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The ripple effect: Institutionalising pro-environmental values to shift societal norms and behaviours

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Abstract

Contemporary markets and societal norms externalise many ecosystem services important for a sustainable future. A range of external legal, market, social protocol and other mechanisms, referred to as 'societal levers', constrain or otherwise influence the behaviour of resource managers, and the expectations and assumptions of the society within which they operate. These 'societal levers' have progressively institutionalised evolving societal values, influencing markets and other choices. We use the STEEP (social, technological, economic, environmental and political) framework to explore case studies of societal transitions, analysing how emergent concerns become shared and ultimately transformed into 'levers', shifting societal norms. Emerging concerns become influential only when they are shared across societal sectors, and when broader implications are realised across multiple dimensions of the STEEP framework. We propose and advocate use of a 'ripple effect' of values as a means to direct and accelerate the pace at which environmental concerns shape mainstream societal norms and structures, and become institutionalised in the form of 'societal levers'.

Keywords

Shared values, Social learning, Transformation, Ecosystem services, Ecosystem approach, STEEP

1. Introduction

In the industrialised world, and increasingly in cultures influenced by it through globalisation, capitalist markets have become the dominant means by which humanity appropriates and converts resources to serve its needs and wants (Gilpin, 2001). Capitalist exploitation of resources is a more globally pervasive ideology than any religious or political doctrine (Porritt, 2005). This paper does not set out to critique the rights and wrongs of the market, but observes that the market on its own is unable to generate an ethical framework that accords with long-term sustainability. Some commentators regard the market as an efficient means to maximise wellbeing by bringing together people's self-interest (Sullivan and Sheffrin, 2003), or suggest that human nature will imbue the market with an inherent instinct for "self-creating" stability (Fukuyama, 2012). Others however, consider that the market requires 'moral governance' to guide it (Buchanan and Tullock, 1962). The values that are incorporated into markets reflect a legacy of societal choices, albeit that the subset of values that it internalises have tended to reflect those related to short-term wealth generation rather than the long-term integrity, equity and resilience of supportive ecosystems. Wealth creation activities have consequently resulted in a broad range of externalities through overexploiting and consequently eroding elements of natural,

human and social capital (Millennium Ecosystem Assessment, 2005). External mechanisms are therefore necessary to progressively internalise emergent societal values into the market and other drivers of mainstream societal norms. We refer to these mechanisms as 'societal levers' (or 'levers'), reflecting their action as external forces to shift institutions that are typically imbued with substantial inertia.

Society has instituted a range of such 'levers' to constrain market-dominated and other power-based freedoms as a means to embed wider societal values. Leopold (1949) identified acceptance of "…limitation on freedom of action in the struggle for existence…" as the basis of ethics, relating both to wider society and ultimately to the ecosystems that support it. For example, Leopold (1949) relates the tale of "god-like Odysseus" who, on return from the wars in Troy, "…hanged all on one rope a dozen slave-girls of his household whom he suspected of misbehaviour during his absence". Leopold noted that concepts of right and wrong were not lacking from Odysseus' Greece, but the ethical structure at the time "…covered wives, but had not yet been extended to human chattels". From this initial observation, Leopold explores how ethical frameworks have expanded to encompass wider dimensions of humanity, reflecting that "…the individual is a member of a community of interdependent parts", culminating in his call for a 'land ethic' (addressed below when considering environmental transitions).

Levers influencing the ethical evolution of society include 'hard' regulation, a range of statutory and 'near-statutory' protocols, an evolving body of common law (and related civil law in other jurisdictions), markets and interventions in them, various market-based instruments, and a variety of cultural values, norms and beliefs including taboos, rituals and consensus views (Everard, 2011; Everard et al., 2014; Kenter et al., 2011; Raymond and Kenter, 2016 in this issue; Cooper et al., 2016). These levers can in turn influence each other. For example, changes in cultural attitudes and values may influence market behaviour through customer choice, with businesses voluntarily deselecting perceived problematic substances or practices from their supply chains and creating differentiated markets for sustainably- and ethically-sourced forest, marine fishery and other products (Everard, 2009). Also, various forms of wildlife- and water-sensitive farming can shift from individually selected voluntary actions to public incentives and/or statutory obligations (Everard et al., 2014).

Emerging public concerns can also result in aspirations expressed in international protocols that then become transposed into national legislation and incentives. Everard and Appleby (2009) review significant progress made throughout the twentieth century in internalising ecosystem services into society. They describe a transition in the UK and much of the then developed world at the start of the century, when, as the common saying put it, "An Englishman's home is his castle", reflecting that property rights implied relatively unconstrained rights to use land as the owner desired. By the close of the twentieth century, the freedom of action of landowners was substantially constrained by a linked set of 'levers' that included a body of environmental, employment and other legislation at scales from international obligations to local by-laws, growing common case law relating to the impacts of resource use on other people, incentives to manage the land in certain culturally-preferred ways, novel markets such as biofuel and feedstock crop production partly displacing dependence on fossil resources, catchment management strategies

favouring water-sensitive land uses, measures to secure public access, and a range of other changes including value chain pressures feeding back to producers and other market and market-based instruments. Though not explicitly using this language, many of these changes relate to what we now term ecosystem services, such as flood and air quality regulation, aesthetic, amenity and recreational value, habitat for wildlife and nutrient cycling processes.
All of these broader-scale outcomes, many of them externalised from governance, have consequences for a diversity of human stakeholders both now and into the future. Progress over the century has occurred beyond the span of an average human life, and so may have been less obvious to those living through it. However, the telescope of history reveals a broad and profound change in values that is in fact very rapid in historical terms (Everard, 2016), recognising and institutionalising the value of publicly-beneficial ecosystem services 'produced' by environmental resources regardless of their status as private 'property'.

Thus, ethical considerations have switched paradigms from the largely uncontested rights of resource owners towards the rights of those in receipt of a range of services provided by ecosystems, ranging from those that impinge directly upon biophysical health (such as air quality impacts) and other services that relate to deeper bequest, existence and other forms of value (such as conservation of nature, heritage and sacred sites; also see Cooper et al., 2016; Fish et al., 2016 in this issue). This has, of course, hardly been a complete or irreversible evolution, as is exemplified by increasingly globalised supply chains regularly exposed by the media as complicit in promoting resource overexploitation, harmful pollution and child and 'sweatshop' labour. However, a net expansion of the 'ethical envelope' (as described by Leopold (1949)) is clearly discernable with the benefit of hindsight, expanding from self-centred considerations to progressively include the local community, and eventually recognise regional, national, supranational and global kinship and responsibilities. This revolution has been formed by a process of awareness, collectivisation and progressive institutionalisation of concerns about the environment and facets of human interest upon which it impinges. This paper uses the STEEP framework to systematically analyse a range of examples of Social, Technological, Environmental, Economic and Political transformations from around the world, and through history, to explore the means by which collective value systems evolve and how they become progressively institutionalised into shared value systems. Based on this analysis, a conceptual model is proposed for the accelerated institutionalisation of emergent environmental concerns in mainstream societal norms and structures.

2. Conceptual framework

Internalisation of new views into pan-cultural shared values and norms is by its nature a complex, multi-dimensional process. For this reason, the STEEP (Social, Technological, Economic, Environmental, Political) framework is used to organise and characterise different initiatives in the context of the macro socio-environmental environment. There are varieties of this framework with more or less factors, including PEST (without the Environment component as it is for exploring wider ramifications of environmental issues) (Aguilar, 1967), and also PESTEL/PESTLE and SLEPT (with Legal included) (Rothaermel, 2012) and STEER (including Regulatory). Our selection of STEEP is based on the importance of the Political

dimension in addressing broader governance issues (involving both formal and informal institutions), rather than solely focussing on the legal and regulatory remit of government. The STEEP knowledge management framework was developed initially to assess global change issues supporting long-range business planning (Morrison and Wilson, 1996). However, it has also been applied to analyse the interconnectedness of different domains of human activity and their interplay with regard to meeting the goals of sustainability (Steward and Kuska, 2011). Everard et al. (2012) and Everard (2013 and 2015a) found STEEP-based analysis valuable for understanding the systemic relationships between constituent parameters in analyses of water, ecosystem service flows and dependent development issues in South Africa, Europe and India, particularly in relation to appropriate technology deployment and associated governance systems making water and its associated ecosystem services available for people and economic uses.

As an analytical tool, STEEP builds on a rich and growing body of theory, notably literature on transitions management and sociotechnical systems (Rotmans et al., 2000; Kemp and Rotmans, 2005; Kemp et al., 2007; Geels, 2004), and literature on behaviour change and pro-environmental behaviour. The socio-technical systems literature conceptualises environmental values, and the rules, technologies and behaviours through which they are enacted, as innovations. The emergence and institutionalisation of environmental values then, is a process of co-production, practical application and diffusion of innovations by social actors. This co-production is coordinated through institutions in safe places where new ideas can be tested and refined ('niches'). When widely adopted (often in response to some sort of trigger or problem), innovations based on these environmental values have the capacity to disrupt stable societal structures and norms (the 'socio-technical regime'), so that society can transition to a new way of doing things (e.g. from fossil fuel to renewable energy systems). In parallel with this literature, there is a rapidly growing body of theory linking individual and societal values to behaviours. In particular, a 'value-action' gap is widely reported between awareness and attitudes towards the environment and their limited behavioural responses to environmental challenges (Blake, 1999; Raymond and Kenter, 2016). A number of explanations have been proposed for this gap between people's values and their actions:

- Early information deficit models that assumed increased knowledge of environmental issues would lead to increased environmental awareness and concern (environmental attitudes), which in turn would lead to pro-environmental behaviour (Burgess et al., 1998);
- The Theory of Reasoned Action and Theory of Planned Behaviour (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980) suggests that attitudes do not determine behaviour directly. Instead, attitudes and social norms influence behavioural intentions, which in turn determine actions, and thus "…the ultimate determinants of any behaviour are the behavioural beliefs concerning its consequences and normative beliefs concerning the prescriptions of others" (Ajzen and Fishbein, 1980, p. 239; for examples of application in this issue see Kenter et al., 2016a and Raymond and Kenter, 2016));
- The Model of Responsible Environmental Behaviour suggests that responsible, pro-environmental behaviour is associated with: i) knowledge of the environmental issue and its causes; ii) knowledge of practical strategies that

could lower the person's impact on the environmental problem; iii) a perception that the individual has the ability to bring about change through their own behaviour; iv) strong pro-environmental attitudes; v) verbal commitment to take action; vi) a sense of personal responsibility towards the environment (Hines et al., 1986–87; Hungerford and Volk, 1990; Sia et al., 1985–86);

- Values, Beliefs and Norms theory suggests that individual choices about pro-environmental behaviours are driven by personal norms (e.g. internalised ways of acting that the individual feels obliged to maintain to avoid negative consequences) and personal values (e.g. altruistic versus egoistic values) drive environmental beliefs (Stern, 2000; for examples of application in this issue see Kenter, 2016b; Kenter et al., 2016a; Raymond and Kenter, 2016));
- The social dilemma system model suggests that social dilemmas occur when groups, individuals or actions based on self-interest come into conflict with those based on more altruistic, community or environmental interests, leading to the adoption of strategies based on varying degrees of co-operation that have the potential to transform behaviours and environmental outcomes (Gifford, 2008);
- Models of altruism, empathy, and prosocial behaviour suggest that people who are strong and competitive are less likely to act ecologically, but that those who have satisfied their personal needs are more likely to act in a pro-environmental manner because they have more resources to care about issues that do not directly or immediately affect them (Kollmuss and Agyeman, 2002);
- Sociological models for analysing pro-environmental behaviour suggest that pro-environmental behaviour may be explained by: i) attitudes and values; ii) opportunities for pro-environmental behaviour; iii) infrastructural and economic factors that help or hinder pro-environmental behaviour; iv) behavioural incentives; v) positive re-enforcement from peers about pro-environmental behaviours; and vi) knowledge, which may indirectly influence behaviours by modifying attitudes and values (Fietkau and Kessel, 1981, cited in Kollmuss and Agyeman, 2002; also see Irvine et al., 2016);
- Social practice theory, when applied to pro-environmental behaviour, suggests that behaviour change is a complex social process that can only be understood and influenced socially e.g. via communities of practice (Hargreaves, 2011);
- Similarly, diffusion models focus on the transmission of ideas and behaviours through social networks, with the adoption of new behaviours determined by the characteristics of the behaviour and the people who come into contact with it, often aided by opinion leaders (Rogers, 2003); and
- Social marketing focuses on adapting pro-environmental messages to the needs and desires of specific target groups, and then uses marketing concepts and techniques to achieve specific behavioural goals for a social or environmental good (Andreasen, 1994).

Summarising these theories, there are two groups of factors influencing the link between values and behaviours: i) external, contextual factors, including demographic (e.g. age and gender), socio-cultural (e.g. prevailing norms), economic (e.g. incentives or disincentives), and political and institutional factors (e.g. infrastructure to enable pro-environmental behaviour); and ii) internal, individual factors, including attitudes, values and beliefs relating to the environment, compared

to other competing non-environmental motives, personal capabilities (e.g. knowledge and skills, disabilities), resources (e.g. time and money), habits, emotional involvement with environmental problems and a belief that it is possible to bring about change through an individual's action. Steg and Vlek (2009) integrate these two types of factors to conceptualise 'pro-environmental consciousness', which they define as the interaction between environmental knowledge, values, attitudes and emotional involvement, embedded within broader personal values, in the context of other internal and external factors.

STEEP is used in this paper both as a classification framework (to ensure a systematic coverage of case studies representing the full range of social, technological, environmental, economic and political transformations that might lead to a more (or less) sustainable society), and an analytical framework to consider interactive links between these different transformations over time within complex socio-ecological systems (c.f. Everard et al., 2012; Everard, 2013, 2015a). Based on the analysis of examples via the STEEP framework in the next section, we then build an explanatory, theoretical framework to guide the institutionalisation of pro-environmental values as a step towards shifting societal norms and behaviours.

3. Analysing drivers of societal change from the literature

Whilst societal issues of concern may be perceived as primarily social, economic or economic in nature, in a complex socio-environmental system all in reality have systemic implications. For example, an ostensibly narrow economic decision relating to selection of type of wood used in the manufacture of a shed has broader implications that are geopolitical (region of wood production and implicit support for its economy and vested interests), social (shares of profits and disbenefits of forestry practices and trade), environmental (implications for forest and connected hydrological and atmospheric ecosystems) and technological (choices of forestry, processing and other methods), all in turn feeding back into the market price (economic) of the shed. Exploring issues on a systemic basis is therefore essential if full sustainability implications are to be identified, and as a basis for making an optimally sustainable response. In this section, we draw upon a range of issues that have emerged into public consciousness from the discrete dimensions of the STEEP framework, exploring their transit into more systemic appreciation and their ensuing societal response.

3.1. Social issues driving societal transitions

A prominent example of an ostensibly social issue that has resulted in a transition of developed world societal attitudes is that of slavery, under which certain social groups were once considered merely as property, and hence a prudent and cheap source of labour (Brace, 2004) and the basis of a lucrative and wholly acceptable "…fair and honourable trade…" (Clarkson, 1808). Now, of course, slavery is outlawed and considered unacceptable in most societies, though often covertly permitted through such practices as debt bondage, indentured servitude, serfdom, captive domestic servants, some forms of adoption in which children are forced to work as slaves or soldiers, and forced marriage. Nevertheless, slavery presents an

example of societal change as the 'ethical envelope' expanded to recognise the rights of more members of humanity (c.f. Leopold, 1949), and which has now become cemented into governance systems by legislation and into trade by the pariah status of abusive employers. For some champions of the rights of all 'sentient' life forms, the ethical envelope should extend beyond humans to all organisms with the capacity to suffer (Singer, 1995). Attitudes and legislation relating to child labour, perceived as mentally and physically harmful and inhibiting access to education and socialisation (International Labour Organisation, 2012), has also seen a marked transition throughout the twentieth century. Child labour was considerably more common in the UK and Europe in the early twentieth century. Indeed, Europe's Industrial Revolution would not have been possible without the wide exploitation of child labour (Humphries, 2011). However, the incidence of child labour across Europe has fallen since 1940 (Cunningham and Viazzo, 1996; Prügl, 1999; Hindman, 2009). Globally, the incidence of child labour in the world decreased from 25% to 10% between 1960 and 2003 (Norberg, 2007). Shifting societal attitudes have resulted in implementation of legislation prohibiting child labour around the world (United Nations, 2006; International Labour Organisation, 2011), though rising household wealth has also been a contributory factor. In poorer developing countries, child labour remains prevalent, with sub-Saharan Africa exhibiting the highest rates in 2010 (UNICEF, 2012).

For both slavery and child labour, transitions in shared societal values have been brought about by declining tolerance across society, driving legislative change as well as ongoing campaigning such as by the retail chain H&M against child labour in supply chains (Doward, 2012). NGOs have been and remain significant in organising public disquiet into effective campaigns, including the boycotting of 'slave-made goods' (for example www.freetheslaves.net). Cinema and other media depictions have also reflected, sometimes challenged and otherwise influenced wider social attitudes (The Root, 2013).

Further social transitions counter-intuitively relate to respect for the human rights of those we are trying to kill, or at least to avert 'collateral damage' to non-combatants. Significant examples of this include anti-land mine campaigning, for example led internationally by the International Campaign to Ban Landmines (http://www.icbl.org/intro.php), which made a major contribution to international protocols including the 1997 Mine Ban Treaty. Formulation of consensus and eventual agreement leading to the Chemical Weapons Convention of 1997, debate at UN level in late 2013 on controls on lethal autonomous weapons (ICRAC, 2013), and the evolution of the Geneva Conventions (http://www.icrc.org/eng/war-and-law/treaties-customary-law/geneva-conventions/index.jsp) established further standards of international law for the humanitarian treatment of war. This body of warfare-related protocols and legislation has evolved as a result of intergovernmental institutionalisation of societal revulsion about methods initially seen as innovative, effective and legitimate.

The evolution of common law through successive case law from its inception in Justinian Law (Codex Justinianus ordered by the Roman Justinian I early in the 6th century CE) is also a manifestation of the cementing of new consensual societal values and norms related to aspects of human rights. For some of these rights, environmental change – pollution, release of problematic species or substances, loss

of valued landscapes and free access, etc. – has been a principal vector of social injustices, including the creation of intergenerational inequities (Sachs, 2003). More generalised attempts to define human rights and to enshrine them in binding international agreements date back to at least The Universal Declaration of Human Rights (United Nations, 1948), arising directly from the experience of the Second World War and representing the first global expression of rights to which all human beings are inherently entitled. Intergenerational equity vectored through environmental damage is indeed explicit in the definition of sustainable development posited by the World Commission on Environment and Development (1987), a UN-backed global call to urgent action recognising the integrally interconnected nature of social and economic progress with environmental health, the responses to which are still slowly playing out.

Rising awareness of links between environmental pollution and human health continue to shape the policy environment, as for example in transformation in developed world societal attitudes to smoking from former glorification to widespread consensus that tobacco advertising should be banned and that smoking should be prohibited in public places to protect public health. A similar decline in drinking and driving behaviour was partly a response to the introduction and enforcement of legal penalties in many countries. The decline could also be attributed to public awareness campaigns that altered the values and beliefs of those within drunk drivers' social networks, leading to shame and embarrassment in all but the most hardened of repeat offenders (Grasmick et al., 1993; Freeman et al., 2006).

3.2. Technological issues driving societal transitions

Technological transitions in the developed world over the past century have been profound, influencing all areas of societal interest from information processing and communications to transport, healthcare, crop pest control, education, construction and leisure. Innovation of many novel technologies has been driven by business considerations offering new products and markets, decreased costs and more rapid access to data, entertainment and retail markets. Human capacities to manipulate the environment have risen in scale in terms of the harvesting of marine fisheries, minerals and fossil resources and the conversion of landscapes for food production and other provisioning services (Millennium Ecosystem Assessment, 2005). Over the same time period, the geopolitical reach of supply chains through the process of globalisation has exerted profound changes. Significant empowerment of people has occurred, for example, through the pervasion of affordable mobile phones, with technologies such as renewable energy conversion yielding considerable environmental 'savings' relative to the environmental burden of alternative established technologies.

However, the bulk of technological advancement has hardly been neutral with respect to its wider environmental, economic and social ramifications, and much has had associated political influence (such as weapon systems, space programmes and major dams as symbols of power). In the case of large dams, technology choice not only often reflects political ideology, particularly conflating 'big technology' with empire-building, but also introduces distributional social, economic and environmental inequities across groups of people (McCully, 2001; World Commission on Dams, 2000; Krater and Rose, 2010). Damming and water transfer

systems have often entailed the 'replumbing' of entire continents, with huge and often overlooked, yet increasingly known but unaccounted externalities (Everard, 2013). We will pick up a number of the environmental externalities of technological progress below when considering, for example, implications for resource depletion and pollution. Some social inequities have already been touched on above in the context of Social transitions.

In a more enlightened and sustainability-literate age, growing societal concern is expressed about novel technologies reaching or approaching market penetration yet without necessarily ensuring that all associated risks have been addressed, with appropriate controls instituted. The contested value of genetically-modified organisms, nanotechnology and synthetic biology are three cases in point. The technology trajectory of the European PVC industry is considered in more detail when considering responses to environmental transitions, which are highly pertinent to the associated economic performance and vulnerabilities of the industry.

3.3. Environmental issues driving societal transitions

The rise of the 'environmental movement', in reality a heterogeneous nexus of local activism and research interests, has been significant since at least the 1960s. Many strands of change in what is inherently a social movement, yet which is driven by social concern about observed and potential future environmental transitions, are traceable back to the preceding century. Much of this has been in response to market and technological externalities, overlooking potential and actual harm to the environment revealed by ever more pervasive media. The origins of UK-based NGO the Royal Society for the Protection of Birds (RSPB) presents an interesting case study. Ladies of a privileged class close to decision-makers recognised in the 1890s that fashionable clothing and headwear provided by the millinery trade made excessive use of 'grebe fur' (the bird's skin and soft under-pelt) and the head frill feathers of adult great-crested grebes (Podiceps cristatus), driving the species to near extinction in Great Britain. Their protestations led to the formation of a civil movement influencing, shortly thereafter, changes in legislation relating to the protection of great-crested grebes and other bird species. This formed the foundations for what was shortly to become the RSPB, today an influential nature-focused campaigning NGO with in excess of one million members (www.RSPB.org.uk).

Concern about environmental issues, in addition to disquiet about issues of social justice which are often in practice linked to environment issues, is a common feature in the genesis of NGOs. Better known and influential examples include Greenpeace and Friends of the Earth, campaigning NGOs founded and devoted to express and promote responses to shared values currently beyond the 'envelope' of society's governance structures and other institutional levers. The environmental NGO movement globally has played an invaluable role in the 'collectivisation' of fragmented public concern about perceived important emerging issues (from whaling to wider animal rights and nature conservation, pollution control and access to the countryside) which were yet to be brought adequately into the mainstream of societal ethics through institutional levers. In the case of the UK rebellion against government plans to privatise a significant part of the public forest estate, forcing a government

U-turn in 2012, it was both the sale of publicly owned assets to private interests and the potential for denial of access and commoditization of the many other public services provided by these valued assets that found expression through civil protests, mainstream media and NGOs (Kenter et al., 2014a, 2015; Irvine et al., 2016 in this issue). It is important to note that environmental issues, like social issues, are often catalysed by marginal groups. In protests, the role of 'extreme' voices is indirectly or eventually influential. For example, radical environmental groups that challenge existing regimes, expressing their deep ecological values through (often illegal) direct action may not often book direct victories, but an indirect effect of their actions is that they influence how others are perceived. By shifting the middle ground, they enhance the negotiating position of more moderate groups who now appear to be less alien and more acceptable. This way, 'niche' environmental values become increasingly 'mainstreamed' as the ethical envelope expands.

The water cycle is of central importance for a multiplicity of human interests, so water resource issues have consequently been influential in the building of institutional levers. A long-established and impressive body of civil law has been formed around water rights, accumulating for example through case law relating to the competing interest of mills, navigation and agriculture since medieval times (Everard, 2005). Statutory controls on water pollution, abstraction for public supply, industry and irrigation, and on spatial development compromising catchment hydrology threatening both flooding and drought resilience are now well enshrined in statutory legislation. A body of statute law has also built up around the conservation of species and habitats, whilst the vitality and enjoyment of fisheries has been the subject of development of a substantial body of common law in the UK (Carty and Payne, 1998). Increasing recognition of the interdependent nature of these diverse interests in the water cycle and with the landscapes and human uses that influence them has led to development of such framing concepts as catchment management as a means to better integrate topics and encourage collaboration of different sectoral interests (Calder, 1999), leading on to consensus about the principles of integrated water resource management (IWRM) (Global Water Partnership, 2000). Whilst IWRM has become the dominant water management paradigm globally over recent decades (Rahaman and
Varis, 2005), a perceived failure of integration of statutory management activities amongst sectors of the public, particularly in relation to the protection of such iconic indicators of river system health as migratory fishes and optimal protection of raw water resources, has led to the formation of a network of Rivers Trusts NGOs across the UK (Everard, 2004). The Rivers Trusts are environmental NGOs that have been effective in enhancing river ecology and water quality by working directly with land managers on the basis of win-win solutions, providing an integrating function and now frequently partnering with regional water companies who benefit economically through controlling the costs of treatment of abstracted water through source protection of the environmental parameters of water quality and hydrology (Everard, 2013). The successful integrated approach of the Rivers
Trusts, consistent with the Convention on Biological Diversity's (CBD's) Ecosystem Approach (CBD, 2004; and see Orchard-Webb et al., 2016), has been taken up by the statutory sector with the government in England promoting a 'catchment-based approach' as strategic policy direction (Defra, 2013). Thus, ostensibly 'environmental' concerns have found a resonance in economic terms (farm businesses and water companies) and social values (nature conservation and fishing

rights) ultimately condensing from informal to statutory governance systems (political).

Transition by the European PVC industry also highlights multiple factors combining to change the attitude and environmental performance of a business sector. In the late 1990s, environmental pressure group campaigns targeting retailers threatened the viability of the PVC industry, leading to recognition and acceptance by some sectors of the British PVC manufacturing industry that proactive engagement with a systemic approach to sustainable development was not only a duty but also the pathway towards enduing profitability (Everard, 2008). Coincident with this was an EU-wide commitment to voluntary targets under the Vinyl 2010 programme, many of which were exceeded by the scheme end (Vinyl 2010, 2010). Vinyl 2010 was superseded in the 2010–2020 period by upgraded voluntary targets across EU-27 Member States under the VinylPlus programme (VinylPlus, 2016). Some examples of progress made under these linked initiatives include substantial increases in post-consumer product recovery and recycling, substantial reductions in fugitive emissions of trace pollutants during manufacture, decreased climate-active gas emissions per unit production, and the development of a certification mark demonstrating that the supply chain of PVC-containing products has observed these voluntary agreements, the latter also creating market differentiation for engaged retailers and consumers. Environmental concerns thus drove technological development to secure economic prosperity, addressing directly social concerns, harmonised across the value chain of the PVC industry at pan-European scale through consensual governance arrangements.

3.4. Economic issues driving societal transitions

As we have seen in addressing social, technological and environmental transitions, economic activities have been shaped by a range of other factors. Market and supporting technological development has yielded a massive uplift in the economy, illustrated for example by unprecedented growth in the US in terms of economic wealth, productivity of workers and standards of living of consumers (DeLong, 2000). There has also been a net increase globally in human wellbeing as indicated by the UN's Human Development Index, but now in many industrialised countries economic growth and improvements in wellbeing no longer correlate (Jackson, 2009). This has been accompanied by an unprecedented divergence of income levels between OECD economies and those of many developing countries (Crafts, 2000). The pan-global economic slowdown of the early twentieth century, and spectacular crashes of major enterprises such as Enron and global banks, also calls into question the sustainability of the existing economic model. In large part, this reflects the externalities of the market model, some of which were highlighted above, but it is also associated with the inherent instability within the economic system, for example due to excessive borrowing and investment in ‘toxic assets’ (Johnson, 2009).

Various attempts have been made within the global economies to become more redistributive. For example, the ‘New Deal’ was put in place in the US between 1933 and 1936 comprising a series of presidential executive orders or laws passed by Congress during the ‘Great Depression’ in the first presidential term of Franklin D. Roosevelt. The New Deal focused on the ‘3 Rs’: Relief for the unemployed and poor;

Recovery of the economy to normal levels; and Reform of the financial system to prevent a repeat depression (Berkin et al., 2011). Beyond these grand historic gestures, the principal mechanism for redistribution in developed economies is through the taxation system, although growing public awareness and concern and associated media disclosure about perceived unfair corporate tax avoidance (for example, The Guardian, 2009) is driving political responses in the UK (for example Elliott and Treanor, 2009) and the US (Nasaw, 2009). However, this has as yet done nothing to halt the 'The Great Divergence' in terms of growing inequalities in income across America (Hartmann and Noah, 2013). Clearly, this aspect of Economic transitions has significant ramifications for Social transitions.

So, in terms of economic transitions, we have seen substantial and unprecedented growth, and also substantial interdependence with other factors. But economic transitions have also increased vulnerabilities, and associated media and NGO campaigning to promote political measures to constrain perceived inequities and other externalities.

3.5. Political issues driving societal transitions

Consideration of 'political' issues relates to governance in the round, of which government-level political action is just one constituent part. Evolution of the 'catchment-based approach', considered under 'environmental transitions' above, demonstrates how public concerns about a lack of integration in management of valued land-water catchment systems can lead to voluntary action and the formation of NGOs, in turn connecting with existing if formerly fragmented land use subsidies and investment by water service companies and influencing central government strategy. Voluntary reform of the EU's PVC industry highlighted above, recognising sustainable development as a strategic organising set of principles to address public environmental and health concerns but also to progress beyond them as a matter both of corporate responsibility and business differentiation, demonstrates how changes in (non-statutory) corporate governance along whole value chains can also be shaped by capturing concerted expressions of emergent public concern. These examples of shifts in governance, respectively in terms of formation of voluntary organisations and consequent shifts in central government policy and business strategy, highlight the role of socialised public concerns in shaping net governance responses.

In semi-arid north Rajasthan, India, government emphasis on industrialisation included the centralisation of control of water resources (Government of India, 2002). However, a net result of this shift towards centralised governance led to the abandonment of communal creation and co-management of a range of traditional structures detaining monsoon rains, which allowed water to replenish groundwater where it was accessible throughout the year. The net consequence was widespread aridification, abandonment of farming and depopulation of villages as people headed to cities for more stable incomes and life opportunities. NGO-driven restoration and modernisation and continued maintenance of these relatively simple technical structures depended on the restoration of traditional village and community governance structures and wider social infrastructure for effective operation (Sisodia, 2009), which has led today to linked ecological, economic and livelihood recovery,

the repopulation of villages, and greater democratic participation (Everard, 2015a). This example emphasises the tight links between sustainable and indeed restorative natural resource stewardship and locally relevant governance structures (Agrawal, 1996).

4. Discussion

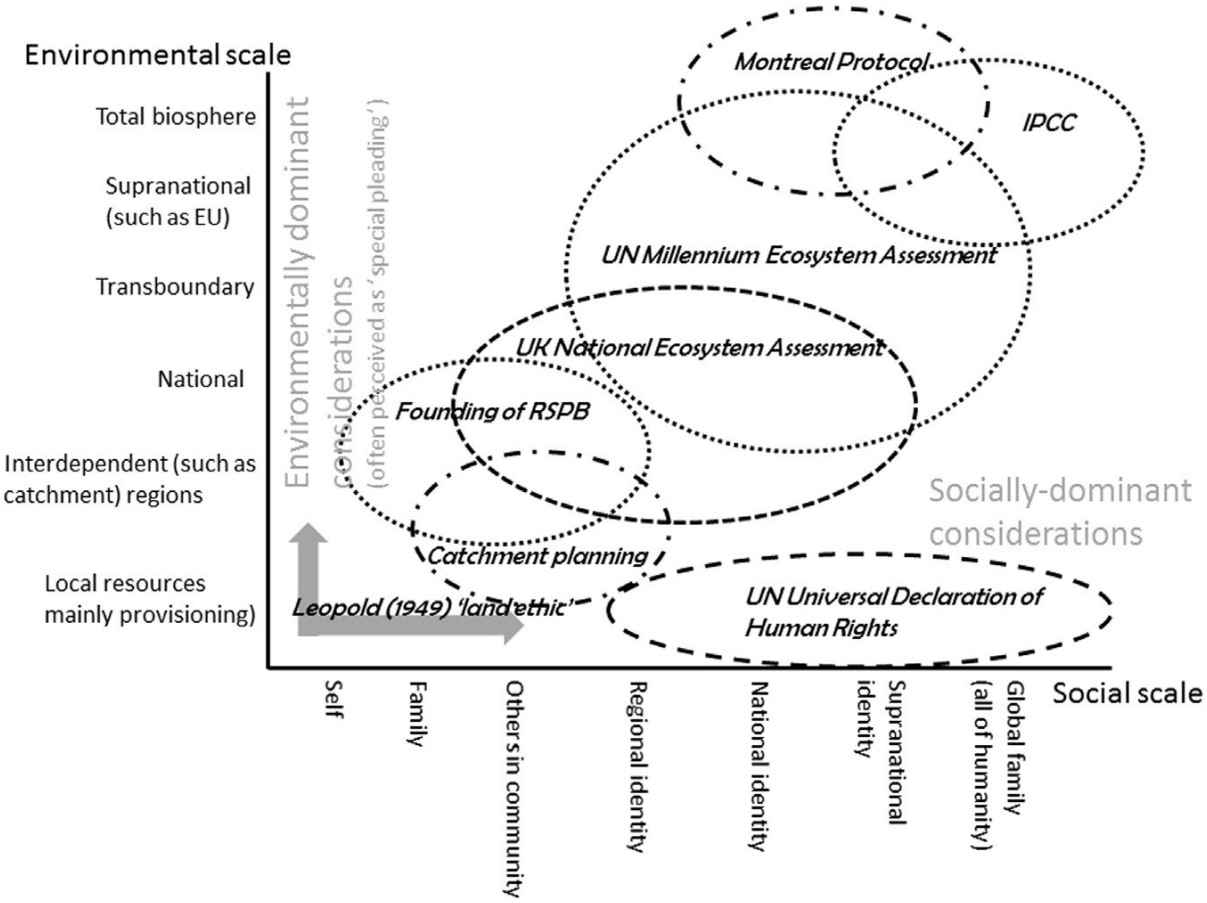
All elements of the STEEP framework reflect interdependent aspects of inherently interconnected systems. Issues perceived as the sole domain of a narrow sector of society, be that a government departmental focus, other special interest group or else belonging solely in one parameter of the STEEP framework, are unlikely to incite society-wide responses. However, when connections are made across the system as a whole – such as health implications arising from a technology or an environmental perturbation – societal change is more likely. For example, historic perceptions of poor urban air quality as a largely aesthetic consideration resulted in little or no substantive societal response, yet regulatory responses accelerated markedly when significant threats to human health (social and economic factors) became more widely appreciated and quantified (Griffin, 1994; Everard, 2015b). As another example, the voluntary engagement of the European PVC industry highlights how NGO activism became effective through cross-linking negative environmental with latent health-related (social) concerns, raising media and political profile of environmental problems ascribed to an industry sector, raising concerns for its economic success, with consequent innovation through voluntary commitments driven by substantially by social responsibility linked to continued profitability. Legislative change has proceeded in parallel with voluntary commitments, in part driven by corporate interest in reducing competition from less environmentally- and socially-responsible producers.

The drawing of linkages between ‘environmental issues’ and their social ramifications does not rely on scientific evidence alone (itself shaped by political factors steering research funding), but also upon mechanisms of knowledge transfer and sharing across society. As with shifting attitudes to smoking, drink driving and the destructive exploitation of wild birds, mass media (often significantly informed by NGO campaigning) has played a key role in the process of social understanding and consensus-forming about such issues, supporting changes in governance to reflect emerging environmental values.

Drawing on the analysis of examples from the preceding section, Fig. 1 illustrates the expanding ‘ethical envelope’ as described by Leopold (1949), magnifying along the X-axis from self-centred considerations to the progressive inclusion of family, others in local communities (e.g. including slaves) through to regional, national, supranational (such as the EU) to global kinship. One of Leopold’s significant contributions was description of the dependence of societal wellbeing upon supportive ecosystems and the need to expand the ‘ethical envelope’ from people alone to a ‘land ethic’. This was subsequently to be expanded substantially by a range of work, significantly through articulation of the multiplicity of benefits flowing from nature to society within the concept of ecosystem services (Millennium Ecosystem Assessment, 2005). The Y-axis of the Figure reflects the range of ecosystem scales providing important societal benefits. Circled areas in Fig. 1 relate

to measures that have been institutionalised as societal 'levers' to safeguard human interests. For example, the designation of local nature reserves and recreational areas reflects a geographically local response to provide for the values of local and regional community members valuing nature conservation and access to green spaces. At wider landscape scale, catchment management activities operate at watershed or multi-watershed levels to protect water resources, fisheries and a range of other linked societal benefits.

Figure 1: Illustrative orientation of selected societal responses to dimensions of social and environmental scales.



The UK National Ecosystem Assessment (2011) primarily addressed the multiplicity of ecosystem service benefits to society by constituent habitats at a national scale, whilst the UN Millennium Ecosystem Assessment (2005) made a similar assessment that considered global habitats and their importance for continuing human wellbeing. The Montréal Protocol (coordinating global measures to control ozone-depleting substances) and the work of the IPCC (informing global action to address the threat of climate change) are examples of the mobilisation of pan-global responses to global threats not only to environmental stability but to human health and economic prospects.

Akin to concerns about air quality that received little societal response when perceived purely as aesthetic, concern about nature conservation for purely altruistic reasons tends not to engender broader societal response as it is perceived as 'special pleading'. However, making linkages between ecosystem structure and

function and the flow of benefits to societal interests, including health, economic activities including tourism and wider quality of life (a key purpose of the ecosystem services framework), tends to generate more concerted responses. Integrated consideration of consequences spanning multiple elements of the STEEP framework therefore reinforces the significance of issues, and the likelihood of institutionalisation of responses (revised or novel 'societal levers') that may cumulatively shape new societal norms. The next section considers how the different elements of STEEP might be combined in a theoretical framework that can explain how pro-environmental values may be institutionalised to affect shifts in social norms.

4.1. Socialising and institutionalising values: the ripple effect

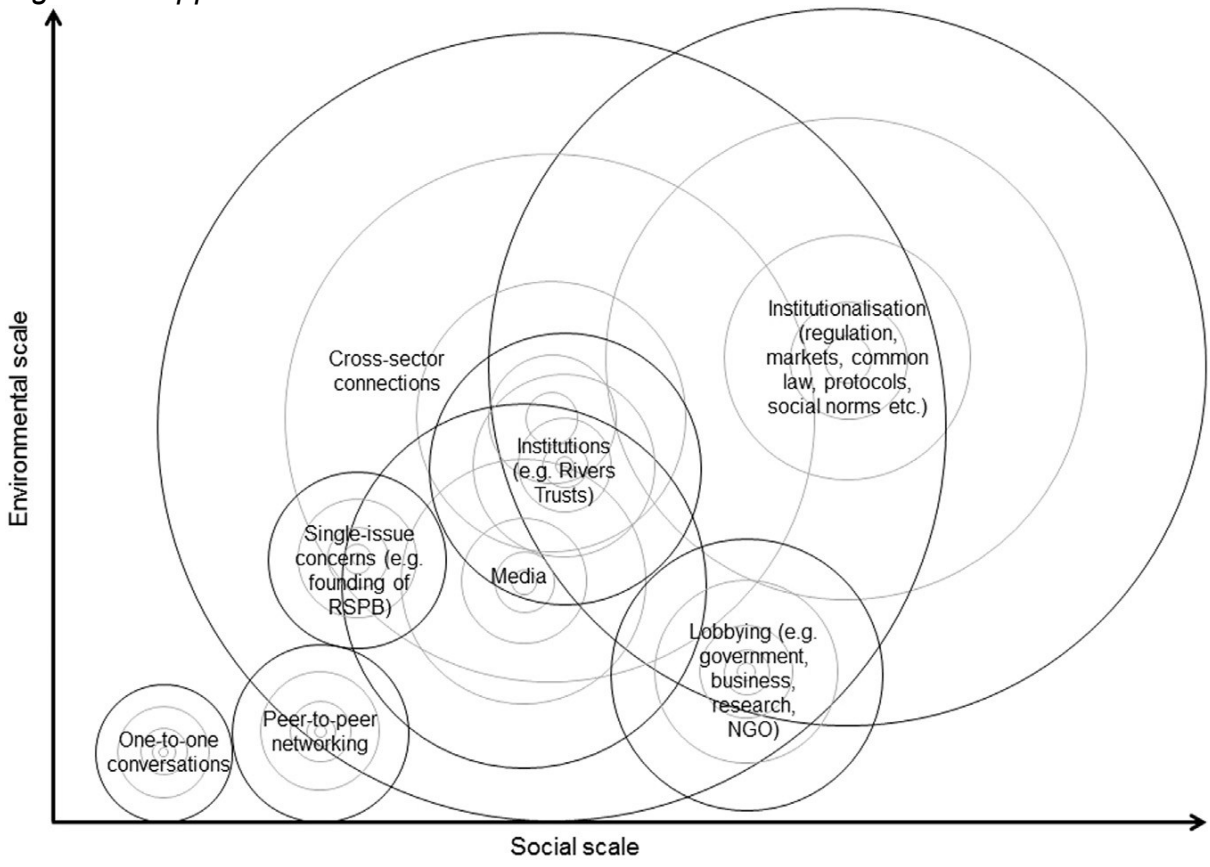
Analysing the preceding case studies and the illustrative examples in Fig. 1 suggests a process of emergence of concerns, often initially fragmented amongst individuals, which progressively become 'socialised' by collective dialogue. This can lead to direct political outcomes (as in the case of constraints of trade in great-crested grebe products underlying foundation of the RSPB). However, institutionalised outcomes more commonly result from a longer-term process in which fragmented emergent concerns are integrated and moderated through NGOs, media campaigning and other social institutions to address perceived democratic gaps. Issues can enter the mainstream media, for example in the depiction (perhaps not always accurately) of issues such as slavery and climate change or the integration of disparate concerns about planned forest sell-off in the UK, reflecting but also potentially deepening societal awareness and debate. This process can tighten the focus of diffuse societal concerns into lobbying in one form or another, including direct political lobbying, petitioning for research funding to explore perceived problems and their solutions, and campaigns to boycott perceived inequitable or environmentally unsound trade (as in the case of 'slave-made goods' or the products of unsustainable fisheries or forestry) or to develop accreditation schemes assuring sustainable production and thereby creating market differentiation.

This process of socialisation and moderation does not automatically result in institutionalisation (formulation of modification of regulations, market development and market-based instruments, protocols, case law development under common law and changes norms of societal acceptability). To achieve this outcome, it is necessary for the expression of values, which may initially occur within discreet niches, to span multiple interests (as reflected by action ensuing when multiple elements of the STEEP framework become linked) and through processes such as social learning, emergent issues may then become situated at the scale of social units, communities of practice or societies, eventually leading to a shift towards a more sustainable institutional regime. A combination of growing scientific evidence about climate change sufficient to trigger concerns for environmental, resource, international and intergenerational security, for wildlife and flood- and drought-related damage, and statutory regulation and incentives remain significant drivers of strong growth in the renewable energy sector (UNEP, 2007). Evolution of the 'catchment-based approach' in the UK demonstrates how lessons from scientific research, field observations but also frustrations felt by local people about the negative effects of a lack of integration in management led to the development of the Rivers Trusts NGOs

as an influential social movement, the successes of which have been seized upon both by water companies recognising economic advantage arising from water resource protection and by central government recognising a innovative approach to policy achieving better integration.

The process of institutionalisation of societal responses then happens through a number of entry points. Fig. 2 presents this spectrum from emergence, socialisation and institutionalisation of values as the 'ripple effect' of values.
The 'ripples' in Fig. 2 are not discrete, with many crossovers between ripples created by the expression of values at different social and environmental scales. The overlapping nature of the model emphasises the role of social interaction and learning through peer-to-peer networks, facilitating social learning. It also recognises the role of traditional and social 'media', for example inciting and shaping individual concerns and forming peer-to-peer linkages as well as prompting or advancing NGO and other campaigning. Social media has a distinct role, offering a new and powerful means to accelerate both peer-to-peer networking, norming of disparate views, instantaneous multi-media input to broadcast media and NGO campaigning, and lobbying in its various forms (Kenter et al., 2014b, 2016b).

Figure 2: 'Ripple effect' of values.



Thus, society progresses not (generally) through top-down leadership, but instead through progressive formalisation of values expressed, shared and moderated, then consolidated by societal processes. Indeed, representation of the will of the people is a central, if often poorly realised, tenet of democracy. Learning how this process of progressive institutionalisation of emergent environmental values occurs is a priority if society is successfully to make the transition from its currently self-destructive

trajectory to one that safeguards the breadth of ecosystems and services essential for future human wellbeing.

The ripple effect of values developed in this paper represents an evolutionary journey from emergent, often individually held concerns which may then become progressively confirmed and consolidated with other people, potentially progressing though a range of transformations towards institutionalisation of pro-environmental values in one or more of society's 'levers', which then progressively facilitates behaviour change. Retrospective review of societal change in much of the developed world suggests that various institutional levers have evolved significantly throughout the twentieth century progressively to safeguard a diversity of publicly-beneficial ecosystem services provided by land and other environmental resources which were formerly regarded largely as private property.

However, elevated societal activism, including media attention, lobbying, research funding and debate by business, does not guarantee institutionalisation. Values felt but not expressed cannot be expected to broker change, be that local (as in the case of influencing local spatial planning determinations) or in terms of wider-scale issues (such as protection of wetlands along global migratory bird flyways or the phasing out of landmines). It is essential therefore to establish mechanisms and freedoms to give voice to concerns which may also be held by others, and to do so as clearly and honestly as possible, which may then be recognised and progressively 'socialised' by peer-to-peer contact, as values ripple out to shape cultural norms. This is indeed consistent with Principle 11 of the Ecosystem Approach, which requires that all forms of knowledge are integrated into wise decision-making, and Principle 12 which acknowledges the need for and benefits of participation (CBD, 2000, 2004). Technological innovations such as social media, videophones and the internet have proven highly effective in speeding up the socialisation of concerns and the fomenting of social movements, consumer campaigns and cultural transformations.

Evidence of this is seen in their role in 2011's 'Arab Spring' (Srinivasan, 2012) and the organisation of anti-capitalist protests, various cyber campaigns, and exploitation by the traditional media to identify 'trending' environmental and social 'good news' and 'bad news'. However, the pressing nature of current erosion of natural capital and services means that we can no longer afford the luxury of serendipitous progress. We need instead to understand how environmental values emerge into the mainstream, and then directing and accelerating this transition towards sustainable responses. Neither does cultural response automatically follow just because there is a compelling body of evidence. The European Environment Agency's Late lessons from early warnings reports (European Environment Agency, 2001 , 2013) review a wide range of 'environmental' and technological issues from which public health and safety and wider ecological issues were known about often for decades before triggering cultural action. Examples include risks from asbestos exposure, smoking, lead additives in petrol, Minamata Bay disease and polychlorinated biphenyl (PCB) contamination, each of which saw long delays between early warnings and substantive responses. Further examples of lag phases between the raising of societal concern and ensuing action are provided by examples since the 1960s of long delays in institutionalising bans on smoking in public buildings, requirements for car drivers to wear seat belts, and prohibitions on speeding and excessive blood alcohol levels whilst driving; all these cases legislation has necessarily followed a

slow process of societal acceptance and changes in attitudes. European Environment Agency (2013, p.671) highlights that "bureaucratic 'silos'" prevent authorities seeing systemic connections and the need for action, and that there is consequently "…a lack of institutional and other mechanisms to respond to early warning signals; a lack of ways to correct market failures either caused by misleading market prices or where costs and risks to society and nature are not properly internalised; and the fact that key decisions on innovation pathways are made by those with vested interests and/or by a limited number of people on behalf of many".

Sometimes, crisis (such as disasters including the breaching of underinvested flood defences in the case of the New Orleans flooding following Hurricane Katrina in 2005, tipping points reached such as the loss or a water resource through eutrophication, or new discoveries about links between chemicals and human health) can trigger quicker responses, though the evidence of the Late lessons from early warnings reports suggests that this is not always so.

The fragmentation of decision-making by those with interests in only narrow societal sectors or disciplines inhibits the kind of systemic view of issues from which insights and concerted action can promote development of societal levers responding to threats. For example, in the case of knowledge about links between smoking and lung cancer, powerful economic interests and political ideologies may suppress the 'truth' and so halt the momentum of societal concern. Evidence from the case studies reviewed in this paper endorses the need for recognition of systematic linkages between policy interests. Some examples of this are where the ramifications of latent environmental and/or social concerns become recognised for their cross-sector implications for public health (for example various air quality policy responses), industrial competitiveness (such as the consequences of disclosure of child labour down supply chains or, positively, market differentiation on the basis of sustainable resource stewardship), international relations (including transboundary acidification of rainfall), national security (which may arise from diverse threats from climate change) or the operation of smooth civil society (as in the case of elevated flood risk threatening power generation and transport infrastructure). Where campaigning remains within a narrow disciplinary 'silo', failing to connect with implications for other policy spheres, the likelihood of formulation of appropriate societal levers appears less likely notwithstanding the inherent importance of the narrowly framed interest. The Ecosystem Approach and the ecosystem services framework may be uniquely useful here as a means to recognise and articulate likely wider, highly interconnected societal consequences arising from ecosystem change. There is a pressing need to shift application of the Ecosystem Approach from a haphazard to an integrated and guided process, better to internalise and safeguard the plural values expressed by society for the natural world across the broader spectrum of societal policy interests. Indeed, the evidence suggests that the effectiveness of campaigning to bring emergent issues into the mainstream of societal attention and response depends on articulating the broad range of implications of issues for shared environmental, social and other concerns, rather than expressing them ever more stridently as 'special pleading' within narrow disciplinary interests.

An important implication is that if we want the valuation of ecosystem services to be transformative, it needs to be situated more explicitly within broader societal, cultural and institutional contexts and consider the dynamics of values between these contexts by integrating deliberation and social learning processes, becoming new boundary objects Kenter (2016a in this issue) and new democratic spaces (Irvine et al., 2016 in this issue). This issue provides examples of how this can be operationalised, including through participatory social-ecological systems modelling (Kenter, 2016b), Deliberative Democratic Monetary Valuation (Orchard-Webb et al., 2016), Arts-Led Dialogue (Edwards et al., 2016), and transdisciplinary deliberative evaluation
based on ethnographic video (Ranger et al., 2016).

These kinds of approaches, although challenging to scale up (Kenter et al., 2016b in this issue), can begin to help address a broader lack of participation in public governance, including for example the progressive decline in voter turnout in the established democracies in the last four decades of the twentieth century (Niemi and Herbert, 2001) and a general decline in participation in civic organisations (Putnam, 1995), can only cement a sense of distance and disempowerment from decision-making. The principles of the CBD Ecosystem Approach, of Integrated Water Resource Management (Global Water Partnership, 2000), the UNECE Aarhus Convention (UNECE, 1998), the Strategic Priorities of the World Commission on Dams (2000), South Africa's National Water Act (Republic of South Africa, 1998) and various other progressive policy instruments at global and national scales all highlight the central importance of taking account of the perspectives of, and encouraging representation by, multiple stakeholders in decision-making.

If citizen and customer concerns remain unheard and so are not shared, or if ‘expert’ institutional decision-making processes discount them, the diverse values and concerns of stakeholders may remain stillborn leaving local people feeling disempowered. This is an inherently dangerous situation as repressed feelings may boil over when events trigger mass recognition of common concern or anger, as for example in the case of England's Peasants’ Revolt of 1381, one of a number of popular acts of insurrection in late medieval Europe stimulating a movement towards the elimination of serfdom, as well as subsequent mass trespasses as demonstration of civic disquiet, or in modern times initially spontaneous but increasingly organised civil protests against human-rights abuses in the Gulf kingdom of Bahrain triggered by its hosting Formula One motorsport Grand Prix in 2012 and 2013 (Tremayne, 2013).

The ‘ripple effect’ of values offers a route map of how citizen/customer engagement can be collectivised and framed progressively to build momentum for cultural change through a process of socialising emergent values. Evidence of how integration of consensus from diverse sources, often mediated by NGOs, covering connected environmental, health and other social, economic and technological perspectives can engender change in transition of the European PVC industry, growth in the renewable energy sector, and many other examples in this paper. Early recognition and response to the systemic implications of technological and business development can result in more robust, ‘shock’-resistant decisions and investment of greater value to corporations and society, and contributing to sustainable innovation. This support a conclusion in the European Environment Agency (2013, p.38) Late

lessons from early warnings report that "…there is growing evidence that precautionary measures do not stifle innovation, but instead can encourage it, in particular when supported by smart regulation or well-designed tax changes".

In an age of complexity, when growing human needs depend upon a dwindling common pool of natural resources, the need for innovation in appropriate pro-environmental and pro-sustainable societal levers and their creation at quicker pace is never greater. For example, instead of developing 'one-size-fits-all' ecosystem service categorisations and market schemes, it is more important to develop a portfolio of approaches. Given that the future is by its nature uncertain, robust decisions are those that are not optimised for a single expected outcome, but perform well under a wide range of scenarios (Brown et al., 2014, 2015). Norgaard (2010) emphasises the importance of expanding the ethical envelope in the context of valuing ecosystems, highlighting how adding markets for additional ecosystem services into current stocks-and-flows based perspectives of the value of nature can improve the efficiency of service delivery but cannot achieve sustainability due to trade-offs of ecosystem service provision between current and future generations. The perspectives and needs of future generations and the operations of fully sustainable markets are not foreseeable from current constraints. Importantly, the unsustainable state of contemporary society reflects that the current set of values underpinning markets and other societal norms is not sustainable. Thus, unless our values change, market-based measures reflecting legacy values will not allow us to attain a sustainable society (Norgaard,
2010). A wide range of niche values, practices and institutions that support transition to a more sustainable perspective need to be encouraged and allowed to co-evolve to influence the mainstream.

Also, this again highlights the potential of deliberative valuations of ecosystem services, as these can be anchored onto explicit social learning processes that improve peoples' capacity to deal with complexity and help reflect on intra- and intergenerational equity and sustainability issues in a way that is not possible through conventional stated or revealed preference approaches (Kenter et al., 2016).

Societal progress arises from across multiple strata and interests in society, not simply 'top-down' leadership, emphasising the importance of governance systems that take better account of emergent environmental values, progressively 'socialising' them by connecting across societal interests leading to appropriate institutionalisation in new societal responses and norms. Using the 'ripple effect' approach, it may be possible to accelerate engagement, revealing shared values and the institutionalisation of appropriate 'societal levels' in responses to emergent yet poorly-framed issues of concern such as fracking, nanotechnology, genetic modification, synthetic biology and 3D printing.

These conclusions offer guidance to citizens/customers and the social structures (such as NGOs) that represent them about how more effectively and rapidly to enable emergent values and issues of concern to influence cultural norms. This may be useful to businesses and trade associations informing them as to how best to harness customer values to guide sustainable innovation, as in the case of voluntary commitments by the PVC industry and the innovation of novel sustainable 'brands' of fishery and forest products. It can also assist government engagement with multiple

stakeholders and how to support niche initiatives (such as the niche emergence and subsequent progressive mainstreaming of the UK Rivers Trusts approach) to shape more resilient and sustainable policies.

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