USGBC TSAC PVC Draft Report dated December 17, 2004 (released 12/22/04)
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Comments:

Page #	Line #	Comment	Supportive citations
		The comments attached below concern the apparent lack of analysis of methodology and suggest alternative analytic methodologies that are proven, transparent, replicable, easily used, and more appropriate to assess material choices for LEED.	

The comments that follow below respond to Malcolm Lewis' request in the preface for public comments that identify "different methods of analysis." It is with appreciation to hear that such comments "will be seriously considered by the PVC TG and TSAC as the assessment of this issue is finalized." Yet one has to wonder what criteria must be met for different methods to be seriously considered, since comments on different methods were submitted a year ago by both the Healthy Building Network and Health Care Without Harm. None of the methods identified in those submissions -- including the MBDC Material Assessment Protocol, Herman Miller Design for Environment approach, or the Health Care Without Harm "Green Screen"[1] -- were ever mentioned in the *Assessment of Technical Basis for a PVC-Related Materials Credit in LEED* (hereafter referred to as the *Assessment*).

Given the existence of different methods of analysis, it is disappointing that the TSAC PVC Task Group never took the step of identifying and evaluating the strengths and weaknesses of different analytic methods before deciding to develop a novel method that integrates life cycle assessment (LCA) and risk assessment (RA).

Over the past year Health Care Without Harm has taken the time to assess how corporations are evaluating and selecting for chemicals, materials, and products with less toxic life cycles. What we are learning is that corporations: use an array of methods, many do not use LCAs, and significantly, none of them make decisions solely on the basis of LCA. For the corporations that do perform LCAs, the LCA results are only part of their analytic equation, not the sole basis for decision-making. The reasons why LCAs are only a part, if at all, of the analytic process, include:

- **The results vary widely across LCA tools.**

[1] **The Green Screen: A Method for Evaluating Materials Used in Health Care based on Toxicity and Environmental Performance at End-of-Use-Life Submitted by: Mark Rossi, PhD; Tracey Easthope, MPH; Ted Schettler, MD, MPH; and Charlotte Brody, RN On behalf of: Health Care Without Harm https://www.usgbc.org/Docs/LEED_tsac/HCWH_Alts_Assess_Method.pdf.**

- **LCAs are best at quantifying impacts related to energy consumption, and are poor at evaluating toxics as well as recyclability.**
- **LCAs are not useful in identifying which chemicals or materials to eliminate (because of concerns with toxicity).**
- **The quality of LCA data vary widely across life cycle stages and different analytic endpoints.**
- **LCAs seldom point to definitive answers.**

It is not surprising, given all the impact categories evaluated in LCAs, that no one material performs consistently better across all impact categories or product categories. The greater the number of analytic endpoints, the greater the complexity, the less likely a clear and consistent winner emerges. An excellent report that evaluated decision-aid methods concluded that since a consistent winner across all categories of a multi-attribute analysis is unlikely, decision-makers must choose a narrower set of priorities for comparison.[2]

One of the few times an LCA gives a clear answer is for products whose use phase involves or affects fossil fuel energy consumption (e.g., windows in the *Assessment*). In these cases, products that are the most energy efficient perform the best. Acknowledging the life cycle importance of fossil fuel energy use in buildings, LEED already rewards energy efficient products by providing one prerequisite and ten credit points for reduced building energy use and another credit for green power purchases. But fossil fuel energy consumption over the use life of a product is seldom a function of a single material; rather different materials can be used to achieve the same energy efficiency. Thus LEED should, as it does, encourage energy efficiency. But energy consumption should not be confused with material selection efforts to attain a healthier environment.

The Commercial Interiors Committee, which initiated the credit language relating to PVC with its proposed "Materials Credit 9: Alternative Materials," did define a narrower set of priorities in its statement of "Intent:" "Reduce use of products containing toxic and/or hazardous substances and encourage use of comparable alternatives." The emphasis of the statement of Intent is on "products containing toxic and/or hazardous substances," not on toxic substances across the life cycle of the product, not on the energy efficiency of products, nor on the risks of using the products.

The statement of Intent is a clear articulation of the pollution prevention principle, where manufacturers and users reduce pollution through changes in product design, and changes in product, material, or chemical selection. The pollution prevention principle is embedded in American law, with the Pollution Prevention Act of 1990, which states that:

> **The Congress hereby declares it to be the national policy of the United States that pollution should be prevented or reduced at the source whenever feasible [emphasis added]; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.**

As will be made clear below, the Task Group did not develop a method that supports implementing the Intent of the proposed Materials Credit 9: Alternative Materials. The Task Group's method does not facilitate the selection of products that do not

[2] **Council of Nordic Ministers, 1997. Council of Nordic Ministers. 1997. *The use of decision aid methods in the assessment of risk reduction measures in the control of chemicals*.**

contain toxic chemicals; nor does it facilitate the implementation of pollution prevention.

Similar to the Commercial Interiors Committee, corporations that manufacture and use building products have statements of intent for implementing pollution prevention. For example:

> **Herman Miller:**
>
> **"The MBDC Cradle to Cradle Design Protocol adopted by Herman Miller goes beyond regulatory compliance to thoroughly evaluate new product designs in three key areas:**
> - **Material Chemistry and Safety of Inputs -- What chemicals are in the materials we specify, and are they the safest available?**
> - **Disassembly -- Can we take products apart at the end of their useful life to recycle their materials?**
> - **Recyclability -- Do the materials contain recycled content, and more importantly, can the materials be recycled at the end of the product's useful life?"[3]**
>
> **Skanska:**
>
> **"We avoid materials and methods with environmental risks when there are suitable alternatives available."[4]**
>
> **Kaiser Permanente, Environmental Stewardship Council**
>
> **"We intend to seek endorsement for a new chemical policy at Kaiser Permanente that calls for avoiding the use of carcinogens, mutagens, and reproductive toxins (CMRs), and persistent bioaccumulative toxic chemicals (PBTs). We want to achieve this policy for our own facilities, and to broadcast our intent in order to drive innovation in the marketplace" (source: Kaiser Permanente, Environmental Stewardship Council, *Summary Report of the Environmental Stewardship Council's April 5, 2004 Strategy Session*).**

From its statement of Intent the Commercial Interiors Committee proposed two requirements:

- **"Eliminate the use of virgin PVC" [hereafter Requirement #1].**
- **"Eliminate the use of any chemical listed in the National Toxicology Program (NTP), 'Annual Report on Carcinogens'; the International Agency for Research on Cancer (IARC) 'Monographs'; or 29 CFR 1910, subpart Z, OSHA Toxic & Hazardous Substances" [hereafter Requirement #2].**

In identifying priority chemicals and materials for elimination, the Commercial Interiors Committee again took an approach common in corporations.

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[3] Source: http://www.hermanmiller.com/CDA/SSA/Category/0,1564,a10-c609,00.html.
[4] Source: http://www.skanska.com/files/documents/pdf/code_of_conduct.pdf.

Herman Miller:

- **Eliminate chemicals that score "red" in the MBDC protocol, such as PBTs and CMRs.[5]**
- **Eliminated PVC in its Mirra chair.[6]**

Skanska:

- **Eliminate the use of acrylamide (containing more than 0.5%), asbestos, CFCs, halon, and PCBs.[7]**
- **In Sweden, eliminate the use of chemicals, mostly PBTs, identified on Skanska's "List of Restricted Substances" and "Phase-out List."[8]**

Kaiser Permanente

- **In addition to the chemicals listed above -- CMRs and PBTs --, Kaiser has also targeted latex, mercury, and PVC for elimination.[9]**

Given the Commercial Interiors Committee's concerns with toxics and hazardous substances as inputs into products, it is odd that the TSAC PVC Task Group should choose a model that evaluates products solely on the basis of the pollutants, the outputs, generated across the product's life cycle (and captured by an LCA), including from energy generation. In adopting a LCA-RA integrated model for evaluating data the TSAC PVC Task Group diverges dramatically from how corporations are evaluating safer products on the basis of toxics and hazards in products.

There are many examples from the business and government sectors on how to identify safer products on the basis of hazard assessments. These hazard assessment methods do not rely upon LCAs or RAs for guiding corporate behavior. Instead they are designed to implement pollution prevention into chemical selection and purchasing decisions. At their core they either:

- **Identify priority chemical lists for elimination or**
- **Develop a method for screening out products that contain chemicals with undesirable properties.**

Identifying a set of priority chemicals for elimination or avoidance is a common approach used in many corporations. Already noted above is Skanska's lists of restricted, phase-out, and under surveillance substances; as well as Kaiser Permanente's targeting of PBTs and CMRs. These are examples of corporations identifying known hazardous chemicals and adopting policies to avoid and eliminate them. And this is the approach suggested by the Commercial Interiors Committee in its second requirement. Because the hazard characteristics have already been evaluated, there is no need for further risk assessments, and the first step is to prevent their use. This is a sensible approach, yet is never discussed in the *Assessment*.

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[5] McDonough, et al., 2003. McDonough, William, Michael Braungart, Paul T. Anastas, and Julie B. Zimmerman. 2003. "Applying the principles of green engineering to cradle-to-cradle design." *Environmental Science and Technology* (1 December):434a-441a.

[6] Source: http://www.usgbc.org/News/usgbcinthenews_details.asp?ID=1260.

[7] Source: http://www.skanska.com/skanska/templates/page.asp?id=5110.

[8] Source: http://www.inkop-miljo.skanska.se/Program_files/pdf/RestrictedSubstances.pdf.

[9] Source: http://yosemite1.epa.gov/oppt/eppstand2.nsf/Pages/DisplayAisle.html?Open&Scientific/Medical%20Store&Healthcare%20Products&Type=1.

It can be countered that the *Assessment* did not consider priority chemical lists because the charge from the TSAC to the TSAC PVC Task Group was to review "the evidence offered by stakeholders and independent sources … for a reasoned decision about the inclusion of a PVC-related credit in the LEED rating system." Yet a "list" method could not only address the question of whether sufficient evidence exists for a reasoned decision to be made about PVC, but more broadly address the challenge before the USGBC currently of how to evaluate materials for LEED credits. Rather than targeting a particular material like PVC, using the CIC intent, the question could be framed more broadly by criteria, such as, does the material in question contain any NTP carcinogens? If yes, then avoidance of the material would receive a LEED credit. Such an approach would require re-structuring the Requirement #1 to state, eliminate the use of materials that do not contain any NTP carcinogen. But this would be a sensible recommendation to be put forward by the Task Group: Requirement #1 needs to be re-defined to clearly support the statement of Intent.

Another method that builds from the priority chemical list approach is to develop a screening method that targets chemicals with certain hazardous properties. Two methods of particular note in this regards are the "BASTA" method and the Dutch Quick Scan Method.

The BASTA method[10] has been developed by the Swedish Construction Federation with the goal of producing a "joint sector system to support the phase-out of substances with very hazardous properties from building materials." The method is defined by the following five characteristics:

- **Properties of chemicals instead of chemical lists.**
- **Hazards instead of risks.**
- **Chemical properties instead of LCA.**
- **Quality-assured self-declaration instead of third party assessed.**

In the BASTA method suppliers who want their products "BASTA registered," must evaluate the properties of the chemicals contained in their products. The properties they evaluate for are:

Health

1 Carcinogenicity
2 Mutagenicity
3 Reproductive toxicity
4 Sensitization by inhalation or skin contact
5 Very high acute toxicity
6 Toxic
7 High chronic toxicity
8 Volatile organic compounds

[10] **The information on the BASTA project presented here is from a presentation made by Lars Jarnhammar of the Swedish Construction Federation on 4 February 2005 in Gothenburg, Sweden. Much of this information can be found at: http://www.bastaonline.se/start_en.asp.**

Environment

9 Highly persistent and highly bioaccumulative organic substances
10 Persistent, bioaccumulative and toxic organic substances
11 Particularly hazardous metals (Cd, Hg, Pb)
12 Highly toxic to aquatic organisms
13 Environmentally hazardous/long-term effects
14 Damaging to the ozone layer

The properties 4-8 and 12-14 are only applied to chemical products. Any product that does not contain chemicals with any of the above properties can be registered in the BASTA database. Suppliers registering in the database pay a fee, and will be subject to random third party certification of the data supporting their product registrations.

The BASTA method is a clear articulation of how to implement the proposed Materials Credit 9. It is hazard-based and focused on toxics/hazards in products.

The Dutch Ministry of Housing, Spatial Planning and the Environment, developed the "Quick Scan" as part of an initiative to implement a chemicals substitution policy for high hazard chemicals and chemical mixtures.[11] The goals of Quick Scan are to:

- **Develop substance profiles based on hazard information.**
- **Classify chemicals into categories of concern.**
- **Direct the industrial community to appropriate actions for chemicals of high concern.**

The steps in the Quick Scan method are:

- **Gather hazard data on chemicals.**
- **Use criteria to assign chemicals to hazard levels.**
- **Use decision making rules to determine concern categories.**
- **Revise concern categories based upon use data.**

The responsibility for implementing Quick Scan resides with the industrial community.

Quick Scan includes:

- **Criteria for determining hazard levels of a chemical for specific hazard endpoints (see Appendix 1 for the spreadsheet format).**
- **Decision making rules for converting hazard levels into concern categories (see Appendix 2).**
- **Criteria for revising concern categories based upon potential for exposure (based upon use categories) as well as availability of alternatives.**
- **Specified required industrial actions related to concern categories.**

The decision making rules for converting hazard levels into concern categories are straightforward for the human health hazards,[12] where a high hazard level (e.g., carcinogenicity "C1") translates into a "very high concern" category (see Appendix 2). The decision making rules for PBTs are more complex, where the assigning of a chemical to a

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[11] Unless otherwise cited, all the data in this section that relates to Quick Scan are from: The Netherlands, Ministry of Housing, Spatial Planning and the Environment. 2001. *Implementation Strategy on Management of Substances: Progress Report*. The Hague: Ministry of Housing, Spatial Planning and the Environment (SOMS, 2001).

[12] The five human health hazards addressed are: toxicity for humans, carcinogenicity, mutagenicity, reprotoxicity, and hormone disruption.

concern category is based upon the chemical's combined hazard level for P (persistence) and B (bioaccumulative capacity) and T (eco-toxicity). For example, a P1 + B1b + T2 = "very high concern," while P2 + B2 + T3 = "concern" (see Appendix2 for further details).

The concern categories are then adjusted for based upon potential for exposure -- as determined by chemical uses (see Table 1) -- and the availability of alternatives.

Finally the classification of a chemical as "very high concern" or "high concern" has specific actions associated with it:

- **"Substances giving rise to Very High Concern must, in principle, no longer be used" (SOMS, 2001, p.39).**
- **Substances of High Concern "are not to be permitted for consumer purposes and in open profession use, unless certain preconditions are satisfied" (SOMS, 2001, p.40).**

Substances of Concern are "permitted, provided that certain limit conditions are satisfied" (SOMS, 2001, p.40).

Table 1. The Dutch "Quick Scan" Method for Substances of Concern

Concern on Basis of Hazard	Use of Substances as Indication of Exposure			
	Site limited intermediate substances	**Substances in industrial applications**	**Open professional use of substances**	**Substances in consumer applications**
	Low exposure	***Exposure***	***High Exposure***	***Very high exposure***
Very high concern	High concern	High concern	Very high concern	Very high concern
High concern	Concern	Concern	High concern	High concern
Concern	Concern	Concern	Concern	High concern
Low concern	Low concern	Low concern	Low concern	Concern
No data, very high concern	Very high concern	Very high concern	Very high concern	Very high concern

Source: The Netherlands, Ministry of Housing, Spatial Planning and the Environment. 2002. *Implementation Strategy on Management of Substances: 2nd Progress Report*. The Hague: Ministry of Housing, Spatial Planning and the Environment.

The Quick Scan Model is designed to de-select high hazardous chemicals to which the general population is likely to be exposed. It can also be used to allow continued use of chemicals identified as low concern. And it can be applied to materials or products as well by identifying the chemicals contained in the materials and products and running them through the model.

The Quick Scan and BASTA are methods that could easily be used to implement the statement of Intent by the Commercial Interiors Committee to reduce the use of products containing hazardous or toxic substances. In fact, the BASTA method is designed to

achieve the same Intent of Materials Credit 9 as proposed by the Commercial Interiors Committee. The BASTA and Quick Scan methods could also be used to evaluate whether PVC, based on its chemical inputs, would pass through their screening methods.

It is striking to observe that in Sweden the Construction Trade Federation, when confronted with a problem quite similar to that confronting the USGBC, chose a widely different method. Rather than LCA, they chose chemical properties. Rather than risks, they chose hazards. And in the end, the Swedish Construction Trade Federation created a method that is transparent, replicable, and easily used by suppliers/manufacturers to evaluate their products; and creates a product database for firms interested in purchasing less toxic building products.

The LCA-RA method developed by the Task Group is the opposite. It is obscure, impossible to replicate except by those who performed the analysis, extremely time consuming, and, for all these reasons, very difficult for manufacturers to use to evaluate their products, making the development of any product database a very long term and expensive project. Thus the decision to use a RA-modified LCA is not appropriate either as the most functional way of effectively assessing the full implications of this proposed credit or as a model for future assessments of potential LEED credits for building materials.

It is worth noting that if the USGBC deems some form of life cycle approach necessary, other organizations have extended the hazards-based methods approach across the life cycle of materials and products. The methods are noted below to illustrate there are other methods besides quantitative LCAs for evaluating the environmental performance of materials and products. It is important to note that these methods are based on a hazard-, rather than a risk-based approach; are focused on reducing toxic inputs by preventing pollution through upstream changes in product design and material selection.

Examples of hazard-based methods for evaluating chemicals, materials, and/or products include:

- McDonough Braungart Design Chemistry (MBDC) Materials Assessment Method
- Herman Miller Design for Environment Method

These methods have already been described in a previous submission to the TSAC PVC Task Group, so they are not detailed here.[13] An additional method for consideration has been submitted to the Task Group by the City and County of San Francisco. This method is a qualitative evaluation of the life cycle concerns (as related to toxics and recyclability) of plastic materials used to manufacture pipes.

Conclusions & Recommendations

The Task Group has developed a method for evaluating the evidence for a PVC-related credit that is out of alignment with similar initiatives being undertaken in corporations. LCA may be useful for evaluating the energy performance of products across their life cycles, but

[13] See: Comments on the PVC Study Methodology of the USGBC's LEED TSAC Submitted by the Healthy Building Network January 29, 2004, http://www.usgbc.org/Docs/LEED_tsac/HBN_TSAC_PVC_Submission_040217.pdf. And The Green Screen: A Method for Evaluating Materials Used in Health Care based on Toxicity and Environmental Performance at End-of-Use-Life; Submitted by: Mark Rossi, PhD; Tracey Easthope, MPH; Ted Schettler, MD, MPH; and Charlotte Brody, RN On behalf of: Health Care Without Harm https://www.usgbc.org/Docs/LEED_tsac/HCWH_Alts_Assess_Method.pdf.

it is singularly ill-suited for promoting pollution prevention in material and product selection. Therefore, Health Care Without Harm recommends that the Task Group:

- **Identify other relevant analytic models, including: Quick Scan, BASTA, MBDC, Herman Miller, and City and County of San Francisco's draft method for evaluating plastic pipes.**
- **Apply these other models to evaluate the materials.**
- **Present results from the different methods in the next Task Group report.**
- **Recommend that Requirement #1 be re-defined to clearly support the statement of Intent. Such an approach would require re-structuring the requirement to state, eliminate the use of materials that do not contain any CMRs or PBTs. This recommendation is similar to the Task Group's recommendation that the effort begin by "working towards eliminating a class of pollutants and/or particulate emissions" (p.11); but the emphasis should be consistent with the Commercial Interiors Committee's Intent: i.e., "work towards eliminating a class of chemicals contained in products."**

From the TSAC itself Health Care Without Harm requests:

- **A statement on the criteria used for determining which "different methods of analysis" will be "seriously considered." The TSAC and Task Group have asked over time for different methods of analysis. Health Care Without Harm and others have over time provided examples of different methods of analysis. Yet these different methods have been ignored. So, what are the criteria used to select different methods of analysis for serious consideration?**
- **An explanation of why the Task Group's review of the evidence of PVC is disconnected from the statement of Intent for proposed Materials Credit 9: Alternative Materials. The Task Group is evaluating the life cycle impacts of pollution associated with PVC and related materials. This is not the Intent of proposed Materials Credit 9, which is to "Reduce use of products containing [emphasis added] toxics and/or hazard substances." There is ample justification for preventing the use of products that contain toxic substances. Why is the evaluation not focused on the presence of toxic/hazardous substances in the product/material itself?**
- **An explanation of why the TSAC did not change the charge of the mission to the Task Group to, "evaluate different methods for analyzing the evidence for meeting the Intent of proposed Materials Credit 9?" According to the background information provided in the *Assessment*, the TSAC did not charge the Task Group with developing a novel method for evaluating the evidence on PVC. Yet the Task Group took upon itself developing a novel method that has never been peer reviewed. If a novel method is in fact needed for evaluating the evidence to support proposed Materials Credit 9, then an evaluation of different methods should happen before not after the evaluation of the data.**

Appendix 1. Quick Scan criteria template for classifying substances according to hazardous properties on the basis of hazards posed to the environment and (in)direct hazards for humans

Note in the table below that the lower the hazard level number, e.g., "P1," the higher the level of hazard; and vice-versa, the higher the number, e.g., "P4," the lower the level of hazard.

Quick Scan criteria template

Property	Hazard Level	Criteria
Persistence (P)	P1	
	P2	
	P3	
	P4	
Bioaccumulation (B)	B1a	
	B1b	
	B2	
	B3	
	B4	
(Eco)Toxicity (T)	T1	
	T2	
	T3	
	T4	
Property	**Hazard Level**	**Criteria**
Toxicity for Humans (He)	G1	
	G2	
	G3	
	G4	
Carcinogenicity (C)	C1	
	C2	
	C4	
Mutagenicity (M)	M1	
	M4	
Reprotoxicity (R)	R1	
	R2	
	R4	
Hormone Disruption (Ho)	H2	
	H4	

Source: The Netherlands, Ministry of Housing, Spatial Planning and the Environment. 2001. *Implementation Strategy on Management of Substances: Progress Report*. The Hague: Ministry of Housing, Spatial Planning and the Environment, p.36.

Appendix 2. Quick Scan Decision Making Rules for PBTs and Human Health Hazards

Quick Scan Decision-Making Rules for PBTs

Hazard Class	Hazard Class	T1	T2	T3	T4
P1	B1a	VHC	VHC	VHC	VHC
	B1b	VHC	VHC	HC	C
	B2	HC	HC	C	LC
	B3	HC	C	C	LC
	B4	HC	C	C	LC
P2	B1	HC	HC	C	C
	B2	HC	HC	C	LC
	B3	C	C	C	LC
	B4	C	C	C	LC
P3	B1	HC	C	C	LC
	B2	C	C	C	LC
	B3	C	C	C	LC
	B4	C	C	C	LC
P4	B1	HC	C	C	LC
	B2	C	C	C	LC
	B3	C	C	C	LC
	B4	C	C	LC	LC

Abbreviations: P = Persistence B = Bioaccumulation tendency T = Eco-toxicity
VHC = Very High Concern HC = High Concern C = Concern LC = Low Concern

Source: The Netherlands, Ministry of Housing, Spatial Planning and the Environment. 2001. *Implementation Strategy on Management of Substances: Progress Report*. The Hague: Ministry of Housing, Spatial Planning and the Environment, p.38.

Quick Scan Decision-Making Rules for Human Health Hazards

Hazard Class	Hazard Class	Category of Concern
G	G1	VHC
	G2	HC
	G3	C
	G4	LC
C	C1	VHC
	C2	HC
	C4	LC
M	M1	VHC
	M4	LCH
R	R1	VHC
	R2	HC
	R4	LC
H	H1	HC
	H4	LC

Abbreviations:
G = Toxicity to Humans
C = Carcinogenicity
M = Mutagenicity
R = Reprotoxicity
H = Hormonal disruption
VHC = Very High Concern
HC = High Concern
C = Concern
LC = Low Concern

Source: The Netherlands, Ministry of Housing, Spatial Planning and the Environment. 2001. *Implementation Strategy on Management of Substances: Progress Report*. The Hague: Ministry of Housing, Spatial Planning and the Environment, p.39.