BUILDINGS & CITIES

SPECIAL COLLECTION: UNDERSTANDING DEMOLITION

EDITORIAL

Understanding demolition

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HIGHLIGHTS

This special issue explores when, why and how demolition occurs with the aim to understand its environmental, socio-economic and cultural drivers, and consequences in policy and practice alike. Based on previous research, demolition is known to have many adverse effects. The potential for avoiding building replacement (demolition and subsequent new build) and favouring retention is also in this special issue's interest. The papers in the issue contribute insights from different scales, from the level of a building to that of a city. As a whole, the articles touch upon all types of impacts, *i.e.* environmental, economic and socio-cultural aspects. Eight case studies from various contexts, mainly Europe, but also the US and Australia, contribute novel methods, findings and policy insights. This editorial sets the need and background for research into demolition, classifies the included papers to three categories, explains their contributions to research and practice, and outlines outstanding research gaps and agenda for further research. The papers are categorised as: (1) drivers and policies on demolition versus retention; (2) environmental and social impact assessment at building level; and (3) practical demolition decision-making. The contributions suggest, among other findings, positive environmental impacts from building retention as opposed to demolition, and discuss how policy designs from the city to the building level can either encourage or discourage retention. Due to its implications, many of which remain understudied, demolition and its alternatives should gain importance on research, design, planning, construction and real estate agendas in the years to come.

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1. INTRODUCTION AND PROBLEMATISATION

This special issue embarked to understand demolition as a phenomenon. For most citizens, demolition flies under the radar; it is something that happens out of our sight, thus it remains out of mind. When its occurrence in our communities is acknowledged, it is usually taken for granted or at most seen as a necessary evil; an inconvenient but inevitable part of the never-ending development of modern cities and societies. As a result, demolition has so far mainly been approached as a technical undertaking, a practical problem that mechanical engineering can help to solve effectively. There has been fairly little problematisation in- or outside of academia whether and how demolition helps to build environmentally, economically and socially sustainable cities, and when it is in fact helpful toward these goals.

The few dissident voices have so far come from architecture, humanities and social sciences. For more than a century, the discipline of architectural conservation has made efforts to save buildings with 'value' from demolition. However, to this day, this type of building preservation is primarily framed as historic conservation, which mainly considers buildings' architectural–historical values, such as rarity, architectural quality, historic role, *etc.* While the temporal scope of the discipline has slowly widened from the very oldest historic buildings to cover the more modern architecture of the 20th century, it is nevertheless stereotypically a process that distinguishes the prominent from the mundane (cf. Smith 2006). In order to make the value of a few masterpieces worth saving visible, their superior quality is highlighted against the backdrop of the 'ordinary' building stock, which is typically assigned little interest. In doing so, the gaze of architectural conservation excludes most of our built environment, which inevitably limits its impact. There is little acknowledgement that mundane or ordinary buildings also have a cultural role, *e.g.* in identity issues and sense of place.

The consequences of demolition for the people affected have also caught the attention of social scientists. The social disruption caused by mass dislocation of underprivileged people has been the subject of debate at least since Baron Haussmann's overhaul of the city structure of Paris in the 19th century. In the US, the interstate highway system was created after the Second World War by routing it through existing Black communities, tearing up their physical and social fabric (Karas 2015). In the contemporary era, several cities in countries such as the UK, France and the Netherlands have introduced mass demolition programmes directed at social housing areas (*e.g.* Kruythoff 2003; Power 2008; Gilbert 2009). The intent of these policies has been to address the perceived concentration of social problems within certain neighbourhoods by replacing the physical infrastructure precarious groups of people had built their lives around with higher end buildings for the middle class. Even though the residents to be dislocated may sometimes consent to this kind of planned gentrification (Wassenberg 2011), social scientists (*e.g.* Gilbert 2009) have criticised the policies for breaking up social networks that ease the lives of vulnerable people while offering them very little in return. The majority of demolished buildings are typically non-residential (Huuhka & Lahdensivu 2016), so their demolition may not directly impact large groups of people. Therefore, the scope of existing social science research may only capture a fraction of the demolition phenomenon.

The primary aim of proposing this special issue was to deepen the understanding of demolition, especially in the context of the prevailing global environmental and climate crisis, by widening the perspective from which the phenomenon is studied. An important predecessor for opening up such novel research avenues was the special issue edited by Thomsen *et al.* (2011) more than a decade ago, titled 'Deconstruction, Demolition and Destruction'. More recently, part of the architectural sector has started to draw attention to the environmental and climatic costs of demolition *inter alia* through the 'RetroFirst' campaign in the UK by the *Architect's Journal* (2019), as well as the UK-borne Architects Declare movement. The latter has spread under the Built Environment Declares (2023) umbrella to 28 countries globally, covering all continents and professional groups not limited to architecture but engineering, contracting, building, project management, supplying, environmental consulting, landscape architecture and interior design. The urgency of fighting the impending climate crisis, together with the emerging readiness of practitioners to engage with the topic, reinforced the notion that it was the time for another targeted collection of research addressing demolition.

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The call for papers for this special issue was construed against the background that most of the developed world's future cities already exist, *i.e.* their current building stocks will remain in use for decades if not centuries to come (*e.g.* Meikle & Connaughton 1994). However, in the sustainability discourse, in particular amongst practitioners, the long-lasting nature of buildings is hardly ever celebrated. More typically older buildings, whether domestic or non-domestic, are seen either as a problem and a threat, *e.g.* as a contributor to climate change due to their allegedly excessive use of energy or, if they are heritage buildings, as being themselves threatened by the changing climate. However, academic research increasingly challenges this perception, suggesting that older buildings can potentially outperform new build environmentally.

As the focus of research has shifted within the last 10 years from buildings' operational energy consumption towards a whole-life carbon perspective, there has been a growing acknowledgement of embodied emissions and their significance for buildings' environmental sustainability (*e.g.* Röck *et al.* 2020; Lützkendorf & Balouktsi 2022). New build is inherently disadvantaged in this regard, as the continued capitalisation of an existing building structure avoids not only the generation of demolition waste but also that of a great deal of embodied emissions that a new building would incur. Embodied emissions are released at the beginning of a building's life (*i.e.* the winning and processing of raw materials together with the manufacture of components). In contrast, operational emissions accumulate slowly. This means that extending the life of existing buildings also outperforms new buildings in the near term, *i.e.* in the timeframe most crucial to climate change mitigation (Salmio 2022). In terms of the operational emissions, many existing buildings may already perform better than is the regular preconception, as simulations and calculations tend to exaggerate their consumption vis-à-vis factually measured consumption (*e.g.* Boström *et al.* 2012; Sunikka-Blank & Galvin 2012). Moreover, in many contexts the decarbonisation of energy supply, which is already programmed into energy policies for future decades, can be expected to reduce the existing buildings' emissions from the in-use phase (Kuittinen & Häkkinen 2020), thus further emphasising the significance of the embodied emissions. There is also the potential to reduce the consumption of the existing stock through renovation measures, and the recognition that climate warming will alter future heating and cooling needs.

The prevailing economic arguments for demolition and rebuilding are often also contentious. Life cycle extension is typically more affordable for tenants, but redevelopment can create greater profits for the developer. Redevelopment increases property prices which often impacts negatively on affordability by displacing existing people and businesses even in cases where this is not an explicit aim of the endeavour. Not all incurred environmental, social and financial burdens are accurately converted into costs in our present economic system.

At the neighbourhood and urban scale, demolition of existing low- and middle-rise areas is often done to increase density. Denser urban structures in well-connected areas are believed to contribute positively to sustainability. However, the CO_2 impacts for the two alternatives are rarely quantified in a satisfactory manner to account for embodied (both buildings and infrastructure) and operational (buildings and traffic) emissions. Questions remain about how they accumulate over time and what the significance of the temporal accumulation is for climate change mitigation. There is a pressing need for a wider and deeper understanding, but making comparisons is complicated and data intensive. Consequently, rigorous comparisons are hardly ever made in the practice but are often replaced by the application of ideological belief systems, which may be more or less evidenced.

Researching demolition and the prospects for its avoidance is further complicated by difficulties in accessing relevant data. Cadastral data on demolition are usually fragmented, not centrally collected and maintained, and/or lack detail. Thus, different approaches and methods are needed in different contexts depending on the existence, availability and quality of data.

This special issue set out to scrutinise the environmental, socio-economic, and cultural drivers and consequences of demolition. It asks whether there are viable alternatives to demolition and it takes an interest in any policy- and practice-related questions stemming from the above. The call for papers articulated a need to understand demolition, potential repercussions and the prospects for its avoidance in favour of more sustainable practices at different scales, from that

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of individual buildings to whole building stocks, urban environments (city/neighbourhood) up to the supra-urban scale (country/region), as well as from various viewpoints and perspectives (urbanism, urban planning, obsolescence, resource efficiency, mass flows, embodied carbon, social value, *etc.*). Submissions were welcomed to examine these phenomena in the radically different contexts of shrinking and growing communities, even if in the end this aspect was not particularly emphasised in the papers that passed through the peer-review process (apart for one contribution). For inspiration, the call for papers asked questions such as:

- What drives the demolition of buildings or their replacement with new ones?
- Is it environmentally, economically, socioculturally more sustainable to extend buildings' lives or to demolish and build new?
- How can planners and other stakeholders compare alternatives for densification without demolition, *i.e.* by extending and infilling?
- What are the wider environmental, economic and sociocultural impacts of these choices on the sustainability of cities?
- What are the specific challenges, potentials and contributions for retaining existing buildings as opposed to their demolition and replacement?
- Is short-term financial gain too privileged compared with other concerns?
- How can retention and adaptive change be applied in different conditions and different scales (buildings, neighbourhoods, building stocks)?
- How can a more sustainable approach be created?

2. PAPERS IN THIS SPECIAL ISSUE

Initially, 30 abstracts were received in response to the open call for papers. A total of 24 were then invited to submit a full paper; however, only 16 manuscripts were received. Of these, eight papers cleared the peer-review process and were published. Table 1 lists the contributions in this special issue. The papers that make up the issue work at different scales. The building scale is the most prevailing one, but urban scales (neighbourhood or city) are also present in the body of research. Some of the papers work simultaneously at different scales, while others have the potential to do so, even if the case studies that demonstrated them featured a particular scale.

The contributions warranted a classification under three thematic headings. The first theme concerns drivers and policies that can direct towards either demolition (*i.e.* demolish and rebuild) or retention. The second theme considers the roles of environmental and social impact assessment to evaluate the performance of demolition or retention. The third theme involves practical demolition/deconstruction decision-making, when retention is no longer a likely outcome.

2.1 DRIVERS AND POLICIES ON DEMOLITION VERSUS RETENTION

Three articles examine the drivers and policies impacting demolition versus retention decisions. One (by Jonker-Hoffrén) scrutinises how housing and circularity policies can confluence to encourage demolition over other alternatives. Another (by Baker *et al.*) studies what influences the choice between demolition and retention in redevelopment areas, whereas the third (by Serhiiuk & Kalakoski) provides insights into the sociocultural issues at play in a post-communist context when decisions are being made on former industrial facilities' retention or demolition.

Jonker-Hoffrén uses the case of Rotterdam in the Netherlands to investigate how different, even unrelated, policy goals on different levels of administration have merged and given birth to a 'circular demolition' policy. He shows that it has emerged from the local housing policy to reduce social segregation and alleged oversupply of social housing at the local level, which became intertwined with national-level policy targets on material circularity. He warns that the narrow definition of circularity as material recycling as well as the failure to loop the benefits back to the community can undermine the social acceptability of the 'circular demolition' policy and by association, wider climate policies.

Table 1: Articles in this special issue, 'Understanding Demolition', *Buildings & Cities* (2023), 4(1), guest editor Satu Huuhka

Note: × = Addressed in the paper; (×) = potential uses/implications.

AUTHORS	TITLE	DOI	SCALE			IMPACT			TYPE OF CONTRIBUTION			
			CITY	AREA	BUILDING	ENVIRONMENT	ECONOMY	SOCIO-CULTURAL	THEORY	METHOD	POLICY	CASE
THEME: Drivers and policies on demolition versus retention												
P. Jonker-Hoffrén	Policy tensions in demolition: Dutch social housing and circularity	10.5334/bc.305	×	(×)				×			×	×
H. Baker, A. Moncaster, S. Wilkinson & H. Remøy	Demolition or retention of existing buildings: drivers at the masterplan scale	10.5334/bc.308		×		(×)	×	×	(×)		(×)	×
I. Serhiiuk & I. Kalakoski	Demolition or adaptation?: Post-industrial buildings in Ukraine	10.5334/bc.307		×				×	(×)			×
THEME: Environmental and social impact or demolition versus retention												
S. Huuhka, M. Moisio, E. Salmio, Köliö & J. Lahdensivu	Renovate or replace?: Consequential replacement LCA framework for buildings	10.5334/bc.309		(×)	×	×	(×)			×	(×)	×
R. K. Zimmermann, Z. Barjot, F. N. Rasmussen, T. Malmqvist, M. Kuittinen & H. Birgisdorttir	GHG emissions from building renovation versus new-build: incentives from assessment methods	10.5334/bc.325			×	×				(×)	×	×
R. Lundgren	Social life cycle assessment of adaptive reuse	10.5334/bc.314		(×)	×			×		×		×
THEME: Practical demolition decision-making												
Z. Zhang & J. D. Lee	Decision-making analysis for Pittsburgh's deconstruction pilot using AHP and GIS	10.5334/bc.306	×	(×)		×	×	(×)		×	(×)	×
M. van den Berg, L. Hulsbeek & H. Voordijk	Decision-support for selecting demolition waste management strategies	10.5334/bc.318			×	×	×	(×)		×		×

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Having noticed that literature has so far addressed demolition versus retention either the building or the city scale, Baker *et al.* investigate how decisions to retain or replace are formed in the redevelopment processes of large brownfield sites at the masterplan scale. By analysing three case studies in Europe and Australia, they argue that the present theoretical models regarding adaptation often fail to recognise the complexities at play in decision-making in this scale and context. The influential factors arising from the case studied include, among context-specific processual characteristics, situational aspects pertaining to the redevelopment site. These include the targeted density and infrastructure provisions after the redevelopment, which influence the economic viability of retention. For example, whether developers can offset building preservation costs elsewhere in the redevelopment area. The authors acknowledge the effectiveness of traditional heritage preservation systems as a retention tool, but argue that embodied carbon considerations should receive a more prominent position in future policies and practices.

Serhiiuk & Kalakoski embark to understand the treatment of Soviet industrial heritage in Ukraine. Their research operates in similar brownfield areas as Baker *et al.*; however, the post-Soviet history and the 2022 Russian invasion of Ukraine denote particular circumstances. The raging war influences not only the sites themselves (by the ever-present threat of destruction) and the resources for and attitudes towards regenerating them but also the researchers' access to up-to-date data. Theorising through the lens of 'dissonant heritage', Serhiiuk & Kalakoski discuss potential underlying factors, such as underdeveloped and conflicting public policy as well as negative attitudes and connotations emerging from so-called post-socialist trauma, that can shape the redevelopment of these sites in Ukraine beyond the ongoing crisis.

2.2 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF DEMOLITION VERSUS RETENTION AT BUILDING LEVEL

Three contributions examine the impacts and their assessment methods in demolition versus retention situations at the building level. Huuhka *et al.* and Zimmermann *et al.* focus on the environmental impact, while Lundgren examines social life cycle impacts.

Most life-cycle assessment (LCA) methods have focused on new build. There has been a lack of clear LCA methods for comparing retention versus demolition and replacement. This area of LCA is currently fragmented, inconsistent and lacking in rigour. Huuhka *et al.* aim to establish a robust approach for LCA specifically comparing the performances of building retention and replacement. This paper provides a harmonised set of practice and introduces a name for such an analytical framework: the Consequential Replacement Framework for buildings. Its use is demonstrated with the help of a case study on school buildings in Finland. The findings show that the retentive alternatives of the case study outperform demolition and new-build scenarios in terms of climate change mitigation in the context and cold Nordic climate of Finland. While the use of the introduced methodological framework is demonstrated on the building scale, the consequential replacement approach is applicable at other scales as well, such as neighbourhoods, cities or building stocks. It can also be used in life cycle costing.

Also acknowledging that building-LCA methods have primarily been developed for new build, Zimmermann *et al.* set out to investigate how the calculation rules within existing methods may influence the results and conclusions when applied to the renovation of buildings. The scrutiny of the same case study energy renovation is undertaken using three different national LCA methods from three Nordic countries. This investigation and analysis reveals that the three methods assign different outcomes for the performance of the renovated building vis-à-vis that of replacement (demolition and new build). Although variation in outcomes exists, they nevertheless find renovation lower in carbon than new build using all the methods. The observed variation is due to the different scopes of the methods, in particular how they consider the temporal accumulation of upfront and operational emissions.

Lundgren takes the general social life-cycle assessment (S-LCA) framework and adapts it for the built environment by creating a set of sector-specific indicators. The introduced additional indicators are related to end-users, the local community, value chain actors, workers and society

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at large. She then demonstrates the use of the adapted framework on a case study of adaptive reuse, situated in Sweden. In the case study, the evaluation identifies positive economic and cultural impacts on the community from the proposed approach to adaptive reuse. The framework could, however, also serve the evaluation of demolition projects or help to determine whether retention or replacement is socially more sustainable.

2.3 PRACTICAL DEMOLITION DECISION-MAKING

Two articles investigate decision-making in practical demolition. They do this on two different scales: Zhang & Lee work on the urban scale, while van den Berg *et al.* consider the building scale.

In the US, conventional destructive demolition and landfilling still dominates, although it causes *inter alia* adverse local environmental effects. Zhang & Lee combine analytic hierarchy process (AHP) with geographical information systems (GIS) to devise a geospatial methodology for identifying, at the urban scale, which neighbourhoods would be good candidates for reuse- and recycling-minded deconstruction of buildings due to contextual factors. (Readers should note there may be differences as to how the term 'deconstruction' is understood in the US in comparison with, for instance, Europe. What Zhang & Lee describe as deconstruction, Europeans might call 'selective demolition'.) A five-level prioritisation model created by Zhang & Lee considers mainly environmental and economic criteria. It is underlain by a weighting of the criteria for importance by local experts, thus representing the local priorities. The use of the method is demonstrated with the help of condemned properties that have fallen to the hands of the City of Pittsburgh, which is a shrinking US city. The aim is to select districts for Pittsburgh's deconstruction pilot. While there still are data gaps and further methodological finesses to consider, a proof of concept is nonetheless presented for an approach that could consider urban environmental and other locational factors in deciding which surplus condemned buildings to harvest resources from in a shrinkage context (and which to direct for preservation as whole buildings or conventional demolition).

Van den Berg *et al.* also introduce a decision-support tool based on AHP. This tool is intended for use by demolition contractors when deciding whether to direct different types of building parts and materials for reuse, recycling or conventional energy recovery/landfill disposal. Their approach introduces a process to make informed decisions at an earlier stage. Their targeted circular strategy influences how the removal of a component or material from a building should be conducted. First, van den Berg *et al.* study how a demolition contractor in the Netherlands presently makes these decisions. Second, with the help of design science, they alter the decision-making process, which is traditionally based on the contractors' employees' tacit knowledge. The tool makes the involved considerations explicit and, by doing so, can help contractors to make more informed and data-driven decisions. The tool considers technical, economic and environmental criteria to rank the alternatives, and lets the user identify trade-offs between the different aspects.

3. MOVING FORWARD

3.1 THE ISSUE'S CONTRIBUTION

This special issue has advanced research on demolition on various fronts. The three categories introduced in the previous section form the three main lenses through which this issue contributes to the state of the art. The first group, 'Drivers and policies on demolition versus retention', contributes understanding of the underlying factors of demolition and their practical implementation in the form of policies. Jonker-Hoffrén's research is connected, though via some distance, to the longstanding research stream in housing studies (*e.g.* van Kempen *et al.* 2005; Rowlands *et al.* 2009), which scrutinises, from a social science viewpoint, the policies to restructure large housing estates in Europe, among other means by demolishing social housing. However, Jonker-Hoffrén's work contributes a new perspective to this discourse: that of circular construction policy, and how it can become distorted and intertwined with existing policies to argue—erroneously—for increased demolition. Serhiiuk & Kalakoski, on the other hand, tap into the discourse on post-Soviet restructuring in the East of Europe—a discussion taking place on

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many fronts, including heritage and housing studies. Indeed, the particular issues of mass housing built with large precast concrete systems ('Plattenbau') is an integral part of the aforementioned research into Europe's social housing trajectories. However, the work by Serhiiuk & Kalakoski focuses on Ukraine's under-used industrial facilities, contributing to the discipline of 'industrial archaeology'. The research by Baker *et al.* also operates in former industrial areas, but in culturally Western contexts. Their study on the drivers of demolition versus retention of buildings as a part of a larger redevelopment area contributes to bridging an important masterplan scale-related gap in the existing literature. Together, the three papers contain new contextual insights from culturally differing locations. They provide convincing arguments that large parts of the ordinary or mundane building stock have significant cultural value and identity—even if this is not considered 'high culture'.

The second group of papers, titled 'Environmental and social impact assessment of demolition versus retention at building level', contributes important methodological insights. While building-LCA research has in recent years expanded from its traditional scope of new build to incorporate the assessment of renovation, too, the treatment of the question whether to retain or to replace has remained inadequate (Salmio 2022). Huuhka *et al.* and Lundgren adapt environmental and social LCA methodological frameworks, respectively, so that they become more suitable for use in the built environment and can rigorously address the question of retention or replacement. Additionally, Zimmermann *et al.* tap into the policy aspect, focal to the previous group of contributions, in that their results increase understanding on how methodological features of LCA may influence interpretations (and eventually, policies) that are made of the performance of retention versus replacement. All these viewpoints bridge significant gaps in the state of the art.

Lastly, the two papers under the umbrella of 'Practical demolition decision-making' represent in a sense the most traditional type of research into demolition, one that is connected to waste management. Unlike some of their counterparts in the first two groups, the articles in this category do not question whether given buildings should be removed from the urban structure in the first place but rather investigate how to achieve this in the most optimal manner. Interestingly, both Zhang & Lee and van den Berg *et al.* use the AHP methodology, but in a very different scale and manner. The idea of Zhang & Lee is to combine AHP with GIS to consider locational factors in favour of deconstruction is quite unique. While AHP has been used before in demolition decision-making applications at the building scale, similar to van den Berg *et al.* their case study with the viewpoint on increasing circularity is fairly novel. Acting at the interface of research and practice, both papers devise science-based tools for practitioners to capitalise on. In doing so, they also contribute valuable viewpoints from the practice to the research community.

3.2 MAINSTREAMING THE UNDERSTANDING ON DEMOLITION WITHIN PRACTICE

As the implications and consequences of demolition become more apparent, profound questions arise about the nature of 'development' in the Global North and, in particular, about whether the role (and business models) of the construction industry need to be reconfigured from today's emphasis on new construction to a larger emphasis on stewardship (maintenance and alteration) of the existing building stock. The research community has an important role in providing clear evidence, tools and processes to assist civil society together with policymakers, practitioners and clients with understanding demolition and changing existing paradigms and practices.

This collection of research offers many learnings and tools for practice. First, the contribution by Jonker-Hoffrén sheds light on how policies are manufactured. They do not directly result from facts but a framing and an interpretation of those facts, which may be contestable. Even though Jonker-Hoffrén does not discuss the following explicitly, decisions to demolish are usually framed as a technical necessity. Rather than acknowledging demolition as a choice to which alternatives exist, in the practical discourse buildings often allegedly 'have to' be demolished because they 'cannot' be saved. Symptomatically, the confluence of social housing reduction policy and circular construction policy, too, which Jonker-Hoffrén prefers demolition as the instrument, even though the same aims could ostensibly be achieved through transformation. Understanding the construed nature of policies may be helpful to environmental and resident advocacy groups wishing to

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challenge prevailing policies favouring demolition and the interpretation of facts underlying such policies.

On the other hand, understanding the thinking influencing retention versus demolition decisions in the masterplan scale by owners, developers, planners and designers, as identified by Baker *et al.*—if accepted as a basis for decision-making by involved advocacy groups—can help to reduce tensions arising from redevelopment of former industrial sites. While there are additional complexities at play in comparison with the building scale pertaining to *inter alia* a city's aims for the area within its context, community groups' vested interests on such sites likely differ from those prevailing in the social housing areas context, in which most previous research has been conducted, as no homes are usually at stake. Baker *et al.* show that the planning outcome is largely negotiable and enables considering trade-offs within the larger area. Perceiving the leeway of the other party and tapping into their interests can help planners and developers advance their own aims, as well as community groups to advocate for their own interests. To the same end, Serhiiuk & Kalakoski contribution on socio-cultural insights contextual to Ukraine can be helpful in negotiating the controversies and complexities in similar post-industrial, post-regime transformation settings, not only in Ukraine but also beyond. The social LCA methodology, which Lundgren adapted for use in the built environment, particularly adaptive reuse situations, could be a future tool to uncover an array of social viewpoints worth considering in redevelopment projects.

Indeed, when it comes to discovering the expected impacts that should underlie the decision-making, the methods presented by Lundgren for social sustainability assessment and Huuhka *et al.* for environmental impact assessment are important tools for building the evidence base in the practice, too. While the results of their case studies, including those from Zimmermann *et al.* can already give indications for the directions policies should target, policies are often designed to incorporate case-by-case evaluations. In order for such evaluations to be employed as the basis of decision-making for demolition versus retention situations, it is essential that rigorous harmonised methods are available that are easy and cost-efficient for practitioners to use. Huuhka *et al.* contribute a harmonised approach for LCA, which is also usable for LCC. This is much needed in the light of the findings of Zimmermann *et al.* who bring to light major discrepancies between national LCA methods, which may lead to inadvertently different interpretations and policy emphases. To ensure sufficient policy support for embodied carbon efficient solutions such as renovation, policies should either regulate upfront and future emissions separately as a part of whole-life assessments, as suggested by Zimmermann *et al.* or encompass explicit temporal evaluation and visualisation, as proposed by Huuhka *et al.* The finding by Baker *et al.* that embodied carbon impacts are still largely absent from practical decision-making considerations or are overdriven by outdated beliefs that new buildings will contribute a more positive result through lower operational carbon, suggest an urgent need to inform practitioners and provide them tools to take action.

Once buildings are already beyond the consideration for retention, the methodologies introduced by Zhang & Lee and van den Berg *et al.* can offer practical decision-making support. The GIS-aided model by Zhang & Lee can help cities to prioritise geospatially, *e.g.* neater and quieter deconstruction over messier and noisier demolition in areas that have environmental protection issues to be considered. The basic build of the model enables cities to customise it with contextual issues that are of interest in the given city (and of which geospatial data are locally available), as well as to weight those issues according to their relative significance for the community. While Zhang & Lee's method works in the urban scale, it is complemented in the building scale by the decision-making tool for contractors by van den Berg *et al.* The tool can help contractors to, among other things, make more accurate and thus more competitive bids to clients, as the resale value of deconstructable building parts and recyclable materials can be factored in the calculation. A more accurate accounting of the value of reuse and recycling in these considerations may also help to divert more materials towards the highest level of circularity they have potential for. Having a tool available which makes a given contractor's considerations and priorities explicit, wider organisational learning and knowledge exchange can be enabled within the company. This can reduce the dependency of a company's operations on the tacit knowledge of a few key individuals

and may help the company to capitalise on the circular potentials of materials consistently, despite of, for example, changes in personnel over time.

3.3 RESEARCH GAPS AND AGENDA FOR FURTHER RESEARCH

While the published papers in this special issue explore manifold aspects around demolition, other worthy issues are not represented but deserve a mention. These issues include spatiotemporal patterns of demolition; actor networks and business ecosystems in building retention; social and societal costs of demolition to individuals and communities; technical and economic viability of deconstruction and reuse as a climate-friendly alternative to building retention; and designing buildings for disassembly before they are even built.

Geographically, the issue's contributions turned out to be Eurocentric, with a further emphasis on Northern Europe in terms of the case studies' locations as well as the authors' affiliations. Nevertheless, one contribution (Zhang & Lee) was received from the US, and another one (Baker *et al.*) that contains a case study from Australia along with European counterparts. Apart from the case study in Ukraine (Serhiiuk & Kalakoski)—a nation fighting for its sovereignty and under attack—the cases were from developed countries with mature building stocks and stable political regimes. Taking this as a sign of demolition being a so-called First World problem is an over-simplification. A complex set of issues pertains to the Global South, where pronounced wealth and power inequalities may exacerbate the effects of demolition on affected communities. Among such issues is demolition driven by the construction of large infrastructure projects. In such projects, a large number of people may have to relinquish a great deal (*e.g.* their homes, businesses and neighbourhoods) in exchange for the good of the wider community. However, such developments may not be free of corruption by private business interests. In tightly built-up urban areas (whether in the Global South or the Global North), the question of whose homes are proposed for clearance and whose are not, is an inherently value-, interest- and power-infused question. Indeed, the social impacts on individuals and communities is a topic which does not cease to warrant more exploration.

Economics are undeniably a major determinant in practical decision-making. More research is needed to understand the wider economic implications of demolition. Given the today's market economies, the importance of such evidence cannot be understated.

Another area requiring more research is the spatiotemporal patterns of demolition and vacancy. It can be difficult to obtain detailed and/or longitudinal data on demolition in a large spatial scale, even though the difficulty of accessing data was already noted by Thomsen *et al.* (2011) more than a decade ago. Importantly, the saying goes, 'what cannot be measured, cannot be managed'. Given the many adverse environmental and social effects attributed to demolition, understanding the extent and nature of demolition in different contexts, as well as its many impacts, will not become exhausted or outdated as a research agenda in the next decade, either.

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The author has no competing interests to declare.

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