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## Improving energy performance: many small interventions or selective deep renovations?

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### Summary

Recent findings from a monitor containing around 1.5 million homes in the Dutch non-profit rented sector show that the energy improvement pace in the sector in the last years is too slow to meet the nationally agreed level in 2020. The findings also show that the improvement of the energy performance of the respective homes is mostly carried out in small steps: in many of the improved dwellings only one single measure is applied, and deep energy renovations are rare. Advocators of such renovations nevertheless believe that such improvements are the most appropriate way to substantially reducing energy consumption and argue that the developments and proliferation of energy renovation concepts is the best way forward. Others, however, do not see this as realistic and argue that reality forces us to proceed on the path of small interventions. This study sheds more light on this debate from the way in which housing providers conceive and implement their portfolio and asset management strategies. From these investment policies, it seeks explanations for the dominance of the small interventions and investigates the room for a more concentrated allocation of budget resources. To this end, housing providers with different energy investment policies are selected and interviewed. Results show that current practice leaves little room for deep renovations, but that a more mixed picture of small and deep interventions may be expected when zero-energy renovations grow out of their experimental status.

**Keywords:** portfolio management, asset management, non-profit, housing, energy performance

### 1. Problem statement and research question

Since the implementation of the Energy Performance of Buildings Directive (EPBD), energy efficiency is a matter of great concern in the Dutch non-profit rental housing sector. In 2008 *Aedes*, the national umbrella organisation for housing associations (which almost exclusively own the non-profit housing stock in the country), the Ministry of Housing and *Woonbond*, the national tenants' union, signed a covenant in which, among others, a 20% reduction on the total gas consumption in the non-profit housing sector over the years 2008-2018 was agreed.

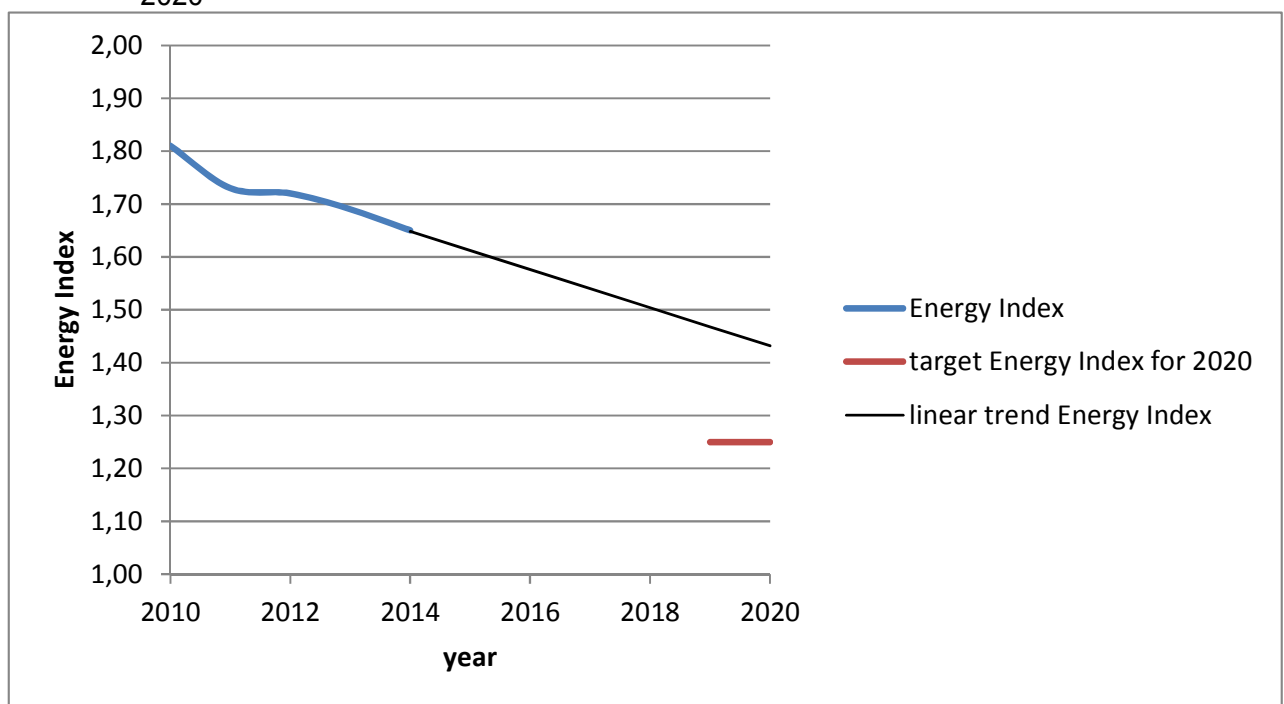
In 2012 the 2008 covenant was repealed. The covenant that came in place (and that is still in force) is stricter and makes use of the Energy Index (*Energie-Index*), a dimensionless unit that denotes the energy performance of a building according to the official Dutch calculation method. The value range of this unit approximately ranges between 0 and 4, in which 0 is energy neutral and 4 is extremely

energy inefficient. The 2012 covenant states that in 2020 the average Energy Index of all homes of the Dutch housing associations must be 1.25, which is within the bands of energy performance rate B. In the Netherlands categories ranging from A++ (very high energy efficiency) to G (very low energy efficiency) are used. Rate B can thus be seen as a high standard.

In the 2008 covenant it was also agreed that Aedes would develop a database to monitor the improvement of the energy performance of the Dutch non-profit rental housing stock. This monitor has been called SHAERE (*Sociale Huursector Audit en Evaluatie van Resultaten Energiebesparing* – in English: Social Rented Sector Audit and Evaluation of Energy Saving Results). Since 2010, when the monitor became operational, housing associations report their stock to Aedes in the beginning of each calendar year accounting for the situation on December 31<sup>st</sup> of the previous year (e.g. in the beginning of 2015 for December 31<sup>st</sup>, 2014). Housing associations are not obliged to participate in the monitor, so the number of homes for which data are available varies from year to year. Nevertheless, the monitor covers each year a large part of the sector, approximately 50-60%.

Results from the monitor show that the improvement of the energy performance of the non-profit rental housing stock is too slow to attain the agreed level in 2020. If the current improvement pace would continue until 2020, the Energy Index will be 1.41 by then (see linear projection in figure 1).

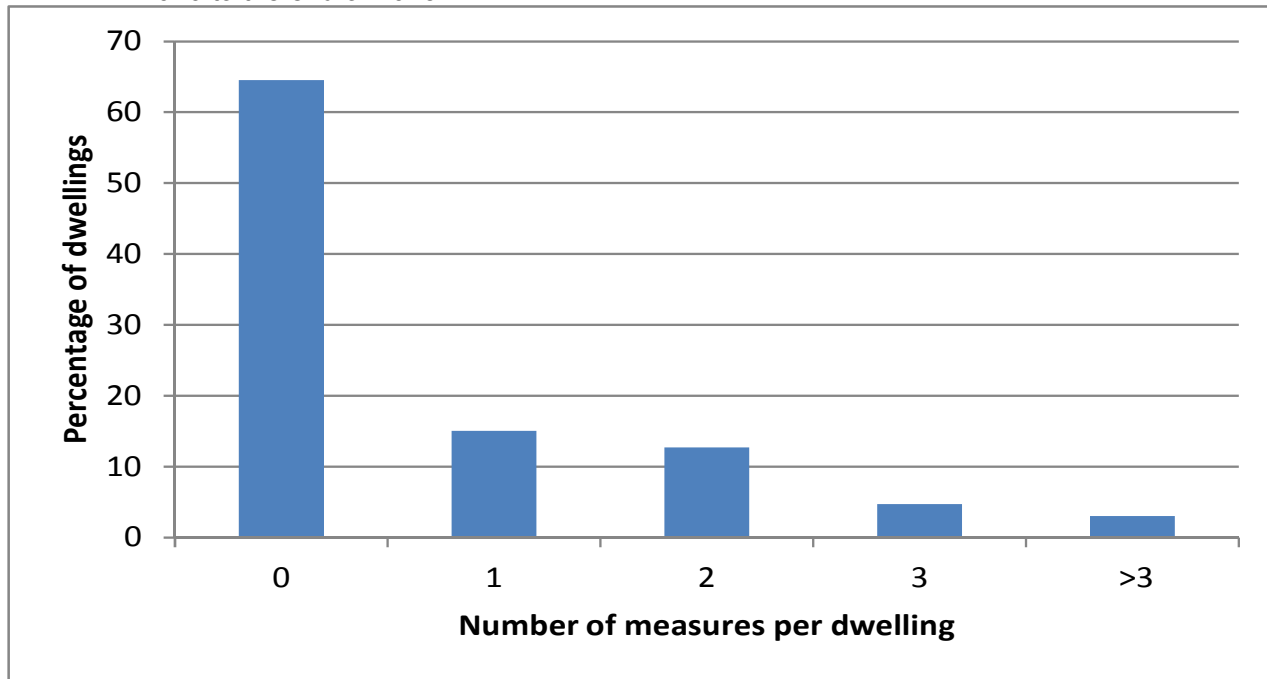
Figure 1: Development of the average Energy Index in the Dutch non-profit housing sector, 2010-2020



Sources: [1], [2] and [3]

Results from the monitor also show that many homes have been improved in a relatively short period. In the years 2011, 2012 and 2013, 35.5% of the homes have undergone an improvement of the energy performance (Filippidou *et al.*, 2015).

Figure 2: Number of measures per dwelling in the Dutch non-profit housing sector, from the end of 2010 to the end of 2013



Source: calculations on SHAERE by OTB, Delft University of Technology

At the same time, however, deep energy renovations are rare and most improvements are small. In half of the improved dwellings, only one single measure is applied. In only 3% of the homes more than three measures were applied (see figure 2). Advocators of deep renovations nevertheless believe that such improvements are the most appropriate way to substantially reducing energy consumption and argue that the developments and proliferation of energy renovation concepts is the best way forward. Others, however, do not see this as realistic and argue that reality forces us to proceed on the path of small interventions. This study sheds more light on this debate from the way in which housing providers conceive and implement their portfolio and asset management strategies. From these investment policies, it seeks explanations for the dominance of the small interventions and investigates the room for a more concentrated allocation of budget resources.

## 2. Method

For the study 12 housing associations have been selected and interviewed. It was chosen for interviews, because this research method gives room for expressing the underlying opinions, views and contexts for the decisions on energy investments. From an earlier study, held in 2012 ([4] and [5]), we expected that a big minority of all housing associations had not formulated an energy investment policy, which makes it plausible that these organisations do not have many own experiences about various ways to invest in the energy performance of their stock, and therefore are less appropriate as respondents for this research. For this reason, we did not apply a random selection, but selected housing associations from which we expected more advanced energy investment policies. We chose them among the members of an existing platform on technical management and also from a group of

housing associations that, according to an own telephonic investigation done in 2012, had improved the energy performance of a relatively big share of their housing portfolio. We selected organisations that had carried out deep renovations and organisations that had not, in order to ensure that housing associations with different energy investment policies were represented. At each organisation, we spoke with persons which were responsible for the implementation of energy policies into investment planning, for example heads of real estate planning. The topics in the interviews were:

- the energy policies and ambitions of the respective organisation;
- the types of investment (notably renovation, planned preventive maintenance, void repairs and possible separate investment 'flows') in which the energy investments are included;
- the room for selective deep renovations.

The interviews took place in October 2015; one interview was conducted in November 2015.

### 3. Results

Table 1 presents the targets of the interviewed housing associations regarding the energy performance of their housing stock.

Table 1: Aims of the interviewed housing associations regarding the energy performance of their housing stock

<b>Aims</b>	<b>Number of housing associations interviewed*</b>
Average energy performance label B for the whole portfolio	4
Average energy performance label C for the whole portfolio	1
Improve at least x dwellings by at least 3 label categories or improve them to energy performance label B	1
30% of the dwellings will have energy performance label A of B	1
At least energy performance label C after an intervention	1
Phase out dwellings labelled E, F and G	4
Phase out dwellings labelled F and G	3
Reduce CO <sub>2</sub> emission by 25%	1

\* Because housing associations can have multiple aims, the sum of the number of housing associations in the table is higher than the number of housing associations interviewed.

Phasing out the most inefficient homes is relatively popular among the interviewed housing associations: 7 out of 12 housing associations aim at this. Also relatively often mentioned (4 times) is to attain an average label B for their housing stock. With this aim the respective housing associations apply the national covenant agreement of an average label B for the national stock directly to themselves. Some housing associations, however, stated that they had lower targets (such as an average of label C), because their financial means would be insufficient. The years in which the aims have to be attained vary between 2018 and 2025.

The moments at which the interviewed housing associations take measures to improve the energy performance of their homes is presented in table 2.

Table 2: Moments for energy investments as mentioned by the interviewed housing associations

<b>Investment types</b>	<b>Number of housing associations interviewed*</b>
Planned preventive maintenance	9
Refurbishment / renovation	10
Void repair	5
At a 'natural' moment of replacement	all 12

\* Because the housing associations include their energy investments in different investment types, the sum of the number of housing associations in the table is higher than the number of housing associations interviewed.

Except from the replacement of boilers and so-called "open" heating installations (e.g. geysers, gas heaters) energy investments are combined with other more or less planned forms of investment, notably renovations (mentioned by 10 out of the 12 selected organisations) and planned preventive maintenance (mentioned 9 times). Combination with void repairs was also mentioned, but less often (5 times).

Important to note is that housing associations can be highly selective in the measures that they take: building elements are usually replaced at the end of their lifespan, meaning that early write-off hardly takes place, even if this would result in a notable improvement of the energy performance. So, unlike table 2 could suggest, 'natural' moments of replacement must rather be seen as a criterion for selecting measures than as an additional investment type. Especially this can be an important explanation for the small number of measures per dwelling.

The interviewed housing associations think different about including deep energy renovations. Some of them reject these investments, mostly because of the costs, others argue that different homes should be (and actually are) treated differently, and argue that deep energy renovations can be executed if the technical and market prospects of the respective dwellings allow this. These organisations carry out experiments with zero-energy renovations or plan to do so in the near future.

## 4. Conclusions

The regular investment practice seems to be a good explanation factor for the overall picture of small steps in the improvement of the energy performance of the non-profit housing stock in the Netherlands. Planned preventive maintenance and void repairs are not very suitable for large-scale investments. Renovations do, but rarely take place, too little to have a serious impact on the average number of measures per dwelling. Although many housing associations are, in their official policies, inclined to make big steps forward in the (average) energy performance of their stock, they seem to strongly dislike early write-offs and additional investment schemes. In practice, energy investments have to be fit in regular investment schemes and have to follow general decision criteria such as the lifespan of the respective building element and the market position of the respective dwelling. In their approach, the main choice is *not* between many small interventions or selective deep renovations,

because all housing associations broadly invest in their portfolio. The question which divides the housing associations is rather: which investment room is available for deep retrofits as well?

The current investment practice of the interviewed housing associations shows little room for acceleration of energy performance improvement in the non-profit housing stock on the short term. Deep renovations are mostly seen as innovations, which could be suitable for individual experiments, but not (yet) for wide application. This may change when this kind of renovations will be more generally recognised, but to date this is not the case. It would be helpful that zero-energy renovations, which are still in their infancy, but are developing rapidly, will continue to follow the current trend of decreasing expenses. However, it must be admitted that even then, (pre)financing of the measures remains a barrier for investments (e.g. [6]). For this reason, a step-by-step approach (see e.g. [7]) could be more practical, although this approach bears the risk of preventing further improvements. Further research is needed to assess the size of this risk and the efficiency of the step-by-step approach compared to other approaches.

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