weekly coordination
Financial	Explanation of unprofitable part	Is an unprofitable part justifiable based on social benefits?				The score for the "Social" dimension is positive.
	Subsidy opportunities	Are there unused subsidies that could increase the IRR?				SET scheme and SDE+ subsidies have been applied for
	Value increase of existing property	Is there an increase in the value of existing homes due to the extension that can be included in the business case?				No additional budget is reserved for extra architectural quality
	Ground lease as a cost factor	Is the project fully owned?				Additional conditions apply

Key considerations

Dimension	Point of Attention	Explanations	Relevant / Not Relevant	
	Flexibility in housing stock	Does the project contribute to meeting the changing housing needs of tenants?	Relevant	
	Technical risk management	Have risks for execution, leakage, or disruption been assessed and mitigated?	Not Relevant	
	Early administrative and political coordination	Is the municipality involved early in the process, both at the administrative and political level?		
	Utilizing municipal scaling strategies	Is the project aligned with municipal strategies to develop multiple buildings at once?		
	Cost versus savings on land	Are the savings on land costs compared to the extra costs for roof construction and preparation?		
	Compensating through portfolio management	Is there room in the portfolio to compensate for financial shortfalls in the extension project?		
	Deviating from return requirements due to	Is there a reason to deviate from the minimum		

Conclusion		**Meets knock-out criteria**	**Yes**			***Go / No Go***
		Score	**1**			***Score of 14 points***

Conclusions

06

Conclusions

How can housing associations **effectively assess the value of rooftop extensions** as a strategy to expand within the existing building stock?

How can housing associations **effectively assess the value of rooftop extensions** as a strategy to expand within the existing building stock?

[SQ1]: by recognizing the strategic value of rooftop extension

[SQ2]: by explicitly incorporating societal value into investment decisions

[SQ3]: by not assessing rooftop extension solely through new-build or renovation frameworks

[SQ4]: by identifying and weighing both opportunities and barriers

[SQ5]: by using the decision-making framework developed in this research

Limitations

“Can the structure handle it?”

- Built on a single foundation
- Reinforced on one side
- Without long-term monitoring
- Designed for a single resident

From pilot to strategy

Rooftop extension is not a trick, it’s a serious development strategy.

But only if it is structurally embedded in policy and decision-making.

It’s time to leave ad hoc thinking behind.

What is needed for that?

- Link rooftop extensions to portfolio **strategy** and investment framework
- Measure **social value** too, not just IRR
- Work with **municipalities** on clarity, pace, and trust
- Promote **replicability** through standard concepts
- Organize internally as a housing association, with the right tools, teams, and mindset

And then? Just get started

Thanks for

your attention!