Visions for Sustainability

IRIS

*Vision without action is useless.*
*But action without vision*
*is directionless and feeble.*
*Vision is absolutely necessary*
*to guide and motivate.*
*(Donella Meadows)*

*Interactions between different logical levels*
*produce phenomena unseen at either level.*
*(Gregory Bateson)*

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**VISIONS FOR SUSTAINABILITY is an indexed scientific journal published in open access by the Interdisciplinary Research Institute on Sustainability (IRIS). The journal promotes a debate on how the concept of sustainability can be addressed and applied in existing and foreseeable societies worldwide. Particular emphasis is placed on facilitating communication between researchers of different disciplines, supporting educational projects and examining the role of contemporary science in dealing with issues related to sustainability. Papers are welcome from researchers and scholars of natural, political, social and other sciences as well as philosophical and humanistic disciplines, and in particular from anyone wishing to make a contribution which combines multiple viewpoints. The aim is to host as wide a range as possible of multidisciplinary, interdisciplinary and transdisciplinary perspectives on sustainability. Discussions or comments on articles which have previously appeared in the journal are also welcome. All submissions will be refereed before publication.**

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VISIONS EDITORIAL

# Going Beyond Current Perspectives, Moving Towards Transformative Visions

**Osman Arrobbio[1,2], Giuseppe Barbiero[1,5], Elena Camino[1], Alessandro Cerutti[1,6] Laura Colucci–Gray[1,3], Martin Dodman[1], Enzo Ferrara[1,4] and Silvano Folco[1]**

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In *Visions for Sustainability* no. 7, we published a paper by Nanni Salio, “Nonviolent Conflict Transformation and Peace Journalism”, in which the author draws on Galtung’s vision of the transformation of the *triangle of conflict* into the *triangle of nonviolence*, in such a way that the three vertices *attitude*, *behaviour* and *contradiction* become those of *empathy*, *dialogue and nonviolence* and *creativity*. Salio then shows how this can be enacted by people working at micro and macro levels in such a way as to “dispel the fog of war”. Whether by appealing directly to these principles or to other theoretical and practical frameworks for promoting peace, the International Campaign to Abolish Nuclear Weapons (ICAN), an international movement characterised by diversity and united by a common purpose, was founded in 2007 and has taken root and spread as a worldwide social conscience with 468 partner movements in over 101 countries. On December 10, ICAN was awarded the 2017 Nobel Peace Prize “for its work to draw attention to the catastrophic humanitarian consequences of any use of nuclear weapons and for its ground-breaking efforts to achieve a treaty-based prohibition of such weapons".

For the first time ever, the award has gone to a vast movement of this kind, rather than to a specific association, a group or single individuals. At the Oslo ceremony, three women in particular gave voice to that movement and underlined their vision of the key issues at stake. In her presentation, Berit Reiss-Andersen, chair of the Norwegian Nobel Committee, emphasized how “ICAN arose as a protest against the established order. Nuclear weapon issues are not solely a question to be addressed by governments, nor a matter for experts or high-level politicians. Nuclear weapons concern everyone, and everyone is entitled to an opinion”. The executive director of ICAN, Beatrice Fihn, then warned how "the deaths of millions may be one tiny tantrum away" and how "a moment of panic" could lead to the "destruction of cities and the deaths of millions of civilians" by nuclear weapons. Finally, Setsuko Thurlow, a 13-year-old victim of the bombing of Hiroshima, talked about how she has spent all her life as a *hibakusha* – a survivor of Hiroshima and Nagasaki – bearing witness to the events and the consequences of August 6, 1945. “When I was a 13-year-old girl, trapped in the smouldering rubble, I kept pushing, I kept moving toward the light. And I survived. Our light now is the ban treaty. To all in this hall and all listening around the world, I repeat those words that I heard called to me in the ruins of Hiroshima: Don't give up! Keep pushing! See the light? Crawl towards it".

The efforts of ICAN to harness collective intelligence, consciousness and competence, while at the same time emphasizing the importance of individual contributions, are a clear embodiment of what can be achieved when human endeavours are based on rational visions of attitudes, behaviours and contradictions within situations of conflict. Yet, at the same time, at both micro and macro levels, at this moment in history there are numerous irrational and potentially devastating manifestations of how attitudes can be based on intolerance and aggression, on ignoring or negating other points of view, while behaviours are based on threatening and attacking, on manipulating and exploiting, and contradictions are based on defeating and destroying, on greedy consumption or profit-seeking and blind pursuit of interests (both self-interests and those of others who are considered to be one’s “allies”).

Although they are by no means the only examples within the current alarming global scenario, the irrational proclamations and actions by Donald Trump and members of his administration during the first year of his presidency – on worldwide issues such as nuclear weapons and climate change, relationships with countries such as North Korea, Iran or others in the Middle East, internal policies concerning immigration and healthcare – all stand out in this respect. Together they provide expressions of attitudes, behaviours and contradictions that work to exacerbate tensions and create risks, treat problems to be solved as threats to be destroyed, ignore or deny the existence of dangers and act in such a way as to worsen them, present complex situations as black and white contests with winners and losers, while failing to understand that there can only be losers when conflict spirals out of

control.

At times, what is most alarming is the affirmation of the patently irrational or the negation of what is rational and based on data. On the one hand, according to the U.S. Department of Agriculture, damage caused by fires in 2017 makes it the nation's costliest year ever, while long-term climate trends will inevitably lead to increasingly frequent droughts. At the same time, 97 percent of scientists agree that global warming is evident[1]. Nevertheless, blatant deniers of climate change and its consequences abound in Trump's entourage. In other cases, there is an equally alarming attempt to confound issues rather than simply deny them, such as when the head of Environmental Protection Agency (EPA) claims that scientists continue to disagree about the degree and extent of global warming and this means that government action cannot be taken without the necessary agreement, or when the director of the Soil Health at Department of Agriculture (USDA) advises the avoidance in official documents of terms such as "climate change" (to be replaced by "weather extremes") and "reduce greenhouse gases" (to be replaced by "increase nutrient use efficiency") in such a way as to use language to obfuscate rather than clarify vision.

In the face of such confusion, the only way to address problems and transform conflict of all kinds into sustainable trajectories is through dialogue – seen as interaction between humans and between humanity and nature based on reciprocal respect and meaningful language – in order to develop and propose visions that can be the basis for shared, constructive and creative action. Individual, collective and planetary life courses are made up of contexts, events, choices and actions that require understanding reasons why situations develop as they do, weighing up alternatives and options available and imagining possible solutions based on participatory action. The roles of education and involvement are paramount in promoting multiple points of view and a consequent multiplicity of visions, an awareness of how within any context there exists the danger of adopting single visions that are inevitably limited and lead to partial, ineffective or biased action.

Each one of the papers published in this issue offers a vision of how human beings can go beyond current and conventional paradigms and situations in order to build future and transformative scenarios, go beyond perspectives based on immediate reactions or short-term gains in order to create pondered solutions by considering a range of options and long-term perspectives, go beyond themselves and their presumed centrality in order to consider their collective wellbeing within the framework of planetary wellbeing.

Helen Kopnina's paper on *European Renewable Energy* looks at current European energy policy in terms of the differences between conventional and transformative sustainability approaches. The author considers the different renewable energy options that are available to policy makers and how such choices have been shaped. She argues that European energy policy has been developed within a conventional sustainability framework that focuses on criteria such as eco-efficiency and 'energy mix', examines the limitations of this perspective, and proposes a move toward a transformative approach based on circular economy and Cradle to Cradle frameworks.

In their paper, *Rewilding Education in Troubled Times; or, Getting Back to the Wrong Post-Nature*, Sitka-Sage, Kopnina, Blenkinsop and Piersol show how the recent move to introduce a "post-nature" world risks confirming and consolidating anthropocentric perspectives and techno-scientific approaches to managing the environmental crisis. They analyse the bases and the dangers of such approaches and argue that troubling nature has profound implications for education. They then illustrate case studies from nature-based programs in The Netherlands and Canada to show how anthropocentric thinking can be reinscribed even while ostensibly working within a "sustainability" framework. At the same time, they argue that, despite what they call "the tenacity of human hubris and the advent of the Anthropocene", our troubled times offer examples of emerging "post-anthropocentric"

[1] https://climate.nasa.gov/scientific-consensus/

perspectives and practices. “Rewilding” is proposed as a means for re-thinking education in order to modify actions and go beyond ideas of human exceptionalism.

The papers by Berto and Barbiero, “The Biophilic Quality Index: A Tool to Improve a Building from “Green” to Restorative”, and by Nota, Marian, Callegari, Berto, and Barbiero, “When Biophilic Design Meets Restorative Architecture: the Strambinello Project”, both look at human beings’ relational structures and their interaction with their physical-spatial surroundings, emphasizing how current “green” architecture pays exclusive attention to being environmentally friendly and considering ways of introducing biophilic design based on the importance of the restorative environment dimension. Berto and Barbiero present the *Biophilic Quality Indexes* as an instrument for calculating to what extent a building is biophilic and argue that this dimension corresponds not only to an aesthetic need but also to a necessity for efficient human cognitive functioning. Nota, Marian, Callegari, Berto, and Barbiero present an experimental case study of biophilic architecture that becomes a design variable for the physical and psychological wellbeing of the inhabitants on the basis of certain characteristics known as regenerative factors within *Attention Restoration Theory*.

In *Environmental Security and Sustainability of Community Resources in Nigeria*, Uzoaru and Chidinma examine the question of how human activities have created environmental insecurity and its implications for the sustainability of community resources in Nigeria. They illustrate contents, objectives and methodologies for adult environmental education programmes for environmental sustainability and security in order to consider how, when adults receive adequate information through awareness-raising activities, they can be equipped with the necessary knowledge and skills to manage the environment in a sustainable manner and prevent the environmental insecurity their own actions can provoke if not guided by a desire to be a community and work together for the common interest.

Moving towards a vision of the environment we inhabit and care for and the resources we use and replenish can only be achieved if we promote peace by refusing the perspective of defence through nuclear, or indeed other, weapons, that deforms both the purported defender and the defended, and if we promote nonviolent ways of transforming actual and potential conflicts within humanity and between humanity and nature that involve us all. In the words of Berit Reiss-Andersen, “ICAN does not accept that the lack of progress towards nuclear disarmament is a realpolitik necessity. ICAN's premise is humanitarian, maintaining that any use of nuclear weapons will cause unacceptable human suffering (…) ICAN has succeeded in generating fresh engagement among ordinary people in the campaign against nuclear weapons. The organisation's acronym is perhaps not a coincidence: “I CAN”.

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# European Renewable Energy. Applying Circular Economy Thinking to Policy-Making

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**Abstract.**
This article addresses European energy policy through conventional and transformative sustainability approaches. The reader is guided towards an understanding of different renewable energy options that are available on the policy making table and how the policy choices have been shaped. In arguing that so far, European energy policy has been guided by conventional sustainability framework that focuses on eco-efficiency and 'energy mix', this article proposes greater reliance on circular economy (CE) and Cradle to Cradle (C2C) frameworks. Exploring the current European reliance on biofuels as a source of renewable energy, this article will provide recommendations for transition to transformative energy choices.

**Key words.** climate change · Circular Economy (CE) · Cradle to Cradle (C2C) · European Union · renewable energy · solar energy · wind energy

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**Introduction**

The use of renewable energy is seen as one of the crucial components of sustainability strategy developed by the European Union (EU) over the past decade. In 2016, the European Commission aimed at designing the European Energy policies for the next decade[2]. These policies are aimed to devote a major effort to establishing new sustainability criteria for biomass and biofuels within the larger framework of sustainability largely in terms of increasing eco-efficiency and increasing the use of renewable energy.

According to the International Energy Agency,[3] "renewable energy is derived from natural processes that are replenished at a higher rate than they are consumed". Solar, wind, geothermal, hydropower, bio-energy from biomass, power of ocean or sea, and more contentiously, nuclear generation are associated with renewable energy [4]. Today, wind power, solar power, tidal waves, and geothermal power stations and the like produced about 1.3% between them[5].

Basically, some types of renewable energy, like hydropower, are considered clean, safe, and widely available from local sources[6]. However, the same hydropower may have unintended negative side-effects, such as dams that can cause disruption of natural systems, affecting river environments, fisheries and land[7],[8]. Other renewable energy sources have been even more controversial. For example, after the Fukushima nuclear accident in 2011, Germany has permanently shut down eight of its 17 reactors.[9] Presently, there is no broad scientific consensus about how safe nuclear energy is, and the debates are still raging in both scientific, as well as political, public and vested interests arenas.

While some sustainability experts, including those involved in formulating European energy policy, propose eco-efficiency (*reducing* energy use per unit of output) or a mix of strategies (*combining* both fossil fuels and renewable energy); others are in favour of more strict and transformative measures[10]. Generally, eco-efficiency as a term associated with sustainability is widely accepted in European policy documents as well as public discourse. Those advocated more transformative measures will be discussed further in this article.

This article will focus on specific types of renewable energy, biofuels on the one hand and wind and solar energy on the other hand, and examine these through the use of Cradle to Cradle (C2C) and Circular Economy (CE) frameworks. The CE[11] and C2C[12] are specifically highlighted as they provide measures that seek to reach beyond conventional approaches that are based on the assumption that pragmatic approach to renewable is more feasible and economically desirable[13]. Concretely, pragmatism in this case implies that the 'energy mix' includes whatever sources of energy are balanced in accordance to economic imperatives, social needs and partially ecological requirements.

By contrast to conventional eco-efficiency, CE and C2C postulate that rather than environment being merely one of the three commonly accepted pillars of sustainability

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[2]

[3] IEA (International Energy Agency). FAQ: renewable energy. http://www.iea.org/aboutus/faqs/renewableenergy/ (2015). Accessed 13 December 2016.

[4] Stigka et al 2014

[5] The Economist 2015b

[6] https://www.energy.gov/eere/water/benefits-hydropower

[7] http://www.conserve-energy-future.com/Disadvantages_HydroPower.php

[8] International Rivers http://www.internationalrivers.org/environmental-impacts-of-dams 'Environmental Impact of Dams' Accessed 13 June 2015.

[9] Breidthardt 2011.

[10] Ellen MacArthur Foundation 2014

[11] EC http://ec.europa.eu/environment/circular-economy/index_en.htm 'Circular economy strategy' Accessed 13 June 2017.

[12] McDonough and Braungart 2002; EC http://ec.europa.eu/environment/ecoap/about-eco-innovation/good-practices/eu/575_en.htm 'Eco-innovation' Accessed 13 June 2017.

[13] Duflou et al 2012.

(the terms coined by John Elkington 'people, planet, profit'), it is foundational as economic and social systems are contingent upon functioning of healthy ecosystems. Ideally, at least, circular economy is 'restorative and regenerative by design, and aims to keep products, components, and materials at their highest utility and value at all times'.[14] Consequently, these transformative frameworks advocate renewable energy, outlining the danger of compromise in which economic imperatives take the front seat. According to C2C, eco-efficiency allows energy sources that are harmful to 'be less bad' rather than eliminating them altogether[15]. One example of 'less bad' energy source is biofuel derived from wood.

*The Economist*[16] journal termed the use of wood as a renewable energy source 'Environmental lunacy in Europe'. The article reflects that while biofuels are supposed to be 'carbon neutral', biomass plantations are harvested at the rate faster than they grow back. Also, these plantations displace ecologically diverse ecosystems that could have absorbed carbon more efficiently. They also compete with land that could have been used for food production. A poverty-combatting charity *Action Aid* has issued this statement: "If biofuels targets set by the U.S. and Europe are met the amount of land used to create fuel rather than food will increase dramatically. The result? Food prices could rise by up to 76% by 2020, pushing 600 million people into hunger[17].

This article will focus on the energy policy in the European Union in the larger context of sustainability, considering both conventional and alternative approaches. The sections below will place the issue of energy in Europe in the larger context of climate change, and then turn to the discussion of renewable energy. It will be argued that while EU claims to lead ecological modernization,[18] as well addressing global concerns about climate change[19] – yet its leadership role for a transition to renewable energy leaves some room for interpretation[20], especially in European embrace of biofuels.[21] We shall discuss the problematic role of biofuels in the European 'energy mix' in the sections below by first introducing the concept of C2C and CE, and then discussing how renewable energy is currently conceived in Europe. The question explored in this article is how the C2C and CE can be applied to evaluate the energy policy in Europe. The reason why these specific frameworks are especially relevant to the task of transition to sustainable energy is that they reach beyond the currently acceptable 'energy mix' solutions which still allow non-renewable or partially renewable sources of energy to be used. In being more categorically opposed to any sources of non-renewable energy, C2C and CE promise to address the root causes as well as offer realistic solutions to climate change, one of the key issues of concern identified in European environmental policy.

**Climate Change**

Increased consumption of fossil fuels results in emissions of greenhouse gases (GHG) and particularly carbon dioxide ($CO_2$) that most scientists agree cause climate change and air pollution.[22] The International Panel for Climate Change (IPCC)[23] has established that it is necessary to limit GHG to avoid the 2 degrees Celsius warming threshold. However, at present, the use of fossil fuels has not subsided and the global GHG emissions have actually risen to about 40% after the signing of Kyoto

[14] Ellen MacArthur Foundation https://www.ellenmacarthurfoundation.org/circular-economy

[15] McDonough and Braungart 2002; MacArthur Foundation 2014

[16] The Economist 2013.

[17] https://www.actionaid.org.uk/sites/default/files/publications/biofuels_fuelling_hunger.pdf

[18] Schelly 2015, pp 55-69.

[19] Lewis 2015.

[20] EC http://ec.europa.eu/clima/policies/international/negotiations/future/index_en.htm 'Paris agreement' Accessed May 17, 2016

[21] Van Renssen 2016.

[22] Kopnina and Blewitt 2014.

[23] IPCC 2011.

Protocol.[24] The Kyoto Protocol[25] signed in 1987 was followed by initiatives developed in the consequent climate change conferences, including the Paris agreement (2015) that is currently threatened by the American presidency of Donald Trump[26]. A great threat to climate change is the immense complexity of the challenge, in social, economic and even cultural terms. Climate change is intimately intertwined with energy, transportation and tax policies, with the very fabric of 'modern' living dependent on fossil fuel economy[27]. As a result of difficulties of addressing climate change, at the turn of the millennium, the five-year mean of global surface air temperature has increased by 0.5 degrees Celsius.[28]

Despite present American withdrawal from climate mitigation commitments the curbing of emissions is seen as an issue of primary importance within international sustainability politics. The climate and energy package developed by the EU is a set of binding legislation, which aims to ensure the targets for 2020. Known as the "20-20-20" targets for 2020, the targets include a 20% reduction in EU emissions from 1990 levels; raising the share of EU's renewable energy consumption to 20%; and a 20% improvement in the EU's energy efficiency[29]. There is large variation in the level of target fulfilment with France, the Netherlands and UK lagging behind, and Sweden, Denmark, Finland and Belgium over-fulfilling their target[30]. Remarkably, many laggard countries rely on biofuels as primary sources of renewable energy[31].

**Circular economy (CE) and Cradle to Cradle (C2C) frameworks**

The authors of the Cradle to Cradle concept, McDonough and Braungart[32], criticize the dominant method of industrial production as a "cradle to grave" process in which a product is made and then wasted. Recycling is in reality 'down-cycling' – an energy-costly process that invariably involves transportation, energy and water, and results in a product of less value. In fact, McDonough and Braungart argue, most products are not made from the start to be recycled, or even better, re-used infinitely: most of ubiquitous materials such as paper and plastic diminish in quality if recycled.

Another problem with conventional sustainability thinking is reliance on eco-efficiency – a strategy that tends to 'save' at least part of the product, such as electricity, by using it more efficiently. As McDonough and Braungart argue, however, a bad thing (such as fossil fuel converted to electricity) should not be 'efficient'. Efficiency helps to retain unsustainable products, instead of eliminating them altogether. In fact, most products, from cars to phones, are based on the 'built-in-obsolescence' or 'planned obsolescence' principle[33]. This means that products are intentionally not made to last, stimulating consumers to buy newer models.

C2C formulates three key design principles for production, which are also crucial for understanding sustainable energy generation principles: (a) waste equals food; (b) use current solar income, and (c) celebrate diversity. More concretely:

*Waste equals food.* Unproductive waste does not exist in nature because the processes of

[24] IPCC 2014.
[25] IPCC 2014.
[26]http://www.independent.co.uk/news/world/americas/us-elections/president-donald-trump-disaster-paris-climate-change-agreement-cop-22-un-climate-summit-a7406366.html
[27] Kopnina and 2014
[28] IPCC 2011.
[29]EC http://ec.europa.eu/clima/policies/international/paris_protocol/energy/index_en.htm 'A Global Deal for Climate'. Accessed 13 June 2015.
[30] https://ens.dk/sites/ens.dk/files/Globalcooperation/eu_energy_and_climate_policy_overview.pdf
[31]http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_The%20Hague_EU-28_7-15-2015.pdf
[32] McDonough and Braungart 2002
[33] Bulow 1986

each organism contribute to the health of the whole ecosystem. Typically, for example, a cherry tree's 'waste' is productive and even nutritional for other species – if not eaten, the berries and the leaves decompose into food for other living things providing nutrients flow indefinitely. Besides biological metabolism, the technical metabolism is designed to mirror natural cycles in a closed-loop system in which valuable, high-tech synthetics circulate in cycles of production, use, recovery and remanufacture.

*Use current solar income.* Noting that plants literally convert sunlight into useful substances used by other 'users' that are dependent on oxygen and vegetable food, sunlight is a logical source of endless renewable energy. Broadly, in C2C systems, any other types of endlessly available energy can be used, including wind and kinetic (power generated by movement) energy.

*Celebrate diversity.* Diversity in this case refers to healthy and various ecosystems that include highly complex communities of living things with a unique adaptation system to their surroundings that works in concert with other elements of this ecosystem. In recognising this natural diversity, C2C uses the idea of highly diversified and locally adapted natural systems as a prototype for making products[34].

In C2C planning, life cycle assessment helps to make informed choices at various stages in the product's life[35]. Life cycle assessments[36], which are also very useful as cradle-to-cradle analyses, are a way to look at all the inputs (raw materials, energy, etc.) and all the outputs created from the production, use, and disposal of the product (the product itself, pollution, waste by-products, etc.). In this way, business leaders or indeed energy companies can use life cycle assessments to select the types of energy sources or materials that are really safer and cleaner and without unforeseen negative side effects. Based on C2C, a circular economy framework proposes 'closed-loop' systems in which it is – at least ideally – possible to decouple[37] economic growth from impact. In the section below, we shall discuss how the case of renewable energy can be viewed through C2C and CE frameworks.

**Renewable energy**

Biomass is typically constituted from organic material such as plants, or algae and agricultural and urban organic (biodegradable) rest-products, with these materials used for generation of heat, electricity, fuel, and chemicals (ECg[38]). Another way to produce energy from biomass is garbage incineration, a technology otherwise known as "waste-to-energy technologies" or "energy recovery", which is a widely used energy source notably in The Netherlands[39]. However, some sustainability experts have pointed out that there are severe side effects of most of such renewable energy sources.[40] The monocultures of 'fuel forests' compete with productive agricultural land[41] and wild habitats. Biofuels generate CO2 when burned, but also the process that involves planting crops for generation of biofuel, fertilizing, harvesting, processing, and distribution emits significant amounts of CO2.[42] Biofuels also require continuous supply of timber, some of which takes tens of years to regenerate.[43]

Solar and wind were singled out as the most promising sources of renewable energy and were calculated to be able to supply between

[34] Kopnina and Blewitt 2014.

[35] http://eplca.jrc.ec.europa.eu/uploads/LCT-Making-sustainable-consumption-and-production-a-reality-A-guide-for-business-and-policy-makers-to-Life-Cycle-Thinking-and-Assessment.pdf

[36] https://www.gdrc.org/uem/lca/lca-define.html

[37] Kopnina and Blewitt 2014.

[38] http://ec.europa.eu/energy/en/topics/renewable-energy/biomass 'Biomass' Accessed 13 June 2017.

[39] http://www.suez-environnement.fr/wp-content/uploads/2015/03/Reenergy_EN.pdf

[40] Steer and Hanson 2015.

[41] Walsh 2014.

[42] Steer and Hanson 2015.

[43] The Economist 2013.

10 and 31% of electricity worldwide by 2050.[44] Complementary to wind and solar energy, geothermal energy, the energy of the ocean's waves, which are driven by both the tides and the wind[45] look promising. Geothermal energy, using hot water or steam reservoirs deep in the earth, taps the Earth's internal heat for electricity and heat production[46]. Tidal stream systems utilize the kinetic energy from water currents to turn turbines[47]. Indeed, according to C2C and CE frameworks, such systems are the only truly renewable sources of energy. Below we will focus on solar and wind energy and relate them to European energy policy.

**Wind power**

Wind power is known for hundreds of years for its use in windmills, and wind turbines today.[48] The Dutch windmills, for example, were present before the fourteenth century, with wind power applied to a wide range of industrial production[49].

At present, wind power can be stored either as electricity in batteries, heat in such media as molten salt, or as hydrogen, compressed air, or pumped storage, so that power is available on demand.[50] Battery storage has recently helped to improve capacity to store intermittent wind energy.[51],[52] The enlargement of the grid system, linking geographically dispersed wind turbines has facilitated power transfer.[53]

The challenge of integrating wind power into established electric power grids is described in the report *Technology Roadmap: Wind Energy,* by the International Energy Agency[54]. The *Roadmap* estimates that wind energy could account for up to 18% of the world's electricity by 2050, compared with 2.6% today. Yet, continuous obstacles hamper the successful spread of wind energy. One of the central arguments against wind energy is its cost.[55] An important factor in this respect is when established power companies buy excess power from disseminated wind power sources at a good price.[56] In the UK, the Government's Department for Energy and Climate Change (DECC) introduced the feed-in-tariffs or FITs in 2010,[57] providing opportunity for consumers to get money from their energy supplier if they installed a wind electricity-generating technology[58], enabling private users to save money on self-generated electricity, exporting surplus electricity to the grid.[59] According to the European Wind Energy Association (EWEA), onshore wind is cheaper than most other sources of energy when the costs of 'external' factors like pollution; toxicity and GHGs are taken into account.

Direct support mechanisms, such as government subsidies, as well as indirect ones, such as tax exemptions, price controls, trade restrictions, and limits to market access in regard to renewable energy need to be examined[60]. Indeed, if government regulators were to levy a significant carbon tax, they would drive the most polluting energy generators off the market, instead of relying on

[44] Barthelmie and Pryor 2014, pp 684-688; Diesendorf 2014.

[45] Renewable Energy World http://www.renewableenergyworld.com 'Renewable Energy News & Information'. Accessed 13 June 2017.

[46] NREL http://www.nrel.gov/learning/re_geothermal.html 'Geothermal energy basics' Accessed 13 June 2017.

[47] Tidal energy EUa http://www.tidalenergy.eu/tidal_stream_systems.html 'Tidal energy stream systems' Accessed 13 June 2017.

[48] Manwell et al. 2010.

[49] Kaldellis and Zafirakis 2011, pp 1887-1901.

[50] Armand and Tarascon 2008, pp 52-657.

[51] Divya and Østergaard 2009, pp 511-520.

[52] Teleke et al 2010, pp 787-794

[53] Sathyajith 2006

[54] https://www.iea.org/publications/freepublications/publication/Wind_2013_Road map.pdf Accessed 13 June 2017.

[55] Breton and Moe 2009, pp 646-654.

[56] Mendonça 2009.

[57] Seyfang et al. 2013, pp 977-989.

[58] Walker 2012, pp 383-388. (2012).

[59] Energy Saving Trust 2015, UK. scheme http://www.energysavingtrust.org.uk/domestic/content/feed-tariff-scheme. Accessed 1 May 2016.

[60] Rhodes 2016, pp 97-104.

the European Emissions Trading system which at present has a very low carbon price[61].

One significant barrier is industrial lobbies unwilling to undertake costly transition from fossil to renewable energy,[62] as well as protectionist national laws.[63] Fossil fuel lobbies often mediate public support of[64] or protest against[65] renewables[66]. Clever political and media manipulation by established power hegemonies[67] often places renewable energy production at a disadvantage in comparison to more 'traditional' industries that supposedly provide jobs and economic prosperity.[68] Such manipulation obscures the multiple benefits offered by wind power, including job creation and indeed, long-term prosperity.[69] The so-called 'green jobs' within wind industry are professions including engineers, iron and steel workers, millwrights, sheet metal workers, construction equipment operators, industrial truck drivers, and industrial production managers.[70] Thus, wind power provides hope for a possibility of generation of environmentally benign generation on the global scale.[71]

**Solar power**

In 1905, Albert Einstein published a paper explaining the photoelectric effect on a quantum basis.[72] Since then, technologies have been developing quickly. Generating solar power involves the conversion of sunlight into electrical charge, either directly or through concentrated solar power (CSP)[73], [74]. CSP can generate electricity without direct sunshine[75], rather requiring clear-sky solar radiation.[76]

As in the case of wind energy, research and development helped to bring down the price of solar power technologies, with the battery capacity to store solar energy improving so rapidly[77],[78]. It was calculated that, solar technology could potentially generate enough clean, renewable energy to provide a global supply of energy, provided land, sunlight, and legal permits[79],[80]. More recent discoveries and technological advancements have even enabled the first around-the-world solar flight[81]. Moreover, jobs in the sectors such as engineering, industrial machinery mechanics, welding, metal fabrication, electrical equipment assemblies, construction equipment operating, and construction management have actually resulted from development of solar technologies.[82] It becomes also evident that the plummeting prices for solar panels can also be beneficial to both the solar power developers and consumers. The energy generated by the sun and wind can be potentially appealing as aside from harnessing, storage and transfer technology, it is cost-free[83] as the production becomes more advanced and cost competitive.[84] Once a wind turbine or solar farm is set up, the marginal cost of it power output is almost zero[85]. It has been argued by the proponents that sunlight and wind are

[61] The Economist 2015c
[62] Washington 2015.
[63] Braun 2012, p 14.
[64] Firestone & Kempton 2007, pp 1584-1598; Firestone et al. 2009, pp 183-202.
[65] Van Klaveren 2016.
[66] Van Klaveren 2016.
[67] Michaelowa 2000, pp 277-292.
[68] Levy and Egan 2003, pp 803-829.
[69] Bell et al. 2005, pp 460-477.
[70] Blanco and Rodrigues 2009, pp 2847-2857; Cleary and Kopicki 2009.
[71] Ibid.
[72] Pais 1982.
[73] Blair et al 2008.
[74] http://cordis.europa.eu/news/rcn/132388_en.html Accessed 1 May 2016.
[75] Pfenninger et al. 2014, pp 689-692.
[76] Boyde 2014.
[77] Divya and Østergaard 2009, pp 511-520; Teleke et al. 2010, pp 787-794.
[78] Nemet 2006, pp 3218-3232.
[79] Diesendorf 2014.
[80] London 2012.
[81] http://www.solar-flight.com 'Solar Flight' Accessed 13 June2017.
[82] Cleary and Kopicki 2009.
[83] Kopnina and Blewitt 2014.
[84] Kopnina and Blewitt 2014; Kopnina and Shoreman-Ouimet 2015.
[85] The Economist 2015c.

waste-free[86] as they avoid depletion of resources[87] and safe[88], as their use does not include potentially hazardous by-products, as nuclear energy does.[89] Thus, proponents of long-term sustainability have argued against compromises in energy mix and for strict reliance on wind and solar energy.[90]

However, there are still some considerable obstacles to the global use of solar energy. First of all, the demand did not keep pace with increasing supply, partially due to competition from other type of energy sources.[91] There are also significant political and ideological barriers to the use of solar power[92], with fossil fuel lobbies cleverly placing public and media attacks against measures that would restrict their operations.[93]

**The business of subversion**

Prior to the EU Treaty of Lisbon[94] in 2007, EU energy legislation was based on the EU's authority in the area of the common market and environment. The Treaty of Lisbon involved member countries' solidarity in matters of energy supply and changes to the energy policy. In practice, individual European countries still decide on their energy mix.[95] In Britain, Luxembourg, Malta and the Netherlands got less than 5 percent from green sources.[96] Solar energy now satisfies about 2% of the demand in the EU[97], while supply has grown many-fold in the last few years due to Chinese and American production[98]. Biomass appears to be a source favoured by environmental and energy ministries in Europe[99], with some of supply coming from American and Canadian forests that are cut to create wood pellets.[100]

Cultivation of biofuels often moves to natural land such as forests or grasslands[101]. Yet, the effects of this include the loss of biodiversity[102], deforestation and the actual net increase of emissions[103] in Europe and beyond. Applying the C2C and CE frameworks, it is clear that the burning of biomass is a 'cradle to grave' process, with energy generation similar to down-cycling, in which valuable materials are 'reworked' for a less valuable (and in this case, briefly lasting) product.

Non-renewables are limited in terms of their permanent availability and ability to 'earn back' technology investment harnessing and storing their power[104]. By strict definition, the only truly renewable sources of energy are sun, water (tidal waves), geo-thermal and wind.

Yet, closed-loop frameworks can be subverted to the business-as-usual practices. The Ellen MacArthur Foundation website[105] that places some businesses on the 'best case study' list of circular economy is replete with companies that focus on conventional business-as-usual sustainability[106]. The companies report their efforts at minimising damage, recycling (thus downcycling) and eco-efficiency in parts of

[86] McDonough and Braungart 2002.
[87] Washington 2015.
[88] Delucchi and Jacobson 2011, pp 1154-1169.
[89] Barthelmie and Pryor 2014, pp 684-688; Diesendorf 2014.
[90] Daly 1991; Washington 2015.
[91] Wang 2012.
[92] Geels 2014
[93] Adger et al. 2009, 93:335-354.
[94] Ibid.
[95] Ibid.
[96] Lewis 2015.
[97] EPIA 2016 http://www.epia.org/news/publications/global-market-outlook-for-photovoltaics-until-2016 'Global market outlook photovoltaics' Accessed 13 June 2017.
[98] Vaughan 2017.
[99] EC http://ec.europa.eu/energy/en/topics/renewable-energy/ biomass 'Biomass' 17 May 2016.
[100] The Economist 2013.
[101] EC http://ec.europa.eu/energy/en/topics/renewable-energy/biofuels 'Biofuels' Accessed 17 May 2017.
[102] https://www.nature.com/nature/journal/v405/n6783/full/405234a0.html
[103] Walsh 2014; Steer and Hanson 2015.
[104] WEF 2013
[105] https://www.ellenmacarthurfoundation.org/
[106] https://www.ellenmacarthurfoundation.org/ce100/directory/the-coca-cola-company

their operations, without revising the entire business models and supply chains. Circular economy is still advertised as a 'new engine of growth', rather than promoting fundamental change. Thus, optimistic 'simple and easy' approaches or compromises such as energy mix need to be treated with caution.

The Roadmap to Circular Economy formulated by the European Commission seems to be narrowly focused on economic growth, sustainable development[107] and 'sustainable and inclusive economic growth'[108]. The recent European energy strategy referred to in the Introduction of this article is replete with 'economic growth' objectives[109]. Often, the terms used in the so-called 'best case' examples placed on MacArthur Foundation's website include the terms describing practices of the good old efficiency and recycling (and not infinite reuse)[110], suggesting, regrettably, green-washing.

Another risk of subversion comes from over-reliance on monumental technological projects to solve climate change, and in the process abandoning the common-sense solutions offered by infinitely reusable energy of wind and sun. An example of this subversion is the Economist's article[111] in the Special issue titled 'Clear thinking on climate change'. The editorial states:

> *Paying for yet more wind turbines and solar panels is less wise than paying for research into the technologies that will replace them. Mankind will also have to think much more boldly... It will have to adapt, in part by growing crops that can tolerate heat and extreme weather, in part by abandoning the worst-affected places. Animals and plants will need help, including transporting them across national and even continental boundaries. More research is required on deliberately engineering the Earth's atmosphere in order to cool the planet.*

It is not entirely clear how humanity is going to engage in such planetary ambitious project, undertaking the Noah's monumental effort to move all species into safety (and what region will be safe?). C2C and CE do not require such apocalyptic (and very possibly dangerous) scenarios. While C2C and CE production systems still has a long way to go in practice, these systems can potentially reach beyond business-as-usual. This can imply that producers and consumers need to draw examples from pre-industrial design. Alternatively, and perhaps more appealingly to those averse to 'retrogressive' products, such production system can be innovative. In fact, a combination of 'ancient' natural materials, such as sun, water and wind, and modern technologies such as photovoltaic panels or wind turbines, illustrate how energy supply can be made sustainable.

In the case of biofuel, the material input (e.g. vegetable matter or garbage) and outputs created from the production process all present reasons for concern. Presently, considering different renewable energy options that are available on the European policy making table[112], the policy choices do not seem to be guided by understanding of transformative sustainability frameworks. Citing the case of biofuels, the authors of C2C describe that the 'typical response to industrial destruction has been to find a less bad approach'[113], particularly as regards those

[107] EC http://ec.europa.eu/smart-regulation/impact/planned_ia/docs/2015_env_065_env+_032_circular_economy_en.pdf 'Circular economy' Accessed 17 May 2017.

[108] EC http://ec.europa.eu/environment/ecoap/about-eco-innovation/good-practices/eu/575_en.htm 'Eco-innovation at the heart of European policies' Accessed 17 May 2017.

[109] http://europa.eu/rapid/press-release_IP-16-4009_en.htm Accessed 13 June 2017.

[110] EC http://ec.europa.eu/environment/circular-economy/index_en.htm 'Circular economy' Accessed 17 May 2017.

[111] The Economist 2015b, p. 5.

[112] https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v7_1.pdf Accessed 17 May 2017.

[113] McDonough and Braungart 2002: 45

produced by burning trees or garbage[114]. The authors of the Cradle to Cradle book and model have asserted that while the garbage incineration may seem 'green', it is only one step removed from the so-called cradle–to-grave model in which the "Waste to Energy" paradigm fails to consider the high nutrient value of waste.[115] Most significantly, burning mixed garbage that contains valuable biological and technological materials literally makes valuable resources go up in smoke for a short spurt of energy:

> *Through incineration, we are throwing away exhaustible raw materials, along with the energy needed to mine natural resources and manufacture them into consumable products. With this approach, not only do we lose valuable nutrients, we also create an aggressive disincentive for materials' reuse*.[116]

Moreover, incinerators must keep being fed garbage for many years to be economical, removing incentives to reuse or recycle materials, or to terminate production of waste substances and toxic materials in the first place[117]. Through the creation of an 'eco-efficient' material, the destructive production process or material is only being slowed down, not halted completely.

**Conclusions**

If the EU is to revisit the *Limits to Growth*,[118] transformation based on C2C/CE principles needs to be considered, with political leaders taking decisive action on environmental problems associated with energy use[119]. The American inventor Thomas A. Edison[120] asserted many years ago: "I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that". Will the EU follow this advice? Future projections support this hope as it is predicted that the price of solar power will continue to fall[121], until it becomes one of the cheapest form of energy. Increasing technical advances lead to the better affordability of wind[122] and solar power[123], [124].

An appropriate decarbonisation of the energy system must involve the three main sectors of heat, electricity and transport. Different renewable sources are differently suitable for each of the sectors, which sometimes overlap, and are sometimes distinct. Renewable electricity resources are often supported by solar and wind, with sources for renewable heat often relying on biomass, and renewable energy use in transport (biofuels). A technological as well as social and economic transition is needed for the transition to Cradle to Cradle and circular economy in energy.

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[117] The Economist 2015a
[118] Meadows et al. 1972.
[119] Ross 2013.
[120] In Rodgers 2007
[121] Randall 2015.
[122] Neslen 2015.
[123] Norwood 2014.

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# Rewilding Education in Troubled Times; or, Getting Back to the Wrong Post-Nature.

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**Abstract.**

The first part of this paper provides a series of conceptual critiques to illustrate how the recent move to inaugurate a "post-nature" world works to vindicate anthropocentric perspectives and a techno-managerial approach to the environmental crisis. We contend with this premise and suggest that troubling nature has profound implications for education. In the second part, we provide case studies from nature-based programs in The Netherlands and Canada to demonstrate how anthropocentric thinking can be reinscribed even as we work towards "sustainability". Despite the tenacity of human hubris and the advent of the Anthropocene, we suggest these troubled times are also rich with emerging "post-anthropocentric" perspectives and practices. As such we offer "rewilding" as a means to think about education that moves beyond the romantic vestiges of "Nature" without lapsing into delusions of human exceptionalism.

**Key words.** post-nature · wilderness · rewilding · sociomateriality · anthropocentrism · ecocentrism · critical pedagogy of place

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## Introduction

> Asserting that "nature" is an idea is far from saying that it is only an idea, that there is no concrete referent out there in the world for the many human meanings we attach to the word "nature". There are very real material constraints on our ideas and actions, and if we fail to take these into account, we are doomed to frustration if not outright failure. The material nature we inhabit and the ideal nature we carry in our heads exist always in complex relationship with each other, and we will misunderstand both ourselves and the world if we fail to explore that relationship in all its rich and contradictory complexity (Cronon, 1996, pp. 21-22).

> Indeed, wilderness deconstruction—the literal kind, not the abstruse theorizing of academics influenced by postmodern literary criticism—concerns us most. Of primary importance is how "Anthropocene" thinking is influencing the communications and strategies of on-the-ground conservation practitioners... If conservation is to be framed primarily within the context—and acceptance of—human domination of the planet, there will continue to be profound consequences for life... Apparently each generation will have its "great new wilderness debate." (Butler, 2014, pp. xiv-xv).

This paper is comprised of two main sections that converge in the conclusion. The first section is a series of conceptual background conversations that build upon each other to posit that anthropocentrism still informs much of the recent "post-nature" discourse in environmental education. The second section explores similar ground, but focuses on three case studies that illustrate typical kinds of practices and language in environmental education initiatives in The Netherlands and Canada. These cases involve thoughtful educators working in intentional school settings with the express purpose of nurturing environmental awareness and eco-ethical commitments. And yet, as the cases will show, the ecological principles guiding these programs are often undermined by subtle but consistent anthropocentric messages conveyed in the language and by the material conditions of the learning experience. We suggest that the reinforcing of human exceptionalism that we witness in many of the case studies derives from the kind of unexamined assumptions we examine in the first section of this paper. In the conclusion, we offer some thoughts regarding the concept of *rewilding* education and point towards some new theorizing that seeks to challenge environmental education to move towards the "right" kind of "post-nature" world; one where we work to move beyond the will to appropriate and towards a new natural contract with a more-than-human world.

### Section 1: Part 1: The Trouble with Troubling Wilderness: Wherein we posit the search for a post-nature world that moves beyond anthropocentrism.

While an intriguing "great wilderness debate" rages on (Callicott & Nelson, 1998; Nelson & Callicott, 2008) in geography, the conservation sciences, cultural studies and beyond—and informs the philosophical motive for writing this paper—our intention here is to offer something more concrete for educators and others working for environmental justice. Indeed, what concerns us most is the devastation of the "concrete referent:" the living beings and material assemblages formerly known as "nature." As environmental educators working in the so-called Anthropocene it is incumbent upon us to explore the complex relations between material configurations and the varied, often contested, discourses attached to "things" like *nature*, *wilderness*, *progress*, *environment*, and especially *human*. While troubling foundational categories may seem an overly "philosophical" undertaking at first, we suggest that environmental education research already bears a rich lineage of such work and that, as practitioners on-the-ground, environmental educators will play a key role in shaping these debates in the future. Confessing ultimate concern for "nature" is not intended as a rhetorical strategy to expedite a certain position in the debate, so much as a candid gesture disclosing our *ecocentric* ethical commitments. By *ecocentrism* we mean, in the simplest terms, an ethical view of "nature" as having intrinsic value and perspectives beyond the human. And that ecological destruction is rooted, in part, in

its converse, *anthropocentrism*: the view that all value and meaning inheres in one uniquely special species—humanity. As ecological ethicist Patrick Curry explains, "The rest of the Earth, including all its places and creatures, is entitled to respect only instrumentally, insofar as it is needed for humans to 'progress'" (2017, p. 5). It is this insistence upon an "ecological reality" that is of primary importance in a world where "Anthropocene thinking" is employed to advance a permanent end to the debate. For instance, Erle Ellis, director for the Laboratory for Anthropogenic Landscape Ecology, sums up the "neo-green" (Kingsnorth, 2014) or "post-wild" (Marris, 2011) position with acerbic closure: "Nature is gone... You are living on a used planet. If this bothers you, get over it" (as cited in Wuerthner et al., 2014).

We get it—fossil fuel particulates in the atmosphere envelope the globe, and commingle with Fukushima radiation carried on ocean currents, and it is the "end of nature" (McKibben, 1999), and the time has come to rethink "pristine" notions of "wilderness" (Cronon, 1996), and in order to have "ecological thought" we must relinquish the very notion of a capital "N" (Morton, 2007, 2010). In these ways, we too advocate for a "post-nature" world—but one characterized by carefully rethinking some of our foundational notions (like say, human supremacy, or the political agency of nonhuman forces, or the logic and sustainability of *homo economicus*).

Regrettably, much of what passes for "Anthropocene thinking" these days seems more concerned with distorting and appropriating science and environmental philosophy to legitimize the "wrong" kind of post-nature world. A world of business as usual, where anthropogenic mass extinction and climate catastrophe is not framed as a clarion call to political conscientization (Esteva & Prakash, 1998; Kahn, 2010), or a great turning (Korten, 2006), or an earth democracy (Shiva, 2005), but rather evidence of the apotheosis of human and capital to god-like geological forces (see Moore, 2016). It simply does not follow, for us, that because we live on a "used planet" and the time has come to contest the uncontested nature of "nature," ipso facto, We are "the god species" (Lynas, 2011). This is what we mean by getting back to the "wrong" post-nature world.

As French philosopher Michel Serres has maintained, the globalization of pollutants is not indicative of some emerging omnipotence, but rather the colonial hubris of the "species" writ on a planetary scale. As Serres has written: "The giant garbage dumps of the cities mark the collectivity's appropriation of the nature surrounding the cities. As we never cease to dirty our surroundings, we (*who we?*) appropriate them without noticing it. Don't we actually admit as much when we say *environment*? That which surrounds man makes him into the center. We never stop calling him 'owner.' At the limits of growth, pollution is the sign of the world's appropriation by the *species"* (2011, p. 53).

For us, moving towards a post-nature world thus requires post-anthropocentric ways of thinking in order to steer "us" (moderns, industrialists, colonial settlers, educators, etc.) away from the will to appropriate. While this is by no means an original thesis (Lupinacci & Happel-Parkins, 2015; Quinn et al., 2015), we hope to illustrate some of the practice-based challenges of (un)learning anthropocentrism through our case study research.

**Section 1: Part 2: The Future is Exceptional: Wherein we illustrate the anthropocentric logic informing techno-scientific moves to manage the environmental crisis**

In his book, *The World We Made* (2013), British environmentalist Jonathon Porritt relinquishes the doom and gloom tactics of environmental alarmism and looks back from an "alternative" 2050 to tell the story of how we got "our world back from the brink of collapse" in order to inaugurate "genuine sustainability." Despite the staggering scope of transformations required to get there, the story remains doggedly upbeat and aims to celebrate afresh "the collective genius of what it is that makes the human species so special" (p. 6). The central character, Alex McKay, happens to be a history teacher who enters the profession in 2022 with deep apprehensions about how to inspire students in a time when an archaic model of progress has ravaged both the biosphere and the human spirit. His early 21st century cynicism is

eventually rendered obsolete, however, as a brave new "technotopia" emerges.[125] Porritt's world is one where "philanthro-capitalist enterprises" ameliorate the lives of the urban poor around the globe, nanotechnology and empathy enhancing drugs allow for longer and happier lives, and universal internet connectivity (including brain implants for some) combats government corruption and greatly improves education. In concluding his future history, Alex recounts a brilliant psychology professor who inspired him back in the brutish days of our present, who helped pioneer a movement to focus public policy on early childhood education. His pedagogical advice: "Limitless love, total security and lots of fun and games – forget the rest! If it's a better world we're after, just make sure that every child reaches the age of six feeling radiantly happy" (p. 270).

Making claims against radiant happiness for children is never a popular position; however, we are compelled to contend with the Disney-like "warm glow" (Foster, 2015, p. 11) undergirding such visions of a smooth transition to ecotopia vis-à-vis pedagogies of "limitless love" and technical optimism. Even without lapsing into Lovelockian doom mongering (Lovelock, 2015), surely we must recognize that education in the so-called Anthropocene will be more existentially trying and pedagogically complex than simply getting kids outside and forgetting the rest? Surely, the mainstreaming of books with troubling titles like: *Requiem for a Species* (Hamilton, 2010), *The Sixth Extinction* (Kolbert, 2014), and *This Changes Everything* (Klein, 2014) ring a warning bell that the "environmental problem" is more complex than these proposed technocratic management solutions assume?

Scholars within the field of environmental education have been positing the need to examine the cultural-historical roots of the ecological crisis in order to change hearts and minds for decades (Martusewicz et al., 2014; Stevenson et al., 2013; McKenzie et al., 2009; Gruenewald & Smith, 2008). And yet, when tasked with considering the future of environmental education—particularly in urban contexts—there is a troubling tendency to gloss over some of the more difficult existential quandaries and focus on revitalizing hope in the indefatigable "genius" of our species (see Kopnina, 2014 for critique).

This is precisely the kind of "Anthropocene thinking" we find troubling and if we are to be ushered into a *post-nature* world, we suggest the move begin with careful, sustained and rigorous reconsideration of other conventional categories, exploring what notions like *post-progress*, *post-individualist* and, perhaps most importantly, *post-human* might mean for education in the coming decades (for recent examples of such work see Lloro-Bidart, 2016, 2015; Affifi, 2011).

**Section 1: Part 3: Moving Beyond the Human in Environmental Education: Wherein we explore the challenge of anthropocentrism, the quick "get outdoors" fix, and the impact of sociomaterial practice**

Reading through recent volumes of journals such as *Environmental Education Research*, *The Journal of Environmental Education*, or *The Canadian Journal of Environmental Education*, one gets the sense that never before in the history of Western thinking has anthropocentrism been so disputed and openly disparaged (for examples, see Kopnina, 2015, 2016). And this notwithstanding the fact that thinking in environmental education, in many respects, tends to lag behind the "nonhuman turn" (Grusin, 2015) or the move to "more-than-

[125] For a related critique of a future characterized by technical management and technological breakthrough see Crist, 2012. We share in the sense that what is most repugnant about such visions is not so much their technological optimism per se, but the anthropocentric marginalization of all other-than-human life: the "totalitarian conversion of the natural world into a domain of resources to serve a human supremacist way of life, and the consequent destruction of all the intrinsic wealth of its natural places, beings, and elements" (p. 149).

human agency" in numerous fields such as ecofeminism (Plumwood, 2002; Mathews, 2005), the environmental humanities (Goodbody & Rigby, 2011; Rose, 2011), critical geography (Braun, 2005; Castree, 2013;) and ontological anthropology (Kohn, 2013; Viveiros de Castro, 2014; Tsing, 2015) just to name a few. So it comes with some dismay that while, on the one hand, a profound realization appears to be unfolding across diverse academic fields; there is, on the other hand, the move to commodify an expanding array of "natural resources" under the aegis of neoliberalism. Moreover, the latter seems increasingly normative in the public sphere to the point of being considered "commonsense" (Heynen, 2007; Henderson et al., 2017;).[126] It would seem human-centeredness is truly the bedrock presupposition of the "Western mind," as even committed conservationists, urban designers and, regrettably, environmental educators seem loath to trouble the naturalization of human dominion (Crist, 2004; Kidner, 2000). This is, perhaps, most apparent in the widespread adoption of "sustainable development" as the principle objective of environmental education despite widespread critique that, as currently conceived, it is patently anthropocentric in its ethical neglect, or even acknowledgement, of the other-than-human beings that constitute "our planet" (Kopnina 2012; Kopnina & Gjerris, 2015; Lotz-Sisitka et al., 2015; Kopnina & Cherniak, 2016; Jickling & Sterling, 2017;).

The deepening of anthropocentrism in recent decades vis-à-vis neoliberal "restructuring" and "sustainable development" discourses has profound implications for environmental education (Derby et al., 2015). Pushed to make the environmental conversation relevant thinkers have chosen to focus on the deleterious human impacts. Work has been done with respect to health and wellness, for example, where it has been noted that children are becoming increasingly alienated from "nature," suffering from so-called "nature deficit disorder" (Louv, 2008). The obvious pedagogic response to this deficit, despite the fact that it ignores the health of the natural world while at the same time making it a backdrop for human health, echoed in environmental education conferences across the globe, is to "get children outside". Get children to directly encounter more "nature," including the "zoopolis" as Louv and green urbanists refer to multispecies urban environments (pp. 245-270). While this is undoubtedly a key component of any effective environmental initiative, it does not *necessarily* trouble anthropocentric inscriptions of power manifest in the *sociomateriality* of urban or, as we shall see, "natural" environments and thus risks reinforcing colonial relations and human mastery as self-evident. We cannot simply get outside and forget the rest.

Attending to the way everyday experience is shaped by the entanglement of social discourses and material circumstances has been recently described as sociomaterial practice.[127] As McKenzie & Bieler explain, "Such an orientation to practice links both social and material conditions (e.g. social relations, other species, physical context, objects, etc.) to human consciousness and learning, as well as considers the relationship between such learning and broader cultural change" (2016, p. 2). Tracing the sociomaterial in education thus entails foregrounding the materiality of learning to make visible the historical trajectories, foundational categories (i.e. nature, human, progress, etc.), and problematic binaries (i.e. nature/culture, human/nonhuman, self/other, etc.) that *enact* the taken-for-grantedness of educational events. This differs from

[126] For a collection of works concerned with environmental education in the neoliberal climate see the special issue of *Environmental Education Research* Volume 21, Issue 3, 2015, guest edited by David Hursh, Joseph Henderson and David Greenwood.

[127] For examples of educational texts drawing on notions of sociomateriality see *Critical Education and Sociomaterial Practice* (McKenzie & Bieler, 2016), *Education in the Age of Biocapitalism* (Pierce, 2013), or *Emerging Approaches to Educational Research: Tracing the Sociomaterial* (Fenwick, Edwards & Sawchuk, 2011). For principle texts explicating sociomateriality see *Reassembling the Social: An Introduction to Actor-Network Theory* (Latour, 2005) and *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Barad, 2007).

conventional approaches drawing on phenomenology and social constructivism in that there is an explicit move to de-center the human by attending to the agency of material, more-than-human assemblages.

> The material includes tools, technologies, bodies, actions and objects, but not in the way that treat these as brute or inherently distinct from humans as users and designers. The material also includes texts and discourses, but not in ways that focus solely on linguistic, semiotic, intertextual and cultural matters. The material is entangled in meaning, not assumed to be separate from it (Fenwick et al., 2011, p. vi).

While the implications of sociomaterial practice in education are still emerging, we share in the sense that recent turns towards understanding agency as an expression of sociomateriality and practical experience, offer some promise for cultivating post-anthropocentric pedagogies. As McKenzie and Bieler maintain, such "critical situated learning" aims to "move beyond conceptions of agency understood as located within human subjects and related understandings of the world as passive or inert matter—an anthropocentric view of the world that has plagued us since the enlightenment" (2016, p. 14). Indeed, sociomaterial practice is only one of the latest incarnations of a "lineage" in environmental education research calling for the "decentering of anthropocentric assumptions about language, agency, and meaning" (Fawcett, 2013, p. 412). To this end, we hope these case studies will challenge the banal charge that children simply need to get outside and encounter nature and contribute to how we think about (un)learning anthropocentrism in order to inaugurate a post-nature world characterized by humility and a celebration of entangled interdependence. This would also entail environmental education practices that can challenge narratives of human dominion both explicitly in terms of discourse analysis and tacitly in terms of what stories and learning experiences the sociomaterial conditions or relative "wilderness" of the learning experience enables.

**Section 2: Case Studies: Wherein we introduce, through examples, some of the challenges of rewilding education.**

In these case studies we would like to illustrate some of the challenges we have experienced and witnessed in attempts to rewild education and (un)learn anthropocentrism; first by way of two Dutch examples, and then expanding the discussion by adding a more "immersive" educational experience from Canada. The objective here is not to needlessly disparage well-meaning environmental initiatives or teachers, but rather to provoke discussion about the complexities of realizing ecocentric pedagogies in a world increasingly appropriated by the wrong kinds of Anthropocene thinking. We present the case studies in order of deepening immersive levels of direct contact with nature-on-its-own-terms i.e., a school gardening initiative, a forest week, and eventually total immersion in a relatively wild place more or less full-time.

***The Netherlands Case Studies***

The Netherlands is a territorially small nation consisting of 41,543 kilometers, including water, but densely populated with over 17 million people at the rate of 501 people per km² and rising. Much of the land is either used for agriculture or industrial development. Due to the lack of land most Dutch "rewilding" initiatives have involved smaller species, with larger ones such as deer and wild cows needing annual "maintenance" and "management" (such as shooting "excessive" populations of herbivores that have neither corridors to move nor natural predators) (described by Kolbert 2012; 2014; and Shoreman-Ouimet & Kopnina 2016). This has led Kolbert (2012) to describe the "movement" as little more than glorified farming and land management. However, despite its relative limitations compared to continental Europe, "rewilding" in the Netherlands has attracted some educational attention. Nature education in The Netherlands is often intertwined with agriculture as "the Netherlands is one of the world's largest exporters of agricultural and food products, thanks to its innovative agri-food technology. The Dutch agri-food sector is a sustainable source of healthy,

safe food that is produced with respect for nature and the environment."[128] Thanks to generous subsidies to domestic farmers, the Dutch are also able to export their produce to many countries in Africa.

Dutch environmental education includes multiple stakeholders (schools, communities, garden centers, local businesses, NGOs, etc.). The Dutch school curriculum typically involves a number of nation-wide "nature activities," including "*schooltuinen,*" a "school gardens" program in which pupils are allocated small plots of land to learn basic horticulture, and "*bosweek*" or "forest week," when pupils perform nature-based "scouting activities" (Kopnina 2011a; 2011b). Other urban environmental education for children is characterized by ad hoc initiatives to visit "wild areas" that tend to be typically small parks, to participate in botany, biology, and geology-related coursework.

***Schooltuinen/School Gardens***

In the case of a Montessori school in Amsterdam, a group of 62 children between the ages of 9 and 11 followed a number of "nature education" directions including the school gardening program. The urban gardening involved children attending to their crops, typically potatoes and cabbages, in a recreation park called Westerpark (described in Kopnina 2013b and 2015c) close to their school. The Westerpark area is largely paved, with most grass carefully trimmed, and trees and shrubberies "maintained" (cut) every few months by municipal workers. The municipality typically sells "green garbage" to energy companies as biofuel to be incinerated as a form of "green energy" (Kopnina 2016).

The garden itself is an area of the park used exclusively for educational activities. Alongside outdoor activities targeted at teaching children how to "grow their own food and flowers," children are also involved in indoor activities in a "garden house" where they receive basic botany and biology lessons. The children also learn rudimentary facts about the benevolence of Dutch agriculture. As one of the children interviewed stated with pride, "[Dutch] farmers are able to send food to Africa." The children learn to clear weeds and are allowed to harvest their produce and cut flowers to take home. As one of the teachers explained, "This way they learn how important land is… They learn how to take care of the land." As a reward for taking care of the land, students, according to the same teacher, learn that ''nature feeds them." At the end of October, when harvesting is complete and all crops and weeds have been cleared, the land is left bare for next year's gardening activities. The land is prepared by discarding all remaining greens the use of industrial fertilizers (note: this information is not shared with children).

***Bosweek/Forest Week***

Another event is *bosweek* where children go to a forested area close to Lage Vuursche in Utrecht province for a few days in late Spring. The Lage Vuursche forest covers about 1150 hectares planted mostly in the 19th century and is traversed in many places by paved and dirt roads and contains many private residences and miniature cultivated parks. The children stay and sleep in a specially designated *woonboerderij* ("residential farm"), get involved in "camping and survival type activities" (e.g. learning to cut wood, make fires, tree climbing, "wild" river crossing, and discover basic outdoor "rules and ethics" as the school brochure states). Students are also involved in competitive games, talent competitions and music performances. Of note, children are told "scary stories" about the past when wolves and bears used to roam the territory where their picnic tables with designated camp fire areas are now located. Some of the most memorable experiences, according to the children interviewed, are the role-playing activities ("pretending to be the cavemen!") and musical competitions inside the house, as well as chopping wood. A few children claimed the things they missed most, besides their parents, were their phones and video

[128] See https://www.hollandtradeandinvest.com/key-sectors/agriculture-and-food

games; however, most children that the researcher spoke to referred to their experience as "fun."

***Some Reflections***

As these case studies illustrate, Dutch children are exposed to "natural areas" that are heavily managed and primarily understood to be "working landscapes" (see Wuerther et al., 2014). Yet, educators often frame these experiences as encounters with "the wild." Thus, even though the authors are outspoken advocates for school gardens (one author even co-funded and managed an award-winning school garden), these places clearly pose a danger of reinforcing the "metaphysics of mastery" if not thoughtfully "mediated" with a post-anthropocentric orientation.

In the case of Dutch school gardens, students are not taught to recognize that "weeds" are wild plants that can potentially contribute to a more biodiverse whole—bees making honey, birds catching bees, etc. They are not taught to see that the barren land requiring fertilizer to be productive after the end of the season as a managed landscape shaped by humans for humans. Producing food and flowers for international markets in fields that promote extremely limited biodiversity seems to be recreated in a miniature in school gardens with students learning how nature functions to "feed them." A larger lesson drawn from the local gardening activity is that by "taking care of nature" one can make not just one's household but "even Africa" dependent on their produce. While this article is not about critiquing European agricultural subsidies or food insecurity in so-called "developing nations," we note how these geopolitical arrangements are normalized vis-à-vis such environmental education initiatives. In other words, while framed as "nature-based" education, the take-away message for most students is the narrative that conservation can be better served if humans become global ecosystem managers and learn to celebrate the "rambunctious human-tended garden' rather than decry loss of wild places" (Marris 2011).

The case of *bosweek* is perhaps even more problematic as the site is framed and celebrated as "wild" and "natural," despite the fact that children are engaged in an entertainment-laden program in a heavily managed forest area traversed by roads and where few other-than-human beings beyond the microscopic can flourish. Moreover, children learn that "the animals" that do live in the remaining fragments of wood—for instance, doves and squirrels—are "safer" than the "scary predators" of the past. "Nature" is thus framed as a remediated and "working landscape" that must be well managed to remain "safe" from predators, maintain "ecosystem services" such as food production, wood lots, sport and recreation affordances, and "saved" as a "scenic place" of unique experiences where we ought to try and unhook from our electronic devices, at least, for a while. Children's interaction with nature or being 'part of nature' is associated with continuous pruning, cutting, and consuming, not trusting wild nature to do its work as it has done for millennia before humans have evolved into *homo economicus*.

One key pedagogic implication we would like to reiterate is the way in which valuable sites, activities and experiences, such as school gardens or forest weeks, are framed and critically reflected upon. Rewilding, in this sense, entails co-creating the free space for the possibility of encountering the "alien being" of wilderness in the unexpected and emergent properties of a place or in the design of a learning experience. But also in the ways in which these experiences are debriefed and how we make sense of what happened. Taking hyper-vigilant care with language and metaphor, for example, is one way educators can challenge some of our most basic assumptions in a post-nature epoch and encourage students to think differently about conventionally uncontested categories such as *nature*, *wilderness*, *food*, *animal, weed, etc.* For instance, instead of situating a garden in strictly resourcist terms — a working landscape *for* human utility or a novel background for satisfying learning outcomes—the educator might begin to situate the "garden-as-teacher" (Ostertag, 2015) with its own, sometimes troubling, historical dimensions (such as the colonial role of school gardens in Canadian

residential schools or Nazi Germany),[129] its own political agency as "vibrant matter" (see Bennett, 2010, chapter 3 in particular), and its own wilderness to the extent that the beings, forces and relations that comprise the garden "elude the mind's appropriations." We speculate and hope that by challenging the narratives of management and mastery that children may begin to respond in ways that facilitate less rigidly hierarchical understandings of "nature."

We suspect one of the most challenging, yet important, lessons with respect to (un)learning anthropocentrism is the realization that while "the natural world" is "useful" and "recreational," humans also require healthy, diverse and, we argue, "wild" ecosystems (i.e. places that are relatively "nature-on-its-own-terms:" apex carnivores, no roads, "old growth," etc.) because we *are* "nature" without and within. This does not, however, "naturalize" all human behavior, as William Cronon has maintained, in an attempt to clarify his oft-misread work, "not all ideas or uses of nature are equally defensible" (1996, p. 22). In addition to learning to how to recycle, co-create special places, and grow vegetables, the role of environmental educators ought to be provoking discussion and involving children in thinking about, acting with, and relating to "things" with ecological humility as ethically significant others. This might include re-conceptualizing their homes, schoolyards and, garden patches as homes for a multitude of intrinsically worthy other-than-human beings and subsequently part of a larger interconnected network that requires rethinking "use" (or "non-use") beyond human utility and economy?

Concretely, a good starting point might be growing "weeds" (perhaps by simply observing what happens to a garden patch without human care). Or observing how bees make their ritual dance to indicate where flowers are and make honey that is used for bees themselves, not just "for us." Children might also be asked to think about how their own lifestyles are connected to nature, not to evoke guilt or sadness (though these are appropriate responses), but with an eye to radically rethinking their place in the "Anthropocene" where "human being" means leaving space for others to flourish. There is no doubt that this will be challenging, unconventional, and contentious work, but we propose it is the kind of "real work" called for in a post-nature world.

So what if we just did it, took away all the walls, removed all curriculum and just went out in the woods to "start again"? We turn now to a Canadian environmental school project that attempts to teach ecological principles by way a "placed-based curriculum" and "full immersion" in "the natural world."

***Canadian Case Study***

In comparison to the Netherlands, Canada is a large and by global standards relatively sparsely populated country with just over 36,000,000 and almost 10 million square kilometers of land with a density of under 4 people per square kilometer. In addition, as a result of the fact that most of its population lives in close proximity to the southern border with the United States, there are still vast tracts of land had are relatively "undeveloped" compared to the Netherlands. Comparatively, Canada has substantial populations of megafauna and areas of wilderness that lie beyond constant human management. This means Canadians tend to have different operating definitions of "nature" and "wilderness" and, possibly as a result, there has been less of call for "rewilding" per se, but there is a growing push within education towards more nature-based, environmental programs particularly at the early childhood level.

In response to the call for more place-based schooling, the Maple Ridge Environmental School Project (MRESP) was initiated. It began

[129] For an analysis of school gardens drawing on material feminist and posthumanist scholarship please see the excellent doctoral thesis by Julia Ostertag (2015). Osterag explores gardens as places to 'become teachers together' as a way to reimagine alternatives for the persistent and familiar figure of the teacher as a rational, autonomous individual working within the closed doors of the traditional classroom.

with two assumptions: the first, that "Canadian culture" (i.e. the dominant settler colonial culture) maintains an instrumental, anthropocentric, and colonial relationship with "the natural world" (Blenkinsop et al., 2016). Secondly, the role of public education, loosely construed, is to induct the next generation into these cultural norms and ways of being. The central research inquiry of the school was thus what role education might play as an agent of cultural transformation in the move towards more ecojust and flourishing ways of being in a more-than-human world. Supported by a grant from the Social Sciences and Humanities Research Council, the school district, and myriad community partners, the MRESP opened its "metaphorical" doors in 2011 (see: http://es.sd42.ca). Presently, there are 88 students (aged four to twelve), four full-time teachers, two support teachers, three educational assistants, and a principal. The school has no permanent buildings (there are some yurts and shelters and students occasionally visit libraries and swimming pools "in town", etc.) and the vast majority of learning occurs outdoors in various forested parks, research forests, rivers and lakesides. Additionally, the project is shaped by a set of ecological principles that attempt to bring all aspects of conventional schooling into question and guide the pedagogy towards place-based and ecological kinds of understandings. Although legally required to teach the provincial curriculum, the MRESP has significant latitude to experiment and think differently to explore new conceptions of learning, teaching, and assessment, while pursuing a curriculum deeply rooted in place.

***The Free Time Politics of Nature-Based Play***

Picture a boreal rain forest in November. The air is cool and a crisp, yet a subtle fragrance radiates throughout the life-saturated stand of trees. Suddenly, a chorus of excited voices builds in the distance, faint at first, and then drawing closer and closer and louder, until children clad in all manner of brightly colored rain gear burst onto the scene wielding saws and twine. It is "fort time" and students are thrilled to get into "The Village" where they have made structures from windfall (and some sawed) branches and bailer twine. Now that the initial clearing, cutting and building phases are relatively complete, however, the focus of the free time shifts to play with social relations and dynamics (Derby et al., 2013). A new society is emerging, but what manner of society is it to be?

The building of forest homes, dens, caves, and "forts" has long been praised as part of the development of children and an important part of our environmental education process (Sobel, 2001; also see Donald, 2009 for a critical appraisal of the "fort curriculum"). Here we have an example of what appears to be all the right conditions: the space is certainly not "cultivated" to the extent that the Dutch examples were (although it does occur in a "managed" research forest), as the students are in a second growth forest that rests at the foot of the Coastal Mountains. The learning community and the teachers are committed to being outdoors and to rethinking education in an attempt to become more connected and eco-literate. And the students spend a lot of time relatively unsupervised in this experientially rich, interactive, and relatively "wild" place. And yet, listen in to the words of some of the students interviewed during the "development phase" of the village taken directly from research recordings. The following comes from research notes from the same "free time" period and the conversation in quotations is verbatim (Note: "I" refers to the researcher).

*On that particular day, I noticed several of the older boys carrying ominous-looking sticks around that they began loading with invisible bullets, cocking back and taking aim at the sky, firing at will upon enemy fighters, and occasionally, a very real robin. They converge upon one of the larger forts and began to modify its structure, refashioning it into a prison. Other students were starting businesses and beginning to horde sticks and twine in order that they might "sell" the surplus. I frantically searched my rain jacket pockets for my voice recorder and situated myself as a visiting reporter interested in the emerging politics of The Village.*

*"What kind of buildings are there here in the Village?" I ask a Grade 6 girl.*

*"Well, I know that there is a McDonalds,*

*and an armoury, a twine shop, a tattoo shop, a supplies shop and maybe a doctor. We also have two police stations and a jail."*

*"That is a lot of police."*

*"Yeah," she says matter-of-factly, "there are some pretty crazy people here."*

*One of the oldest and largest boys, Travis, emerges quickly as the favored "Prime Minister." He capitalizes on the tangible unrest in the Village over stick stealing and focuses his campaign on a kind of "get tough on crime" enforcement of the law. His party includes most of the older students, who are all promised positions in his caucus should he win the election; social care positions for the girls and police or military positions for the boys. A group of boys forms a perimeter around their Prime Minister elect and travel with him throughout the Village armed with stick-bazookas as he asks the younger students whether he can "count on their vote" in the upcoming election. I manage to inch my way towards them and thrust the recorder in Travis's face.*

*"Travis, can you tell me what life is like here in the Village?"*

*He takes on a confident, almost paternal tone, "Until now it has been very unorganized, there has not been a lot of organization."*

*"Yes, but I have noticed an increase in police stations, weapons… is this part of your campaign?"*

*"Weapons not so much, we do not want to make weapons available to anyone, lots of police stations, yes."*

*"So was the increase in police presence your idea?"*

*"Yes I have made lots of changes, lots of security, lots of police, there is a police station just over there."*

*"Is having more police the best way to… organize this village?"*

*"Well, I find that if we are out and about and we are out there…"*

*"What do you think is the root of the criminal activity?"*

*"Stolen sticks, there are lots of sticks being stolen… and the forest is getting destroyed."*

*"Could it be that some people have more sticks than others?" I ask?*

*"Well, yes, but, if… it's all about… look, we have lots of sticks, it's plentiful, people just do not want to get out there and look, which is why it's not the best thing… Look, I am being sponsored by lots of businesses, I am making sure that they get lots of business."*

***Some Reflections***

Rich in content and contradiction, we first want to draw attention to the fact that while the school is explicitly framed as "place-based," relatively immersed full-time in "natural environments," and interested in listening to and learning from the more-than-human, the students, parents, researchers and even the teachers still enact and reinforce the metaphysics of mastery with troubling frequency. The village rapidly slides from an unspoiled shady grove to a patriarchal state with power maintained through a militaristic and competitive hierarchy; all of which undermines the work of the teachers, the concerned students, and the place itself by ultimately legitimizing this seemingly inevitable anthropocentric utilitarian ethic. This short example, one amongst many, pushes back on two assumptions explored above that permeate environmental education. First, that significant amount of outdoor time with self-directed play will lead to some kind of richer, radiantly happy and more compassionate and ecologically just relationship with the natural world. (Cobb, 1977; Tomashow, 1996). And second, that the "innocent" imaginations of the students are somehow unfettered by cultural norms and orientations such that their interactions with the natural world will allow them to spontaneously perform a more caring, cooperative and interconnected way of being in the world (Taylor, 2013; Instone & Taylor, 2015).

Further to this, we have noted in our research (Blenkinsop, 2014; Blenkinsop *et al,* 2016b) the way many educators, who are deeply committed to environmental education and make eco-oriented claims or requests of the students, still frequently lapse into dominant norms of human-centeredness. For example, one teacher at MRESP, when discussing a swampy area asked, "Is there any value in that space as it is? Other than a giant playground where kids can play and

muck around in?" Thus, despite repeated teachings to respect the other-than-human aspects of place, adult educators and parents (and often the researchers) still consistently framed the natural world as a setting for exploratory play and learning and, in the case of MRESP, only slowly began to recognize place as an agential co-teacher. It is clear that for these teachers rewilding is a slow process involving constant reflexivity. They must reconsider their language and pedagogical practices, their responses to children, and their assumptions with regard to "nature" because all have been profoundly conditioned by a dominant culture of anthropocentric norms, even (and perhaps especially) when they are in "the wild." Given that this deep conditioning has shaped the way they see the world, this also means they/we are likely to make mistakes on an almost continual basis (Blenkinsop, 2012). With respect to the village the teachers have, for the most part, passively sanctioned an imaginative police state with capitalist economic assumptions, patriarchal power hierarchies, and a resourcist orientation as an inevitable norm, even ignoring some more interesting and critical suggestions coming from some "marginalized" sets of students (e.g. a group of girls and younger students started to question the entire system and suggested a much more cooperative "feminist" system). This suggests that educators must engage, and at times mediate, with the students and offer means with which to question and rewild the culture into which they are being inducted by way of domestication.

It is not surprising, given the deep cultural architecture that supports a utilitarian and anthropocentric approach to pedagogy, that when the students are asked "What is the forest for?"[130] several of them quickly responded "mountain biking" and they were then commended on a good answer. At times, the land was presented by the staff as a "multi-user resource" even though "it's also a home to animals" as a younger student pointed out. The staff's way of dealing with these two seemingly incompatible metaphors of place is to decide which areas are of higher "value" and thus, have greater rights to be protected and from this create "high use" areas (low value) and protected areas (high value). It has been interesting to note now this step of hierarchizing landscapes parallels early policy responses and discussions in conservation biology that have since been debunked by environmental theorists because this solution creates islands of wild space that are conserved but lack integrity or continuity and in this educational context the students appear to learn that instead of modifying their behavior they can instead just set aside a chunk of protected space and continue to play hard on the other existing spaces.

We note unequivocally, our intention here is *not* to denigrate the vital work of committed educators struggling to maintain schoolyard gardens, or expand institutional recycling initiatives, or get their kindergarten class outside the box in order to encounter a more-than-human world. Rather, we seek only to warn against allowing a "metaphysics of mastery" (Bonnett, 2015) to continue being reproduced as an article of faith and stand in for "the real work" (Jardine, 2012; Smith, 2006) facing educators today and in days to come. This is difficult work. Accordingly, and with respect, we advocate that it is incumbent upon environmental educators to supplant master species metaphors and practices that perpetuate an image of the world as "ours" to remake according only to our desires—*even* in urban centers. (Incidentally, this is where rewilding urban conservation and rewilding urban education begin to build synergy). In other words—and in addition to all the more "practical" eco-tasks piled upon them—our thesis here is that environmental educators must *also* work to develop the ecocritical dispositions, historical literacies and imaginative sensibilities to teach students how to attend to/with the sociomaterial conditions of learning in ways that challenge human supremacy (for some examples see Blenkinsop &

[130] Even the question itself suggests an *a priori* positioning of forest with regard to human. How might this response head in a different direction if the question were "How does the forest sustain you?", or "what might you do for the forest?", or "what has the forest taught us today?"

Piersol, 2013; Kopnina, 2013; Pacini-Ketchabaw & Nxumalo, 2015).

We also submit that a crucial aspect of any post-anthropocentric pedagogy will entail recognizing the material agencies and affordances of the environment to shape, reify or burst asunder the practices and discourses possible in any situated learning experience. As McKenzie and Bieler note, "The stories we are able to tell about the world through learned practices of critique are enabled by the everyday sociomaterial conditions that surround us" (2016, p. 6). While this can initially strike as a rather obvious point, it is essential to recognize that, to a certain extent, the sociomaterial conditions of any given place will significantly shape what is possible or even *thinkable* with-in that place. We thus share the notion that critical pedagogies of place that trace the sociomaterial provide promising ways to make post-anthropocentric sense of "nature-as-co-teacher" (Blenkinsop & Beeman, 2010). We are tempted to simply upgrade the notion of "nature-as-co-teacher" to something like sociomateriality-as-co-teacher. However, we suggest, this *potentially* neglects something vital at the heart of environmentalism that we haphazardly call wilderness.

While we join with scholars working to reconfigure the naturalization of "nature" by recognizing how relations of power and domination are inscribed in material spaces (see Taylor, 2013), we remain deeply suspicious whenever educational theory begins to overly conflate heavily human-shaped environments, such as the typical urban core, with the relative wild or lack of human control and presence, in places often described as the natural world. Surely we can recognize a spectrum of material wilderness spanning from the Wrangell-St.Elias Preserve in Alaska to downtown Manhattan; from a Douglas Fir in a stand of 400-year-old growth to a wooden desk in a suburban high-school; from the "traditional ecological knowledge" of Haida master myth teller Skaay (Bringhurst) to the "soft pollution" of corporate "writing, signs, images, and logos flooding rural, civic, public and natural spaces as well as landscapes with their advertising" and "will to appropriate" (Serres, 2011, p. 41).

We suggest such a sophisticated notion of wilderness moves beyond the romantic vestiges of pristine often associated with the term and potentially offers a post-nature understanding of the sociomaterial affordances of place(s) and object(s). Canadian poet and philosopher Don McKay has provided an apt definition describing this move:

> By "wilderness" I want to mean, not just a set of endangered spaces, but the capacity of all things to elude the mind's appropriations. That tools retain a vestige of wilderness is especially evident when we think of their existence in time and eventual graduation from utility: breakdown. To what degree do we own our houses, hammers, dogs? Beyond that line lies wilderness. We probably experience its presence most often in the negative as dry rot in the basement, a splintered handle, or shit on the carpet. But there is also the sudden angle of perception, the phenomenal surprise which constitutes the sharpened moments of haiku and imagism. The coat hanger asks a question; the armchair is suddenly crouched: in such defamiliarizations, often arranged by art, we encounter the momentary circumvention of the mind's categories to glimpse some thing's autonomy—its rawness, its duende, its alien being. (1995, p. 21)

Here McKay alludes not only to a sense of material wilderness based on (the relative illusion of) human appropriation and control, but also suggests a potential learning outcome or objective for environmental education. That is, cultivating the place and conditions for the phenomenal moment of surprise when sociomaterial assemblages are defamiliarized and disclosed in their more-than-human rawness (emphasizing the relationship between such experiences and the arts). We refer to this move as *rewilding* and suggest that it replace or redefine "sustainability" as a principal objective of environmental education in the Anthropocene.

Rewilding typically refers to setting aside tracts of land for wildlife conservation (Schenck 2015), reintroducing displaced species, or diversifying urban landscapes from human-centric to more

multispecies environments.[131] For us, rewilding offers a way to think through educational events by attending to the sociomateriality of places, beings, objects and affordances of the learning experience as a whole in order to provoke phenomenal moments of defamiliarized encounter with-in a more-than-human world to which McKay refers. In other words, rewilding is an attempt to seize upon the historical moment of the Anthropocene and its philosophical trends to move education in the direction of ecocentric humility not anthropic dominion. As the domestication of earth, animal and human is, we suggest, part of the same appropriative project, we maintain that rewilding too must be approached as a sociomaterial practice to foster both wild biodiverse ecosystems and wild educational pedagogies.

Unlike techno-triumphalist pedagogies, which always seem predicated on a kind of amnesia of radiant happiness, a key aspect of rewilding entails developing the humility and historical consciousness to recognize loss. Here we mean loss of habitat and wild places, loss of myriad species and particular beings, but also loss of "ourselves" as beings *in* nature, *with* nature, *as* nature. Rewilding advocate J.B. MacKinnon reiterates the courage it takes to look at the history of nature from this historical moment, "It [rewilding] calls on us to remember losses, not only in the wild, but within ourselves. The past asks us how, what and why we allow ourselves to forget" (2014, p. 6). Simultaneously, and importantly, rewilding education must also help students move through loss by providing the tools, experiences and orientations to not only critique the aspects of the dominant culture responsible for ecological degradation, but to recognize and harness emergent (or traditional) ways of being that might help cultivate a post-nature world characterized by ecocentric ethical orientations.

**Conclusions**

Towards the end of the year at MRESP, while we were conducting field research, there was a particularly memorable learning experience that we believe is crucial to addressing anthropocentrism in education. A group of the "older students," grade three to seven, walked to "the clearcut"—a section of the research forest that had been logged with conventional clearcutting techniques—in order to read *The Lorax* by Dr. Seuss. To our minds, this was an ideal synthesis between place-based experience and language-arts curricular content. Imagine how much more meaningful and affectively powerful the message of *The Lorax* might be while sitting in an actual clearcut compared to a classroom. During the debrief, however, the conversation shifted in a way that was, on the one hand, surprising, and on the other all too typical. Students and teachers alike seemed unwilling to acknowledge the destructive nature of clearcut logging even as they sat within it, and instead the discussion rapidly slid into the potential benefits of clearcutting, how it "opened up the forest" and "allowed for smaller plants to grow." This was not an isolated incidence and we have witnessed this phenomenon in several different educational settings now, from conventional school classrooms, to outdoor education experiences, and even at environmental education conferences. There seems to be an unwillingness to appropriately address the damage that our society exerts on the natural world; to sit with the loss.

We included these school examples to demonstrate how the educators arrive in any place, be it garden, managed forest, or suburban forest park with certain cultural, moral, and ontological orientations. It is against these Dutch and Canadian realities that tend to ignore the agency and activeness of the more-than-human world as a potential teacher that the educators in our studies must push back. Given that these contexts tend to relegate the natural world to the background or simple setting for learning there are few examples for educators to learn from where students might go beyond learning about or in the place and start to learn intentionally with or from it.

This anthropocentric orientation, in which we

[131] See for example: Mackinnon, 2014; Monbiot, 2013.

give attention to humans and their interests alone, are the ones most dominant in Western culture so it is not surprising to see them ingrained in the practices at school. Although it does speak to the power of such cultural norms that they remain so present in schools that have specifically environmental mandates. These cultural assumptions while definitely not the entire picture of what the educators present, are important pieces to highlight for if they remain unquestioned, they collectively work to contradict messages of care for the natural world, help to rationalize our moral distance from it, and make rewilding a one directional human endeavor rather than a shared project for mutual flourishing. Awareness around the cultural assumptions that we are passing on is essential especially in the early years, where the children have not yet come to know the plant as a 'weed' and there is still the possibility for them to view a section of land as filled with intricate life rather than to see it as a 'jumbled mess'. Complexity and contradiction is part of any relationship that we must learn to navigate but as educators we can endeavor to become more conscious of how the metaphors, hidden curricula and cultural norms of our practice may be incongruent with the orientations, be they moral, relational, or ecological, we are trying to foster. Indeed, this requires a reflective practice and the willingness to modify actions and language that is antithetical to an ecological orientation and that increases distance as opposed to bridging or narrowing it.

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# The Biophilic Quality Indexes. A Tool to Improve a Building from "Green" to Restorative.

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**Abstract.**

Despite the name, current "green architecture pays exclusive attention to being environmental friendly rather than being biophilic as well. Disregarding Nature in design is not just a matter of aesthetics but concerns also the quality of people's lives. In order to achieve this, there is a need for a paradigm shift from "green" to "restorative" in order to really accomplish biophilic design. In the light of our experience in Human-Environment research we have devised the *Biophilic Quality Indexes* (BQI), a reliable instrument that allows us to calculate to what extent a building is biophilic. The rationale behind the BQI is simple: Biophilia is innate and affects attention through a proper operationalization of restorativeness and biophilic design is good when it enhances a restorative environment. The BQI can be used both as a guide to follow for a building-to-be, and as a rating system for an existing building, where the final score represents the space for improvement. The BQI will help architects integrate Nature in design and promote understanding that to plan restorative environments is not only an aesthetic need but a necessity for human being's efficient cognitive functioning.

**Key words.** biophilia · biophilic design · biophilic quality indexes · cognitive sustainability · environmental sustainability · nature design deficit disorder

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**Introduction**

Ecology and Environmental Psychology are the theoretical frameworks of this short communication which aims to highlight the importance of integrating Nature in design for human's wellbeing and proposes a tool able to quantify how biophilic an artificial environment is. The positive effect of Nature on human wellbeing must be introduced first in order to encompass the rationale behind the proposed tool.

Humans are considered as organisms evolving over two hundred thousand years in their natural environments, growing and organizing in response to them and indeed becoming fascinated by them (Berrill, 1955; Kaplan, 1977; Ulrich, 1977). In order to survive humans had to assimilate information about these natural environments and to develop expectations about them; since humans are genetically programmed for operation in natural environments they cannot operate effectively in non-natural environments (Knopf, 1987). In fact, humans are more likely to function effectively in those environments that possess attributes similar to the settings in which they evolved and there is also evidence for genetically-determined biases that affect environmental preference (Kaplan, 1977; Balling & Falk, 1982). One such attribute of natural environments is *legibility* (Kaplan, 1976), that is the easiness to grasp information: people prefer settings that serve their need to easily comprehend and predict (Kaplan & Kaplan, 1989). Another attribute is *mystery* (Kaplan, 1977), that is preference for settings that promise new information, which are intriguing and encourage exploration. Another attribute is *refuge* (Appleton, 1975): people prefer settings that maximize security and seclusion, providing shelter from elements of the environment that threatened comfort and survival. Moreover, because of the sensory mechanisms developed solely in response to natural environments, humans have also an innate preference for the particular patterns that natural settings carry: the curvilinear forms and edges, the continuous gradations of shape and color, the blending of textures, the lunar and seasonal cycles, and the other features that distinguish natural from artificial environments (Wohlwill, 1983).

However, Nature is not only appreciated for its aesthetical characteristics, it is also a useful resource for people (Ulrich, 1983). (1) Nature facilitates competence building heightening the individual's sense of control and esteem (Houston, 1968; Lewis, 1977). (2) Nature carries symbols that affirm culture and/or the self and emanates the meaning of life Itself. (3) Nature offers a shift in the stimulus field inherently pleasing to an organism fueled by a need to investigate. It injects diversity into urban experience, offering respite from overly complex, chaotic stimulation in everyday life spaces. (4) Nature restores. As far as the last point is concerned, most natural environments meet all the requirements to be "restorative environments" (Kaplan, 1995). Natural environments are distinct settings, either physically or conceptually from everyday environments (*being-away*); they contain patterns that hold one's attention effortlessly (*fascination*); they have scope and coherence that engage the mind and promote exploration in time and space (*extent*); and they fit with and support one's inclinations or purposes (*compatibility*).

Understanding of transactions between people and restorative environments has accumulated, and a large body of data shows that contact with Nature is especially beneficial for urban dwellers whereas low levels of Nature may be a factor in the higher rates of certain pathologies observed for urban populations as compared to rural groups (for a review, see Berto, 2014). Restorative environments research has been dominated by two theoretical positions, one emphasizing stress reduction (*Stress Recovery Theory*; Ulrich et al., 1991), the other one concerned with the recovery of the capacity to focus attention (*Attention Restoration Theory*; Kaplan, 1995). Though the theories differ in the antecedent condition that leads a person to a restorative environment, both emphasize that

the exposure to Nature can positively affect human functioning, and natural environments are preferred over urban environments because Nature holds attention without mental effort, blocking out the demands of daily work and urban living and can mitigate stress and prevent it through aiding in the recovery of the essential psycho-physiological resources.

**Environmental and cognitive sustainability**

The term "green building" has been around for quite some time and interpreted variously. For the public in general it is a building with a lot of landscape and/or water features. Strictly speaking, "green" means sustainable or environment friendly. Technically speaking, the *Green Building* is meant to alter as little as possible Gaian biogeochemical cycles (Barbiero, 2011; Smith & Smith, 2015; Barbiero, 2017, pp. 43-60), striving therefore to an "outer" sustainability, whose final aim is the "impact zero" building. To this end, various green building planning paradigms have been created across South East Asia and the USA, with the prominent LEED®, BREAMS®, WELL®, LBC® and GREEN MARK® extending their influence across the developing new paradigms. While there is nothing intrinsically wrong with these parameters defining high energy performance buildings, there is however a lack of acknowledgment of the real reason for integrating natural features in design. The sustainability indexes underrate the psycho-physiological benefits deriving from the exposure to Nature, basically neglecting the fact that natural features are more than a simple visual pleasure element (Berto, 2005; Berto et al., 2008; Berto, 2011; Berto et al., 2015).

Environment-friendly design can be impressive and good (see for example, Guz Architects' design in Singapore), but very often even though such design is sustainable and seems to be very Nature-associated, it is very rigid and man-made and does not reflect what Nature really has to offer. Sustainability does not really push architects to go beyond form and scale design to encompass the wellbeing and quality of life of users, which should be among the most important architectural considerations today. Nature's restorative value should be considered the most important factor to take into account in biophilic design (Barbiero, 2011; Barbiero, 2014; Berto et al., 2015). In this regard, biophilic design is the way to accomplish "inner" sustainability, whose final aim is a building perceived as highly restorative where it is possible to make the most of human nature. This is the problem we are facing as an ecologist and an environmental psychologist. We have a lot of buildings with "Nature deficit *design* disorder" and we want to help engineering buildings to bring occupants closer to the regenerative power of Nature.

Biophilic design can help. The core of biophilic design (otherwise called biophilic architecture, ecological design or restorative environmental design) is to bridge the gap between human beings and Nature, by taking evolutionary biology, ecology and environmental psychology as the basis for design (Barbiero, Berto & Callegari, 2016). From the biological/ecological standpoint, biophilic stems from biophilia (Wilson, 1984; Kellert, 2008). The experience of real or reproduced Nature has psychological and physiological restorative effects (Berto, 2014; Barbiero & Berto, 2016). However, biophilic design is not just an exotic garden outside the building or a piece of vertical landscape purely for aesthetic reasons, but rather a holistic "restorative" design that does not alienate people, as the environment-friendly technological buildings very often do. Biophilic design is "cognitive sustainable" design (Berto, 2011) and can be applied at all levels of scale, creating interior and exterior revolutionary forms, private and public buildings, landscapes, and whole cities. This transformation from green to restorative requires panoramic, trans-disciplinary thinking and coordinated actions, because the cost of disregarding Nature in design is not just a matter of aesthetics but also extends to the quality of people's lives.

**The biophilic quality indexes**

The Malaysian architect K. Yeang (2008), one of the pioneers in ecological/biophilic architecture, has offered a set of principles for designing "with Nature" (see Table 1). Yeang's suggestions are significant, even though they can sound *intangible* to someone who is approaching biophilic design, together with the first conceptual framework for biophilic design laid out by Cramer and Browning (2008) where three categories were developed to define biophilic buildings. More recently, Ryan et al. (2014) articulated from these categories a list of 14 Nature-based patterns (see Table 2). While it is more *tangible* and with a wide range of application, Ryan et al.'s list doesn't fill completely the gap between theory and practice. We are aware that biophilic design is not a "formula", but our belief is that in the designer's toolkit there is room for another tool specifically meant to guide and assist in the biophilic design process. In the light of our experience as researchers in the field of Human-Environment interaction and after a careful analysis of the effect flaws in design can have on human's physiological, psychological, emotional and behavioral responses, we have devised the *Biophilic Quality Indexes* (BQI) to help architects to address biophilic design. The BQI establishes more robust *quantitative* rather than *qualitative* parameters in biophilic design and measures and tracks variable efficacy in the environment in order to capture the restorative benefits offered by biophilic design. The BQI originates from a set of research studies where the environmental psychology paradigms were verified within the evolutionary biology framework and the relationships between perceived restorativeness, connection to Nature, environmental preference and environmental features were carefully addressed (Barbiero et al., 2014; Berto & Barbiero, 2014; Berto, Pasini & Barbiero, 2015). In addition, the BQI validity and reliability were also observed in the field where the biophilic assessment was correlated with the energetic certification (PassivHaus®, Minergie®, CasaClima®) and the individual's perception of restorativeness of Biosphera 2.0 (Ravotto et al., in press).

The BQI allows us to calculate to what extent a building is biophilic, and it can be used both as a guide to follow for a building-to-be or as a rating system for an existing building where the final score (a percentage value) represents the room for improvement. The BQI is made up of five different sections in order to assess the building in its context (e.g. in the case of a public building) and each single space within the building (see Table 3). Each section presents a list of environment characteristics whose presence or absence have to be assessed in order to label a building as "biophilic". From our point of view, a biophilic building is a single or a network of individually designed spaces that would provide a *restorative* experience for those living/working in it, and for people viewing the building. To this end, each space within the biophilic building has to be specifically designed to foster human wellbeing and a sense of *here-ness*, by providing a restorative environment which allows recovery from urban stress and mental fatigue, and configured in such a way as to allow the experience of relaxation, fascination and interaction with the environment. The BQI allows assessing environment's *enclosure*, *separation from distractions*, *environmental stimulation*, *coherence*, *complexity*, *affordances*, opportunities for *visual contact with Nature* and the presence of *biomorphic patterns,* characteristics that have to be carefully assessed in a building in order to be biophilic. When biophilic design comes to a public space, it has to facilitate the sense of *there-ness*; meaningful public spaces have to allow people to make strong connections between the place, their personal lives and the larger world. Since restorative public places are relevant for people by enriching their lives, the BQI allows assessing the presence of *detractors*, the *façade* characteristics, the *location* and the *provision of access,* i.e. the characteristics to be assessed for a public space to be biophilic.

**Conclusions**

Architecture is the profession of designing the built environment, but to properly accomplish biophilic design and to plan environments/buildings/cities in harmony with their ecosystems, architects should include the contributions from researchers in related fields like environmental psychology and ecology because each one has a significant role in restoring the balance between architecture and our biological/ecological/psychological inventory.

Since the Biophilic Quality Indexes have proved reliable on the field, they can help architects not only to translate theory into practice, but also to make comparisons between buildings with different level of perceived restorativeness. In this respect, it would seem reasonable to suggest the inclusion of the Biophilic Quality Indexes within construction paradigms to pave the way for a shift of the WELL® and LBC® certifications from qualitative to quantitative protocols, because even biophilia can be objectively measured, thereby bypassing reliance on the architect's sensitivity to the topic and/or people's perception in a Post Occupancy Evaluation (late) assessment.

**Endnote**

The *Biophilic Quality Indexes* (BQI) is registered at Società Italiana Autori ed Editori (SIAE), Rome, Italy, n° 2017000273.

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**Table 1** Yeang's principles for designing "with Nature"

| |
|---|
| 1-The ecological approach to design is about environmental bio-integration.<br>2- Our built forms and systems need to imitate Nature's processes, structure, and functions, as in its ecosystems.<br>3- The process of designing to imitate ecosystems is Ecomimesis. This is the fundamental premise for eco design.<br>4- There is much misperception about what is ecological design. We must not be misled and seduced by technology.<br>5- The other common misperception is that if our building gets a high notch in a green-rating system, then all is well.<br>6- Ecosystems in the biosphere are definable units containing both biotic and abiotic constituents acting together as a whole. |

**Table 2**: Cramer and Browning's conceptual categories (left column), and Ryan et al.'s biophilic conditions (right column) for biophilic design.

| Conceptual category | Biophilic conditions |
|---|---|
| Nature in space | Visual connection with Nature<br>Non-visual connection with Nature<br>Non-rhythmic sensory stimuli<br>Access to thermal and airflow variability<br>Presence of water<br>Dynamic and diffuse light<br>Connection with natural systems |
| Natural analogues | Biomorphic forms and patterns,<br>Material connection with Nature<br>Complexity and order |
| Nature of the space | Prospect<br>Refuge<br>Mystery<br>Risk/peril |

**Table 3**: Sections and a few examples from the sub-sections making up Berto and Barbiero's Biophilic Quality Indexes.

| | |
|---|---|
| Section 1 | The network (the building in the context; 6 sub-sections)<br>e.g. sub-section "façade":<br>• novelty<br>• transparency<br>• … |
| Section 2 | The individual spaces within the building (8 sub-sections)<br>e.g. sub-section "enclosure":<br>• strategic placement and/or orientation of the building/spaces<br>• physical boundaries<br>• … |
| Section 3A | Opportunities for visual contact with Nature (3sub-sections)<br>e.g. sub-section "indoor plants/ecosystems"<br>… |
| Section 3B | If a garden/backyard/terrace/patio is present (3 sub-sections)<br>e.g. sub-section "trees"<br>… |
| Section 4 | Non-visual contact with Nature (1 sub-section)<br>e.g. sub-section: "biomorphic forms and patterns and natural materials" |
| Section 5 | Sustainability (2 sub-sections)<br>e.g. sub-section "design"<br>… |

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# When Biophilic Design Meets Restorative Architecture: the Strambinello Project.

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**Abstract.**
The current crisis in the complex relationship between Man and Nature offers a fertile context for experimentation within the architectural field, where we must rethink the link between Man's structural relationships and his physical-spatial surroundings in terms of material and non-material components. The multidisciplinary vision of the biophilic program examines the design of living spaces with reference to the physiological functions and the psychological, behavioral, emotional and cognitive development of the individual. Biophilic Design thus brings greater awareness of the concept of sustainability in architecture, which can then facilitate the regenerative features of human residential environments. This project presents an experimental case study of biophilic architecture that becomes a design variable for the physical and psychological wellbeing of the inhabitants on the basis of certain characteristics known as regenerative factors within attention restoration theory (ART). The case study, a single-family home that is being built in the municipality of Strambinello (Piedmont, Italy) is an example of a regenerative residential environment that respects the bond between Man and Nature.

**Key words.** attention restoration theory (ART) · biophilia hypothesis · biophilic design · restorative architecture

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***Perspective**: Experiential and research visions*

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**From sustainable architecture to biophilic design**

In an increasingly interconnected world, more than half the world population (54%) lives in urban areas. Within this framework, cities are clearly important factors of development. However, rapid urban expansion, often unplanned and inadequate, brings with it social, environmental and cultural factors that risk marginalizing that innate relationship that has always existed between Man and Nature. Distancing people from life's natural cycles is leading to an increasingly compromised existence in relation to a broad spectrum of physiological, psychological, behavioural, affective and cognitive aspects. It is necessary to think of new models of development capable of facilitating for humanity an intimate and innate connection with Nature. One possible, experimental scenario is biophilic design, a way of designing the places where we live, learn and work. Biophilic design stands at the root of the connection between Man and Nature by setting the goal of creating regenerative environments where human biophilic propensity can find its realization, and thereby contributes to psycho-physical equilibrium and pleasure in living in one's own environment.

According to E. O. Wilson, biophilia is «our innate tendency to focus upon life and life-like forms and, in some instances, to affiliate with them emotionally» (Wilson 2002, p. 134). Humanity, over the course of our evolution, has developed a set of phylogenetically adaptive learning rules that shape our relationships with the natural world (Wilson 1993). If this hypothesis is correct, the human biophilic tendency would find its expression in (1) attention – the capacity to let oneself be fascinated by natural stimuli, and (2) empathy – the capacity to emotively affiliate with the different forms of life. According to Wilson, biophilia is an evolutionarily adaptive character that emerges, often without awareness, in many human activities, in our thoughts as in our artistic expressions (Wilson, 1984). Indeed, the story of the evolution of biophilia follows the traces of human evolution, in its peculiarities of genetic-cultural coevolution (Barbiero, 2017, pp. 137-163). An example is the choice of habitat, crucial to the survival of the species. For two million years the habitat of the *Homo* was the African savannah, when our ancestors sharpened their survival skills. The savannah is characterized by elements such as open grassland, clumps of bushes, scattered trees (so-called "shade trees" because they offer shelter from the sun and predators), elevated view with great visibility, plenty of sunlight, areas of water like lake, river or sea and grazing animals. Savannah is a landscape scheme that we find pleasing and reassuring (Balling & Falk, 1982) and according to Orians and Heervagen (1992) there is a kind of instinct that brings the individual not only to prefer but also to reproduce certain shapes and configurations attributable to savannah. Orians and Heervagen also note that in Great Britain and the United States many parks and gardens are characterized by meadow with low grassy, isolated shade trees, semi-open environments characterized by a good level of stimulation with a coherently complex structure which can be traced back to the spatial characteristics and configuration of the savannah. The long evolutionary path of humanity in natural environments has left its mark in the form of predispositions (not learned but inherited) to pay attention and respond positively to certain characteristics typical of the natural environment (Ulrich, 1991). For this reason, humans prefer environments with attributes similar to *natural environments* where they have evolved, where they have learned to select important information, acquired appropriate response patterns and learned to predict what might happen to them (Berrill, 1955; Kaplan, 1977; Ulrich, 1977). Moreover, the preference of humans for natural rather than built environments is also linked to the fact that they support psycho-physical well-being, as they are perceived as more regenerative. Biophilic design also originates from the innate preference that humans have for the natural environment that is directly related to the perception of the regeneration level of an

environment: high levels of preference are generally associated with high levels of perceived regeneration, and vice versa (Ulrich, 1991; Hernandez, 2001; Purcell, 2001; Berto, 2004; Berto, 2007). Through the case study of Strambinello, we set out to show that an architectural project can be developed as a design feature within a precise theoretical framework and supported by specific scientific evidence: Attention Restoration Theory (ART). According to ART, the regeneration of attention is due to the presence of four characteristics defined as regenerative factors: (1) fascination, (2) being-away, (3) extent and (4) compatibility. The regenerative factors normally differentiate a natural environment. For Strambinello project, we tried to translate these regenerative factors in the project.

The Strambinello case study experimentation began during a cooperative project between the innovative startup Be-eco, the Laboratorio di Ecologia Affettiva (Laboratory of Affective Ecology) at the Università della Valle d'Aosta and the Dipartimento di Architettura e Design at the Politecnico di Torino designed to go beyond the single dimension of energetic efficiency and achieve the objective of physical and psychological wellbeing of the inhabitants. The Strambinello case study is an important opportunity for a multidisciplinary convergence between architecture, ecology and environmental psychology in order to promote a new quality residential environment.

*See below - Figure 1. The Strambinello Project.*

In recent decades, architecture has often seen the Man-Nature relationship from a utilitarian standpoint, through an excessively technical vision that has shifted the attention from Man to the machine, certifying the energetic performance of the building as the most advanced parameter for evaluating a building in terms of guaranteeing the comfort of the inhabitants. Architecture, in rethinking the vital spaces of Man, and in the face of epochal changes such as the degradation of the environment, the prevalence of anthropogenic environments over natural ones, the exploitation of natural resources and climate change, must identify new ways to look in a systemic manner at sustainability in architecture.

Biophilia can become a very important professional factor in re-establishing a correct relationship between Man and Nature, for planning research in architecture and new working scenarios, not only related to the physical variables of the environment but also to the psycho-physiological variables of individuals. Today we have solid certification protocols for buildings energetic performance, such as the US system of energy efficiency rating and ecological footprint LEED (Leadership in Energy and Environmental Design). But we have no analogous instrument applicable to psycho-physical wellbeing. Strategies for human health and wellbeing play a relatively modest role in the evolution of building standards, and in fact, at the time of this study, it is impossible to estimate the degree of biophilia present in a building (Berto, 2017). Protocols that are currently dealing with biophilic design are the *WELL Building Standard* and *Terrapin Bright Green*. *The WELL Building Standard* is a certification and, as such, is to be applied once the project is completed. It contains qualitative requirements (Characteristic 88_Biophilia I Qualitative) and quantitative requirements (Characteristic 100_Biophilia II Quantitative) that are based on an empirical approach. *Terrapin Bright Green*, on the other hand, provides design guidelines where critical issues emerge regarding the quantity and quality of the support tests, that are based on empirical data that do not make it possible to scientifically evaluate the biophilic design. Also, it does not focus on the individual who will benefit from the architectural work. Our analysis demonstrates that the existing protocols are insufficient because they do not provide a method capable of achieving scientific biophilic design and because they both have an empirical approach.

**Individuals' connection to Nature as the project starting point**

Since a biophilic perspective has been adopted for the design and construction of the sustainable building in Strambinello, the starting point of this project was the Man-Nature bond, or rather the Customers-Nature bond. This is crucial because the biophilic design starts with the connection that the *individual* has with Nature. For this reason, the level of connection with Nature of future inhabitants was measured by adopting the *Connectedness to Nature Scale* (CNS) (Mayer & McPherson Frantz, 2004).

The CNS evaluates to what extent individuals identify with the natural world and feel they are part of it. It measures the Man-Nature connection by defining a sort of personality trait of the individual. The CNS is a scale with 14 items, aimed at assessing to what extent the individual feels part of the natural world. The scoring (attributed to each item on a scale from 0 to 4, where 0 = never and 4 = always) defines the measure of personal relationship with Nature, and is obtained from the average of the scores attributed to each of the 14 items. After compiling the CNS by the customer, the scores found are similar: 2.6/4.0 for females and 2.9/4.0 for males. Both types of customers have a good connection with Nature meant as a cognitive and intellectual connection, since those who reach a medium average of scores are usually a people sensitive to ecological issues. The first compiling of the CNS was done during the design stage. We will compare this result with a second CNS score after three years of occupancy by the same customers. Although according to much scientific literature the connection to Nature is a stable trait in adults, the second CNS results are expected to increase, if the Strambinello home is to be considered a restorative environment.

**The theoretical framework**

The challenge is to plan and build a regenerative home, to develop a project based on the biophilia hypotheses designed to promote wellbeing for future occupants. To accomplish this aim we employed the theoretical framework provided by ART in order to explain the positive effects of Nature on human functioning, as contact with Nature promotes regeneration of direct attention, thanks to the presence of the four "regenerative factors" of fascination, being-away, extent and compatibility.

Exposure to the natural environment provides physiological (Ulrich, 1991) and cognitive benefits (Hartig, 1991; Tennessen, 1995; Berto, 2005), and plays an important role in regulating emotions as well as an improvement in perceived wellbeing (Kaplan, 1973; Agyemang, 2007) and a faster recovery from disease (Ulrich, 1984). For this reason, human beings prefer environments with natural attributes, those environments that give us positive emotions and moods. In this regard, according to *environmental preference model* of Kaplan & Kaplan (1989), we can identify the predictors of environmental preference: coherence, complexity, readability and mystery. These are explained as the result of an evolutionary process in terms of adaptation and refer to environmental qualities that derive from the intersection of two important human needs that must be satisfied in order for the subject to decide if s/he likes the environment or not: the need to understand and the need to explore. The coherence and readability of an environment refer to its ability to satisfy our cognitive efforts toward understanding it (Baroni, 2008). Coherence refers to how an environment can be immediately recognized by its organization and repetition of certain elements (e.g. the foliage of the trees, the rocks), the presence of similar textures (e.g. ploughed fields, meadows) and/or defined areas. Readability indicates the presence of information from which we can infer many features of the environment and its potential to be explored once we enter the scene more deeply. A legible environment is well structured, rich in landmarks that facilitate orientation and the formation of a cognitive map (Lynch, 1960). As regards complexity, a low-stimulus environment inhibits the drive toward exploration and is generally evaluated less

positively. However, complexity does not work to the detriment of legibility. Mystery is the promise of further information. Some environments create expectations in that there is something else to explore; windy paths or vegetation that partially obscures the view as when entering a forest are examples of elements that arouse mystery.

Our biophilic design framework is inspired by the model of environmental preference, Nature's characteristics and its positive effects. In this respect, ART distinguishes two forms of attention: direct attention and involuntary attention (or fascination). *Direct attention* is the ability to inhibit competing or distracting stimuli while performing a task. When direct attention is subjected to intense and prolonged use, it becomes exhausted, and mental fatigue appears. This increases distractibility and behaviours become more impulsive and hostile. Involuntary attention or *fascination* is the attention that does not require any effort and is fatigue-resistant. It allows direct attention to rest and regenerate so as to return to normal levels of efficiency. According to ART, stimulation of involuntary attention by contact with the natural environment is an effective way to regenerate direct attention and ensure good cognitive functioning. Fascination is just one of the features that make a natural environment a "restorative environment". From this perspective, direct attention can be restored by the presence of the four restorative factors of *fascination*, *being away, extent* and *compatibility.*

What follows are some examples of how such factors can be translated into an architectural project:

- *fascination*: the building is designed to allow fascinating stimuli such as the presence of water, trees, animals and suggestive elements such as sunsets, light reflections, windy leaves. These features stimulate the use of involuntary attention by regenerating direct attention and ensuring good cognitive functioning
- *being-away*: the building allows individuals to physically and/or mentally move away from their daily routine (e.g. work, everyday worries), that is, from all those situations that require the use of direct attention and which are a cause of mental fatigue as well as environmental stress (noise, crowding, air pollution, traffic);
- *extent*: the building is coherent and legible, characterized by a space-time extension, large enough to be explored and have new experiences where the individual feels "immersed". Immersion is favoured in the environments with coherence, where each part is in harmony with the whole. Natural environments are intrinsically endowed with space-time extension;
- *compatibility*: the environment offers the opportunity to indulge the interests or achieve the purposes of the individual. There is a compatibility or match between the individual's inclinations and the opportunities offered by the environment itself.

Natural environments are more regenerative than built environments, because they feature all four restorative properties (Korpela, 1996; Herzog, 1997; Hernandez, 2001; Purcell, 2001; Peron, 2002; Berman, 2008). Natural environments are different from everyday environments (being away), are rich in ecosystems to observe, paths to follow and explore (extent), are characterized by elements (water, trees, animals) that attract involuntary attention (fascination) and offer a wide range of activities compatible with our personal interests, for example: go out, observe, meditate, walk, etc. (compatibility). Indeed, some researchers have shown a close relationship between preference measures and perception of restorative qualities (for a review see Berto, 2014). Preferred environments recall properties of the ancient environment in which humans evolved (Orians, 1993). In savannah, there is no overload of information and involuntary attention can function while allowing direct attention to rest (Berto, 2011). For this reason, in architecture there should be a special attention to the design of restorative environments to avoid cognitive fatigue and favour the pleasure of living.

In an architectural project, it is possible to work on multiple levels for biophilic design, such as increasing the presence of small ecosystems in buildings through the addition of plants and plant walls, the incorporation of structures with natural shapes or the use of natural materials. Moreover, in the absence of a window or the presence of a natural view from the window, these small ecosystems are a small but effective sources of being-away that allows a temporary escape. This escape is a departure, albeit momentary, from the daily routine with positive effects on the mood of the individual. These are just a few examples showing how the restorative factors can easily be incorporated into everyday settings with significant positive effects both on the wellbeing and the cognitive performance of adults.

**Restorative factors in practice**

The approach adopted for the Strambinello project is a *scientific approach* because it applies within the architectural field a method and a precise frame of reference, i.e. Attention Restoration Theory. This approach is interdisciplinary and involves frameworks offered by disciplines such as ecology and environmental psychology.

The case study is part of a research and development project launched by the company Be-eco, an innovative start up and spin off from the Politecnico di Torino, which aims to innovate the 'housing system' by realizing ecological architecture. Be-eco has developed the residential system Eco-Home™, through which it promotes greater awareness of the environmental imprint of building projects, guaranteeing the liveability of the residence for the inhabitant.

*See below - Figure 2 Solar path*

The single-family housing unit is located in the municipality of Strambinello, a small town situated in the geographical area of Canavese (Northern Italy). It is an executive project situated on a former vineyard facing south and has a gross usable surface of 120 m². The house blends into the surrounding environment and there is a rich interaction between Man and Nature due to the presence of natural elements such as green spaces, woods and vineyards. There is the chance to immerse oneself completely in Nature through trails and paths present within and around the project area. This interaction between the inhabitants and their surrounding natural environment allows them to live in a cosy, peaceful and restoring place, away from the noise of the city. What follows is a description of how the four regenerative factors are present within the house.

*Fascination*

The presence of water, trees, animals and suggestive features such as sunsets, light reflections and rustling leaves guarantees activation of involuntary attention for restoring direct attention. The area of Strambinello project is rich in environmental elements, typically of Pedànea, the geographical area to which the municipality of Strambinello belongs. Pedànea has a clearly recognizable characteristic identity with a widespread presence of vines like Nebbiolo or Neretto; spontaneous and lush arboreal vegetation; a dense forest with plentiful chestnuts and birches; cultivated fields and gardens that signal the presence of nature-friendly horticulture. The view of these elements is conditioned by seasonal factors with varying degrees of colour depending on the time of year. From the site of the house, a hilly landscape of considerable beauty and size can be observed. There is a great variability and intensity of natural light, depending on the time of day time and the season. The site permits being connected to natural seasonal changes. There are also many opportunities for Human-Nature interaction within the internal environment of the building, providing elements which positively influence the individual's psycho-physical well-being. The architect has created internal spaces that have a clear connection with natural systems by evoking the idea of belonging to a larger entity and creating a perceptive change in

what one sees and experiences.

*Being away*

Being away is the physical and/or mental retreat from all those situations that require the use of direct attention and which are the cause of mental fatigue (work, daily worries, imposed habits), but also environmental stress like noise, crowding, air pollution or traffic.

As far as acoustic perception is concerned, the site is quiet and there are no unpleasant and disturbing noises caused by chainsaws, factories or other buildings. The presence of cars is also very limited as there are no busy streets nearby. The pleasant sound of Nature is constantly present through non-rhythmic stimuli such as birds chirping, the wind blowing between branches, rustling leaves, and the sound of rain. All these features allow for immersion in and connection with the surroundings and consequent distancing from environmental stress.

The house is not too close to the workplace of the inhabitants, thereby permitting them to move away from their daily concerns. This is also visible in the porch, designed to extend the kitchen and living space to outdoors, which allows the people to be in an environment protected from atmospheric agents (through the wooden beam roof) and to indulge activities such as rest, relaxation, reading or meditation. The large glass surfaces in the building allow continuous visual contact with the outside, favouring the view of natural environments and the perception of natural light. The distribution of the rooms follows the path of the sun, from dawn in the east to sunset in the west, so that day and night areas absorb the maximum irradiation. Inhabitants are able to clearly see and contemplate the surroundings, identify people who approach, the presence of animals or changes in the weather. In this way, there is no loss of relationship with the external environment and the notion of time.

The living room and the kitchen are essential, cosy, family gathering places, and the decor does not obstruct doors and windows. They are south-facing, in the part of house that enjoys the best view. The double and single bedrooms are located to the east in order to enjoy the dawn, as the sun's rays are beneficial to the body and create a pleasant feeling of awakening. Passageways and utility rooms such as staircases, workshop, bathroom and wardrobe are north-facing, the coldest side of the building which also presents a view which is more limited since there is a "green" consolidation escarpment. In addition, there is an area designed for horticulture, thus creating a fertile connection between the inhabitants of the building and the surroundings.

*Extent*

Extent is the space-time extension, the feature of an environment that can be explored and provide new experiences. A person feels "immersed" and this sensation is favoured by the presence of coherence and purpose in the environment, where each part is in harmony with the whole.

The project site is within an extensive natural environment that can be explored so that inhabitants can have new experiences in Nature, such as observing or experimenting, and sense a feeling of being in a wholly-different world. The house plan has been developed following Lynch's approach (Lynch, 1960), which gives meaning to the perception of space and the complexity of environmental information. According to Lynch, the individual creates a mental space map based on the recognition of various elements within the environment, in order to use them for particular purposes. The elements that usually make up mental maps are pathways (along which the observer moves, such as lanes or roads), edges (linear elements that the observer does not perceive as paths and which separate the various parts, such as walls, boundaries buildings, hedges), districts (areas that may have different functions, such as squares, parks), nodes (focal junction points, such as crossroads, squares or places of relationship) and landmarks (reference points, such as noticeable buildings or hills).

Around the area of the Strambinello project

there are pedestrian paths though the greenery. There is only one road where there is no traffic and a feeling of safety in crossing and walking. A small junction point is recognizable close to the road crossing. The landmarks are homes that become a real reference point in particular at night, since there is no street lighting. The perceived borders are fences or walls that identify private properties and are weak borders that do not conceal the view but allow good visibility, providing also a feeling of security. There is also a barrier that can be seen in the woodland located south of the project area which is both enjoyable to look at but does not permit seeing beyond. The "built" area is limited to a few isolated buildings and the conformation of their interior space gives the chance to simultaneously see different places. The open space design of the kitchen, dining area and living room means there are no visible barriers. The interior corridor leading to other places is short, connects the living area to the sleeping area and creates a sense of awareness of space.

*Compatibility*

Compatibility is the correspondence between people's inclinations and the opportunities offered by the environment to achieve their interests or purposes. Experiences in the natural environment are characterized by a high degree of compatibility that facilitates mental regeneration, whereas lack of compatibility can generate or worsen the state of cognitive fatigue.

In the area of the Strambinello project, inhabitants can admire the surrounding landscapes thanks to good illumination. In the evening or at night, the lack of streetlights means the area is completely dark, but this does not hinder the feeling of safety and familiarity while travelling along the road to get to the site. The natural environment offers various experiences that facilitate mental regeneration and reflection, there are many opportunities for gardening and there is a fenced area dedicated to cultivating fruit and vegetables, with a covered area for storing tools and a water supply. The site offers a wide range of activities for inhabitants with interests such as walking, observing nature and meditating.

The indoor environments are designed to meet all the daily needs of inhabitants while the natural materials used for both structure and interior furnishings improve their wellbeing and health, enabling them to perform a variety of activities in complete harmony with the outside world and themselves.

**Future research developments**

The Strambinello project has been designed so as to translate each single regenerative factor into an environmental characteristic. The expectation is that the home will be perceived as pleasant and regenerative by the people who live there. In order to verify this hypothesis, the inhabitants will be asked to produce Connectedness to Nature Scales (CNS). Since biophilic design starts with our relationship with Nature, the CNS help us to evaluate people's bond with Nature. This tool was developed during design (CNS at design stage) and the initial outcome reveals a good level connection with Nature. The inhabitants showed a medium-high average of scores, corresponding to sensitive to ecological issues. CNS is a stable trait in adults and should not change from place to place. However, we expect that people who are living in a regenerative environment will strengthen their bond with Nature. This can be evaluated by CNS at post occupancy stage. The next step will be to compare, after two years, the CNSs at design stage with CNS at post occupancy stage. CNS results are expected to increase.

A second study concerns the customers perceived restorativeness and after two years we will administer the *Perceived Restorativeness Scale* to the customers. The scale is based on ART (Kaplan, 1995), consists of 17 items in a Likert-10 scale, and the restorative value of an environment is given by the average of the scores for each item (Purcell, Peron & Berto, 2001).

If the Strambinello project has been successfully developed by following ART, the PRS score will

be high. We expect that inhabitants will acquire a greater awareness of their needs and increase their affiliation with Nature through living in a restorative environment (Berto, Pasini & Barbiero, 2015). The project is intended as a first step towards a biophilic design intended for daily living. Reconciling architecture with Nature by integrating natural elements should increase the perception of restorativeness as well as raise the aesthetic value of the environment (Kellert 2012).

**Conclusions**

Biophilic design could play an important role in contemporary western society where people are often overwhelmed by a wide variety and large amount of sensory information (Lipowski, 1970), which can cognitively overload their limited processing capacity (Berto, 2014). To prevent this, modern urban environments should be more "cognitively sustainable", and to this end psychological restoration can play a role in coping with mental fatigue (Berto, 2011). Architecture should take into consideration both environmental and cognitive sustainability. Sustainable architecture is currently focusing its attention on the building energy performance to certify the parameters of residential comfort. Biophilic design encompasses and goes beyond this concept, by involving the inhabitants' cognitive wellbeing. The Strambinello project embodies the necessary energy and restorative factors and is intended as an example of advanced biophilic design that can be subjected to scientific verification.

NOTE: This paper is the result of a research project developed for the degree theses of Roxana Georgiana Marian and Giulia Nota (2017), coordinated by the tutors Professor Guido Callegari and Dr. Giuseppe Barbiero at the Politecnico di Torino, as part of the Master in Architecture for Sustainable Design program. The thesis experimentally applied the scientific protocol of Biophilic Design drawn up by Dr. Giuseppe Barbiero and Dr. Rita Berto, from the Università della Valle d'Aosta, to an architectural case study with low environmental impact designed by the company Be-eco, a spin-off from the Politecnico di Torino, founded by Professor Guido Callegari. In the light of the various contributions to the work, the authors are listed in reverse alphabetical order.

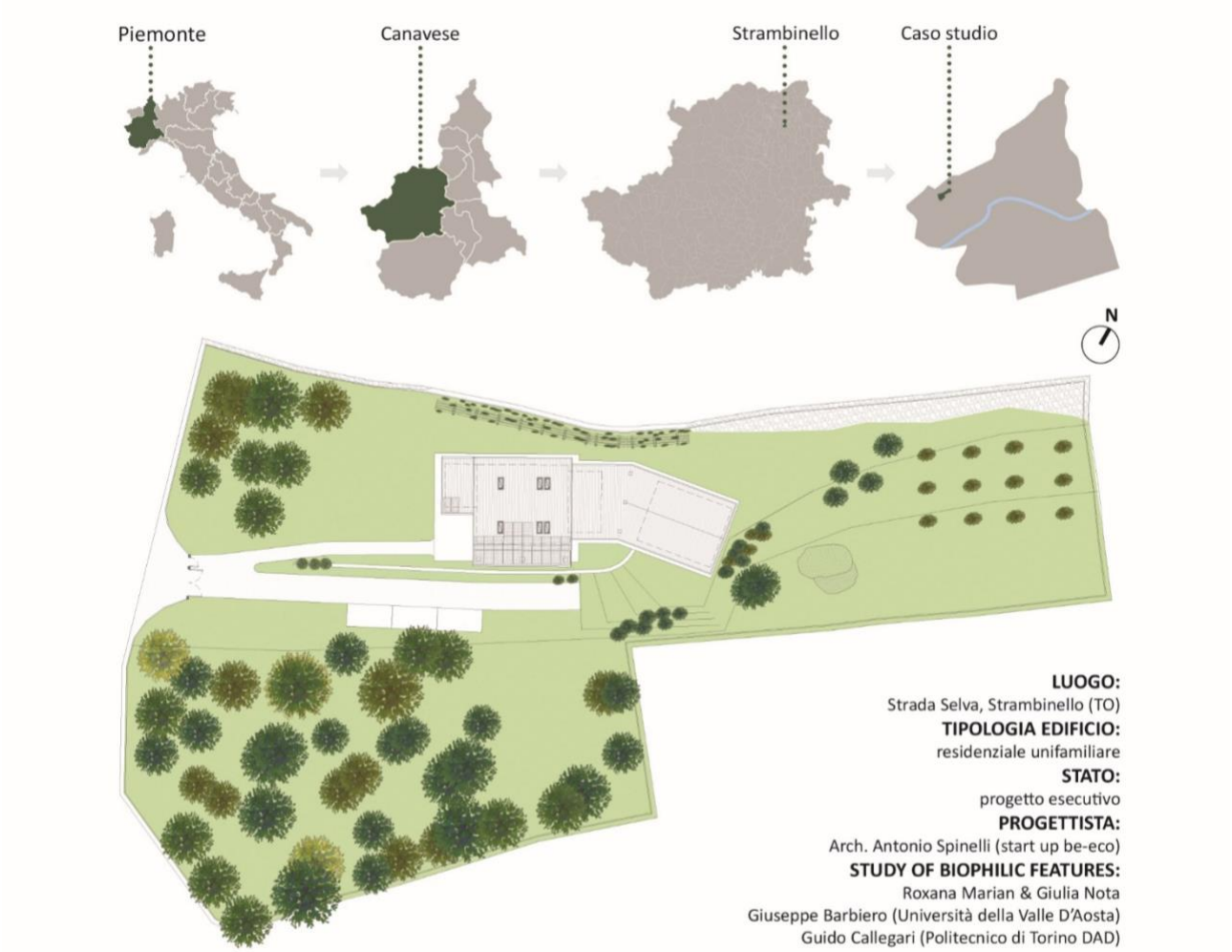


Figure 1: The Strambinello Project.

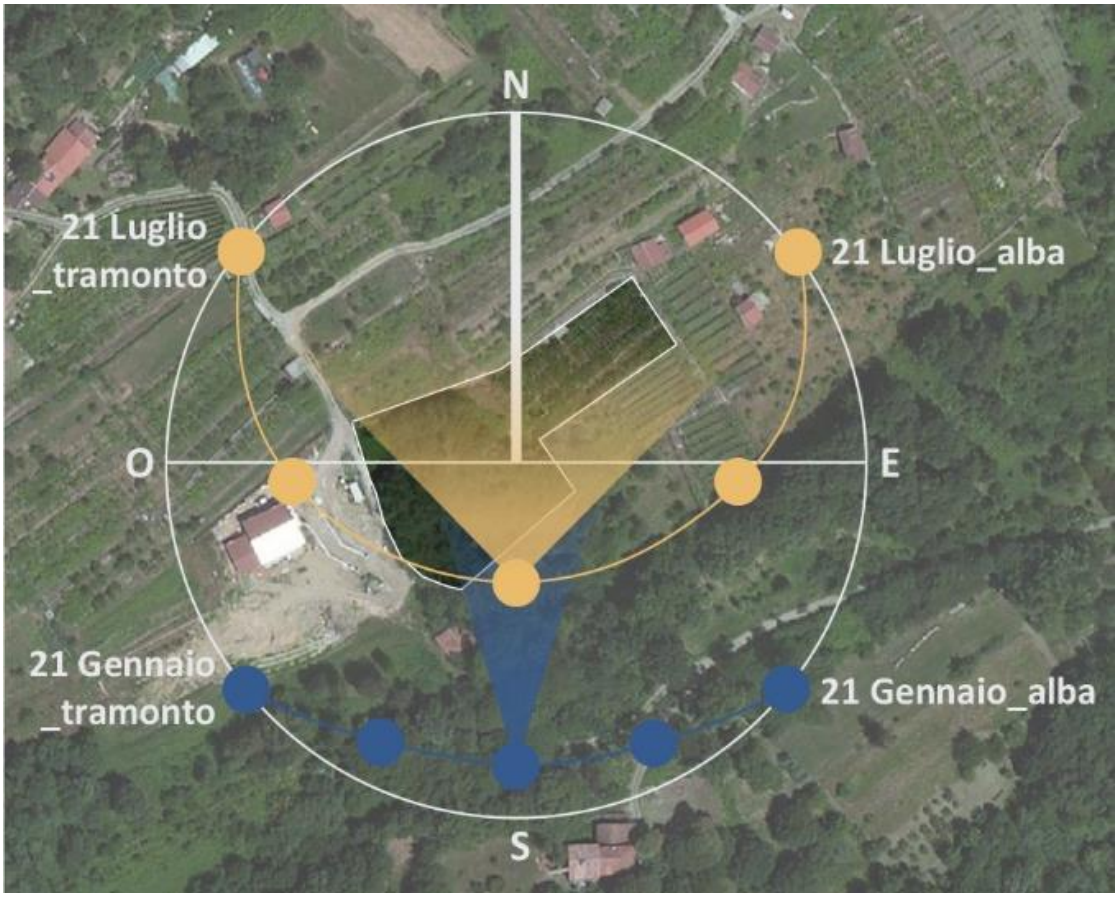


Figure 2. Solar path elaborated by R. G. Marian & G. Nota
(Image source: https://www.bing.com/maps)

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# Environmental Security and Sustainability of Community Resources in Nigeria. Promoting Community Participation through Adult Environmental Education.

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**Abstract.**

This paper examines the question of how daily human activities have created environmental insecurity and the implications for the sustainability of community resources in Nigeria. Particular reference is made to examples in Rivers State and Ebonyi State. Through its different agencies working at state and local levels the government has started to introduce various measures to monitor the effects of human activities on the environment and resources in the state. In this respect, we discuss the introduction of adult environmental education programmes for environmental sustainability and security. When adults receive adequate information through awareness-raising activities, we consider how they can be equipped with the necessary knowledge and skills to manage the environment in a sustainable manner and prevent environmental insecurity.

**Key words.** environmental insecurity · community resources · sustainability · community participation · adult environmental education · environmental security awareness

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**Introduction**

Development in any community setting involves all sectors - social, economic, political and cultural - of the life of the community. Major determining factors of that development are the availability and sustainability of abundant material and human resources present within the environment of the community. Sustainable use of the available resources is dependent upon the level of consciousness within the community concerning the different measures necessary for guaranteeing environmental security and which the community itself can adopt. In recent decades, many community resources have been partially or totally depleted due to unsustainable ways in which they have been utilized, thereby creating environmental insecurity. When the environment of a community is insecure because of unavailability of resources, the life of the inhabitants will be at risk and this will in turn affect environmental security on a large scale that goes beyond the single community. In order to achieve environmental security, human beings that utilize the resources for their own developmental activities must be educated about the dangers their activities can pose to the environment and about the appropriate ways in which they should use these resources in order to maintain community sustainability. What follows is a discussion of issues concerning how to render community resources secure through adult environmental education and security awareness programmes.

**A community and its environmental resources**

A community can be defined as a group of people living together with a common interest and who are attached in various ways to their place of residence. In their working document, the sub-committee of the *Welfare Advisory Council for Black Communities* in South Africa (1993) defined a community as a collection of people living within a geographical bounded area, who have a physical tie with their place of residence and socially interact with each other. In addition, Ross (in Midgely, 1995) considers a community as a group of people with a common culture, religion, education and other features. Ferinho (1980) offers a broad definition of community which includes characteristics such as a way of life, defined by a set of common values and interests upon which institutions are developed and with which residents identify themselves (cultural approach); a network of social interaction with which people relate to one another (social approach); a place from which human populations receive the energy they need to live and survive (ecological approach).

In this paper, a community is considered as a collective number of people who live in the same environment which in turn provides them with the human and material resources which they depend upon for survival, who share same cultural values, human needs and social interests. Moreover, a community is characterized by different kinds of natural resources which the community members depend on for their developmental activities.

Communities in Nigeria have long enjoyed plentiful natural resources necessary for the sustenance of their members. Today, however, in many communities these resources have been totally depleted due to ways in people utilize them for satisfying their present needs without considering the availability of the same resources in the future. The unsustainability of community resource exploitation has already rendered current new generations unable to access many natural resources present in their communities up to 20 or 30 years ago, including forest and water resources as well as various parts of a rich cultural heritage.

**The growth of environmental insecurity in Nigeria**

The issue of community environmental insecurity is related to those negative environmental outcomes that occur naturally or are mainly caused by humans' interaction with the environment. Such outcomes affect the security and sustainability of environmental resources. Promoting environmental security is concerned with safety measures adopted in

order to avert possible dangers which result from natural events or human activities that pose threats to the environment and all its associated resources and can also be referred to as freedom from the risk of loss or damage to environment. Key elements of environmental security as outlined by King (2000) are public safety from environmental dangers caused by natural or human processes due to factors such as ignorance, mismanagement and misuse; amelioration of natural resource scarcity; maintenance of a healthy environment; amelioration of environmental degradation; prevention of social disorder and conflict and the promotion of social stability.

In Nigeria, the threat to the environment was not widely considered as a national issue until the incident that occurred in Koko in 1998, where toxic waste threatened the lives and properties of the inhabitants of that village. This incident led to environmental issues becoming a priority at national level and the establishment of the Environmental Protection Agency (FEPA). However, despite the efforts, numerous threats to the environment occur daily as a result of human activities. The Report of the *Vision 2010 Committee* (Fagbohun, 2010) classified three types of threat to the Nigerian environment. *Internal threats* can be defined as those that affect a nation's domestic tranquillity, health or prosperity. *External threats* include international and transnational entities or actions that threaten a nation's interests such as free trade, commerce, diplomacy and national safety. *Immediate threats* are those (mostly physical) that pose an immediate danger to the population's wellbeing or livelihood.

Fagbohun further established that Nigeria's environment is faced with many problems across the length and breadth of the country. These include population pressure and the continuous exploitation of marginal lands, aggravating the process of drought and desertification in the north; severe gully erosion in Eastern and Northern states together with coastal and marine erosion, and land subsidence in coastal and riverine states; flooding in the low-lying belt of mangrove and fresh swamps along the coast, the plains of large rivers and short-lived flash floods in the inland river; uncontrolled logging, with inherent problems of the destruction of bio-diversity,

together with the destruction of vast agricultural lands and inappropriate agricultural practices; destruction of watersheds and soil-crust formation caused by loss of water; creation of burrow pits associated with bad mining practices and road works; oil pollution from spillage and gas flaring related problems; urban decay and squatter settlements; industrial pollution and municipal waste generation; climate change and ozone depletion.

Moreover, all states in Nigeria experience two categories of environmental problems that causes insecurity in the environment. These environmental threats are classified by Bowonder (1987) as problems caused either by underdevelopment, which includes lack of a protected water supply, unhygienic equation settlement (mostly on the water front) and deforestation, or by activities aimed at economic development which include water logging from irrigation projects and individual pollution.

**The examples of Rivers State and Ebonyi State**

Some of the principal resources that are found in communities in Rivers State include forest resources, water resources, crude oil and land. All these components of the environment have been threatened by human developmental activities, thereby causing widespread environmental insecurity. Some of the environmental insecurity issues that affect community resources are:

1. Population Increase. Most of the urban cities and towns in Nigeria such as Rivers State have experienced influxes of people from different parts of the world who, through their developmental activities, contribute to the degradation of environmental resources. They also exploit the marginal land for shelter and economic purposes, ignoring any

negative impact this has on the environment of the community.

2. Deforestation. Uncontrolled felling of trees and the consequent depletion of forest resources also pose a great threat to the environment and the inhabitants of the community. This leads to desertification, contributes to an increase in temperature and the depletion of ozone layer which causes generalized climate change. According to Eheazu (2016), deforestation occurs in the quest for firewood and for land for agricultural and other developmental purposes in response to population increase linked to urbanization, estate development, road construction and other related developments. He further shows how deforestation leads to disequilibrium in biodiversity through the destruction of wild life involving various kinds of flora and other living organisms. In Rivers State, the mangrove is continually disappearing due to expanding economic activities in the riverine areas. Trees are being felled for various reasons such as farming and the building of houses to accommodate the increasing populations.
3. Flooding. According to Okorie (2016), flooding in Nigeria is basically caused by human interaction with the environment. This interaction stems from such factors such as urbanization, technology development, deforestation, agricultural activities, improper waste disposal and blockage of canals. Rivers State was among the many states in Nigeria that were hit by the 2012 floods and large numbers of residents were trapped, rendered homeless or lost their lives during the period of their displacement.
4. Erosion. Land and water resources are depleted daily due to gully and marine erosion. Gully erosion is on the increase due to human activities in the environment. In Rivers State, there is an increase in marine erosion due to the disappearance of mangrove as well as dredging activities. The high risks associated with dredging activities have contributed to marine erosion and the displacement of people living along the coastal areas.
5. Creation of burrow pits. Artificial burrow pits created by construction activities also create danger and insecurity for the environment of host communities. Some of these burrow pits have grown to become large ponds which pose a threat to the lives and property of people living within the vicinity.
6. Inappropriate agricultural practices. In Rivers State, crop and fish farming are the basic farming activities practiced. Recently other farming activities such as poultry, piggery, and snail rearing are scattered in some parts of the state. Some of the methods used by the farmers are aggressive practices that pose a threat to the environment and the associated resources.

The particular problems facing Ebonyi State derive from the fact that many resources that formed part of the cultural heritage that was a mainstay of the indigenous economic life are no longer available, due to unsustainable use of the resources which derives from a lack of environmental education among the community members. Such resources include exploiting salt lakes in Uburu and Okposi, pottery using clay in Ishiagu and Uburu, quarrying in Amasiri, Afikpo, Abomege, and many others. Some of these resources have served as main source of income in particular to women in the communities where they are found.

The Okposi and Uburu communities have long been well known for salt making. These communities have been characterized by the presence of salt lakes called “Nmahi” from which women fetched salt water from the lake and boiled it so as to produce salt. Today, however, the lakes are gradually drying up because of negligence and the unsustainable way in which they have been managed. Even during the civil war in the late 1960s Uburu and Okposi were known for their salt trade and the rich proceedings these furnished for the people in these areas, but today a once thriving trade in

these communities has ceased.

A special type of clay used for moulding characteristic local pots, saucepans, vases, plates and many other objects was once abundant in the Ishiagu and Uburu communities. This unique cultural heritage served as an income-generating resource for the local people until very recently. Today these types of pot have disappeared from homes and the present generation are indeed even unaware of their existence.

Abundant quarry resources present in communities throughout Ebonyi State have also been exploited by both men and women on a daily basis without consideration for their sustainability. There has been a lack of awareness of how, for community-based resources to be preserved so that future generations can benefit from them, current users must practice sustainable ways of utilizing such resources. As Hornby (in Okorie, 2016) asserts, sustainability of community resources is a process whereby these can replenish themselves and continue to be used for a long time. Thus, building awareness of the need for conservation and preservation of the natural environment is essential for maintaining community sustainability.

**The effects of environmental insecurity on the community**

The effects of environmental insecurity on the community can be seen through the extent of environmental degradation resulting from human interactions with the environment. Natural habitats are destroyed or rendered unusable through pollution or contamination or when natural resources are misused, over-used, made scarce and eventually depleted (Fagbohun, 2010).

These types of situation are both a threat to the environment in general and lead to deprivation of basic resources such as water, food and the quality of the air upon which the community members depend for their survival within the environment. Numerous manifestations of environmental degradation such as climate change, the increase in atmospheric heat, desertification, drought, the contamination of water and its sources, the loss of land nutrients, acid rainfall, the loss of biodiversity, the outbreak of diseases and various other connected health problems put at risk the bonds between members of the community. For example, as in the case of climate change, the impact of global warming and persistent drought and desertification has been identified as the primary cause of reduction of the inflow of water into the Lake Chad, causing the shrinking of the lake and resulting in conflicts between the people living along its borders. The shrinking of the lake has led to reduction of land available for cultivation and this has contributed to food insecurity and reduction of land for grazing. The environmental insecurity caused by the shrinking of lake inevitable brings about conflict between shepherds, farmers and fishermen.

**Environmental security strategy**

Promoting environmental security requires the adoption of effective measures to respond to various issues that pose threats to the environment and thereby create insecurity. Environmental security thus refers to the protection of ecosystems. Some of the components of Environmental Security Strategy as outlined by Vest (1997) consist of:

1. Restoration. Restoration processes as environmental security strategy involves prompt identification of environmental threats, evaluation of the extent of threat, and designing measures of containment, treatment, and/or removal of contamination so that it no longer poses a threat to public health and the environment.
2. Compliance. This entails following applicable statutory guidelines toward management of environmental issues. There are different environmental policies that are formulated to guide the use and management of environmental resources that need to be followed when interacting with environmental resources and serve as guidance for maintaining the security of environmental resources.

3. Conservation. Environmental conservation should be the primary concern of mankind and involves planned management, use, and protection of environmental resources, sustainable use of environmental resources for the benefit of present and future generations, and prevention of over-exploitation and consequent destruction.
4. Pollution prevention. Environmental pollution of any form, be it land, water or air, poses a serious threat to the community and its resources. The degradation caused by pollution contributes to insecurity in terms of lives and other environmental resources. Pollutants such as oil spillage, waste (household or industrial waste), gas flaring, and many others, are dangerous both to human beings and the ecosystem at large. Prevention control measures need to be adequately put in place to avoid the occurrence of pollution and related environmental insecurity problems.
5. Safety. Different kinds of safety measures should be put in place to mitigate the threats to the environment. These mitigating measures also require the training of personnel to educate people about the processes underlying environmental insecurity.

**Promoting the sustainability of community resources for environmental security**

The sustainability of community resources is the process by which community resources can continue to be used and be available over a long time. As Arokoyu (2004:19) puts it:

> Sustainability is a new form of development perspective which integrates the production process with resources conservation and environmental enhancement; it should meet the need of the present without compromising our ability to meet those of the future. It recommended that there should be a break away from the past pattern of development and seeks security through change, reduce risk to survive and put future development on the paths that are sustainable.

According to Perman et al. (in Arokoyu, 2004:21) the sustainability of community resources for environmental security can be seen in terms of six broad concepts. A sustainable community is one in which utility (for consumption) is non-declining through time; resources are managed so as to maintain production opportunities for the future; natural capital stock is non-declining through time; resources are managed so as to maintain a sustainable yield of resource services; minimum conditions for maintaining the ecosystem are satisfied; there is stability and resilience through time;

there is a capacity for consensus building. Thus, for community resources to be beneficial to present and future generations of the community, the various resources that are peculiar to that community should be secured through maintaining a process of environmental sustainability and this will create the basis for community environmental security. In order to achieve this, it is necessary to provide environmental education programmes for the members of the community in order to promote learning outcomes such as awareness of and sensitivity to the environment and environmental challenges; an attitude of concern for the environment and motivation to improve or maintain environmental quality, the skills necessary to identify and help resolve environmental challenges; participation in activities that lead to the resolution of environmental challenges (UNESCO, 1978a). In this respect, Rivers State offers an example of how the Ministry of the Environment, together with organizations such as the Environmental Sanitation and Management Agency, the Waste Management Agency and the Sustainable Development Agency, are all working on educational programmes to promote environmental awareness; to check on people's actions in terms of harming or maintaining the environment; to create incentives for a sustainable use of resources.

**Adult environmental education and environmental security awareness**

Environmental education is thus a learning process that increases people's knowledge and awareness about the environment and its associated challenges, develops the necessary skills and expertise to address the challenge, and fosters the necessary attitude, motivation and commitments to make informed decisions and take responsible action (UNESCO, in Ifoni,2013). Furthermore, Nag and Vizayakumar (2005) observed that the objectives of environmental education are based on three domains of learning which are cognitive, affective and psychomotor domains. In each of these domains of learning, the learner should achieve the following objectives.

Within the cognitive domain the learner acquires knowledge of biotic and abiotic factors and components of the environment; understands unchecked population growth and its significance for the socio-economic development of the country; is able to check unplanned resources utilization in the environment; diagnoses the different causes of environmental pollution and envisages remedial measures; diagnoses the causes of social tension and develop methods for avoiding them.

Within the affective domain the learner should acquire an interest in the flora and fauna of the locality and other more distant areas; know community inhabitants and understand their problems; value equality, justice and truth; respect the national boundaries of all countries.

Within the psychomotor domain, the learner should actively participate in programming for reforestation, minimizing air, water, soil and noise pollution, preventing food adulteration and contribute to rural and urban developments such as solar heaters and solar gas plants.

Of particular importance is showing how environmental security is dependent on public awareness of those activities that pose threats to the environment. Somanathan (2010) argues that if people are not aware of environmental risks, they will be less willing to bear the cost of reducing them. Adding to this, Okorie (2015) affirms that every citizen has a role to play in the task of protecting the environment since we all in one way or the other contribute to the deterioration of our environment. The knowledge built through environmental security awareness programmes can lead to significant changes in people's values, attitudes, skills and behaviour. Programmes and topics dealt with include waste prevention awareness, water conservation awareness, pollution awareness, biodiversity awareness and climate change awareness.

**Perspectives on community participation in sustainability of community resources.**

Education for community participation in sustainability of its community-based resources aims to empower the community members through developing participation skills that will lead to change in their perception of management, use and ownership of resources (UN Agenda 21, 1992:320):

> … there is still a considerable lack of awareness of the interrelated nature of all human activities and the environment, due to inaccurate or insufficient information … there is a need to increase public sensitivity to environment and development problems by involving them in activities that will bring about solutions to identified environmental issues … participating in these activities will foster a sense of personal environmental responsibility and greater motivation and commitment towards sustainable development.

Community participation in sustainability of community resources is thus a process that involves joint effort on the part of all members of a community. When community members are integrated into processes that will promote sustainability of resources in their community, they will be willing to effectively participate in those processes. According to White (1981), the depth of participation is the extent to which all members of the community are involved in all aspects of a project. Slocum and Thomas-Slayter (1995) emphasize that participation is a process

of empowerment that helps to amplify traditionally unacknowledged voices, strengthen the confidence of all members of a group in the knowledge and capacity of each, and can also foster the ability to question and contribute to both local and international systems of knowledge. They argue that participation involves consciousness-raising, a shared understanding of problems and a vision for the future that leads to commitment and ownership by the community. In this respect, Musch, (2001) proposes a ladder of participation, which involves the community being in control, jointly managing, being consulted, informed, persuaded and not excluded or coerced in all activities that will lead to the sustainability of their community resources.

Benavides (1992:43) argues that environmental adult education must be a process that enables human beings and societies to "reach their fullest potential in order that they might live in harmony among themselves and in nature"; empowers all who participate in the learning process, learners and educators; creates interest and motivation by helping people to feel ownership and also a sense that collectively they can make change (LEAP/Ecologic, 1994).

Empowerment comes when "communities seize the right to manage their immediate environments through open and democratic institutions, that this is community environmental democracy". Clover (1999), asserts that environmental adult education is empowering when it teaches people how to be leaders in their own homes and neighbourhoods as contain in ASPBAE, (1993); strengthens women's "contribution to environmental conservation" (Tabiedi. 2000); moves people towards self-reliance - not just financial self-reliance, but self-reliance in skills, knowledge, information - so that dependence on others on the outside is reduced.

For Grossi, (1999), empowering people in the context of environmental adult education must be education that help people to 'learn how to learn', to take risks and use their imaginations and creativity to make a change. ASPBAE (1995:6), observes that:

> environmental adult education to empower people can be realised only when and where local communities are free to participate, think, discuss, be critical, organise and implement solutions they see fit to address these environmental problems and the other issues that confront them.

Tilbury (2004:107) proposes a view of structured community-based learning programmes that empower those involved, promote lifelong learning and promote the ability of the community to influence, share and/or control the decision-making process. She also argues that this is much more influential than classroom approaches to environmental education. In the same way, Guevara (2000) argues that adult environmental education is empowering and transformative when it helps people to believe in their capacity to change themselves, their community and their environment.

**Approaches to Adult Environmental Education for Promoting Community Participation in Sustainability of Community Resources**

In order to be empowering and transformative, environmental adult education needs to be based on certain types of approaches to human learning.

*Interactive and practical*

Interactive and practical approaches enable people to learn more by doing and that process of practicing can be an avenue for others to learn. Adult learners have a wealth of experiences that educators can tap into in the process of facilitating learning (ASPBAE in Clover (1999). Environmental adult educators should make provision for discussion during their meetings with their target audience. Rendael and Mason (in ASPBAE, 1995) contend that knowledge-based education is not enough to change behaviour, that even those with conservation-oriented attitudes do not necessarily translate into conserving behaviour but can be encouraged and assisted to change through interaction.

*Participatory and experiential*

According to Taylor (1995), a participatory and experiential approach to environmental adult education engages educators, students and community members in a process that not only addresses environmental needs but also legitimates the role of the individual to be critically conscious and be an active participant in the shaping of his or her own reality. Ibikunle-Johnson (1989) argue that people's environmental awareness, knowledge, attitudes and perceptions can be better understood through a participatory approach and these grassroots attributes mobilised and transformed skills for effective environmental management. Ibikunle-Johnson and Rugurnayo, (1987), assert that participatory approaches are framed in terms of hands-on approaches that go beyond merely critique' towards individual and, more importantly, collective action.

*Action oriented*

According to Ibikunle and Rugurnayo (in Clover, 1999), adult education must ultimately be 'gains and solutions' oriented. Orr (1992) observes that in the reciprocity between thinking and doing, knowledge loses much of its abstractness and becomes its application to specific places and problems, tangible and direct. Orr (in Clover, 1999), further asserts that in terms of actions, adult environmental education must also recognize the plethora of forms of action that exist, that taking action does not always have to be 'doing something' but also entails decision making, revising a particular point of view, posing a new problem or question or reframing a structure of meaning.

*Freirian strategy or dialogic method of problem solving*

Usang in UNESCO (1992), suggested that adult environmental education should be based on Freirian Strategy or dialogic method of problem-solving, through critical thinking and reflection in a shared process of non-directed learning. This approach will promote in adults the ability to question the condition of their environment and to seek for answers to the questions raised. Usang (in UNESCO, 1992), also explains that when people begin to ask questions about the conditions of their environment, that they will develop a change of attitude and be encouraged to rethink ways of acting and work towards challenging and changing external processes that impact on them.

*Feminist approach*

According to Clover (1999), a feminist approach to adult environmental education will promote ideas of teaching based on responsibility, protection, nurturing, caring and training. It emphasizes how we need to orient our education practices towards sustaining life, rather than generating profits. She asserts that as feminist adult educators we learn that consciousness-raising is simply not enough, that consciousness-raising must be combined with active participation so that people not only understand their society, but are willing to participate in efforts to sustain the environment and its associated resources.

**Conclusions**

Our intention in this paper has been to analyse reasons for an increasing level of environmental insecurity in Nigerian communities and to consider how this issue can be addressed through adult education environmental awareness programmes. In many cases, community-based resources have either been abandoned or not properly maintained and their income-yielding capacity neglected or severely depleted. Largely this is because community members have diverted to alternative sources or failed to utilize their resources in a sustainable way. To bring about a change and move towards environmental security, it is necessary to create new educational pathways based on empowering and transformative approaches that enable community members to understand how their activities and their environment are interrelated and learn how to practice sustainable uses of their resources.

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