

Evaluating brownfield redevelopment projects: a review of existing sustainability indicator tools and their adoption by the UK development industry

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Abstract

There is a plethora of sustainability indicator tools, yet their capacity to monitor the sustainability of Brownfield redevelopment projects is questionable. Furthermore, there is a lack of knowledge about the actual extent to which these tools are being utilised by the development industry. This paper reviews the applicability of sustainability indicator tools to Brownfield redevelopment projects and assesses their capacity to evaluate sustainability throughout the life cycle of such projects, from project conception, design and planning, through construction and remediation to operation and recycling. The results of a survey sent to more than 900 developers in the UK exploring how, and to what extent they assess or monitor the sustainability of their developments are presented. Results indicate that currently there is no sustainability indicator tool designed specifically for brownfield redevelopment projects, and that uptake of existing tools in the development industry is poor. The paper concludes by considering developers' own proposals to overcome the barriers to the adoption of such tools.

Keywords: sustainability, indicators, monitoring, assessment.

1 Introduction

A recent study by the SUE-MoT Consortium identified 632 tools for the assessment of urban sustainability [1]. Innes and Booher [2, pg174] state, referring to the sustainability evaluation tool development, *'this movement is developing so quickly that little has as yet been published documenting, much less critically evaluating, these experiments or assessing their impact. The*



internet is a much better source than the library for finding out about much of this work, although its descriptions are sketchy and reflect the image each group want to offer'. Mitchell [3] comments on the ad hoc development of tools and sustainability indicators, whereas [4] an overlap between tools. Both [1] and [5] point out the lack of knowledge with regard to the extent of use of sustainability evaluation tools.

Pediaditi *et al.* [6] define the essential characteristics of a BRP sustainability evaluation tool as being:

- **Holistic:** Assessing environmental, social and economic aspects of a BRP.
- **Site and Project Specific:** Assessing the sustainability of a BRP at the wider development scale rather than only focusing purely on the building structure as well as being able to take into account site conditions.
- **Long term:** Assessing the sustainability of a BRP throughout its land use life cycle, including the planning and design phase, the construction and remediation phase as well as operation phase.
- **Participatory:** Enabling evaluation users to make their values and risk perceptions explicit as well as to develop their own sustainability indicators based on those. (Transparency being an essential element of such a process).
- **Integrated within existing decision making processes:** For example the UK land use planning process and developer project management.

Therefore 27 existing sustainability evaluation tools, (which are representative of the different types of tools; See References 7 to 32) were reviewed with regard to their relevance to BRP based on the above criteria, and their extent to which they are used by the UK development industry. The paper concludes with an outline of the perceived barriers to BRP sustainability evaluation and developers' own recommendations for enabling the wider adoption of such practice.

2 Methodology

In order to conduct the tool evaluation, a secondary review of the literature as well as examination of the information available on the tools websites was used, and juxtaposed against the aforementioned criteria. The majority of these tools do not disclose the actual indicators or benchmarks used therefore a detailed evaluation was not possible. Where relevant the authors' conclusions are supplemented with that of other indicator review research.

In order to establish the extent of long term BRP sustainability monitoring a questionnaire was sent out to 987 UK developers both commercial and house-builders. A 9.5% usable response rate was achieved. (Responses were more representative of the medium to large scale developers, thus the sample is more representative in terms of annual volume of development.) Developers were questioned whether they carry out long term sustainability monitoring (i.e., from project inception to development operation) and which methods they use.

Follow up semi structured personal interviews were carried out with 10 developers to establish what incentives and barriers they perceived to the adoption of sustainability evaluation practices, as well as to obtain recommendations on measures required to enhance the wider use of such tools.



3 Review of existing sustainability evaluation tools

3.1 Holistic approach

Pediaditi *et al.* [6] and Hardi and Zdan [33] emphasise the need to adopt a holistic approach when assessing sustainability by giving equal consideration to social, environmental and economic issues. However, when examining Table 1 it is apparent that there is a predominance of solely environmental evaluation tools, which are thus inappropriate for the evaluation of BRP. This conclusion is also drawn by [34] who attribute the lack of emphasis on social indicators to the lack of consensus surrounding what significant social impacts are. A particular gap evident in Table 1 (and confirmed by [35]) is the development of social indicators with regard to building assessment methods.

3.2 Site or BRP specific.

An overview of different tools identifies that there is diversity with regard to the different scales they address, ranging from building component to neighbourhood or city scale, (classified as wider community in Table 1). Cooper [35] assert that the spatial dimension plays an important role and can hinder the integration between different tool methodologies. Pediaditi *et al.* [6] establishes that the appropriate scale to evaluate the sustainability of a BRP is (as classified in Table 1) the development scale, which encompasses the assessment of the developments wider impacts on a locality rather than focusing entirely on the impact of the buildings itself. The majority of reviewed tools focused on evaluating the environmental performance of buildings and at a more detailed level, material and components, mainly based on Life Cycle Assessment methodologies. Therefore, based on the above it is concluded that out of the 27 tools reviewed only 3 tools [13, 15, 28] are potentially relevant for the evaluation of BRP.

3.3 Potential for sustainability evaluation throughout land use life-cycle.

As pointed out in [36] and [4] there are very different tools and assessment approaches in planning (strategic and local) and between the different sectors of development projects i.e. design, construction, operation and all they entail. What is apparent from Table 1 (and supported by [37]) is that there is a tendency for the tools to focus on the initial planning and design phases, which overshadow the sustainability assessment needs of the construction and operational phases of a development. Even tools which claim relevance to the operation phase mainly consist of one off assessments rather than ongoing monitoring schemes. However, it was established in [6] that there is a need to evaluate the different impacts of a BRP throughout its life cycle and thus the only potentially relevant tools are [13, 15, 28].

BRPs often have the characteristic of requiring remediation which may also have sustainability impacts [38] and thus should be evaluated. However, a review of the tools in Table 1 as well as the literature [39–42], it was established



that there is no tool designed to evaluate holistically the sustainability of remediation and reclamation schemes. Although theoretical frameworks are available for remediation option selection, (for example [41–45]), they have limited practical application as decisions are currently based on [46] model procedures for the management of land contamination which do not take sustainability into consideration. Furthermore, these frameworks do not assess the sustainability of different options, neither the sustainability impact of remediation processes particular to site circumstances or post BRP completion. (Apart from 45 which is a checklist for the assessment of BRP funding applications which include assessment criteria of remediation processes.) There is a clear gap in the availability of sustainability indicators for remediation and reclamation processes, which deserves further research.

3.4 Participation (stakeholder involvement in BRP sustainability evaluation)

Defining and evaluating sustainability involves value based decisions, and thus participation methods are required to enable stakeholders to define the criteria with which to carry out BRP evaluations [5, 6, 47]. However the review of the tools in Table 1, established that none of the existing tools relevant to the development scale adopted this approach. This is in accordance with [5] who claim that traditional approaches to sustainability indicator development are characterised by rigid scientific method which in turn reflects the reductionist mind set of evaluation developers. Brandon *et al.* [48] referring specifically to built environment sustainability assessments express the limitations of reductionist science to capture the interactions between the parts of systems and feedback which make the resolution of insoluble trains difficult or impossible.

One of the criteria of ‘good’ participatory decision making as well as risk communication is transparency [49]. From the author’s review all the tools relevant at the development scale apart from [28] are developed by consultancies or patented and thus required a fee to be carried out. As a result few of these tools’ assessment criteria or benchmarks are disclosed resulting in a loss of transparency, making them less appropriate for the evaluation of BRP.

3.5 Evaluation tool integration with existing planning and BRP decision making processes.

It is important to integrate sustainability evaluation processes within existing planning processes to enable the results of the evaluation to impinge on the nature of the development [6]. However, the review of tools in Table 1 it was identified that only tools [15, 28, 31, 32] made any reference to UK planning policy or Regulations.

Table 1: Classification of existing urban sustainability tools according to their scale, land use life-cycle phase and holistic approach.

	Planning and Design Phase			Construction Phase			Operation Phase		
	Environmental	Social	Economic	Environmental	Social	Economic	Environmental	Social	Economic
Materials/ Components Scale	8,9,14,20,22,23,30			7, 8, 20			8, 20		
Building Scale	8, 10, 11, 13, 14, 17, 20, 21, 22, 24, 25, 28, 30, 31, 32	13, 28	13, 28	7, 13, 18, 20, 21, 24, 25, 28	13, 28	13, 18, 28	8, 13, 18, 21, 24, 25, 28, 30	20, 13, 28	13, 18, 28
Development Scale	13, 15, 24, 28, 31, 32	13, 28, 32	13, 15, 28	7, 13, 15, 28	7, 13, 15, 28	13, 15, 28	13, 15, 19, 28	13, 15, 28	13, 15, 28
Wider Community Scale	12, 16, 26, 29	12, 26, 27, 29	12, 16, 26, 27, 29	12	12	12	12, 26	12, 26	12, 26

The most relevant evaluation tools are in both **bold** and *italics*. They are tools which are applicable to the development scale, look at issues holistically i.e., have environmental, social and economic indicators, and evaluate the sustainability throughout a BRP life cycle phase (planning, construction and operation). Therefore, the only potentially relevant tools as [13, 15, 28]

All numbers relate to references.

Many numbers in a cell indicate potential overlap of tools, whereas a gap in a cell identifies areas for further research.



It can be concluded that the only partially appropriate existing evaluation tools reviewed are [13, 15, 28], with [28] being more suitable due to its transparency, with disclosed and freely available criteria as well as UK planning policy relevance. However, this review is not exhaustive and therefore it was considered important to carry out a UK National Developers Survey to establish to whether sustainability evaluation of BRP was being carried out and which tools were used.

4 Sustainability evaluation practice of the UK development industry

Figure 1 illustrates that half the developers have never carried out long term sustainability monitoring whereas only 17% always do. The survey included an open ended question which asked developers to specify the type of sustainability monitoring which they used. The responses were unclear, many developers did not specify, or provided responses ranging from cost control to the use of independent consultants. Follow up interviews with 10 developers established that they conduct a lot of monitoring regarding output deliverables, cost control, market research etc as part of project management. However, what was also clear from their answers was a lack of understanding of the meaning of long term sustainability monitoring, for example:

‘we monitor all our operations closely, looking at cost control, return on investment, quality control, safety audits I could spend all day listing the monitoring we do’.

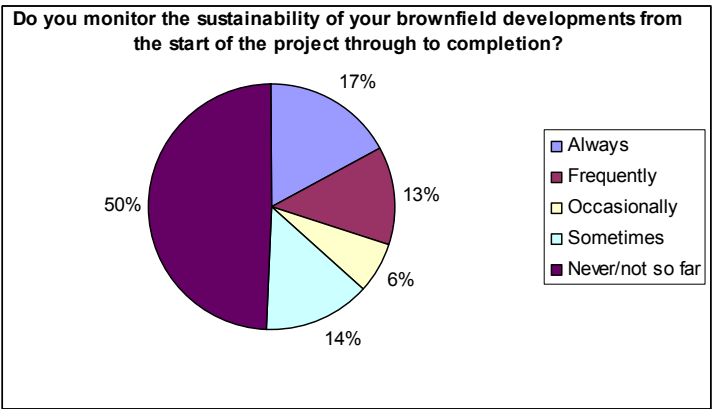


Figure 1: Percentage of developers claiming to carry out long term sustainability monitoring.

The above results demonstrate that there is little sustainability monitoring going on in the development industry. The lack of understanding of the phrase potentially indicates that even the low percentage of developers who claimed to be undertaking sustainability monitoring may in fact be referring to other types of monitoring not relevant to the tools reviewed in Section 3. This confirms the

fact that despite the wide range of available sustainability tools there is a lack of uptake and use by the development industry. Therefore, in the interviews developers were questioned with regard to the drivers and barriers to sustainability evaluation practice and were asked to make recommendations for evaluation tool developers and policy makers.

5 Drivers, barriers and recommendations for the wider use of sustainability evaluation tools

Nine out of the 10 developers interviewed stated they saw themselves undertaking sustainability monitoring within the next few years, some drawing parallels between the status of sustainability monitoring today and health and safety monitoring ten years ago. All developers stated policy and changing regulations as being the major driver and examples were provided with regard to the new more demanding energy efficiency regulations. Market pressure was seen as a driver by three developers but was classified as less important in relation to changing regulations.

The perceived barriers to the adoption of sustainability evaluation practices have been summarised in Table 2. All developers commented on the lack of a level playing field in development decision making and emphasised the need for a structured process to enable assessment of development planning applications. Developers, pointed out that the only incentives for carrying out voluntary evaluations would be their potential to smooth the planning process or to save time and resources. A main recommendation by all developers was that any sustainability evaluation tool should be compatible with project time lines and be context specific and simple to overcome the procedural barriers.

Table 2: Barriers to sustainability evaluation.

Barriers to adoption	Procedural limitations	Tool limitations
<ul style="list-style-type: none"> ▪ Lack of understanding of sustainability ▪ Lack of market demand ▪ Lack of enforcement/ resources & skills ▪ Too many tools resulting in lack of confidence in them ▪ Build & Forget development culture 	<ul style="list-style-type: none"> ▪ Lack of time ▪ Lack of a structured process to follow ▪ Lack of communication ▪ Lack of ownership of the assessment process ▪ Lack of integration of existing tools with planning processes e.g., planning application process, EIA, SEA, SA 	<ul style="list-style-type: none"> ▪ Scope of assessments limited to building performance ▪ Scope of assessments mostly covering environmental issues ▪ Lack of context specific assessments ▪ Lack of measurable benchmarks ▪ Output approach to monitoring

Overall, developers expressed confusion with regard to which tools to use, and that instead of more indicators, a process which would integrate existing tools into the planning and development decision making processes was needed. Importantly developers argued that they would not hesitate to fund sustainability



assessments provided they were mandatory for all developers and that they helped bring structure to existing planning decision making.

6 Conclusions

In conclusion the review of existing tools identified that there are no evaluation methods directly relevant to assess the long term sustainability of BRP in a context specific, holistic and participatory way. A particular gap was found with regard to the availability of methods able to assess the sustainability of remediation processes linked to development decision making. The national developers survey indicated that uptake of sustainability evaluation was minimal, with confusion apparent over the meaning of sustainability evaluation. On the positive side, developers did see themselves carrying out such processes in the short term future and made recommendations to overcome the procedural issues which have hindered uptake thus far. In response to these results the authors have developed and trailed the Redevelopment Assessment Framework RAF described in [6] and [38]. This is a process which is designed to integrate existing evaluation tools into the UK planning decision making processes in a participatory way and which aims to develop context specific and holistic assessments of BRP with the aim of increasing industry utilisation.

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