

Proposal to Inform LEED® 3 with The Natural Step and a Strategic Sustainable Development Planning Hierarchy

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1 INTRODUCTION

Industry-specific sustainability planning and management tools are useful, even necessary, because they can relate overall sustainability principles to the activities and processes that people know, assuming that those sustainability principles are embedded in the tools. This is likely to produce greater and faster overall progress towards sustainability than if we make it hard for people to learn about sustainability by forcing them to learn about the principles in a manner they are not accustomed. It will do this by both shifting the mindset through educating people about sustainability in an accessible manner and by providing practical tools that they can apply immediately.

Green buildings are key components of society's quest for sustainability. The US Green Building Council, a deliberately diverse coalition of many parts of society, formed in order to transform the market for green buildings, developed an industry-specific tool called the LEED® rating system. The primary stated aim of LEED is to transform the market.

2 BACKGROUND

LEED attempts to bring together the science of sustainability and the needs of the market, and therefore, while it should be grounded in good science, it must relate to the market in which it operates. The market aspect, however, dominates and the science get much less emphasis, in the LEED Foundations Policy Manual¹:

- In Section 2, *The Essence of LEED*, there are 5 sub-sections but only 1 deals with the science: "LEED™ is a flexible, yet consistent rating system: . . . That is updated regularly to take account of new knowledge about the environmental impacts from buildings and their relative importance, while providing sufficient time for the building industry to adapt to these updates"
- In Section 2, LEED Strategic Goals , only 1 of 9 bullets deals with the science or performance part of the standard: "Improve LEED's performance criteria as the industry gains experience with integrated design and green construction."
- In Section 3, LEED Committees, there is only one section under Committee Policies, Technical Quality, that contains a rather broad statement "LEED committee discussions and decisions should be grounded on technical and scientific considerations of the highest quality."

In its primary market transformation goal, LEED has been very successful. One of the reasons it has succeeded is by virtue of its apparent simplicity, which produces ease of access and understanding. The structure and the process of using LEED have also fulfilled three key requirements for organizational change:

- First, in order to effect a change, everyone needs a shared mental model of what the change is about – LEED has provided that by defining what a green building is in the North American context.
- Second, an explicit leadership position needs to be articulated – LEED has done that by explicitly targeting the leading 25% of the market.
- Finally, there needs to be a good management structure and supporting system to ensure that the proposed change gets implemented – LEED provides a clear process for implementation and certification.

In spite of this success in getting the market moving, LEED has been criticized for its lack of scientific robustness, particularly its lack of credits dealing directly with practices that impact climate change and failure to address persistent organic pollutants. Others have argued that issues are weighted inequitably.

In addition, it can be argued that LEED, by focussing on impacts, in effect rewards incremental solutions and does not adequately recognize major, step-change or paradigm-shifting advances. Failure to address these concerns may limit the market penetration and ultimate success of LEED and of the green building movement.

LEED, as an environmental rating system, also does not explicitly address economic or social issues. An implicit assumption of the voluntary nature of LEED overall, the relatively few prerequisites and the graduated recognition of achievement, is that individual projects will determine what makes the most economic sense for them, as determined by the particular mix of financial and market recognition drivers that apply to the project.

Social issues are generally addressed indirectly, usually by referencing other standards that have social equity components built into them. One example² is the reference to wood supply certified by the Forest Stewardship Council, that forms the basis for Materials & Resources Credit 7.

It is unclear whether the success of LEED in future will be limited if economic and social issues are not addressed more explicitly.

LEED's structure and technical foundations are nearly 8 years old, and while they have been incrementally improved with versions 2.1 and 2.2, there has not been a fundamental re-think of the approach to incorporating the science underpinning it. LEED is structured primarily around environmental impacts, which tends to lead to end-of-pipe mindsets and incremental solutions.

Society has learned a lot since the beginnings of LEED, in terms of environmental assessment methods, rating systems and understanding of sustainability frameworks. This work has been lead mostly by people whose primary interest is not buildings and has not always been integrated into on-the-ground tools and systems such as LEED. The target market for LEED (the leading 25%) has become more sophisticated in its understanding of the sustainability issues at stake.

3 ISSUE

There is an urgent need to align LEED more closely to established sustainability principles, without losing the accessibility that has contributed to its market success to date, in order to keep LEED relevant to its target market and to continue to allow to do its part in fulfilling the stated goal of transforming the entire market.

4 PROPOSED SOLUTION

4.1 General

There is a way forward. The seminal 2002 paper³ by Robèrt et al in the Journal of Lean Production has demonstrated that there is a remarkable agreement among proponents (including Robèrt, Hawkins & Wackernagel) of leading tools⁴ for understanding and managing sustainability, on;

- a commonly agreed, physics-based definition of sustainability beyond the Bruntland Commission definition (The Natural Step),
- a set of hierarchical principles to enable us to understand what is needed to comprehensively plan for, and work towards, sustainability, and,
- how a given framework, tool method or system fits with other frameworks⁵.

Another key paper⁶ in 2006 by Ny et al in the Journal of Industrial Ecology has proposed using the hierarchical principles as the basis for an approach to incorporating sustainability into planning and management that they call strategic life cycle management. The primary objective is to identify viable investment paths towards social and ecological sustainability.

The remainder of this paper summarises the arguments and ideas in the Robèrt et al and Ny et al papers, uses the strategic planning hierarchy to analyse LEED as it currently exists, proposes a mechanism by which these ideas can be used to inform a next generation of LEED and provides an example of how this might be done, in order to illustrate the approach. Weightings are not discussed in this paper.

Generally, the approach set forth in the two papers, i.e. the frameworks and system levels, can be used to inform the next generation of LEED in two major ways:

1. As a filter, to ensure that prerequisites and credits align with fundamental sustainability system conditions, and to fill gaps if they exist.
2. As a way of re-structuring or fine-tuning the language in the prerequisites and credits, and, specifically to separate objectives and indicators from actions and process principles.

4.2 The Natural Step

A brief summary of The Natural Step (TNS) Framework may be useful for those not familiar with it. The framework was developed by Dr K-H Robèrt of Sweden in the late 1980s, is in harmony with fundamental principles of physics and has been extensively peer reviewed by the scientific community in Sweden and elsewhere. It is presented as a set of complementary, non-overlapping conditions for social and ecological sustainability for human society - the Four System Conditions:

“The System Conditions for ecological sustainability are derived from the three basic mechanisms by which natural life sustaining systems can be destroyed, followed by inserting a “not” to create the converse of those mechanisms. The System Condition for social sustainability is simply stated as the requirement to meet human needs (within the frame set by the three System Conditions for ecological sustainability):

In the sustainable society, nature is not subject to systematically increasing...

1. *Concentrations of substances extracted from the Earth’s crust.*
2. *Concentrations of substances produced by society*
3. *Degradation by physical means, and in that society*
4. *People are not subject to conditions that systematically undermine their capacity to meet their needs.”*⁷

These System Conditions have been accepted by most people, and in particular by the authors of the papers in question, as a good statement of the principles for sustainability needed by human society to survive.

4.3 The Planning Hierarchy

In order to make use of the framework, Robèrt et al propose five hierarchically different system levels comprehensive planning for any complex system, within which the System Conditions fit. The five levels are ⁸:

- “1. Principles for the *constitution* of the system (e.g. ecological and social principles).
2. Principles for a favorable *outcome* of planning within the system (e.g. *principles for sustainability*).
3. Principles for the *process* to reach this outcome (e.g. *principles for sustainable development*).
4. *Actions*, i.e. *concrete measures* that comply with the principles for the process to reach a favorable outcome in the system (e.g. recycling and switching to renewable energy).
5. *Tools* to monitor and audit (i) the relevance of actions with reference to principles for the process e.g. indicators of flows and key-figures to comply with principles for sustainability), and/or monitoring (ii) the status of the system itself, and impacts (e.g. ecotoxicity and employment), or reduced impacts, as a consequence of strategically planned societal actions.”

4.3.1 Level 1 Principles

These principles describe human society and the physical system in which society operates. They are, in effect, a re-statement of the laws of physics.

4.3.2 Level 2 Principles

The authors of the 2002 paper argue that the TNS System Conditions constitute the level 2 *principles for sustainability*. They further argue that Sustainability Objectives can be derived from each of the System Conditions as follows:

- “1. *Eliminate our contribution to systematic increases in concentrations of substances from the Earth’s crust. This means substituting certain minerals that are scarce in nature*

with others that are more abundant, using all mined materials efficiently, and systematically reducing dependence on fossil fuels.

2. Eliminate our contribution to systematic increases in concentrations of substances produced by society. This means systematically substituting certain persistent and unnatural compounds with ones that are normally abundant or break down more easily in nature, and using all substances produced by society efficiently.

3. Eliminate our contribution to the systematic physical degradation of nature through over-harvesting, introductions and other forms of modification. This means drawing resources only from well-managed eco-systems, systematically pursuing the most productive and efficient use both of those resources and land, and exercising caution in all kinds of modification of nature.

4. Contribute as much as we can to the meeting of human needs in our society and worldwide, over and above all the substitution and dematerialization measures taken in meeting the first three objectives. This means using all of our resources efficiently, fairly and responsibly so that the needs of all people on whom we have an impact, and the future needs of people who are not yet born, stand the best chance of being met.”⁹

Further, the authors argue that there are fundamentally only two broad mechanisms or Strategies for achieving the objectives, either Dematerialization or Substitution, although the particulars vary somewhat for each System Condition. Ny et al point out that these Strategies produce measures that are dynamic with respect to each other and to the 4 principles.

4.3.3 Level 3 Principles

The level 3 principles are defined in the Robert et al paper as process principles that need to be followed in order to guide the actions taken and to move in the direction of sustainability. Sixteen process principles are articulated for society as a whole, ranging, for example, from the precautionary principle, to good return on investment, to international agreements. The Ny et al paper focuses on 3 key principles for informing viable investment paths or solutions in strategic life cycle management. These principles can be posed as questions to be asked of proposed solutions or actions:

- Direction – is the proposed solution headed in the direction of compliance with the 4 system conditions (level 2 principles)?
- Flexible – will the proposed solution avoid dead ends in the future – will it provide a flexible stepping-stone to link to future solutions in the same direction?
- Good ROI – will the proposed solution (monetary, meeting market demand, foreseeing regulatory changes, etc) in order to seed subsequent solutions?

4.3.4 Level 4 Principles

Actions that need to be taken are defined as level 4 principles. We are reminded that actions should not be confused with the principles underpinning them, for example, more efficient automobiles may lead to increased consumption of fossil fuels through rebound effects.

4.3.5 Level 5 Principles

Tools and metrics to indicate and audit progress towards sustainability are defined as level 5.

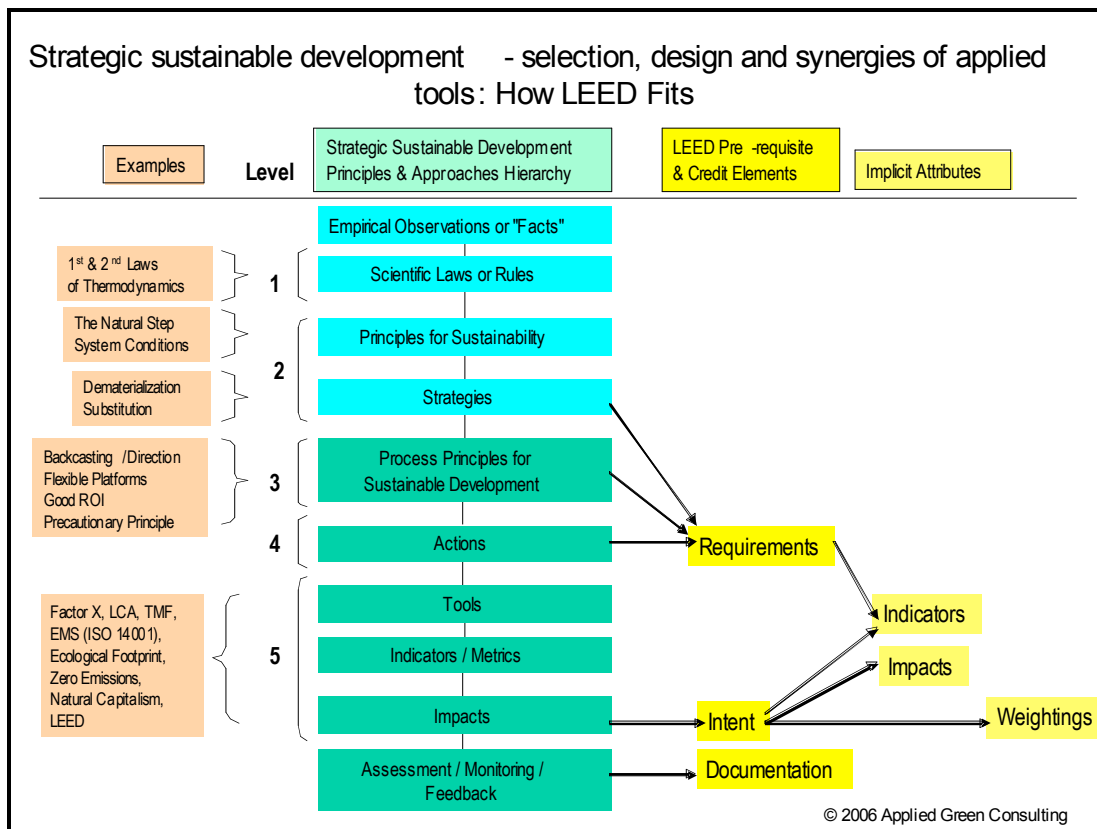
Robèrt et al agree that many well known tools and approaches, such as Factor 10, Ecological Footprinting, Zero Emissions, Natural Capitalism, ISO 14000 and Life Cycle Assessment (LCA) can be considered as belonging to Level 5. They emphasize that all these tools have different entry points in a sustainability planning framework and therefore different primary focuses, and that these should provide opportunity for synergies rather than being viewed as being competitive.

4.4 LEED Analyzed with the Planning Hierarchy

When LEED is analysed with this set of principles and hierarchy, it can be shown that it effectively covers from Level 2 to Level 5. This is represented schematically in Figure 1.

Strategies and Actions are described in the Requirements of LEED, along with processes to achieve them. Impacts are embedded in the Intent statements. Indicators are largely a by-product of the Requirements and Documentation statements. Assessment is spelled out in the Documentation. Weightings are implicit in the assignment of points to prerequisites and credits.

Figure 1: LEED Analyzed with Planning Hierarchy



This spanning of several levels of principle in large part helps to explain the success of LEED in a marketplace that, at the time of the launch of LEED, was unsophisticated in its knowledge and understanding of the scientific issues at stake. Within one tool, sufficient definition of the impacts and rationale for appropriate action is presented, along with practical actions that can be taken, that users can immediately understand how to move forward on their projects. Assessment is related to existing standards and guidelines, which reduces the learning curve, and the market recognition of graduated progress provides tangible incentives beyond the intrinsic satisfaction of doing the right thing.

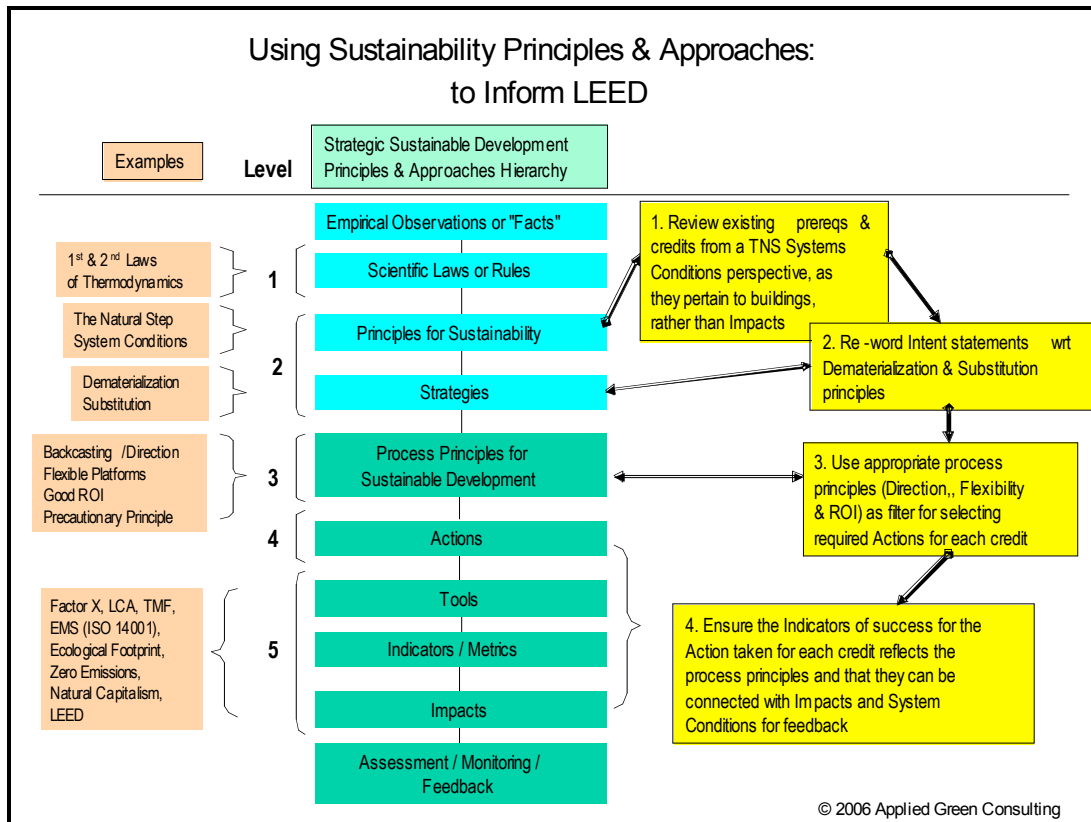
4.5 Using Planning Hierarchy Approach to Inform LEED

The planning hierarchy can be used to inform how LEED can be better aligned with sustainability principles. One way to do this is to approach the problem in a series of steps, as follows:

1. Review existing LEED prerequisites & credits from a TNS Systems Conditions perspective, rather than solely from the perspective of Impacts.
2. Identify the System Condition that the prerequisite or credit is intended to move the project towards. This could be stated as an Objective.
3. Re-word the Intent statements in relation to Dematerialization & Substitution principles.
4. Use appropriate process principles as filters for selecting the required Actions for each credit.
5. Ensure the Indicators of success for the Action taken for each credit reflects the process principles and that they can be connected with Impacts and System Conditions to ensure measurable feedback directly to principles for sustainability.

These steps are represented schematically in Figure 2.

Figure 2 Using Planning Hierarchy to inform LEED



4.6 Example Credit Examined with Proposed Planning Hierarchy

In order to illustrate the proposed process, two credits, Energy & Atmosphere Credit 2, Renewable Energy and Energy & Atmosphere Credit 6, Green Power, are examined and new wording and structure is proposed for a single credit to replace them.

4.6.1 Existing Wording EAc2:

Intent

Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use

Requirements

Supply at least 5% of the building's total energy use (expressed as a fraction of annual energy cost) through the use of on-site renewable energy systems.

4.6.2 Existing Wording EAc6:

Intent

Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Requirements

Provide at least 50% of the building's electricity from renewable sources by engaging in at least a two-year renewable energy contract. Renewable sources are those that meet the Environment Canada Environmental Choice programs' EcoLogo requirements for green power supplies.

4.6.3 Proposed Wording:

Objective

Eliminate humanity's contribution to systematic increases in concentration in the ecosphere of substances from the Earth's crust.

Intent

Increase the rate of substitution of fossil fuels by renewable energy from the lowest LCA source.

Indicator

Renewable energy supply, characterised by LCA impact

Requirements

Supply at least xx% of the building or project's total energy consumption with renewable energy, chosen from the alternative with lowest LCA impact of those available.

5 **ADVANTAGES**

There are several advantages to be obtained from using the proposed approach to inform and re-work LEED:

- Provides awareness and education on a deep level to the industry about the fundamental sustainability challenges facing society
- Allows solutions to move faster in the direction of solving or avoiding problems we are not yet aware of
- By focussing on a first-principle, physics-based approach, the end objective is more easily understood, which should encourage projects to move beyond "point-chasing".

- More integrated set of credits and issues if they are examined with goal of satisfying all of the system conditions and not, potentially, one at the expense of another
- Better able to withstand criticisms from vested interests, because the science is more easily defended
- By leading with first-principle, physics-based underpinnings, it will be relatively more straightforward to deal with contentious issues such as the PVC issue that recently came up, rather than deal with the end-of-pipe, allowable dosage, toxicology, mindset that seems to prevail with these kinds of discussions. It would also put issues such as PVC and PBDE in better context with other POPs and materials where low-level pollutants cause long term toxicological effects

6 CONCLUSION

The success that LEED has had to date in transforming the market for green buildings is at risk because of the increasing sophistication of its target market with respect to understanding of sustainability issues. Recent work by highly respected authors and proponents of sustainability tools, methodologies and frameworks provide a basis for informing the next generation of LEED. A practical process is proposed that will allow greater rigour to be introduced while retaining the accessibility that has been a key part of the success of LEED so far. An example demonstrates how the outcome of such a process might look. There are several advantages to the approach proposed and the new structure of LEED language that would result.

7 REFERENCES

¹ LEED Foundations Policy Manual, 2003, US Green Building Council

² LEED NC 2.2 Rating System, 2005, US Green Building Council

³ *Strategic sustainable development - selection, design and synergies of applied tools*, Robèrt et al, Journal of Cleaner Production 10 (2002) 197–214

⁴ Ibid. Including ISO 14001, Life Cycle Assessment (LCA), Ecological Footprinting , Factor 4, Factor 10, Sustainable Technology Development, Natural Capitalism, and The Natural Step Framework.

⁵ *Tools and concepts for sustainable development, how do they relate to a framework for sustainable development, and to each other?*, Robèrt, K.-H.2000, The Journal of Cleaner Production. Volume 8 (3) 2000, 243-254.

⁶ *Sustainability Constraints as System Boundaries, An Approach to Making Life-Cycle Management Strategic*, Henrik Ny, Jamie P. MacDonald, Goran Broman, Ryoichi Yamamoto, and Karl-Henrik Robert, Journal of Industrial Ecology, Vol 10, Number 1-2

⁷ Ibid, Robèrt et al, 2002.

⁸ Ibid, Robèrt et al, 2002.

⁹ Ibid, Robèrt et al, 2002