Seeing Sustainably Everyday

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Abstract
In this paper we propose a "Sustainable Lens"- both actual and conceptual – to assist in acting as a Sustainable Practitioner. We describe how the complexities of everyday sustainable activities go beyond simple resource visualisations. More abstract issues of scale, ethics, and responses require a different approach to considering sustainability.

Keywords
Sustainable HCI, sustainability, diagram

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Human factors

Introduction
This position paper describes current work in developing understandings and applications towards a *Sustainable Lens.*

Sustainable Lens
Imagine you had a pair of glasses that had a sustainability mode. This mode meant that you looked

at the world through a "sustainable lens"[1]. What would you see?

These lenses wouldn't merely be green tinted glasses like the ones from the Emerald City in the Wizard of Oz. Instead, think about the analytical eyes of the Predators (robots) in the Terminator movies. These eyes scan the landscape, identifying threats, analysing options and proposing actions. In late 2010 'Terminator Vision' took a major step towards becoming a reality when DARPA released a request for the development of Soldier Centric Imaging via Computational Cameras [5]. SCENICC proposes an augmented reality system for soldiers in war situations. Among other goals, DARPA describes "Automated Threat Detection and Mitigation" and "Multi-Platform Collaborative Imaging" systems that include "imagery may be analyzed automatically in real-time to determine the existence/location of interesting objects (e.g., a person carrying a weapon) within a soldier-centered 1 km sphere of influence and a suitable alarm could then accompany an image of the potential threat".

Research imperative

We do not discuss here the ethics of spending on military hardware, rather the intention here is to borrow from the compelling vision of the SCENICC/Terminator Vision and use it to begin to consider a potential '*Sustainable Lens'*.

The intention of this research is twofold. First to argue for the development of a framework for work in HCI (and related fields) that might, one day coalesce to provide an integrated system. It is hoped that such a framework will move HCI research beyond piecemeal and limited understandings of sustainability (as pointed out by [9,1,7,14]. Second, in the absence of technological development, is it hoped that this exploration of the interface of sustainability literacy and visual literacy – will further our understandings of sustainability.

The key to this work is

1. asking how might we conceive our internal heads-up display to make the invisible visible to help us better live, work and play in a sustainable manner. As we work, live or play, we all need to be able to "see" sustainability. In order to see through a natural sustainable lens we need to improve our capabilities to see sustainably - hence an exploration of visual depictions of sustainability. We believe, in turn that such understandings will inform the development of ecovisualisations [10,13].
2. understanding what is required of everyday practices in sustainability in a way that goes beyond the simple reduction of marginal resource use (Fogg's "grey squares" [8] instead taking a wide and deep interpretation of sustainable literacy [16]. This area of work we refer to as the "Sustainable Practitioner" [11].

Everyday sustainability vision

As we go about our daily lives we are good at avoiding threats - we can see the pothole and drive around it. We can see when our child has cut her knee and offer

[1] With a grateful nod to Eli Blevis from whom we borrow and extend this term.

care and sympathy. We can also see the relationship between our actions and the consequences - when I push on a pile of blocks I can see them tumble to the floor. We're not so good when the threats are hidden (such as poison in a stream). We're not good when the action and consequences are separated by time or space, or when the effects are cumulative or bedevilled by a myriad of complicating factors. Such factors are inherent in sustainability - we cannot easily see the impact of our actions on generations to come, or how our situation is affected by decisions made on the other side of the world, or how seemingly innocuous behaviours multiplied across society result in possibly irreparable damage to our connected socio-ecosystems.

Seeing through a sustainable lens is not just a matter of optics and simple resource use visualization, it requires a way of thinking to organise what we see. Sustainability requires explores a different approach to understanding and representing sustainability, one that recognises that as a society we have to learn to live in a complex world of interdependent systems with high uncertainties and multiple legitimate interests [15]. The authors are considering how the thinking behind the sustainable lens might be represented by diagrams of ethics, values, systems thinking, a connected socio-ecosystem, and participatory approaches to engagement.

Our way of seeing the world frames our behaviour, as does the context of our skills, knowledge and occupation. No matter what our discipline, we need everyone to act in a sustainable manner. So what could a *Sustainable Lens* contribute to anyones' discipline? to their understandings? to the behaviours expected of being a sustainable practitioner in any specific discipline? The answers lie beyond the almost trivial, the things that every worker should do (recycling office paper, walking up stairs etc – which are the foci of many papers in HCI), but with harder questions about the nature of the trade or profession.

Imagine a forestry worker - let's call him David - attending a chainsaw maintenance course. As part of that course the chainsaw operators are taught all about being careful when changing the chainsaw oil, not spilling it and collecting it for recycling. The first task for the *Sustainable Lens*, then is to see the opportunities to practice such skills. What is going to matter, perhaps more so, is what our David does on the first day when, after a morning of carefully changing oil, he is roundly abused – 'just chuck it in the stream, you're holding up the whole gang'. How might a sustainable view of the world help here? How would he respond if told that his selfishness is preventing a colleague earning money needed for a child's lifesaving surgery?

And what do we expect our David to do when told to go and chop down the last Kauri (a NZ native tree - let's assume our David's *Sustainable Lens* recognised it!). The answer isn't as simple as saying no (he'll get fired and someone else will chop it down), nor is as simple as saying 'yes' (surely unsustainable). Nor is the answer something about integrated catchment management – such material is perhaps considerably outside the purview of our chainsaw operator. Instead the answer is something about polite questioning and discussing alternatives.

David's problem can be further extended by considering that most problems are not of the "last Kauri tree"

variety, rather, the 999th Kauri tree (i.e. a tragedy of the commons problem). Recognising the significance of the tree is also something not going to happen by accident.

Equivalent scenarios abound in every discipline. Take, for example, the role of procurement within computing. Every year major organizations purchase hundreds if not thousands of computers. How will the *Sustainable Lens* help when the IT manager is told to 'get them off the back of a truck this year', or told to buy something she suspects is has child labour implications, or to choose between several competing suppliers, all touting apparently green credentials. Clearly one of the things we expect our *Sustainable Lens* to be able to do is to recognise if something is unsustainable, or distinguish degrees of sustainability. This has two aspects, they need to recognise and deal with greenwash, and they need to understand the implications of the potential purchase in terms of systemic thinking.

We explored this chainsaw scenario with a group of building trades lecturers. They agreed with the premise that their graduates should act as sustainable practitioners, but that this would not extend to changing any behaviours that they considered unsustainable. It is, they say, vital to the safety of the building process, that you do exactly as you are told on a building site. Fair point, but this is in itself a value position – that of safety. We further explored the ramifications of safety. What would we expect our David to do if instructed to climb on an unsafe structure? He would be expected (required even) to object to this immediate threat. Clearly, in the area of safety everyone on the building site is empowered to manage their own safety. The same applies if they see someone else doing something dangerous – they are required to intervene. So, let's say they are instructed to do something unsustainable – maybe hide some heavy metal in material destined for landfill, or to order rainforest timber – the timescale of the threat might have changed, but it is still there.

We don't have actual answers for what people should do in these everyday situations, clearly the line is blurred. The wobbly ladder poses an immediate peril, sustainability may have an equal threat – but only if seen through a lens of different spatial and temporal scales. Acting sustainably is not a (relatively) simple matter of changing ones driving habits or reducing home electricity consumption.

Visualising Resources

Figure 1 is overlaid with a diagram of sustainable thinking – not obscuring the original, but hopefully giving the message that everything can be viewed through a lens of sustainability. (In this case the diagram is one of Strong Sustainability [4]. These concentric circles carry an important message that is quite different from the more common Venn diagram overlapping circles approach).

A Sustainable Lens would need to operate on multiple scales. It is the result of layers of context, and combines history, the present and the future. This very structure – the multiple scales and the layering – gives some notion of sustainability: every story has a back story, every image can be viewed with a sustainable lens. The augmentation provided by the lens needs to carry the essence of sustainability in a few lines. The goal is to add value to the primary image, not detract from it.

Figure 1: Strong sustainability as a diagrammatic overlay

A necessary component of the Sustainable *Lens* is resource visualisation (eg [10,13] etc). These though are just the beginning. It is our contention that much of this work falls short of adequately recognising the complexity of sustainability – in oversimplifying the issues and the responses.

As an example, consider a simple visualisation of a laptop. A laptop computer takes power to run and its manufacture resulted in considerable carbon emissions. These embodied emissions can be elucidated with a life cycle assessment giving between 5247 to 7826 MJ (a desktop machine is 25% higher), over an average laptop life span average 3-5 years gives 3500MJ per year day ({Deng, 2009 #10647}). Despite being concerned about carbon footprints, however, this information means little to us. Converted to coal equivalent, this gives about 400grams of coal per. If we could see this smoke (Figure 2), if our computers were dirty and emitted smoke, would we perceive them differently? Would we be more vigilant about turning it off when not in use? Would we use it less? Would we value it more? Hopefully we might reconsider decisions about upgrade cycles and try to extend its functional life. We might seek a laptop designed for upgradeability rather than planned obsolesce. We might even investigate a different model of computing ownership. Unfortunately, the simple visualisation does

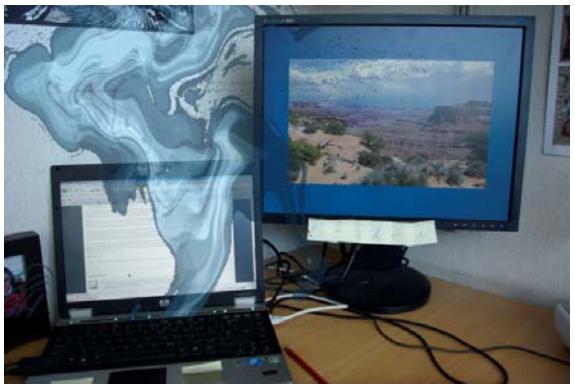

Figure 2: Energy intensity represented as smoke.

little to promote these activities. We really need our *Sustainable Lens* to have a context of action [12,7] and ongoing transformation [17].

A further limitation of such visualisations is an inability to represent the complexity of sustainability. Figure 2 represents only the energy impacts. Bonanni's [2] work on open source supply chain mapping gives an example of the sources of the components of a typical laptop (from www.sourcemap.org). Their approach takes life-cycle analysis in a different direction - instead of focussing on energy independent of geography, they examine transparency of the supply chain with disclosure of materials and processes and where they occur. An interesting challenge is to try and find a source component that isn't described somewhere as being linked to unsustainable practices: "Cobalt Congo" for example (hint: Butcher's 2008 Blood River). [3]. For some components on Bonanni's map you don't have to look very hard to find the sustainability issues, for others you can speed the search by adding key search phrases such as environmental degradation, human rights injustice, war, pollution and so on.

The smoking laptop on the previous page provided a direct visualisation of one component of sustainability. While energy/smoke is admittedly useful as a

integrator, it does not provide a visualisation of those killed in the Congo, nor the environmental and social effects of the copper from the huge open cast pit and smelter in Chuquicamata Chile (nor the contribution of the mine to Chile's economy) and so on through the list of 43 components. Nor does it give any indication of the cumulative role of millions of laptops.

Visualising sustainability

What we can learn from this is that there is more to a *Sustainable Lens* than visualisations of single elements (or even metaphorical or combined indices). Instead we need to represent complex systems of both impacts and drivers. These systems require more than a literal unmasking of the invisible. Simple visualisations of single parameters - representing values of sustainability or perhaps unsustainability, while informative, do not provide sufficient depth to provide a basis for *Sustainable Lens*. Instead we need to consider more fundamental representations. We are then, focussing on examining the diagrammatic representation of sustainability.

Our ongoing research explores the diagrammatic representation of sustainability. How might our *Sustainable Lens* encourage these attributes of sustainability?

- Systems thinking
- An understanding of the connected nature of our socio-ecological system
- Critical and creative thinking
- Ability to act as change agent
- Understanding of ethics
- Sense of participation and action

How might we look at a scene and see the dimensions of time or space, or even risk, uncertainty, ambiguity and ignorance?

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