

Demolition in Europe, a research proposal

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Abstract

What determines the life span of dwellings?

Much is known about the initial phase of buildings. The vast majority of scientific knowledge is concentrated on the building initiative, the programming, design and in particular the construction. Knowledge about the utilization phase, including management, transformation and redesign is growing. But applicable knowledge about the end of life is still scarce.

As the housing is ageing and the deliberation between life cycle extension or demolition is getting more and more important, knowledge about demolition, the decisive motives, the pro and cons and the consequences is getting just as necessary as the initial phase.

In the last decade we did a series of surveys on demolition in the Netherlands, directed at the social rented as well as the private stock. Based on these surveys we developed a conceptual model of demolition and underlying decisive motives. In search to what extent our findings are also viable in a broader area, we also looked at demolition data in other EU countries and found similarities as well as differences.

To initiate a European research cooperation on demolition, our paper explains the relevancy of a Europe wide survey, defines the research objectives, problem definition and main research questions, and proposes a conceptual model and an outline for a broad comparative research.

Keywords:

demolition, dwellings, life cycle, life span, housing management, decision making, motives, comparative research, Netherlands, Europe

1. Introduction

What determines the life span of dwellings?

Much is known about the initial phase of buildings. The vast majority of scientific knowledge is concentrated on the building initiative, the programming, the design and the construction. Knowledge about the utilization phase, including management, transformation and redesign is growing. Applicable knowledge about the end of life phase is still scarce.

The knowledge development in the housing and building sector is closely related to the social, demographic and economic developments in the last century. The rapid growth of the population, the rising demand for decent shelter, the technological capability and the economic potential to realise these demands, focused the solutions on the production of mass housing to which all resources were directed. In particular in the Netherlands, the poignant dwelling shortage after WW2 concentrated the attention of state and trade for decades on new construction. The quality and life span of the existing stock did not get much attention. Since the production of new dwellings is declining, below 1% of the existing stock annually to date, the awareness for the ageing stock is growing, but new construction is still the dominant mindset.

The limited knowledge about demolition may also be related to the relative small volume of demolitions, in the Netherlands less than 0,2 of the existing residential stock and in most other EU countries far less. As part of the building process the importance of demolition is very limited and its share in the building trade of minor importance.

Apart from the technological aspects of demolition as a craft, the decision to demolish is first of all a managerial issue, and as such closely related to the professionalism of the owner. As in the Dutch case less than 45% of the housing stock -and less than 30% of the older stock - is professionally owned and managed¹.

The relative youth of the housing stock may be another reason. Due to the mass production after WW2 the average age of the housing stock is relatively low. Over 75 % of the Dutch housing stock was built after 1945 and over 50% after 1970. As far as the age of dwellings is determining the life span - for which there is only partly evidence (Van der Flier & Thomsen, 2006) - only a very limited number is near the potential end of it.

This touches the most important but also most problematic question regarding demolition: when has a building reached the end of its life? Or more precisely in the respect of this paper: what determines the life span of dwellings?

The housing stock in Europe is ageing as consequence of relatively low housing production in the last two decades and high production in the first decades after WW II. For a growing part of this stock the debate about the future has started or will start. As a consequence the deliberation between life cycle extension and demolition becomes more important in housing management. The knowledge about demolition, the decisive motives, the pro and cons and the consequences is getting just as necessary as the knowledge about the initial phase. However, as said, this knowledge is scarce. To fill this gap this paper proposes a European research project on demolition.

The objective is to investigate the phenomenon demolition in the EU. This knowledge can be used to analyse and support the life cycle management of, and improve decision making about demolition of residential stock. Careful decision making is necessary because there are a series of social, cultural, economical, and environmental reasons to be reserved about demolition on a wide scale.

Demolition is an intervention with well known severe social effects, on individuals as well as on communities and neighbourhoods ('waterbed'-effect). Also well known and documented is the historico-cultural impact of drastic demolitions. Though often disputed as being less than the future gains, demolition implies destruction of capital and - economically also relevant - increased user costs and loss of affordable living and working space. And, last but not least, demolition waste together with the use of new building materials implies a substantial environmental burden. As evidence grows that demolition plus replacement is most likely less sustainable than life cycle extension of the existing building (Thomsen and van der Flier 2008) also the environmental consequences necessitate a careful consideration.

From this problem statement the following problem definition and main research question can be derived:

- To what extent (numbers) and why (motives) owners in the various housing sectors (owner occupied, social rented and commercial rented) in the EU decide to demolish what (building period, building type, quality) dwellings?

Sub-questions that will be addressed in this paper are:

- what are the main variables in decision making about demolition and how can they be related in a conceptual scheme?
- what are the main research questions and what is an outline for a research design?
- what has been investigated in the past?
- what next steps should be taken?

The paper starts with some data about the phenomenon demolition in relation to the tenure, the age, the quality and other characteristics of the housing stock in the Netherlands and neighbouring countries to illuminate and substantiate the above description.

1. Demolition in NL and Western Europe

The analysis of demolition and related data requires first of all clear definitions of the relevant figures and variables.

Demolition can be defined as 'The tearing-down of buildings and other structures, the opposite of construction. Demolition contrasts with deconstruction, which involves taking a building apart while carefully preserving valuable elements for re-use' (www.wikipedia.org). In the context of this paper demolition is defined as 'The abrupt end of the life span of buildings and building parts by deliberate man-made destruction'.

Demolition is only one variety of the last phase in the life cycle of buildings. Buildings resp. dwellings can lose its function, left vacant and/or finally cease to exist. Regarding the life span, Awano (2005) distinguishes into the physical service life (the period of physical existence between construction and demolition), and the real service life (the period a dwelling actually meets demand).

In most Dutch housing stock statistics (CBS Statline 2008a/b), demolition is not a primary subject but included in the more general item 'decrease', including withdrawal (loss or change of use, merging with other dwelling and demolition) and demolition (destruction, fire etc.). Other national statistics make the same distinction. As a consequence it is often difficult and laborious to extract more detailed data.

To understand what variables are to what extent of influence on demolition, additional data are necessary. Based on previous research about demolition, tenure, building period, building type can be considered to be relevant explanatory variables. The next section contains an overview of relevant Dutch housing stock statistics and a first summary of similar Western-European data.

1.1. The Dutch housing stock

Tables 1-3 picture the Dutch housing stock. The owner occupied sector is growing and gained a majority in 2000. The social sector comprises one third of the stock, the highest percentage in Europe. The housing stock is relatively young: three quarters were built after WW II, over 50% after 1970. The physical quality of the social sector is relatively high. High percentages of dwellings in poor condition can be found in the pre war owner occupied and private rental stock.

Table 1: The Dutch housing stock, tenure in %, 1995-2007

| 1 | 2 | 3 | 4 | 5 |
|------|----------------|----------------|-----------------|------------|
| | Owner-occupied | Housing assoc. | Commercial rent | (N x 1000) |
| 1995 | 48 | 38 | 14 | 6,192 |
| 2002 | 54 | 35 | 11 | 6,710 |
| 2007 | 57 | 33 | 10 | 6,967 |

Source: MVRM 2008

Table 2: The Dutch housing stock; building period and tenure, 2002

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------------|------------------|-------|-----------------|-------|---------------------|-------|----------------------|-------|
| Building period | Total stock N | % | Owner occ. N | % | Housing assoc. N | % | Commercial rent N | % |
| < 1946 | 1.501.443 | 22,8 | 869.125 | 25,2 | 278.864 | 11,8 | 353.454 | 45,5 |
| 1946-1970 | 1.986.395 | 30,2 | 818.605 | 23,7 | 989.678 | 42,0 | 178.112 | 22,9 |
| 1971-1990 | 2.332.133 | 35,4 | 1.257.002 | 36,3 | 870.443 | 37,0 | 204.688 | 26,3 |
| 1990 < | 768.100 | 11,6 | 510.937 | 14,8 | 216.114 | 9,2 | 41.049 | 5,3 |
| Total | 6.588.071 | 100,0 | 3.455.669 | 100,0 | 2.352.099 | 100,0 | 777.303 | 100,0 |

Source: Meijer & Thomsen 2006 / MVRM 2003

Table 3: The Dutch Housing Stock; relative repair costs in % of new construction by building period, tenure and building typ, 2002

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------------|-------------|------------|----------------|------------|-----------------|------------|
| Building period | Owner occ. | | Housing assoc. | | Commercial rent | |
| | Single fam. | Multi-fam. | Single fam. | Multi-fam. | Single fam. | Multi-fam. |
| < 1946 | 7.80 | 4.86 | 5.95 | 3.21 | 13.21 | 7.35 |
| 1946-1970 | 5.16 | 2.63 | 4.53 | 2.25 | 7.99 | 3.46 |
| 1971-1990 | 2.83 | 0.92 | 2,58 | 1.80 | 3.26 | 1.94 |
| 1990 < | 0.86 | 0.54 | 0.79 | 0.53 | 2.24 | 0.65 |
| Total | 4.28 | 2.61 | 3.78 | 1.98 | 8.64 | 4.81 |

Source: Meijer & Thomsen 2006 / MVRM 2003

1.2. The Western-European housing stock, some figures

Tables 4 and 5 show tenure and building period in selected European countries. Except for Germany, the Czech Republic and Sweden the main part of the stock is owner occupied. Almost two third of the stock was built after WW II. The housing stock in Finland, Ireland, the Netherlands and Sweden is very young: over 50% was built after 1970.

Table 4: Housing stock in selected European countries, home ownership in 2003 (%)

| 1 | 2 | 3 | 4 |
|-------------|----------------|---------------|-------------------------|
| | Owner-occupied | Other tenures | Total stock (x 1000) |
| Belgium | 68 | 32 | 4,820 |
| Denmark | 53 | 47 | 2,561 |
| Germany | 45 | 55 | 38,925 |
| Finland | 63 | 37 | 2,574 |
| France | 56 | 44 | 29,495 |
| Ireland | 77 | 23 | 1,554 |
| Italy | 68 | 32 | 26,526 |
| Netherlands | 55 | 45 | 6,811 |
| Austria | 58 | 42 | 3,280 |
| Czech rep. | 47 | 53 | 4,366 |
| UK | 69 | 31 | 25,617 |
| Sweden | 46 | 54 | 4,351 |

Source: MVR0M 2008

Table 5: Housing stock in selected European countries, building period (%)

| 1 | 2 | 3 | 4 | 5 | 6 |
|-------------|-------------|---------|-----------|-----------|------------|
| | Measurement | Pre-war | 1946-1970 | 1971-1990 | After 1990 |
| Belgium | 2004 | 32 | 29 | 24 | 15 |
| Denmark | 2003 | 41 | 25 | 26 | 9 |
| Germany | 2002 | 28 | 47 | 14 | 11 |
| Finland | 2002 | 11 | 31 | 43 | 14 |
| France | 2002 | 33 | 18 | 36 | 12 |
| Ireland | 2002 | 17 | 16 | 27 | 39 |
| Italy | 2001 | 24 | 37 | 31 | 8 |
| Netherlands | 2005 | 22 | 28 | 34 | 16 |
| Austria | 2004 | 26 | 29 | 29 | 17 |
| Czech rep. | 2005 | 25 | 25 | 38 | 11 |
| UK | 2004 | 34 | 21 | 42 | 8 |
| Sweden | 2005 | 27 | 38 | 27 | 40 |

Source: MVR0M 2008

1.3. Demolition NL and Europe

As mentioned before, the Dutch Bureau of Statistics (CBS) makes a distinction between the total decrease of the stock by withdrawal (loss of use, merging with other dwelling and demolition) and by demolition (destruction, fire etc.). Table 6 shows that the main part of the decrease by withdrawal is due to demolition. The demolition rate (the ratio of demolished dwellings and the total dwelling stock) is growing steadily. Before the year 2000 the rate fluctuated around 0.17 %; after 2000 it rose to 0.25% in 2008.

Table 6: Decrease of the housing stock due to withdrawals according to year and tenure and decrease by demolition

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------|---------------------------|----------------|--------------------|-------------------------------|------------|--|
| Year | Housing stock (x 1000) | Total decrease | Decrease rented | Decrease owner occupied | Demolition | Demolition as % of stock (6):(2)x100 |
| 1995 | 6,192 | 13,691 | 9,605 | 4,083 | 10,382 | 0,17 |
| 2000 | 6,590 | 13,529 | 9,759 | 3,769 | 10,258 | 0,16 |
| 2001 | 6,651 | 15,555 | 11,096 | 4,459 | 11,959 | 0,18 |
| 2002 | 6,710 | 16,410 | 11,952 | 4,458 | 12,738 | 0,19 |
| 2003 | 6,764 | 17,763 | 12,706 | 5,057 | 12,633 | 0,19 |

| | | | | | | |
|------|-------|--------|--------|-------|--------|------|
| 2004 | 6,810 | 19,313 | 14,201 | 5,112 | 15,910 | 0,23 |
| 2005 | 6,859 | 19,057 | 14,701 | 4,345 | 13,907 | 0,20 |
| 2006 | 6,912 | 21,656 | 15,992 | 5,664 | 16,765 | 0,24 |
| 2007 | 6,967 | 23,840 | 18,785 | 5,055 | 19,449 | 0,28 |
| 2008 | 7,043 | 22,373 | 17,192 | 5,181 | 18,485 | 0,25 |

Source: CBS Statline (2008a, 2008b)

The main part of demolition in the Netherlands takes place in the rental sector. Most of the demolished dwellings are social rented dwellings. The demolition rate in the social sector is over two times as high as in the total stock (table 7).

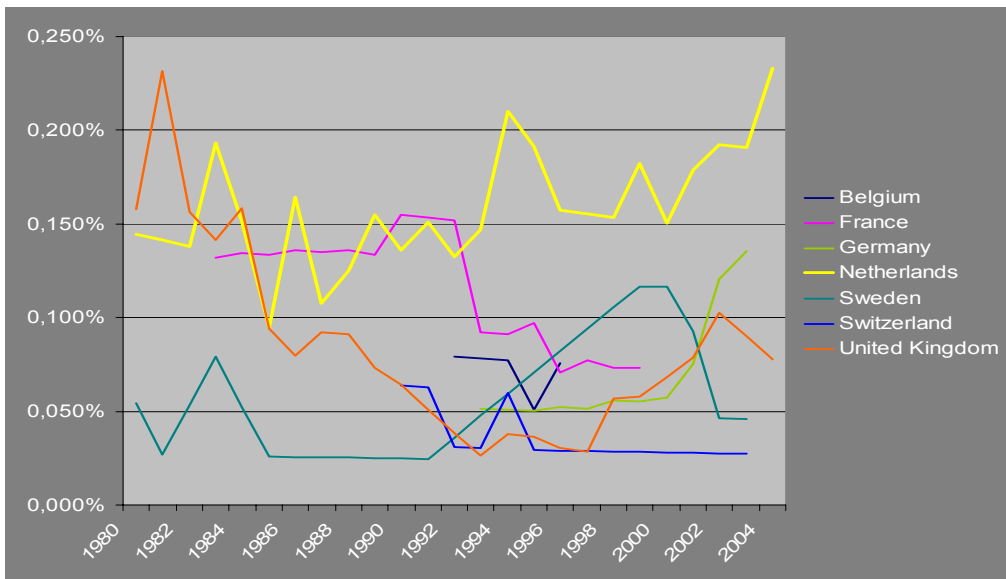
Table 7: Demolition and demolition rate in the Dutch social sector

| 1 | 2 | 3 | 4 |
|------|------------------------|------------|--------------------------------------|
| Year | Housing stock (x 1000) | Demolition | Demolition as % of stock (3):(2)x100 |
| 2000 | 2.438 | 7.540 | 0.31 |
| 2001 | 2.440 | 8.200 | 0.34 |
| 2002 | 2.432 | 9.700 | 0.40 |
| 2003 | 2.420 | 14.200 | 0.59 |
| 2004 | 2.412 | 13.500 | 0.56 |
| 2005 | 2.409 | 14.000 | 0.58 |
| 2006 | 2.408 | 16.600 | 0.68 |
| 2007 | 2.404 | 15.900 | 0.65 |

Source: CFV (2008)

The demolition rate in the Netherlands is much higher than in neighbouring countries. In the nineties and the first years of this century the rate in most countries was below 0.1 %. Only Germany tried to keep up with the Netherlands, but the demolition rate in that country was in 2004 still below 0.15% (figure 1).

Figure 1: Demolition rate NL compared to neighbouring countries



Source: Van der Flier & Thomsen (2006)

It could be discussed to what extent the actual demolition rate is too low. Presuming that the annual demolition rate is equal to the replacement by new dwellings, the minimal required time to replace the existing stock, the minimal required life span, in the Netherlands with an annual demolition rate of 0.25%, is 400 years. In for instance Germany with a demolition rate of 0.13% it is 750 years (Thomsen, 2007). Though the housing stock of most western EU countries is rather young (table 5) and these figures give only a random indication, they show that the average life span of the existing stock will be much longer than usually expected.

2. Decision making about demolition, main variables

As included in the definition, demolition is first of all the result of decision of the entitled proprietor. Main variables in the decision making process are the characteristics of the object - the dwelling - and the motives of the decision maker - usually the property owner or proprietor.

2.1. Life cycle and dwelling characteristics

For this investigation the life cycle perspective is used. Following a range of scholars, the life cycle of buildings can be described as a cyclic revolving process of building initiative, design, construction, utilization and redevelopment or destruction / recycling (Lönberg-Holm and Larson 1953; Straub 2001). Other scholars describe the decay of buildings as a linear life span development. Vroman (1982) describes the decay process of dwellings as the gradual loss in time of the original (physical) performance capacity: the theoretical amalgam of the technical and functional qualities of the building. Frictions occur where the performance capacity sinks below the for the users acceptable level. Interventions to prevent frictions and thus extend the lifetime can be either addition of performance by i.e. short term technical maintenance or longer term renovation or change of users/ target group.

Awano (2006) relates the life cycle of buildings to their ability to fulfil their function, for which he uses the concept of service life. As explicated before he distinguishes into the physical service life (the period of physical existence between construction and demolition), and the real service life (the period a dwelling actually meets demand. However, this concept is somewhat ambiguous because it is not easy to establish when a dwelling has lost its basic performance. Dwellings can be left vacant for some time without being demolished or can be demolished even though they are still usable in the technical sense (Kohler and Hassler 2002). The same applies for the period a dwelling actually meets demand, as this as relevant as normative.

Miles et.al. (1996) link the life span of buildings to their economical performance. Unlike Vroman and more practicable than Awano they give concrete form to the performance by using the income appreciation in dollars as a measure. As the balance sheets of Dutch housing associations are at present assessed by using the income appreciation of their stock, this variable may be an important input for further analyses.

Following Vroman, Awano and Miles, motives of proprietors to decide to demolish can be related to:

- the *physical* quality of dwellings; dwellings can be demolished because the 'physical service life' has come to an end, either caused by
 - o the *technical quality*: the structural parts of dwellings are deteriorated and no longer keep their basic physical performances, and/or
 - o the *functional quality*: the dwelling is no longer serving its purpose due to insufficient functional performance.

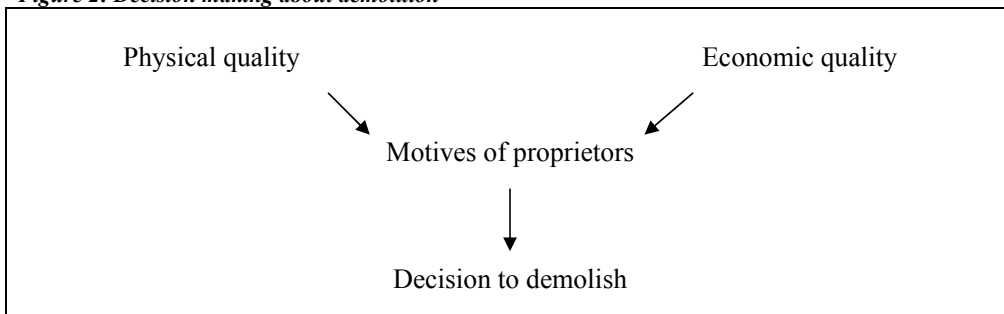
- the *economic* quality of dwellings; dwellings can be demolished because the dwellings can no longer produce a positive cash flow and the ‘real service life’ has come to an end, either caused by
 - o the *market potency*: the effective demand for the dwellings has decreased, and/or
 - o the *return potency*: the returns are no longer covering the costs.

2.2. Proprietor motives

In Western Europe, the final decision about demolition rest at the owner(s) of the property, the proprietor. In some specific cases (safety, illegal construction, land clearing) the government can force demolition, but only in case the proprietor refuses cooperation and/or has violated building or property regulations. In the case of demolition there may be also other interested parties involved, such as tenants and other residents and neighbours with or without legal rights. Though this paper allocates the decision making primarily at the proprietor, the position of the other interested parties should not be neglected.

Wassenberg (2006) distinguishes 5 main motives for demolition: 1) physical, 2) market prospects, 3) decay of area, 4) differentiation and 5) oversupply. His classification roughly covers the above stated object characteristics, as simplified in figure 2.

Figure 2: Decision making about demolition



Although - in line with this - it may be expected that object characteristics and proprietor motives are strongly related, this is not always true. The motives for demolition vary by tenure according to their interest and scope of the property owners. Motives of home owners will be different from motives of social landlords or real estate managers because they have different primary objectives concerning their property: home owners are mainly motivated by the physical quality of their home and commercial landlords by profit related motives. Social landlords will probably have both types of motives (source: Priemus 1978), while property developers are hardly interested in the characteristics of existing buildings as their scope is in the first place directed to the redevelopment of the land (Van der Flier & Thomsen, 2007).

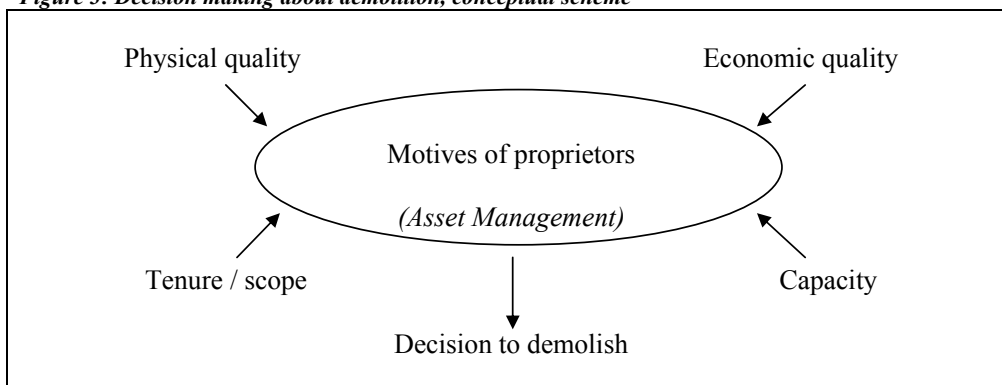
The decision to demolish may have to do with the motives of housing managers but also with their capacities regarding capabilities and resources. The Netherlands is an example. Tables 6 and 7 show that the larger part of the demolition in the Netherlands takes place in the social sector. That is remarkable because the physical quality of the social housing stock clearly surpasses the other parts of the stock (table 3). In the Netherlands the quality of dwellings in the social rented sector is in fact higher than the quality in the owner occupied sector and much higher than in the relative small and partly poor commercial rented sector (Meijer and Thomsen 2006). The actual large scale demolition of social stock apparently occurs because

professional non profit housing managers like housing associations have the capacity to organize and finance it, and (small) private landlords and owner occupiers do not. Therefore the ability or the capacity of the proprietors has to be added to the scheme. Depending on the professionalization of the management, motives and capacities can be formalised in asset management or policy (Gruis and Nieboer 2004).

2.3. Conceptual scheme

Applied in figure 2, the above additional results in the following general conceptual scheme (figure 3):

Figure 3: Decision making about demolition, conceptual scheme



3. Main research questions and research design

The main research question of the proposed project is: to what extent and why, do landlords in the various housing sectors in the EU decide to demolish dwellings. To answer this question a two step research project is proposed to be conducted in the participating countries.

3.1. First step: inventory

The first step comprises a descriptive inventory, answering three research questions for each country using the variables in the conceptual scheme:

- a. what are the physical and economic characteristics of the residential building stock, divided into tenure / sectors?
- b. what is the demolition rate in the various sectors?
- c. what are the motives and capacities of the proprietors in the various sectors?

The answers in this step should provide a general picture of the relation between the demolition rate and possible determining factors and should enable the selection and qualification of the case studies in step two.

3.2. Second step: case study analyses

The second step of the investigation is an ex post analysis of one or more demolition projects in each country. Also using the variables in the conceptual scheme an analysis should be made of the:

- a. project: physical and economic quality of the estate before demolition

- b. proprietor: motives and capacities of the involved owner
- c. process: the decision making about demolition including potential alternatives.

The answers in this step should enable insight in the decision-making and the most relevant influential factors and the question why, how and to what extent these factors can be affected. If possible two cases from various sectors should be analysed in each country to be able to reduce the impact of the specific national context.

3.3. Related comparative research

Though a research project as proposed in this paper is new - no references to similar research projects was found - there are some other recent comparative international research projects and data resources in the field of housing management, transformation and urban restructuring that can be useful resources and inspiring examples.

Regarding statistical resources, EUROSTAT, UNECE and the EU/EC Urban Audit, as well as branch originations as CECODHAS and RICS supply digital available statistical data. As most of these statistics do not contain data about demolition it will be necessary to extract and combine these from national statistics.

Regarding comparative analyses, research projects as SUREURO, RESTATE and EPI-SOHO contain not only useful information about housing stock management and transformation policies on (inter)national, urban and case study level, but also provide useful insight in national policy contexts, networks etc.

4. Conclusions and next steps

The European housing stock is ageing. For a growing part of this stock the debate about the future, the deliberation between various types of life cycle extension and demolition followed by new construction, has started or will start. As stated in the introduction the decision to demolish or not has to be taken carefully but our knowledge about demolition is limited. This paper proposes a research project to fill this gap. The objective is to investigate the phenomenon demolition in the EU. This knowledge can be used to analyse and support the life cycle management of, and improve decision making about demolition of residential stock.

For funding of this proposal, the EU LIFE+ program seems appropriate and promising. Both the 2nd pillar LIFE+ Environment Policy & Governance, directed to a.o. the development of innovative policy approaches, technologies, methods and instruments, and 3rd pillar LIFE+ Information and Communication, directed to a.o. communication and awareness raising campaigns on environmental issues, are potentially open for the subject of this proposal. The LIFE+ 2009 call is open from May 15 till September 15, 2009 (<http://ec.europa.eu/environment/life/index.htm>).

But the first condition to implement this proposal and organise, fund and start the research project is a network of dedicated participants, who underline the relevancy of the project and its objectives and are interested in developing new knowledge for both theory and professional practice.

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Naformátováno: Švédština (Švédsko)

Změněn kód pole

Naformátováno: Švédština (Švédsko)

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¹ Housing associations and institutional commercial landlords.

² Though more recent surveys (WoOn) are in progress, detailed figures are not yet available.