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Research note

Contested Commensuration: The case of a valuation instrument for historical buildings

Tineke van der Schoor, Harro van Lente, and Alexander Peine

Abstract
Environmental values are becoming increasingly important in restoration of historical buildings, while energy interventions can seriously damage historical qualities. Cultural-historical values and environmental values are often considered difficult to commensurate, with energy engineers and heritage experts adhering to widely differing values and relating to different discourses. Valuation instruments are devised to deal with such value conflicts in restoration projects. In this article we study what such instruments perform in the case of assessing historical buildings. We ask how these instruments work, and how they afford, support and guide valuation processes? Furthermore, we enquire what is achieved and what is lost in the reconciliation of values. Theoretically, we start from the notion of commensuration, which allows comparison of values through a shared metric. Empirically, this research note examines the history and use of DuMo, an instrument that aims to reconcile cultural – historical and environmental values and provides a range of sustainable restoration strategies. We find that DuMo indeed performs commensuration of these conflicting values, but also keeps intact the epistemic authority of the two professions. Our claim thus is that valuation instruments can successfully perform commensuration while at the same being contested by involved professionals.

Keywords: valuation instruments; commensuration; cultural heritage; energy efficiency; sustainability; assessment

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Introduction

Since the beginning of this century, European and national policies put increasing pressure on building owners to perform energy performance assessments and acquire an energy label. Although this is not obligatory for historical buildings, experts nevertheless perceived this as a threat to the cultural and aesthetic values of historical buildings because the special needs of historical buildings are not considered in energy assessments (RDMZ 2001; Cassar 2009, 2011; Grytli et al. 2012; Pankhurst and Harris 2013). In many countries, heritage professionals were confronted with increasing political pressure to improve the energy efficiency of historical buildings. Furthermore, demands regarding comfort and energy efficiency were raised. Heritage professionals feared that these developments could lead to ill-advised retrofit measures which would damage historical buildings.

Theoretically, valuation instruments have been characterized as tools for 'commensuration', which is defined as a social process that condenses the evaluated aspects and combines, or reconciles them in a shared metric (Espeland and Stevens 1998; Espeland and Sauder 2007). Typically, commensuration requires boundary work, to maintain and regulate boundaries between conflicting values and the epistemic authorities of professions. In the case of historical buildings, energy performance measurements and historical value assessments are performed by experts belonging to different professional groups. Energy assessments are usually carried out by energy engineers; heritage assessments are performed by trained assessors with a background in architectural or building history.

Environmental and cultural-historical values are considered difficult to commensurate, or to measure on a common scale. For historical buildings, a gain in environmental value can cause an irreducible loss in cultural-historical value, to quote Norrström (2013: 2624): 'exhaustive refurbishments with the energy measures undertaken [can lead] to the destruction of cultural, historic and architectural values'. Even stronger, energy intervention can threaten the survival of the building itself (Schellen 2002; Stappers 2008). Stephenson (2008) emphasizes that cultural-historical values are strongly related to cultural identity, communal identity and self-identity. Environmental values, on the other hand, refer to the protection of the environment and the mitigation of climate change.

To deal with conflicting values, several instruments have been proposed to find a common scale and to produce commensurability (Stubbs 2004; Landorf 2011; Liusman et al. 2013). In these instruments, topics such as heritage, environment, economy and social issues are brought together in one valuation method. In this research note we investigate how commensuration is achieved in a particular valuation instrument, the so-called DuMo instrument. We investigate how the DuMo instrument was designed and how it works. Mobilizing the perspectives of energy engineers and architectural history experts, we assess what is gained and lost in the articulation and commensuration of values when using the DuMo instrument.

The research note is organized as follows. In the following two sections, we further elaborate on values and valuation practices in the case of assessing historical buildings. In the next we present our methods and materials, while the following section introduces our case study of the DuMo instrument, including its development, procedures and experts' views on its application. We will describe how different values are represented in the instrument, how they are weighted and how the results of the measurements are interpreted and translated into metrics that are easy to communicate. Clearly, the commensuration of values is an ongoing challenge, as will be discussed in the penultimate section. We conclude that while the valuation instrument combines historical and environmental values in one instrument, it also keeps the epistemic authority of the two professions intact. Our claim is that valuation instruments achieve commensuration while remaining to be contested by involved professionals.

Conservation and sustainability

Conservation of historical buildings connects philosophical ideas and human values with technical interventions, as Drury (2012) remarks:

> Building conservation is distinctly different from the physical processes of repair and adaptation. It is an attitude of mind, a philosophical approach, that seeks first to understand what people value about a historic building or place beyond its practical utility and then to use that understanding to ensure that any work undertaken does as little harm as possible to the characteristics that hold or express those values. (Drury 2012: 1).

Conservation requires constant monitoring, decision making and acting on the materials that make up the structure. Moreover, new demands regarding comfort or functionality often prompt changes to the form, material or layout of buildings. Indeed, buildings are constantly reconfigured: they need daily management, regular maintenance (Denis and Pontille 2015), repair (Graham and Thrift 2007) and sometimes restoration (Yaneva 2008). Such reconfiguration work can be in conflict with the conservation principle of minimal intervention, because even minor changes can seriously damage the cultural-historical qualities of historical buildings.

On an international level, codes for conservation have been established by the International Council on Monuments and Sites

(ICOMOS), under the auspices of the United Nations. Charters have been negotiated for specific building types, archaeological sites, immaterial heritage or specific cultures (Pickard 1996; ICOMOS 2003; Fredheim and Khalaf 2016). Authenticity, as affirmed in the Charter of Venice (ICOMOS 1964) and the Nara Document (ICOMOS 1994), is considered essential for the knowledge and protection of cultural-historical values. Based on these international charters, national heritage agencies published practical guidelines for conservation (Stovel and Smith 1996; English Heritage 2008; RCE 2009). Figure 1 depicts the categorization of interventions based on their impact on the heritage character of the building.

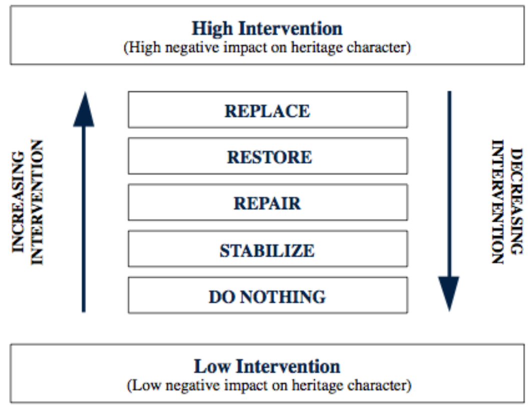

Figure 1: Minimum Intervention Scale, from FHBRO Code of Practice
Source: Stovel and Smith 1996: 18

Alignment of conservation with environmental values has been investigated before. Cluver and Randall (2010), Cassar (2011) and Godwin (2011) describe, for instance, technical results of energy efficient restorations. Cassar (2009) emphasizes the importance of monitoring the actual energy use and the effects of energy measures on the integrity and meaning of historical buildings. Several methods have been proposed to assess and manage the sustainability of historical buildings, cities, sites and landscapes, based on an integration of environmental, social and economic aspects. For example, Stubbs (2004) has developed a framework for the sustainability appraisal of the historic environment by distinguishing four topic areas: environmental, social/cultural, economic and sense of place. Landorf (2009) has crafted a model for sustainable management of industrial heritage sites with the two dimensions of long-term holistic management and the participation and empowerment of multiple stakeholders. Liusman et al. (2013) put forward a set of 'tailor-made' indicators for the assessment of heritage and applied these to a case study of a heritage building in Hong Kong. Eriksson et al. (2014) developed a software tool to support decisions on energy retrofit measures. National heritage agencies have also published reports and guidelines on how to balance environment with conservation (RCE 2010; English Heritage 2013).

Nevertheless, commensuration of historical, environmental, social and economic values in building reconfigurations remains a contested space. These values cannot be reconciled easily, as is recognized by Wallace et al. (1999) and Pendlebury (2002). Moreover, Strange and Whitney (2003) argue for more research into the integration of sustainability in heritage management, especially as part of wider regeneration strategies.

Summarizing, the importance of balancing historical values with sustainability principles is increasingly recognized in the literature. Several generic frameworks have been proposed to balance historical and energy values, but theoretically this balancing is not fully understood. In the following section, we continue with the key question of this research note, how instruments of valuation afford and guide reconciliation of values.

Values, assessment instruments, commensuration and epistemic authority

The development of value assessment methods entails negotiations about the identification and relative importance of values, and how to bring them together in a shared framework. In this respect, Espeland and Stevens (1998) coined the notion of *commensuration*, which they define as a social process that brings various entities together in a common quantitative framework. Commensuration simplifies and reduces information, and subsequently imposes a shared metric on what remains. The metric is often used for ranking purposes, for example of schools (Espeland and Sauder 2007). Commensuration translates qualitative statements – on, say, how 'good' a school is – to quantities; in this respect Espeland and Sauder note that numbers create authority, circulate more easily and travel more easily to other contexts (2007: 17). Furthermore, they argue that 'Commensuration presupposes that widely disparate or even idiosyncratic values can be expressed in standardized ways and that these expressions do not alter meanings relevant to decisions' (2007: 12).

Professionals generally strive to gain 'epistemic authority', that is 'the legitimate power to define, describe and explain bounded domains of reality' (Gieryn 1999: 1). Boundary work is performed to construct and guard these professional domains, both regarding the division of labour and the definition and description of what is at stake. Gieryn (1995) points to the different epistemic authorities of professional groups and the concomitant incommensurabilities. When it comes to the experts involved with historic buildings, the different professional groups of architectural-history experts and energy engineers can be characterized as 'two interdependent professions with more or less equal structural power and resources' (Gieryn 1995: 411). Since the nineteenth century, conflicts over boundaries between the domains of architects and engineers have been very common (Bruegmann 1978; Aibar and Bijker 1997; Saint 2007).

For commensuration of cultural-historical and environmental values these two types of values are brought together in a common framework. Commensuration entails boundary work to delineate epistemic authority and a division of labour. In our case study of the DuMo instrument this brings the question how the instrument affords and guides the reconciliation of values and how it depends on boundary work between professional groups.

Method and materials

The research was set up as a case study (Yin 1994), employing various materials to investigate the case of the development, goals and application of the DuMo instrument (see the case introduction section). To investigate experiences with DuMo assessments we held interviews with four members of the national steering group that was responsible for the development of DuMo. This includes architectural historians and building engineers, representing the main disciplinary perspectives in our study. The interviewees are identified by 'Exp.int.' professional background and a number. The interviews were transcribed and analysed in Atlas.ti. In the analysis of interviews we used an inductive approach (Charmaz 2014). We first identified and coded meaningful quotations in the interviews. We then performed a thematic analysis and compared the identified themes to the literature on cultural-historical valuation and sustainability. In the section Commensuration by an instrument, we discuss five themes: cultural-historical values, energy performance, intangible values, economic aspects and expert knowledge.

We also studied documentation on the DuMo instrument and reports on its application. First, we relied on the *Handboek Duurzame Monumentenzorg* [Handbook on Sustainable Conservation of Historical Buildings] (Van de Ven et al. 2011) (henceforth: the Handbook), which describes the assessment procedures and gives examples of finished projects. The Handbook also provides (online) assessment sheets. We investigated how experts are addressed in the Handbook and how specific professional values are transmitted through the instructions and energy improvement strategies. DuMo assessments are commissioned by the owners of historical buildings and performed by architectural experts and energy experts. A full report is typically between 75 and 100 pages long and includes detailed descriptions and illustrations of valuable features in the investigated building. DuMo reports remain the property of the commissioner and are not usually publicly available. Here, we only refer to public sources. We examined DuMo reports (Dulski 2006, 2009, 2013), research notes about DuMo studies (van Bommel 2009, 2013; Nusselder 2009; de Jonge 2011) and archival materials of listed buildings across the Netherlands. Last, we compiled a comparative overview of 41 DuMo assessments which were published by NIBE.[1] The buildings investigated by NIBE were restored with a high energy ambition and revealed design strategies used to reconcile energy and historical values. This overview provided insights into the results of DuMo assessments, the applied restoration strategies and allowed comparison of the buildings to search for regularities, for example in building type, age and applied energy measures.

Case introduction: DuMo, an instrument for assessing historical and environmental values

In this section, we will first describe the background, development and design of the DuMo instrument. Then we introduce the different parts of the DuMo instrument and how the calculation for the DuMo label is constructed.

Development and design of the DuMo instrument

Since the 1990s, heritage professionals in the Netherlands have been faced with increasing political pressure to improve the energy efficiency of historical buildings. 'We realized that there was a threat, fear for political decisions on environmental standards, without recognizing that historical buildings are different' (Exp.int.1, historian). Furthermore, our interviewees stated that it was expected that owners of listed buildings would increase their demands regarding comfort and energy efficiency. They feared that these developments could lead to ill-advised retrofit measures and ultimately damage historical buildings. 'At that moment we already feared that the obligation for energy labels would be extended to historical buildings, or that new demands would be formulated for energy efficiency, we thought that in that case, we should be able to say, "You can", or "You can't"' (Exp.int.2, engineer).

In 2003 the Dutch Cultural Heritage Agency (RCE) initiated development of an instrument to value the sustainability of historical buildings. The method is called 'DuMo', which is an abbreviation of 'duurzame monumenten'.[2] Moreover, a knowledge base for historical

[1] NIBE is a Dutch consultancy specialized in sustainability. It was a member of the steering group responsible for the development of the DuMo instrument. The original list with projects can be obtained by the corresponding author. https://www.nibe-sustainability-experts.com/nl/dumo-duurzame-monumentenzorg

[2] Dutch for [sustainable historical buildings].

experts would be constructed, which could be used to assess proposals for energy efficiency. A steering group was set up, in which professionals from two backgrounds were represented: cultural heritage and sustainable energy. NIBE, a sustainable building consultancy, was commissioned to develop the new method. Architectural and building historians stressed that the instrument should be an expert model, to avoid lay persons from performing historical valuations. Users of the instrument would be architectural historians, energy engineers, civil servants and other heritage professionals.

First, an inventory was made of traditional sustainability features of historical buildings, such as rainwater cellars, window shutters, natural ventilation and insulation. Second, pilot buildings with recent energy efficiency measures were investigated, evaluating energy performance as well as loss of historical values. Assessment procedures, examples and strategies for improving the energy performance of historical buildings are described in the Handbook (2011). For practitioners, a code to download the DuMo calculation sheets is included. The Handbook also describes the pilot projects that formed the empirical basis of DuMo methodology.

Usually, DuMo assessments are carried out in preparation for a restoration project with a high energy efficiency ambition. To support the design process, the Handbook gives a broad range of appropriate technical strategies for energy efficiency and other sustainability measures. The restoration design is the basis for a second assessment of both cultural-historical and environmental values. The achievable gain in energy efficiency as well as the gains or losses of cultural-historical values are measured. The DuMo label (Figure 2) gives visual insight in the label-jump from the lowest level (G) to the highest level for existing buildings (A) that is achieved or expected after the energy efficient restoration.

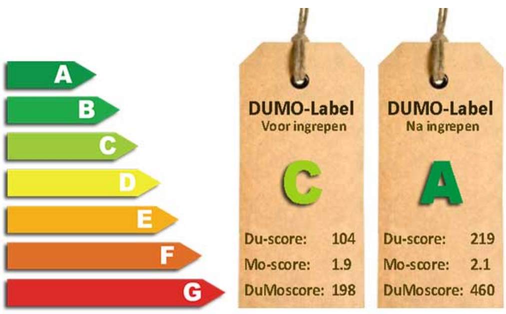

Figure 2: Example of DuMo Label Paushuize, Utrecht, the Netherlands

On the left, the EU-energy label categories ranging from A (most efficient) to G (least efficient). To the right, we see first DuMo Label C, which describes the situation before intervention. To the far-right DuMo Label A, after intervention. The lower part of the labels shows the scores for Sustainability (Du-scores), Historical values (Mo-scores) and the multiplied result (DuMo score).

Source: www.dumoprestatie.nl

Step 1: Historical values-coefficient

How does the DuMo instrument build this bridge between historical and environmental values? The reconciliation takes place in three steps: Step 1 is the assessment of historical values, leading to the Historical-Values Coefficient; step 2 is the assessment of sustainability performance, leading to the Sustainability Score. In step 3 the numerical results of these two assessments are multiplied, so the result is a merger of the two separate assessments. Importantly, valuation with DuMo is not an end in itself; it forms the basis for an energy efficient restoration plan.

Assessment of cultural-historical values in general requires a thorough investigation of building history, through examination in situ as well as by studying archival documents, local history and connections to important residents. A DuMo assessment requires considerable cultural-historical knowledge; therefore, it can only be carried out by a qualified evaluator.

Categories and items of historical value		
Architectural historical values (max. 60 points)	1	Building type and style
	2	Architectural quality
	3	Building quality
	4	Importance in oeuvre of architect
Cultural historical values (max. 27 points)	5	Importance with respect to historical themes
	6	Relation with local historical developments
	7	Relation with historical persons or events
Context values (max. 13 points)	8	Significance of environment for the building
	9	Significance of building for its environment
Completeness (factor 0,3-1)	10	How much of the historical material is preserved
	11	Technical state

Table 1: Categories and items of historical value DuMo instrument
Source: Based on Handbook Duurzame Monumentenzorg

The value-bearing features are noted on sketches or drawings of building elements, using the provided assessment sheets. Next, expert judgements are made on the value of each feature, which result in points. The main categories are architectural-historical values (max. 60 points), cultural-historical values (max. 27 points), context values (max. 13 points) and completeness (factor min. 0,3–max 1) (Table 1). Each category has two or more subcategories. For each subcategory the importance of the building is scored. All scores are transferred to an aggregate statement. In this part of the scoring procedure, values are translated in an ordinal scale, ranging from very positive (P), positive (Q), average (R), to negative (S). However, the underlying forms still contain the quantitative scores.

Total of the scores leads to the assignment of a 'Touchability' category to the building. This category combines two aspects: importance of the historical values and the vulnerability to interventions. DuMo defines four main touchability categories: A, B, C and X. Category A denotes 'museum quality', B stands for 'important historical value', C is characterized as 'flexible building with historical values' and X is reserved for buildings that are not listed[3] but do possess relevant cultural historical values. Furthermore, a numerical Historical Values Coefficient is given based on the total score. This coefficient later becomes the cultural-historical multiplier, as will be shown in Step 3 below. The DuMo report includes a comprehensive description of all identified values.

In this procedure we recognize first the certification of assessors, which must be architectural-historical experts. Second, a classification of values in four main categories with subcategories takes place. The large amount of information that is gathered for this procedure is significantly reduced and simplified, and scores are assigned for each feature and category. Next, a shared metric is applied which leads to the Historical Values Coefficient, a number. A further simplification is achieved by translating the scores to an ordinal scale (P, Q, R, S). The touchability category does not only express the importance but also the vulnerability of the building (A, B, C, X). Last, the procedure is validated by a second certified assessor.

Step 2: Sustainability Score

The Sustainability Score is based on GreenCalc+, a certified environmental assessment method[4] which was already being widely used when the DuMo instrument was developed. The sustainability sheets include three themes: water, materials and energy. The questions relate to the measurements of the building, technical installations, insulation, glazing, yearly energy use and so on. According to our

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[3] 'Listed buildings' is commonly used in English to denote buildings that are placed on a national or municipal 'List of Buildings of Special Architectural or Historic Interest'.

[4] Audited and approved by the Bureau Veritas Certification and compliant with ISO 14040 and ISO 14044.

interviewees, these forms are not difficult to complete; any building professional could do it based on their education. The software performs calculations in the background and presents the viewer with the result. Figure 4 shows an example of the calculation sheet for sustainability, from the DuMo calculation package.

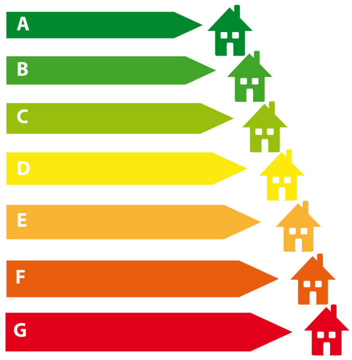

Figure 3: EU-labels for buildings

Source: European Parliament, https://www.europarl.europa.eu/resources/library/images/20171009PHT85660/20171009PHT85660_original.jpg

The resulting sustainability score can be translated to an energy label in the system of labels ranging from A (very efficient) to G (very inefficient). This labelling system has been used in the EU since 1994; it has regularly been updated and is very widely known. Figure 3 depicts the most recent EU-label system. Energy performance assessments are based on a benchmark, so new versions of the GreenCalc+ method reflect changes in energy efficiency technologies, national energy policies and building regulations. Because of more ambitious national energy goals and more efficient technologies, the rankings become more stringent as time progresses. This means that the building owner has to implement more energy measures to acquire a certain label, because the stakes are raised but the building remains the same. Presently, GreenCalc+ is merged with BREEAM-NL, a broad certification method for sustainable buildings managed by the Dutch Green Building Council (DGBC).

Figure 4: Example of sustainability assessment sheet used to calculate energy demand
In this part, the insulation values of the building and the installations for heat provision are described. The graph on the right shows the Sustainability Index (Du Index) for building part 1 (Bouwdeel 1)
Source: DuMo calculation sheets 2012, package provided with Handbook Duurzame Monumentenzorg

Calculation of the DuMo label

The aim of DuMo is to give a building a sustainability score that takes the special character of historical buildings into account. To this end, the result of the assessment of historical values (historical values coefficient) is multiplied by the calculated Sustainability Score. The resulting DuMo score is then translated into a traditional energy label ranging from A to G. In this way, both architectural historians and energy engineers find their respective expertise and valuation represented in the results of the assessment.

Take for example the scores of Paushuize, a house in Utrecht, built in 1517 for Adrianus VI, the only Dutch pope. The sustainability score is 104, which would lead to the assignment of label G, the lowest possible label. In DuMo, this score is multiplied by the historical values coefficient of 1.9, and this results in a score of 198. With this score, the building receives a DuMo label B (Dulski 2009). Scores can be checked in Figure 4.

We checked if energy performance is in any way related to historical characteristics. To that end, we examined the NIBE database to find relationships between historical values and potential improvements of energy performance. In these 41 cases we could find no relation between energy performance and building characteristics such as touchability, age, type or function. For example, buildings with the highest energy-improvement can be found in all four 'touchability' categories; buildings date from the late Middle Ages to the first half of the twentieth century; building types vary from dwelling to factory to city hall; and functions (both original and new) vary from dwelling, museum, to office. We did not find any relation between historical values and energy performance. Thus, the assessment of these two parts of DuMO, as well as their multiplication, is not hampered by interdependencies.

High touchability of a building (category A, see previous subsection) relates to the importance of historical values present and its vulnerability to intervention. However, high touchability does not preclude energy improvement. Nevertheless, it does give an indication of the amount of care, creativity and architectural knowledge that will be required at the design stage of the restoration plan.

Commensuration by a valuation instrument

Certification of experts

The DuMo instrument was explicitly developed as an 'expert method' and is not designed to be used by laypersons. In the Handbook target groups are identified, such as contractors, heritage agencies, builders, architects or engineers. For each group an indication is given as to which parts of the DuMo instrument they can accomplish by themselves and for which parts they will need expert help (van de Ven et al. 2011: 11). In this framework, two professional groups are involved: energy engineers and architectural-historical experts.

To become a qualified valuator of historical values, one should either hold a masters in architectural history, or a postgraduate degree in building history and restoration. Furthermore, having assessed 150 historical buildings is an obligatory requirement for certification. Energy engineers do not receive cultural-historical training in their education. This inhibits engineers from recognizing historical values and conservation principles and can lead to ill-informed advice regarding insulation, glazing or appliances. As one of our interviewees states: 'If you arrive at a building with an experienced architectural-historical expert, he sees a hundred thousand things that I still overlook' (Exp.int.2, engineer). This lack of knowledge can also lead to failure to recognize the importance of authenticity. For example, producers or engineers offer new fixtures that 'look just the same' as historic items (Exp.int.2, engineer). However, according to international conservation principles (ICOMOS 1994) authentic material should have priority, because historical fabrics and materials are a finite resource; once lost, they are irretrievable. This ties in with the principle of minimal intervention as relayed above (Figure 1) (Stovel and Smith 1996).

Categorisation of values and reduction of information

The DuMo procedures in Step 1 (design of the DuMo instrument) (i) identify what features are valuable; (ii) describe why these features are valuable; (iii) assess how valuable they are, which is congruent with the observations of Fredheim and Khalaf (2016).

In the DuMo procedure, architectural-historical and cultural-historical values are made commensurate by bringing scores of general design and specific features into clear and discrete categories and a judgement is provided which renders the categories comparable. The procedure reduces the large amount of gathered information to a numerical score for each subcategory. Within the division of historical values, a low score in one category can be compensated by a high score in another. The completeness of the building and its features is used as a factor, which may decrease the total score. The division in clear categories makes the valuation process more transparent, and numerical values are easier to communicate. The Historical Values Coefficient subsequently assigns a numerical value to the building, which is later used as multiplier in calculation of the DuMo label.

However, DuMo does not stop after assigning the Historical Value Coefficient. In the next step, buildings are graded according to a 'touchability' degree that further condenses the information about the building and makes buildings comparable along this metric. This concept was originally developed by one of our interviewees:

> At a certain moment, I just devised that concept, with the idea of investigating the different viewpoints for analysing a building, which could be a building-historical viewpoint, or a cultural-historical viewpoint, an important inhabitant who lived there, well, from these various perspectives, you can start the historical research of the building, with which you can underpin these stories, as well as explain much more clearly where the (historical) values actually reside. (Exp.int.1, historian).

According to this interviewee, during the development of DuMo various attempts were made to make touchability measurable, but in the end, it was decided to devise three simple grades (A, B, and C) and a non-grade (X).

> You have buildings that just are very untouchable, for example Hunting Lodge St. Hubertus; there you can do approximately nothing; then you have buildings where you can do something, but not too much, the Palace in Amsterdam is an example of that, you can do one thing and the other, but

> within boundaries; and then you have the average historical houses, where you have a lot more freedom. (Exp.int.1, historian).

The touchability degree thus is inversely proportional to degrees of freedom for the implementation of energy measures. With grade A you can do 'approximately nothing', with grade B you can do 'something, but not too much', and with grade C you 'have a lot more freedom'. For buildings that are characteristic, but not protected as a historical building, grade X is reserved.

Limitation of scope values

DuMo includes intangible values in assessments by identifying located stories, traditions, genealogies etc. (Stephenson 2008: 137). Values can be attached to intangible objects, such as stories, poems or music. Intangible values have been discussed in international venues under the auspices of UNESCO and are codified in the Burra Charter (Vecco 2010; ICOMOS 2013). Stories of buildings are part of the collected memories of buildings and places. Furthermore, such stories serve to interest local citizens and visitors and provide motivation for protection. 'Stories also make buildings sustainable' (Exp.int.3, historian). Nevertheless, as one of our interviewees says, energy measures are unlikely to damage the link with historical figures or important events. 'Take the Binnenhof as the [symbol of the] centre of government, and before that of the Graafschap (of Holland), I would say, if I apply double glazing it will still be this symbol' (Exp.int.1, historian).

In DuMo, values arising from relations to historical themes, local historical developments, historical persons or events are scored in the second part of the cultural-historical dimension (Table 1). Historical research can reveal for example if the building has played a significant part in local history or whether it is the birthplace of a local historical figure. However, DuMo does not take up lay values, collected memories or local traditions. We conclude that DuMo takes up a limited scope of cultural-historical values.

Energy performance in DuMo is calculated following existing certified methods for energy assessment. However, energy assessments generally do not take user behaviour into account. Likewise, DuMo does not consider user behaviour, although this has a large influence on energy use, especially in historical buildings. Indeed, according to our interviewees, there is a risk that unnecessary drastic interventions are proposed in the restoration plan.

Risks and limits of energy assessments

In the DuMo instrument, a standard energy assessment method is used to predict energy performance, however, this is not uncontested. Such methods are based on predicted heat loss, not on actual measurements. These predictions are based on premises that are impossible to ascertain in a historic building. 'You know nothing about existing buildings, except when you knock them down and build them up again, then you know!' (Exp.int.3, historian). Instead, our expert states, a simple yearly report of actual energy use would give a much more reliable indicator for energy performance. The difference between calculated and actual energy use ties in with the literature (see for example Aksoezen et al. 2015).

The second issue regarding energy performance is the influence of user behaviour. According to our interviewees, some users are quite happy to refrain from using certain draughty rooms in winter, if that is the price they have to pay to live in a historical building. They are also prepared to adapt their personal clothing and interior decoration, such as applying heavy curtains. 'Especially in historical buildings behaviour of users is very important for the actual energy use in a building' (Exp.int.2, engineer). If users do not show 'energy awareness', even in an energy neutral building the actual energy use can be much higher than expected. Therefore, monitoring actual use for heating and ventilation is necessary, both before and after restoration. 'First monitor what they actually do, where energy leaks away, or what it is used for' (Exp.int.3, historian).

The heavy influence of user behaviour together with the impossibility of rating a historical building is the reason one of the interviewees concludes that it is the user, not the building which should be labelled. In her view, this also lays the burden where it belongs, because it is actually the user that needs heating, not the building. 'Because the building doesn't mind if it is draughty, nobody cares, or if doors clatter, doesn't matter! (…) you just have to take care that it does not get wet, that is much more important. Don't get wet and keep it nicely draughty' (Exp.int.3, historian).

Last, according to our interviewees, it is not only user behaviour but also user knowledge that should be taken into account. Users have specific information about their building, they know where cold draughts exist and what spaces are especially cold or moist. Therefore, from this viewpoint, the starting point for energy advice should be the building itself and how to improve energy efficiency with minimal intervention.

Alignment of professional groups

In a DuMo assessment, these two professional groups are brought together. Working in DuMo projects teaches engineers to appreciate their own limits of knowledge: 'In all these years I have learned what I don't know (laughing), that is the difference with the Energy Performance advisors, I think, they don't know what they don't know – and I do' (Exp.int.2, engineer).

Expert cultural-historical knowledge is often lacking in many municipal organizations. Therefore, before giving a building licence for restoration work, municipalities in the Netherlands typically employ experts from provincial agencies and rely on (compulsory) advice from RCE. Civil servants of small municipalities are not experienced valuators: 'And I exaggerate enormously, but such a civil servant does historical buildings on Monday, management of the swimming pool on Tuesday, and on Thursday he takes care of parking facilities. So, they have only limited time for heritage, which makes them very uncertain' (Exp.int.2, engineer). This uncertainty precludes civil servants from supporting owners by finding appropriate solutions for energy efficiency in historical buildings.

Owners of historical buildings are also laypersons, who although they often display great interest in their building, are usually not trained in architectural history. Some municipalities advise citizens to use freely available DIY checklists such as the Groene Menukaart to assess their historic buildings. However, according to our interviewees, it can still be difficult for laypersons to identify the valuable features of their building, because they do not recognize the historical styles. Owners can be overwhelmed by advisors that push expensive, heavy equipment that does not suit their building, says one of our interviewees. This development is exacerbated by the pressure for energy labels: 'What you often encounter is that people are overwhelmed by so many parties. There comes a contractor, there is the energy advisor, saying you should implement installation of so-and-so, and before you know it, they have done things that don't fit the building at all. Don't fit the use-pattern at all!' (Exp.int.3, historian). Laypersons are advised by energy engineers who clearly lack the knowledge of cultural-historical values, but nonetheless push their energy solutions, thereby potentially causing considerable damage. Nevertheless, the expertise of the energy engineer is indispensable in the development of a restoration plan. Here, energy interventions that are specifically suited to historical buildings are required, such as those that are described in the Handbook.

So, the DuMo instrument brings professional groups together in a restoration process. Cooperating in a DuMo project can help historians and engineers to acknowledge each other's expertise and their own limits of knowledge. DuMo standardizes and simplifies the process of valuation. However, DuMo does not make expert knowledge superfluous; in particular the assessment of historical values requires considerable cultural-historical knowledge. Furthermore, although the assessment of energy performance is relatively straightforward, the design of energy interventions that are appropriate for historical buildings still requires expert knowledge.

Conclusion

The key question of this research note is how valuation instruments afford and guide the reconciliation of values that are difficult to commensurate. We studied the so-called DuMo instrument that seeks to commensurate heritage values with environmental criteria, and we traced in detail the steps that constitute the instrument. In our research note, we followed the development of the DuMo instrument and interviewed key persons working with DuMO. They shared their insights about the meanings of the number that is the outcome of the valuation process. Furthermore, the method forms the basis for restoration plans that include measures to improve the energy performance of the historical building. Therefore, we argue that assessing buildings with DuMo can be considered performative; not only does it give a valuation of the building in the form of an energy label in proportion to the identified historical values, but it also suggests pathways to improving energy performance. In our case study, we found that DuMo has also stimulated innovation; it brought about the development of new energy measures that are suitable for historical buildings. However, we noted that threats perceived by the heritage community in the early 2000s are still present. Both our case study and literature study suggest that if energy performance assessments were to become the basis for compulsory measures in historical buildings, the historical values of heritage would be seriously under threat. Therefore, the aims and procedures of instruments like DuMo are still very relevant today.

We studied how the DuMo instrument commensurates values from separate domains, e.g. energy and cultural history. Inspired by the conceptualization of Espeland and Stevens (1998) of commensuration processes, we suggest that understanding DuMo commensuration is achieved by virtue of the following six processes:

Certification of assessors. A precondition of DuMo is that in particular the assessment of cultural-historical values requires 'the right' valuators, as explained in Step 1. So, valuators are selected, and certification schemes are employed.

Categorization. Different values and aspects are divided into two domains or dimensions: cultural-historical values and sustainability values, including energy efficiency. Within these two domains further categorization takes place; different values are articulated and acknowledged as categories with questions or subcategories that can be scored.

Reduction. Not all types of values are included, leading to a reduction in information. A monument may have more than historical values and energy performance properties; it may, for instance, also be appreciated as a touristic highlight, as a meeting place for a community or as a token of spiritual value.

Simplification takes place by condensing multiple themes and aspects of cultural history in concise questions to be answered by expert judgement. The adoption of the EU-label system simplifies energy assessment.

Scoring of values takes place in both dimensions. Scoring for historical values is based on awarding points for valuable features, leading to qualifications on a scale from very positive to negative. The sum total leads to the historical value coefficient and the Touchability degree (A, B, C or X). The energy score is expressed in an interval scale.

Shared metric on what remains. DuMo produces a single number as outcome of the valuation process. The multiplication of the historical value-coefficient and the energy score makes the cultural-historical value have an effect on the energy label. Notably, if the cultural-historical value is low, there is no increase to the label. We note however that the shared metric in this case is basically an 'energy metric' with a cultural-historical multiplier. The resulting DuMo label acts as a translation of historical values in numbers, which is actionable in the different worlds of heritage experts and energy professionals.

The DuMo instrument did more, however. Efforts of commensuration also bring professional groups together and strengthen their identity. The ongoing discourse about energy and historical buildings is also a conflict over 'epistemic authority', that is 'the legitimate power to define, describe and explain bounded domains of reality' (Gieryn 1999: 2). The new guidelines for energy assessment of buildings have been interpreted as an infringement on the 'epistemic authority' of historical building professionals. They felt that their knowledge and experience were not taken into account, to the detriment of the historical buildings they care about. As explained earlier, development of the DuMo instrument was meant to settle or redraw the boundaries between the involved professions and to clearly state which tasks should be left exclusively to architectural historians. The demarcation of boundaries between the worlds of architectural historians and energy experts is reinforced with the separate assessment forms of the DuMo instrument, to be filled out by the respective professionals.

In other words, the DuMo instrument paradoxically brings reconciliation across borders by reinforcing boundaries; it keeps the epistemic authority of the two professions intact through separate assessment forms. So, while environmental and cultural values are reconciled in one final score, their different assessment methods and results are fully acknowledged and maintained in separate forms. Our claim thus is that valuation instruments can perform commensuration and at the same time guard the boundaries of separate domains by acknowledging multiple professions.

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