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Housing pathology, a new domain or a new name?

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Abstract

The term pathology has its origin in the medical science and is generally defined as the systematic study of diseases with the aim of understanding their causes, symptoms and treatment. The term has been applied since in many different disciplines; in the context of the built environment being in particular building pathology, social and urban pathology.

Though it is the combination and interference of technical, social, spatial and economical processes that is determining for the health and life cycle of housing stock, they are not interdisciplinary studied in a pathological context. That is to say, the abundance of theoretical and applied knowledge about the different fields of housing management is up to now quite segmented and not combined in a comprehensive pathological domain.

The paper defines and explores the field of housing pathology, overlooks the available knowledge and concludes that, regarding the paradigm shift from new construction to maintenance and improvement of the existing stock, housing pathology should be acknowledged and further elaborated as an essential interdisciplinary knowledge domain.

Keywords: housing pathology, housing quality, housing management, life cycle, diagnostics

1 Introduction

The term pathology has its origin in the medical science and is generally regarded as the origin of medical science. By analogy with the medical origin, the term has been applied since in many different disciplines, most often in relation to problems regarding the health and performance of existing artefacts. Frequently used applications in the context of the built environment are building pathology, social and urban pathology.

Though it is the combination and interference of technical, social, spatial and economical processes that is determining for the health and life cycle of housing stocks, it is remarkable that these fields are up to now not interdisciplinary studied in a pathological context. In contrary, the abundance of theoretical and applied knowledge about the different fields of housing management is quite segmented. The on-going fundamental paradigm shift from new addition to maintenance and improvement of the existing stock will however urge the need for more integrated interdisciplinary approaches and sooner or later to a comprehensive pathological domain (Thomsen, 2010, 2012)¹. This paper defines and explores that field. This first section introduces the objectives and growing relevance. Section 2 defines the knowledge domain. Section 3 explores the nature and life cycle of dwellings, Section 4 describes the practical application and section 5 concludes with a message for further development.

The paradigm shift and the need for more integrated approaches is evidently not limited to residential buildings. The focus on housing has however both practical and contextual reasons: the housing stock covers the vast majority of the building stock, consisting of a rather coherent building type, function and a well-developed professional knowledge domain, whereas the non-residential stock is very diverse, consisting of a wide variety of specific building types and functions of which the knowledge is limited and fragmented. Much of this paper is nevertheless also applicable on non-residential buildings and the wider scope of the built environment.

1.1 Existing stock and paradigm shift

The 20th century saw an enormous worldwide growth of the housing stock. In particular the building boom after WW-II, during which the housing stock in most countries was multifolded, focussed the attention of the housing sector primarily to the planning and realisation of new construction; the consciousness of the enormous maintenance and management task to come was still a far cry.

The begin of the 21st century shows a completely different situation that urges for a fundamental paradigm shift. As Fig. 1 shows, new construction in most western countries has faded down below an annual production of 1% of the existing stock, and increasingly far below (ed.on. Dol & Haffner, 2009).

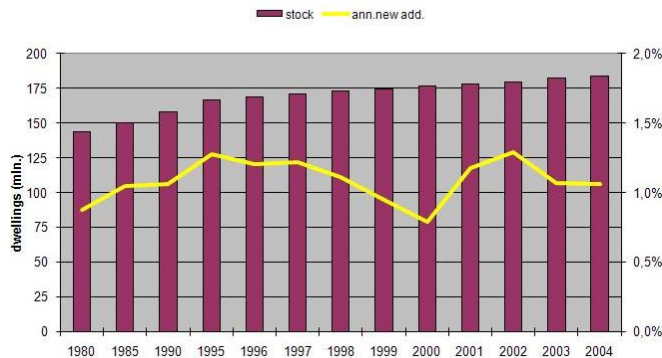


Fig. 1. EU housing stock, annual addition, 15 W-EU-countries + CH

According to more recent data (Eurostat, 2013; Min.BZK, 2013; only available for a limited number of EU-countries), the actual annual production has dropped well below 0,5%, which is insufficient for quantitative stabilization, not to mention to catch up with the ageing of the stock.

¹ This paper is a further elaboration of both cited publications.

As Fig. 2 shows, two-third of the western European housing stock is built after WW-II. In most western European countries over 60% of the stock - in some countries like the Netherlands and Finland even over 75% - is younger than 50 and over half younger than 30 years (ed.on. Dol & Haffner, 2009).

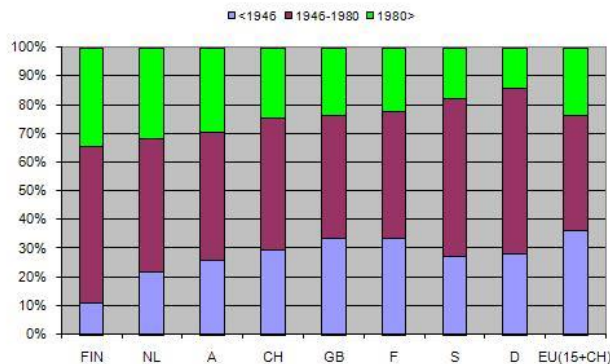


Fig. 2. EU housing stock by Age 15 W-EU-countries + CH.

1.2 Relevancy

Though still relative young the existing stock is ageing fast. In particular the older part of the stock is increasingly facing deficiencies and shortcomings, large parts do not satisfy residents needs and preferences, are far from energy efficient and many post-war neighbourhoods are in trouble. The necessary investments in major repairs, renovation, adaptation and redevelopment count at present for a total turn-over well beyond that of new construction. (Thomsen, 2010). Improving the energy efficiency to the required standards of tomorrow will add a substantial additional assignment. Though the change from large scale new construction to maintenance and improvement of the existing stock is well under way, the knowledge about how and when to successfully maintain a healthy housing stock has still a way to go. This otherwise also refers to the fast growing urban areas in developing countries. At the same time, the awareness grows that housing problems are only partly related to the physical supply side and solving them requires more than bricks and mortar. This shows the relevance of housing pathology as a relative new knowledge field, combining expertise, skills and instruments for a healthy housing stock.

On the other hand much of the knowledge field belongs to the daily practice of professional housing managers to underline management strategies and maintenance plans. The ambition of this paper is to bring the existing knowledge together in a consistent and comprehensible scientific domain.

2 Housing pathology, definitions and knowledge domain

The term pathology has its origin in the medical science (Long, 1965). The word is derived from the Greek word *pathos*, meaning pain or disease. Pathology is generally regarded as the origin of medical science. Though nowadays consisting of a wide variety of specialised knowledge fields and divisions within and beyond the medical domain, the significance for application outside the medical domain lies usually in the systematic approach of deficiencies using successive steps: registration (anamnesis), examination and analysis (diagnosis), remedies and treatment (cure), outlook (prognosis), evaluation and prevention, often referred to as the pathological cycle.

2.1 Definitions

The term pathology is generally defined as the systematic study of diseases with the aim of understanding their causes, symptoms and treatment. Derived from the medical context and similar to its methodical and often forensic practice, Watt defines building pathology, both as a term and as an overall concept, as the holistic approach to understand buildings (Watt, 2007) and consequently building diseases and deficiencies. Building pathology, also referred to as forensic building technology, is a CIB-acknowledged professional knowledge field, generally applied for real estate property owners, insurance companies etc. to assess the causes, remedies and responsibilities in case of serious building deficiencies or disasters.

Housing pathology can similarly but in a broader way be defined as a holistic approach to understand the nature and life cycle of residential buildings and their environment, in order to identify, investigate and diagnose deficiencies, specify preventive measures and remedial interventions and evaluate their effects. In parlance the term housing pathologies is also used for all kind of mainly social deficiencies with a housing or urban background. In the more broad scientific definition in this article, housing pathology refers to pathological knowledge and skills about residential buildings in their social and physical environment, making use of building pathology (Harris, 2001; Watt, 2007) as well as social pathology (Gerhard, 1997; Lemert, 1951) and urban pathology (Choldin, 1978).

In analogy with health as the core condition for the quality of human life, the health of housing accommodations stands for housing quality - or better: performance -, being the ability of residential buildings to fulfil adequate shelter for specified groups of residents, and diseases stand for performance threatening deficiencies resulting in obsolescence and finally obliteration.

The analogy with living beings falls short on one essential difference: Unlike living beings, houses and other buildings are not god given but immobile men made artefacts intended to serve specific needs, and the health and lifespan of dwellings are the result of men's decisions. Consequently the appreciation of the housing quality mirrors the concerns of the partaker involved.

Though buildings can physically exist long after being abandoned, the relevant life span of dwellings is the real service life: the period a dwelling actually meets demand (Awano, 2005). Housing pathology concerns this phase. Pathological studies are directed at the physical as well as the functional, social and economic performance of dwellings and to what extent they satisfy their stakeholders - residents as well as proprietors - demands.

2.2 Holistic and sustainable approach

As housing is a basic need and determining condition for the quality of human life, the quality and supply are subject of governmental control by laws, regulations and public bodies.

Housing, be it single private dwellings or large social housing estates, implies complicated interrelated processes with multiple actors. The results of these processes have far-reaching and long lasting social, economic, ecologic, demographic and geographic effects on different levels of scale, making a sustainable approach indispensable.

A well-known holistic and sustainable approach is the so called 3-P approach (Munasinghe, 1992) as adapted by the UN. In a similar way applied on the scale of existing dwellings and their environment, these processes basically consist of the supply = the dwelling, the demand = the residents, and the management = the landlord and/or property trade, as schematized in Fig. 3.

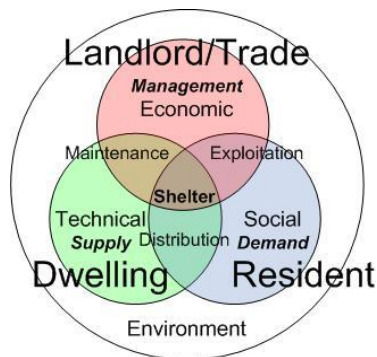


Fig. 3. 3P-approach of residential stock

To understand the nature of these processes, their influence on the life cycle and deficiencies of residential buildings and their environment, a holistic approach is essential.

2.3 Pathology and clinical cycle

Derived from its origin in the medical science and by analogy with the clinical cycle, housing pathology consists of six consecutive steps: anamnesis; diagnosis; remedy; care; evaluation; prevention. In practice these steps are often overlapping and intertwined. Watt (2007 p.1) for instance distinguishes

three steps: identification, investigation and diagnosis; prognosis and recommendations; remedial works incl. monitoring and evaluation.

In this paper four basic steps will be distinguished: anamnesis; diagnosis; remedy and cure; evaluation and prevention.

3 Nature and life cycle of dwellings

Dwellings are composite structures, consisting of a multiplicity of building elements and materials, with different characteristics and life spans, serving many different and partly conflicting functions, as

- Human shelter: protection from climate and external threats; the physical or technical quality;
- Family home: cocooning, cooking, dining, recreating and sleeping; the functional quality, and
- Capital good: a source of actual or future income; the economical quality.

These three main functions are conditional for the quality and the life span of residential buildings and housings stocks.

As a human artefact, the quality and the lifespan of a dwelling are depending on human interventions, from the initial design and the given physical conditions through final obliteration, and the length of the useful service life can in principle be unlimited prolonged or shortened by modification of the physical conditions i.e. maintenance, adaptations, improvements, transformations or demolition.

3.1 Housing quality

What is housing quality, and what is a decent - healthy - dwelling?

Housing quality can be defined as the extent to what dwellings can fulfil the demand of the residents and secondary of the proprietors or otherwise interested parties (Vroman, 1982, see also Fig. 5).

As shown above, the quality of residential buildings is determined by the physical or technical quality, the functional quality and the economical quality. Clear standards for what these qualities are - or should be - are hardly available and strongly depending on country and culture (Visscher et.al. 2012). In practice, the appreciation of the housing quality will considerably diverge between residents and other parties involved: landlords, residing tenants, applying tenants, owner-occupiers or real estate developers, all have their particular measures. In the rented sector, landlords attitudes are as a rule professionally driven by property value and yield - though social landlords also by societal interests -, and tenants by value for money and emotions. Owner-occupiers, by nature non-professionals, face both sides.

Since housing quality is highly determining for the quality of human life, governments interfere in the housing and building market by means of legislation, inspection and subvention. To protect residents en citizens from dangerous and unhealthy substandard building conditions, building regulations for the existing stock set a bottom line for the minimal acceptable dwelling quality, and to enforce a minimum quality of new construction, building regulations set a wide range of minimal conditional quality standards. Both quality levels though do not answer the question what a decent housing quality is: the bottom line for existing stock is too low and the standard for new construction is too high to serve as a feasible and acceptable standard for the maintenance and management of the existing housing stock.

Up to recently, housing quality was usually assessed by an inventory of the presence and acceptability of defects and shortcomings. Actual housing management approaches aim at the more positive question what quality level is needed for maintaining a healthy lifespan of residential stock (Gruis et.al. 2008). The answer is attempted by, as an example, successively distinguish the market potency, using product-market combinations (PMC's); the corresponding physical and functional conditions for optimal performance, using critical success factors (CSF's) and the underlying physical, functional and economic performance requirements (Vijverberg, 2012).

3.2 Life span

As stated above, the life span of buildings can be divided in the length of the physical existence and of the useful service life. The length of the lifespan is a vital variable for the determination of the initial building quality that is required to prevent obsolescence and to maintain a healthy housing stock. The objective of this paper concerns as such the useful service life.

During the housing construction boom, it was a common approach to estimate the life span on the pre-calculated amortisation of the capital investment, generally 50 years for buildings and 75 years for the

land. In practice however, most buildings last much longer, according to a recent expert inquiry 125 years (Van Nunen, 2010). As many of the composing materials have a much shorter life span, maintenance is a vital prerequisite for the health and life span of dwellings.

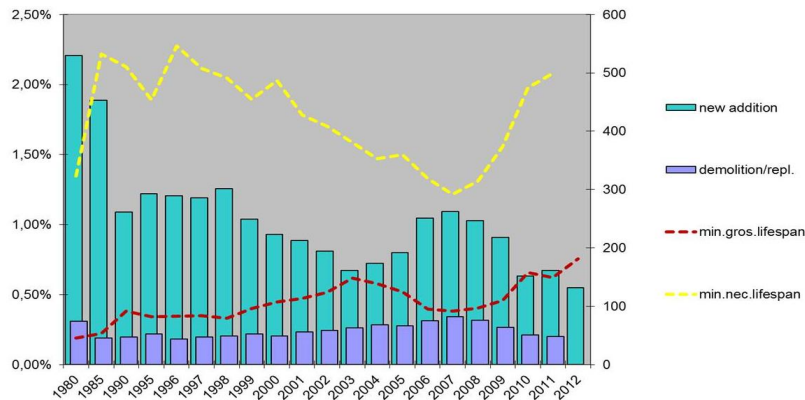


Fig. 4. Minimal gross and net ex ante lifespan, NL dwelling stock.

As Fig. 1 and 2 show, the housing stock is so young that reliable ex-post evaluation data to measure the life span are not yet possible. The question can also be approached ex-ante by computing the minimal needed service life of the existing stock using the actual available replacing capacity. This results in a minimal time to replace the existing stock in the Netherlands, assuming that the available building capacity is entirely used for replacement, in to date some 150 years, see Fig. 4. The actual replacement volume is much lower though - in the Netherlands around 0,25% of the stock annually, resulting in a minimal necessary net life span of at least some 500 years. As the production as well as the replacement capacity of most EU countries is substantially lower, the minimum necessary life span has to be consequently much longer.

3.3 Life cycle models and approaches

Most life span theories and life cycle models of buildings originate from the broader research field of consumer goods manufacture, covering all phases from initiative, production and retail trough use and disposal or recycling. As decisions in the design phase are decisive for the performance, knowledge about the use phase is essential for the design. In particular aircraft and automotive manufacturers have a strong interest in safe, reliable and long lasting products and as a consequence much research in the field of technical maintenance of buildings is derived from that source. On the other side, marketing surveys make up essential input about consumers' needs and preferences. In the housing field, marketing has still a way to go.

Life cycle models of buildings can be divided in three basic types: cyclic models, linear models and process models (Van der Flier & Thomsen, 2006).

3.3.1 Cyclic models

cover all phases in a recurring cycle: the initial phase consisting of research, program, design, production, and distribution; the use phase and the end of life / recycle phase.

The life cycle of buildings consists of 3 main phases: the initial phase or building phase, consisting of the initiative, the design and the construction phase; the use phase or real service life, and the final end of life phase (De Jonge & Arkesteijn, 2008). In the initial phase the initial quality, determining for the future quality development, is established. Afterward change of the initial quality will require capital intensive modifications and adjustments (De Jonge, 2005). Specific for buildings as complex composite and long lasting structures is the recurring repetition of the cycle during the use phase as major repairs, renovation, transformation etc. follow the same cycle. Cyclic models are mainly descriptive, ordering the process without explaining nor predicting possible outcomes.

3.3.2 Linear models

describe the life cycle of building as the development of a value over time. Fig. 5 depicts the development of the building performance as linear declining due to ageing on the one hand, and the required performance to satisfy the user's demand as increasing due to economic growth and prosperity (Vroman, 1982). Problems arise where the actual performance falls through the limit of acceptance, causing tenant complaints and loss of market position, resulting in obsolescence. The model was originally developed to illustrate the main intervention strategies for life span management.

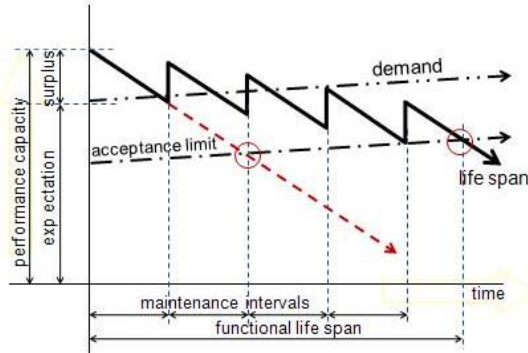


Fig. 5 Dwelling decay process (source: Vroman, 1982)

Possible strategies are preservation by maintenance and major repairs, upgrading by improvements to increase the performance capacity, or downgrading by changing the target group to less demanding residents.

Depicted as the income appreciation over time. Fig. 6 shows the development of the economic performance (Miles et.al, 2007; adapted by Thomsen & Van der Flier, 2011). In the same way as the physical performance, this model shows the strategic and managerial intervention potentials: During the development phase a revision of the planned appreciation i.c. the design and/or of the objectives is required and possible, whereas during the stabilization phase and the decline phase the variables lie in changing the performance by additional earning potential or accepting a lower profit and/or shorter profitable lifespan.

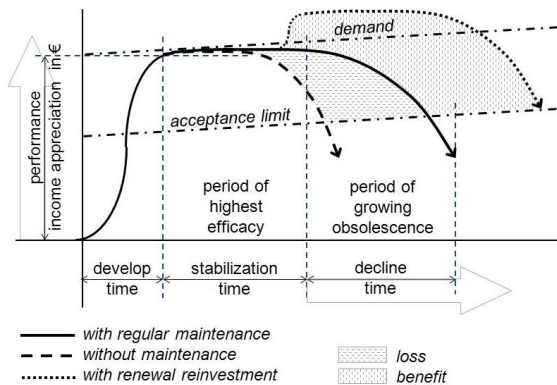


Fig. 6. Real Estate Project Life (source: Miles et.al. 2007 / Thomsen & Van der Flier, 2011)

3.3.3 Comprehensive process models

are intended to relate the life cycle of buildings to determining factors in search of explaining causal relations. Fig. 7 shows a well-known example of this approach, (Prak & Priemus, 1987), further examined and adapted by several scholars (i.e. Heeger, 1993; Van Kempen et.al, 2006).

Further in this paper Fig. 9 shows a more recent version of this kind, a diagnose and decision support model shaped as a decision tree with tangible suggestions for interventions following survey outcomes, based on the results of an international comparative survey of aged housing stock (Van Kempen et.al, 2006). This model that can serve as a backbone for housing pathology analyses will be further discussed in section 3 below.

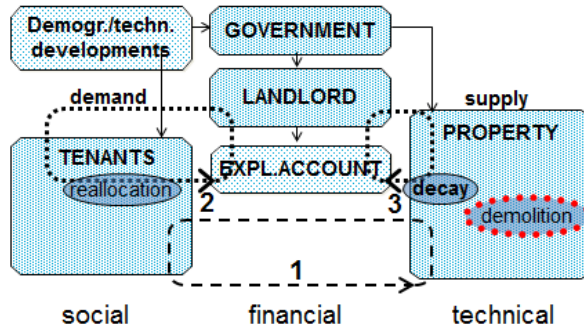


Fig. 7. Decay model (source: Prak & Priemus, 1987, simplified)

3.4 What determines the lifespan?

Empirical knowledge about the lifespan of buildings is limited. This may have to do with the relatively young age of the existing stock and the prevailing attention to new construction (Thomsen et al. 2011). The main source of knowledge about the life span of buildings are quantitative statistical data on withdrawal from the national stock, generally consisting of the total of respectively demolition, end of use, merge to other buildings and loss by calamities. Most countries only maintain statistics on withdrawal of residential stock. Some countries like Finland do not (yet) collect statistical data on withdrawal at all. Qualitative knowledge is still scarce and limited to the models as discussed above. Clear empirical answers on the question what determines the life span of dwellings are hardly available.

Theoretically, the main determining factors of final building decay and demolition can be divided in on the one hand object related asset management factors: obsolescence c.q. physical and (micro)-economical quality/decay and on the other hand owner related proprietor motives: tenure and management capacity, Fig. 8 (Thomsen & Van der Flier, 2010).

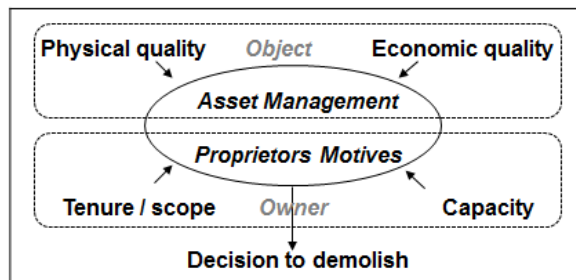


Fig. 8. Demolition of rental property, analytical scheme.

Unlike what most people think, technical causes are generally not decisive for the end of life of buildings. Based on Dutch sources, determining factors for demolition of residential stock were found to be (in decreasing order) tenure, age, building type and location (Thomsen & Van der Flier, 2009). According to these findings, there is a strong correlation between tenure and demolition rate.

Tenure and proprietors motives are strongly connected and play a determining but often hidden role. Though the Dutch social housing stock shows no share of substandard dwellings, the demolition rate of social rented dwellings was 3 to 4 times higher than of the owner-occupied stock; while demolition of the worst part, the commercial rented stock with a substantial substandard share, is almost zero. In the rest of the housing stock demolition most often occurs after property transfer, either to developers and municipalities with the intention to realise new urban plans, or increasingly to new owner occupiers in search of land for a new home, as a result demolition in the owner-occupied stock concerns almost exclusively detached dwellings.

Based again on Dutch sources, demolition motives should be divided in two different underlying grounds: the quality of the existing property or the value of land and location. Quality related motives are typically linked to physical performance, with building age, building quality and technical condition as determining factors. Profit related motives are mostly linked to economic value with market

value of the asset i.e. yield, location, market position and potential land value triggering management decisions.

3.5 Obsolescence as key issue

As stated above, obsolescence is the main threat for the useful service life of buildings. The control, detection, treatment and prevention of obsolescence is a prerequisite to maintain a healthy housing stock and as such a key issue of housing pathology.

Obsolescence of buildings can be defined in various ways: by causes, by elements or by effects (Markus et al., 1972; Nutt et al., 1976; Iselin and Lemer, 1993). In our recent research obsolescence is defined as the process of declining performance resulting in the end of service life (Thomsen and van der Flier, 2011). Performance is defined as the extent to which buildings meet requirements. The decline of the performance of buildings can be absolute when the actual performance is below the performance on completion. It can also be relative when the performance does not meet growing requirements. Based on the literature we distinguish two dimensions:

- an endogenous or internal vs. exogenous or external dimension
- a physical vs. behavioral dimension

Endogenous aspects of obsolescence are related to the building itself; exogenous aspects are related to the location and context of the building. Physical aspects are related to the physical and/or technical characteristics of building and behavioural aspects are related to actions related to the building. Combined in a quadrant matrix results in four corner cells containing resp. A. Physical building obsolescence, B. Physical location obsolescence, C. Behavioural building obsolescence, D. Behavioural location obsolescence.

In previous papers we developed the model and tested it in case studies from the social rented sector (Thomsen and van der Flier, 2012). We concluded that the model was suitable to classify the types of obsolescence found in the cases. In the meantime the model has been further developed, tested and completed with an overview of tools and instruments to detect and measure different kinds of obsolescence as shown in Fig. 9 (Thomsen and van der Flier, 2013).

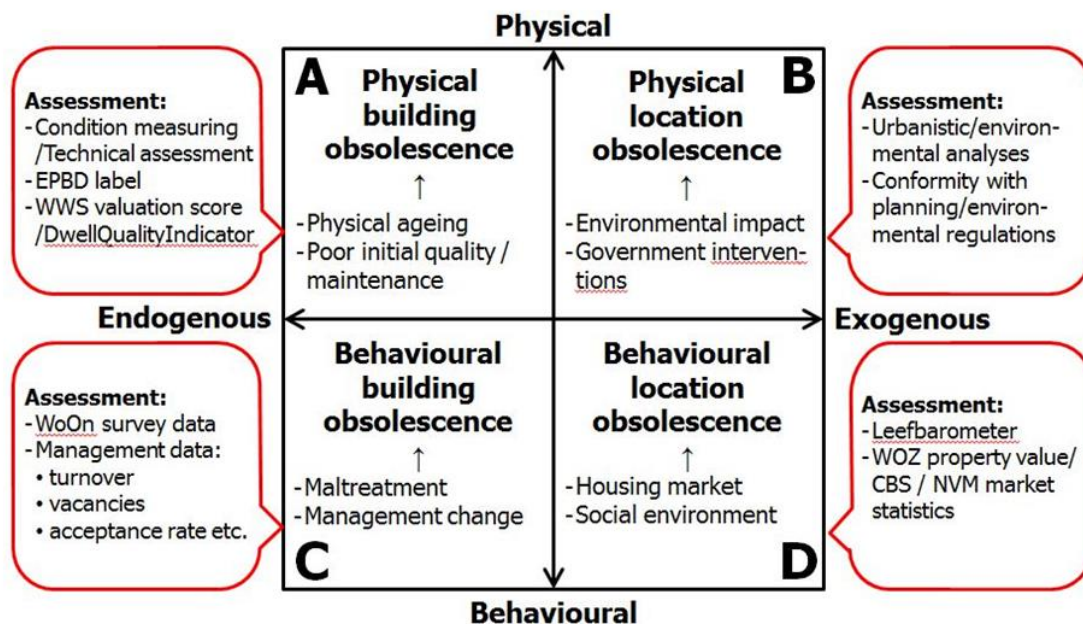


Fig. 9. Conceptual model of obsolescence (adapted)

For the time being the tools and instruments included in the model are derived from what is available in the practice of housing management in the Netherlands. Further research in cooperation with partners from other countries has to be done to give the model a more international basis and applicability. The model has in principle the potency to enable normative assessment, taken the availability of suffi-

cient measuring instruments. As discussed in the next section the model can be very useful as analytic tool for housing pathology.

4 Housing Pathology, principles and practise

Housing pathology in practice will usually be dealing with performance deficiencies in different stages, varying from the apprehension about or prevention of obsolescence through the identification and cure of serious deficiencies. This practice is as such an essential part of professional housing management and will generally be carried out on a regularly basis to underline management strategies and maintenance plans. Unplanned reasons can be unexpected performance deficiencies and sudden serious quality loss by internal (deformation, leakage, stench, fire, explosion etc.) or external (storm, lightning, flooding etc.) calamities, often in addition with assessment of liability and loss. The latter kind of assessment belongs to the highly specialized field of forensic building pathology and will not be further discussed.

Property transactions can also be reasons for in dept examination of the health of the property involved. In any case, fulfilment of the next steps requires proficient professional knowledge, skills and experience.

As described above in section 2, the practice of housing pathology can be divided in four basic steps: 1. anamnesis; 2. diagnosis; 3. remedy and cure; 4. evaluation and prevention.

The way these steps are employed in practice largely depends on the tenure, professionalism of the proprietor and the actual circumstances. In professional property management most of the steps are part of common strategic property and asset management cycles.

Nowadays housing management practice comprises a wide range of approaches, instruments, knowledge bases and tools, varying from technical performance management to resident satisfaction, liveability and housing market analyses and from policy preparation and decision support to evaluation. Some of these tools are applied on a regular systematic basis, some others only in case there is a special need. In fact they all are in some way related to different aspects and steps of housing pathology; a selection is included in the conceptual model of obsolescence (Fig. 9).

This section describes the four basic steps of housing pathology and the tools and instruments involved.

4.1 Anamnesis

The anamnesis consists of the systematic collection of historical and actual data, relevant for the identification of nature and health of residential buildings.

The anamnesis is a vital part of professional strategic housing management. Basic general data are i.e. building and construction type, construction date, location and tenure. It will usually further consist of data about the initial construction, renovation, adaption and maintenance history and the technical, functional and economic/market performance, preceded by formal and legal information, like land register records, building permits etc.

Sources are in the first place legal data including land and ownership registration, building, land and use permits with approved drawings, completed with more building and owner specific data about (periodical) quality and safety assessments, EPBD energy labels, guaranty documents, user manuals, etc.; in case of emergent problems completed with additional specific on-site inspection.

Further basis data for the identification are legal data as administered by government agencies, sometimes on a legal basis i.e. the Building File as used in Australia, containing a complete package of building permit, licences with drawings etc. (ACT, 2013). A further developed (but to date not implemented) example is the Dutch Building File proposal, consisting of four boxes with essential data about the legal status, physical performance and owner's responsibilities (Thomsen, 2003). Similar data sets are used by authorities and agencies in other countries. Though not all relevant, the content gives a useful overview:

- Box 1. Legal data: ownership; legal and cadastral status and commitments and building permits with approved construction drawings and property tax value.
- Box 2. Status report: compulsory periodical inspection reports on vital installation and construction components and additional revision drawings and data.

- Box 3. Quality references: certificates and guaranties on physical and functional quality, i.e. EPBD Energy Performance Certificate, quality assessment and insurance certificates etc.
- Box 4: Functional conditions: safety and security precepts, userø and service manuals and usage costs.

Professional property owners like housing associations and real estate companies use comparable data collections, completed with rental administration and management information data including market position, attractiveness, contracts, inspections, residentø modification permits, post use evaluation, maintenance costs, periodical condition assessments and long term maintenance plans etc. (see i.e. Van den Broeke, 1998; Nieboer, 2009). To date also a range of specialised software is available.

Portfolio sources are portfolio management plans, including strategic planning of supply and target groups and product-market combinations, re- and disinvestments and comparative assessment: rent valuation or property valuation scores and long term market and profit assessments.

Market performance sources are i.e. housing market analyses and performance analyses based on exit interviews, denied lettings, resident satisfaction, tenant preferences, client panels, complaints and consultation of tenant organisations. In particular the last sources are of vital importance for timely observation of, and anticipation on, possible failure and underperformance, be it that the outcomes should always be combined with regular inspection of the physical condition.

Table 1 shows an overview of the respective normative and relative criteria and related project data sources. The interval and urgency of these reviews are mainly depending on the risk and gravity of possible consequential damage and loss and partly covered by formal governmental and/or institutional regulations. The latter concerns in particular the growing importance of quality certification.

Table 1. Housing quality assessment, standards and criteria

	<i>Normative standards</i>	<i>Relative criteria</i>	<i>Project data source</i>
General	- Property regulations - Housing regulations	- General rating systems -	- Property portfolio
Technical/ Physical	- Building code - Technical standards - EPBD	- Condition rating criteria (EN-NEN 2767) - EPBD criteria	- Condition inspection - Maintenance register - Resident complaints - EPBD label
Functional	- Building code - Functional standards	- Functional assessment criteria (WWS) - Quality certificate requirements	- Functional assessment score - Letting register - Resident satisfaction - Exit interviews
Economical	- Rental housing regulations	- Property value criteria - Performance rating systems / - Property Index	- Property value - Performance /index score - Balance sheet - Yield

4.2 Diagnosis

The diagnosis can be described as the systematic search for the nature and possible causes of housing problems, starting with careful analysis of the symptoms found in the anamnesis. In professional practice, the diagnosis follows, as part of the strategic housing management cycle, the analyses of the anamnesis. Thorough knowledge of the symptoms and underlying possible disorders and their causes is an essential prerequisite. As argued above, housing deficiencies are seldom single sided. To serve as a reliable input for possible remedies, the diagnosis should therefore cover all relevant causes of and influences on the central problem, including starting-points for alternative strategies, and excluding hidden biases.

A proper diagnosis is of vital importance; poor diagnoses can have severe and sometimes fatal consequences. As for housing pathology in general, the only criterion for a sound diagnosis is the health, or residential quality: the ability of residential buildings to fulfil adequate shelter for specified groups of residents. As long as clear standards to assess and measure residential quality are practically not available, see above, each diagnose requires a separate quality analysis, with the minimal level of the national and local building regulations as a bottom line. Specific interests of the parties involved can only be of secondarily influence and should be explicitly referred to. This regards not only direct material interests but also attitudes and habits. In the construction and property trade it is not uncommon to automatically combine a rough indication of apparently clear disorders with simple technical remedies, i.e. leaking roofs should be replaced, damp walls are caused by ill-occupancy, and: aged obsolete housing blocks should be demolished. These 'diagnoses' are often more the result of prejudices and biased opportunism than clear analyses. In particular the latter examples entail the risk of planners blight: self-fulfilling authoritative disqualifications, because the accused residents won't bother anymore and few will invest in turned-down property.

Diagnostic procedures can be carried out using a variety of techniques and approaches: deductive, deterministic and/or probabilistic and combinations. Results are most often obtained by elimination of other reasonable possibilities and, in case of physical/structural disorders (leakage, noise etc.) diagnostic tests.

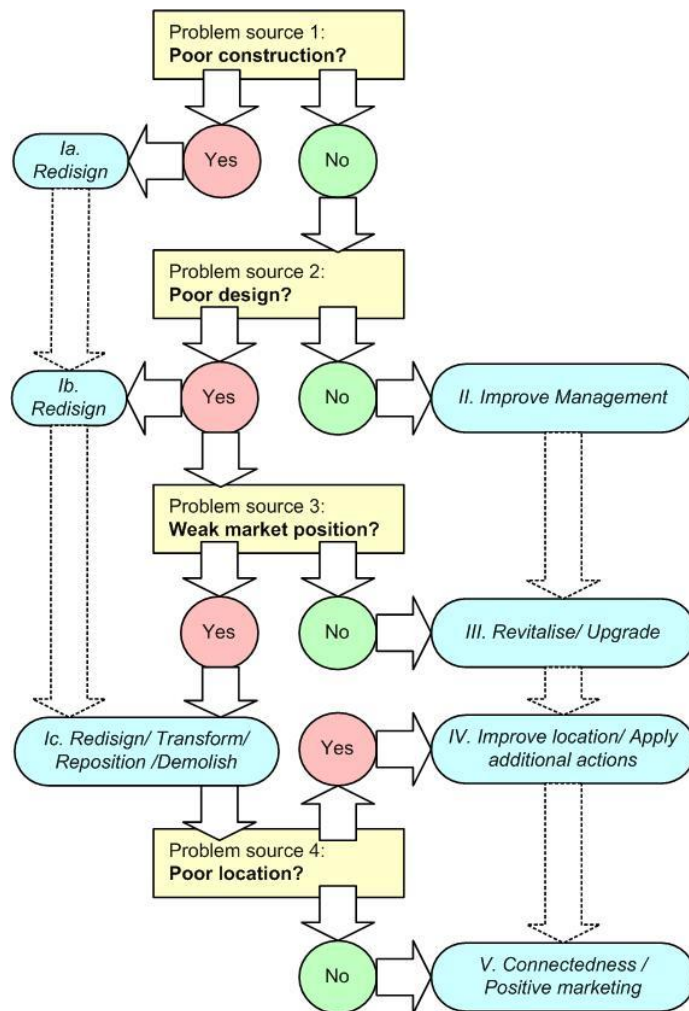


Fig. 10. Diagnostically model Restate (source: Van Kempen et.al, 2006)

Though literature about housing problems and deficiencies is richly available, most of the sources are descriptive case studies and comprehensive theoretical knowledge is scarce. Based on a broad inventory of the available literature, the above described probabilistic model of obsolescence (Fig. 9) covers the current analytic knowledge regarding obsolescence in housing and as such a useful diagnostic tool to distinguish possible causes of housing deficiencies. Also the more deterministic empiric model of Fig. 10 combines analytical outcomes to remedial interventions. Combined they provide a powerful tool for housing pathology practice.

4.3 Remedies and treatment plan

The choice for adequate remedies for housing problems may well be the most difficult step in professional housing management. It implies weighing a range of considerations between often conflicting interests and goals, short or long term solutions and consequences, investments and returns, risks and feasibilities, covering all four quadrants of Fig. 9. As Fig. 10 shows remedial actions may consequently vary between I. Physical interventions, from maintenance through redesign and demolition; II. Managerial alterations, from intensified social and/or client management through sale; III. Revitalisation, from upgrading through change of target group; IV. Locational improvement, from elimination of nuisance through additional provisions; V. Market actions: from active marketing through improving connectedness. Remedial actions should follow and never precede clear analyses. Some problem-solution combinations may look simple, but often are not or even worsening.

Treatment plans will generally be based on strategic portfolio management plans. Following the analytical scheme of Fig. 9 treatment plans are two-sided: influenced by asset management goals and proprietors motives. Following the diagnosis, remedial treatment plans should in the first place solve quality problems, i.c. the ability to fulfil adequate shelter for specified groups of residents. This means that the criteria for decent solutions may vary between i.e. family with children, elderly, students etc. Property tenure is of course also an essential input in the whole process, it is determining for the professionalism of the housing management and pathological approach, from the anamnesis through the conceptualisation of and the decision making about a treatment plan. But a well-developed treatment plan should consider all interests concerned and, in case of ill combinable concerns and contradictory outcomes, provide alternative solutions. Major structural solutions will require long term investments and accordingly burdens. To assess these and compare alternative approaches and options, the use of advanced property valuation and portfolio assessment methods is essential. In particular in the case of combined problems in older stock, a differentiated larger scale approach including the environment and infrastructure should be taken into account.

In the past decades, a growing number of specialized architects, consultants and maintenance companies have focused their expertise on this subject, establishing a new branch and expertise. This professionalization emphasizes the significance of housing pathology as a broad interdisciplinary knowledge domain.

4.4 Evaluation & Prevention

Evaluation is of vital importance, as well to check if and to what extent the treatment was successful, as to gain knowledge to be applied for determination and prevention. The analytical model of Fig. 10 is an example of the fruitful results of case evaluations and secondary analyses. Similar extensive case evaluations are aimed at developing preventive 'thermometers' for the health of residential stock and critical success factors (CSF's) as described above. While large scale comparative surveys are of great importance for the development of pathological knowledge, in practice every single dwelling, row or block has its own characteristics, values and weaknesses.

For the health of the housing stock, the knowledge and experience of the direct responsible housing manager, proprietor and/or consultant is essential. As the ability of the building trade to learn from experience is not strong, a growing number of intermediary knowledge and support organisations, often associated with branch organisations of housing associations, owner-occupiers or tenants, are trying to fill the gap.

On the other hand, some promising recent developments show the emerging awareness of the paradigm shift within the building trade. In the Netherlands a group of maintenance contractors launched a model for performance based long term maintenance contracts for residential property (VGO Keur, 2013). This initiative not only acknowledges the physical and economic importance of long term qual-

ity care but also implies a shift in tasks and responsibilities between property managers and contractors (Vijverberg, 2012). As a more international development, more and more building material manufacturers show long term concern with their products by offering guaranties in combination with operating and maintenance instructions, service and support, provisions that as a matter of fact are regular in most other markets. A few property developers and contractors follow with long term guarantees in combination with operating, maintenance and service concepts, but as far as comparison with also capital intensive products like aircrafts, trains, automotive etc. goes there is still a long way to go.

5 Conclusions and discussion

Housing pathology is both unmistakably a new name and potentially a new domain, but only partly a new knowledge field. As shown in this paper much of the content consists of existing knowledge and practice of professional housing management.

Due to the on-going paradigm shift from mass construction to maintenance and improvement of the existing stock, knowledge of the health of housing provision is of growing social, economic and environmental importance. In the past decades, a growing number of specialized architects, consultants and maintenance companies have focused their expertise on this subject, establishing a new professional branch and expertise.

The inventory in this paper shows housing pathology as a broad, fast growing but fragmented field of existing and knowledge and practice, applied by a range of professionals in the real estate field. It also shows the need for more knowledge and for a more integrated interdisciplinary research and practice. The actual trend towards specialization implies a risk of monoculture and tunnel vision: bricks and mortar do not heal social problems and vice versa.

Unlike classic academically grounded professions, housing management professionals come from different educational backgrounds and knowledge domains i.e. technical, behavioural, economical and juridical sciences with different skills and affinities. This largely applies also to housing pathology. The emergence of a new domain will not be depending on one conference paper. This paper may help though to trigger interested professionals to cooperate in further research and development.

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