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Fundamental Principles of Law for the Anthropocene?

Nicholas A. Robinson
Elisabeth Haub School of Law at Pace University, nrobinson@law.pace.edu

Normative Aspects of Sustainability

Fundamental Principles of Law for the Anthropocene?

by Nicholas A. Robinson*

In May of 2013, the atmospheric monitoring station atop Mauna Loa, the volcano in Hawaii, recorded carbon dioxide at 400 parts per million for the first time since it began operating in the 1950s. From analysis of Antarctic ice cores, Earth has not seen a concentration this high in 400,000 years.[1] As Svante Arrhenius determined in 1896, along with water vapour, carbon dioxide retains the sun's radiated energy in Earth's atmosphere, warming it. It seemed improbable in 1890 that human activities could add so much carbon dioxide as to be disruptive.

Powered by the consumption of fossil fuels at levels incomprehensible before the 19th century, human ingenuity unintentionally has altered the Earth's carbon and hydrological cycles, and changed the planet so greatly that the International Commission on Stratigraphy is studying whether the Holocene Epoch has ended and the Anthropocene Epoch has begun.[2] This finding is a scientific one, not a socio-economic or cultural determination, yet its greatest implications may lie in the realm of the social sciences. The physics, chemistry and biology of climate change are becoming ever clearer, as illustrated in the reviews of the Intergovernmental Panel on Climate Change (IPCC). The IPCC's Fifth Assessment Report (AR-5), in 2014, again asks how human society may mitigate and adapt to cope with the changing conditions induced by climate change.

A wide array of questions arises from global change to confront environmental law.[3] The IPCC has examined social decisions affecting the climate in the design of human settlements, transport systems, industrialisation, agriculture and silviculture, waste management, provisions for energy, and virtually all other socio-economic dimensions of human life. The AR-5, too, cannot avoid raising issues of human ethics and values at local and regional scales. Such issues reach environmental policy and law directly. The IPCC's AR-5 report furthers widespread public debate about the human dimensions of climate change, and how social theory relates to environmental change. Already, climate change has captured the imagination, and a new genre of literature, climate fiction, or "cli-fi", is engaging readers in imagining what is happening and will happen to each of us and our society.[4]

Environmental Law is at a Turning Point

New challenges confront environmental law. Old assumptions no longer work, and our innovations are now out of date because of the pervasive change that the Anthropocene represents. Many of our "business-as-usual" assumptions no longer are reliable. Nations are reacting to the new demands by promulgating substantive environmental rights and procedural means to enforce those rights. Environmental rights seek to shift society toward attaining societal wellbeing, or happiness, and not economic growth as such. Finally, since the disruptions of the Anthropocene have begun, and will continue, human society needs to guide its adaptation by recognising a new set of legal principles. Such principles need to be rapidly embraced if they are to be effective. This all becomes evident when reflecting on the reality of our human impacts that have ended the Holocene.

Social Science and the Anthropocene

In the Anthropocene, every dimension of life is different from times past. The discipline of the law is deeply implicated in the systems that have caused the end of the Holocene, and at once is central also to the reforms needed to cope with the emerging Anthropocene. When law has integrity, it is because it reflects profound social norms, shared in a society; law can also be instrumental, a tool of authority. As humans learn to cope with the disruptions occasioned by a changing climate, the need to strengthen communities around fundamental norms will be a determinant to human wellbeing. This paper begins a discussion of what principles are reflective of these deep norms that can guide a new epoch of environment-society relations. To set the stage, consider seven geological markers that distinguish the onset of the Anthropocene Epoch, each in turn giving rise to research questions that also need examining, by natural and social sciences, as well as by environmental law.

Radioactivity

With the 1963 Atmospheric Nuclear Test Ban treaty, nations ended a period of impregnating the earth with levels of radioactivity not found previously in the Earth's crust. This radioactive layer divides the pre-1945 Holocene Epoch from today's Anthropocene. What motivated societies and nations to end two decades of atmospheric testing and to abide by that decision still decades later? How may we compare these social decisions to the decisions to ban the use of chlorofluorocarbons (CFCs) in order to prevent further harm to the Earth's stratospheric ozone layer, under the 1985 Vienna Convention for the Protection of the Ozone Layer and the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer? Both regimes seek to protect public and individual health; should we study how legal norms associated with health can shape social behaviour to safeguard the environment?

* University Professor for the Environment, Pace University School of Law, New York; recipient of the 1992 Elizabeth Haub Prize for Environmental Law.

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Depletion of Mineral Carbon Dioxide Concentrations and Releases of Carbon to the Atmosphere

Fossilised solar energy found in oil, gas and coal has been extracted from the crust of the Earth, and repositioned in the atmosphere. Why did society not focus on the implications of the scientific projections of Arrhenius? Have human economics eclipsed ecology? What now motivates the energetic technological studies of carbon capture and sequestration? How might economic inducements produce rapid sequestration of carbon and shifts to other fuels? Why did nations agree not to mine coal in Antarctica, and yet now rush to explore extracting oil from subsea regions of the Arctic? Why is the "invisible" threat of carbon dioxide not seen as the same sort of risk as "invisible" CFCs or radioactivity? How can ocean acidification increase without coastal communities caring?

Melting the Cryosphere

The last vestiges of the Holocene's last Ice Age are melting, as the atmosphere warms. Glaciers, which were barely understood in the late 19th century, will soon vanish. As the polar icecap melts, the geo-politics of the Arctic are reshaping the territorial relations of nations and the social relations of the Inuit and other indigenous peoples. Locally, the loss of glaciers or icecaps at the poles and on Greenland are reshaping the planet's geography. But how and why do nations perceive this within their territories as largely a local issue, affecting perhaps their own riverine systems, and not as a call to global action? Why do national foreign policies project the melted North Pole as a place for new geopolitical competition for exploitation of natural resources, rather than a call for cooperation in ocean conservation and scientific study?

Coastal Plain Inundation

The last Ice Age produced wide coastal plains. Later, the melting of frozen waters once above sea-level re-inundated these coastal lands, producing the rich Georges Bank fishing grounds of the North Atlantic. The glacial deposition of soils and materials in the coastal crust of the Earth is a great marker of different geological periods. Far inland, earlier evidence of past shorelines – elevated sea levels, has been mapped. As ocean levels now rise again, might large human settlements again retreat from these habitats into new coastal areas as the old haunts are submerged? Can new coastal wetlands and mangroves be cultivated, rather than destroyed for "development"? Lacking capacity and funds to relocate all coastal human settlements, how will societies decide on resettlements inland?

Ecology and the Fossil Record

One geological record of note in demarcating epochs is embodied in the fossils of extinct flora and fauna. Biologists are currently recording Earth's sixth great period of extinction, and someday extinct life forms will only exist as the fossil record we create today. Why does human society largely still ignore the phenomenon of extinction? Humans have kindred feelings for pets or domesticated animals, so why do we not so relate to all other life forms? Twelve percent of the planet is set aside by national or local law as parks and protected areas, but why does nature conservation still cause such a social backlash? Why do governments favour patents and intellectual property rights over shared interests in the conservation of biodiversity? What inhibits wider use of restoration or conservation biology to enhance ecosystem resilience and species diversity?

Synthetic and Organic Chemical Wastes

The 19th century was a time without plastics or a host of chemical compounds invented by man, deployed usefully across all continents, and then discarded with abandon. The crust of the Earth holds chemical imprints today that never existed in the Holocene. Even today, the European Union's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) programme; the attempts in the USA to resuscitate the weak Toxic Substances Control Act; and efforts to enliven the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal largely failed to avert massive discharges of chemical wastes harmful to life. If humans as a species can be clean in their homes and religious sites and schools, why do they pollute the commons? If we know to treat a knife with care, why do we act recklessly in our handling, use and disposal of potent new chemical compounds?

Human Population Growth and Incremental Impact

The green revolution of the 1960s has allowed us to feed several billion more people than was once thought possible. Each of us makes individual demands on the planet. We shall add two billion more. How should we measure the incremental impacts of the growing world populations? Individually modest human impacts accumulate and nibble at the Earth like a force of nature itself. To ensure that we anticipate possible adverse environmental impacts as we build to accommodate our human needs, we have created analytic systems for environmental impact assessment (EIA). Why do all nations have such a hard time accepting EIA? Why do we resist robust use of EIA? What do we know about our two billion additional neighbours? Do they not share with us the same instincts and human nature? What principles, policies and practices should we all embrace collectively to cope well during the Anthropocene?

Social Evolution and the Anthropocene

The foregoing seven geological facts evidence the stark reality that the Earth reflects how humans have changed it. Why does it matter that we acknowledge our transition to the Anthropocene? Many deny that humans are the agents of global change. Unlike the Copernican revolution, our generation is not simply revising our understanding of what we observe about relatively stable natural systems.[5] Through remote sensing by satellites and powerful computer simulations and models and the integration of data to define Earth's systems, we have discovered that human beings have launched rapid change throughout the Earth. Our wellbeing will depend upon on how we change current human behaviour to adapt to these changing conditions. In this respect, another scientific revolution, that

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of Charles Darwin, may help us to do so. If we can discern what evolved norms are shared across the species of *homo sapiens*, we may have the wits to marshal these values in a coordinated way to help us cope with the disruptions of the Anthropocene. Evolution is neither progressive in some teleological way nor deterministic, but the fact that human nature evidences common values or norms that seem to be shared and are at least in part instinctive, suggests that humans can agree on normative principles, and later codify these in law.

The predicted disruptions of the Anthropocene provide at once a "laboratory" in which to observe and learn about how humans may survive and thrive, and a "theatre" of operations in which the survival of our accomplished civilisations is to be determined. The human family can work together, drawing upon the evolved norms within the human brain, a product of natural selection as dimly perceived in Darwin's *The Origin of Species*. As the human adapts to whatever the Anthropocene becomes, legal principles will need to provide stability and support further scientific inquiry. The risk is that, in seeking to survive, humans will sacrifice scientific inquiry and not inform themselves about the changing Earth.[6] Since scientific communities can achieve consensus across political and geographic and even generational gaps, there is reason to believe that humans can achieve consensus on fundamental principles of human ecology that legal systems can accept.

While many tools of "sustainable development" – such as EIA – can be used once the basic principles are agreed, the concept of "sustainable development" is inadequate to provide the core principle needed. Nations reaffirmed their allegiance to sustainable development at the United Nations Rio+20 Conference in 2012 largely because they had no viable alternative vision, and chose not to clarify what "sustainable development" means in practice.[7] In 1987, *Our Common Future*[8] articulated a vision of inter-generational equity and development so coherently that in 1992, *Agenda 21* could proclaim "sustainable development", in detail.[9] Today, nations need further guidance for how humans and nature can co-exist fruitfully. Nations and local authorities need a fundamental set of principles to guide their reactions to the events of the Anthropocene.

Enhancing Concepts of "Sustainability"

As climate disruptions emerge, society will seek guidance about how to respond and adapt. Prolonged droughts in Australia and central and south-western North America, and elsewhere, have been destroying agriculture and human settlements, exposing the lack of water and igniting wildfires. Widespread floods on all continents displace large numbers of people. Storms in Indo-China, floods in the Indus River Valley, and tornados in North America have in some instances literally erased particular developed cities from the Earth, and computer models suggest that there is more of this weather to come. Earth's atmosphere today holds double the level of carbon dioxide that it had during the last 10,000 years, when humans created their great civilisations. Rapid change is coming. How will we prepare for and react to sea levels that reach one-to-two metres higher than today, soon, perhaps in the lifetimes of our children and grandchildren?

In 2008, John P. Holdren, before he became science advisor to President Obama, summed up the problem thus: "Our options in this domain are three. They are mitigation, adaptation, and suffering. Basically, if we do less mitigation and adaptation, we're going to do a lot more suffering".[10]

As disruptions arise, our settled social preference for "business as usual" erodes. Awakening to new physical conditions, we look for new ways to behave. Environmental change happens faster than we can anticipate or study. Disciplined research in the social sciences can take years to reach consensus about the questions such as those associated with the geological markers ending the Holocene Epoch. In the Anthropocene, events will overtake us, and there will be little time for traditional, gradual research methods. New models for research will be forced upon us. We shall have to test hypotheses in action, raising new ethical concerns.

The author has argued elsewhere that "sustainable development" has become a necessary but not sufficient guide for humanity's rapid adaptation in the Anthropocene.[11] The premise of *Agenda 21* in 1992 was that we could attain and sustain socio-economic growth to eliminate poverty and find a holistic balance with nature.[12] Events have overtaken this approach, which nonetheless globally remains the "business-as-usual" policy preference of governments, the United Nations, the World Bank, and hosts of other authorities. However, with the Earth soon hosting nine billion humans, it is untenable to hold to the expectation that all can live like the high-consuming nations. Moreover, as large migrations retreat from the coasts, neither individual nations nor international organisations have the resources or capacity to re-establish a high-consuming lifestyle. A different approach will have to be found.

Former President of the International Union for Conservation of Nature (IUCN) and renowned agronomist, M.S. Swaminathan, has published a recent book of essays entitled *In Search of Biohappiness – Biodiversity & Food, Health & Livelihood Security*.[13] He advocates a shift from the green revolution of the 1960s, to an evergreen revolution. His practical measures amount to a new mindset, with local farms, local employment, local harvesting of water, local food banks and bio-shields along coastlines and flood plains. His call is for local communities to become self-sufficient, building local resilience. His agenda, practical and scientifically informed, would be enhanced by articulating a set of core principles as its foundation. The principles are already implicit in his writing, but need to be explicit, in order to motivate adoption of his reforms.

Swaminathan's choice of "bio-happiness" as an overarching goal is apt. The Asian concept of happiness embraces concepts of social wellbeing and contentment. As humans are part of nature, humans seek a place of bio-happiness, being part of a balanced and wholesome ecology. Swaminathan's guidance is objectively grounded in science and social science, and is not an appeal to philosophical or religious thinking. The premise of his work, that humans have a right to live in a sound environment, is itself

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becoming a recognised legal right, a part of the "law of the land". Wide acceptance of environmental rights offers a foundation for Swaminathan's prescription.

Environmental Rights

Today, more than 147 nations include an express environmental right in their constitutions. India's Supreme Court has issued many decisions enforcing this right. India's Parliament has adopted a Green Tribunals Act and is establishing environmental courts to make it easier to enforce environmental rights. Comparable undertakings are found in nearly every region of the Earth. China has more than 60 environmental courts, capable of hearing citizen complaints against polluters, in 14 provinces.

The right to a healthful ecology has profound social aspects. In the Philippines, advocate Tony Oposa won decisions of that nation's Supreme Court, enforcing the constitutional right to the environment: "the State shall protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature".[14] In Oposa's cases, the Court has cancelled forest concessions in the name of present and future generations and ordered the municipalities around Manila Bay to eliminate their sewage discharges and cleanse the Bay. Thereafter, in 2010, the Supreme Court of the Philippines established new court rules to provide for an extraordinary Writ of Nature (*Kalikasan*). Any person may submit petitions for the Writ of Nature without the need to pay filing fees. The Court then enjoins the alleged behavior and requires the responding party to demonstrate that it is in compliance with all applicable environmental laws.

South America has several comparable examples. Environmental courts have been established by Federal and state authorities in Brazil. In Brazil, whose Constitution has a well-elaborated *dirigist* right to the environment, the courts are applying the rule of *in dubio, pro natura*. Under this rule of decision, when a matter may be unsure or the equities appear evenly balanced, the court in doubt must always adopt a decision that best protects nature. The Constitution of Ecuador contains a comparable provision to that of the Philippine *Kalikasan,* and also provides for rights of nature, coequal to environmental rights and human rights.

National efforts to enhance judicial protection for the environment are advancing. Principle 10 of the Declaration of Rio de Janeiro on Environment and Development (1992) calls for all nations to ensure public participation in environmental decision making and access to justice; the Aarhus Convention embodies these rights in a formal agreement, under the auspices of the UN Economic Commission for Europe.[16] Fifty nations have set up national environmental courts, including the Nordic nations. The environmental court in New South Wales (Australia) is now more than 30 years old, and England and Wales recently set up a comparable Land & Environment Court.[17] IUCN's World Commission on Environmental Law adopted a decision, last month when meeting in Brazil, to establish an international Judicial Institute for such courts to exchange best practices and enhance the qualifications and capacities of these new courts.

A congruent right to the environment is being enforced through national and local courts. The jurisprudence of this right is coming to hold shared legal principles or values that can guide societies as they adapt to the new living conditions of the Anthropocene. These principles aspire to restore a relationship of people with nature that respects the resilience of natural systems and human communities, and enables humans to live with contentment. This concept of contentment, as the objective of a right to the environment, is well elaborated in the 2010 Gross National Happiness Index of the Constitutional Kingdom of Bhutan. Bhutan's use of happiness "is distinct from the western literature on 'happiness' in two ways. First it is multidimensional – not focused only on subjective well-being to the exclusion of other dimensions – and second, it internalizes other-regarding motivations".[18] Bhutan measures happiness using 33 objective criteria, built on 124 specific variables. It is not about western socio-economic development, and eschews the Gross Domestic Product (GDP) as a legitimate measure for a nation's "development". The norm of "happiness" embeds humans in nature.

As environmental rights become recognised worldwide, the UN Human Rights Council has appointed an independent expert to assess the ways in which human rights are cognisant of environmental rights. Last December, the UN's expert, John H. Knox, issued his first preliminary report on human rights obligations "relating to the enjoyment of a safe, clean, healthy and sustainable development".[19] Safe, clean and healthy are key components of Bhutan's criteria for happiness. Knox will need to consider also that the UN General Assembly has adopted a Resolution on "Happiness" (UNGA Res. 65/309 of 2011) and the UN Secretary General last January issued a Note entitled "Happiness: Towards a Holistic Approach to Development".[20] As the UN's Millennium Development Goals (MDGs) remain largely unrealised, it is becoming evident that the 20th-century concept of sustainable development has not produced happiness and that a new approach will be needed. As Swaminathan put it, "[i]n 2010, India will be completing 60 years of planned development. Hereafter, climate resilience must be mainstreamed in all development programs".[21]

This new paradigm of environmental rights is being forged, incrementally, across and within nations worldwide. Humans can neither do well nor be happy (contented) when environmental rights are not respected. Indeed, when Bhutan was unified, its legal code declared that "if the Government cannot create happiness (*dekid*) for its people, there is no purpose for the Government to exist".[22] Development that denies happiness contravenes environmental rights. Arguably, there can be no body of human rights law without acknowledging the right to the environment as its foundation. In 1948, this foundation was taken for granted. In the Anthropocene, it is being explicitly acknowledged.

No government, whether in an over-consuming or under-consuming region, rich or poor, has enough money or personnel to restore communities disrupted by climate change events to their condition before the tragedy. It will not be possible to "rebuild everywhere" to restore what

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was. The seas will reclaim coastal sites, and funds will be needed to resettle people inland, not rebuild hurricane-ravaged coastal settlements (as New Yorkers are finding today in the aftermath of Hurricane Sandy). So, the norm for adapting after disruption will have to be to build toward a different goal, toward social wellbeing, or happiness, in ways comparable to the index that Bhutan has advanced. Legal principles need to promote measures to help restore social happiness, not socio-economic development. In the Anthropocene, the metrics of economic growth or "sustainable development" are unsustainable.

A new generation of legal principles can come to be applied to give deeper meaning to both sustainability and environmental rights across all nations. The fact that environmental rights are being acknowledged and embraced independently, in different places, is evidence that they share common roots in human instincts and cultural values about human relations with nature. The principles encompassed by environmental rights found in human nature as implicit can be elucidated, be framed explicitly, and serve to guide adaptation to the new physical conditions of the Anthropocene. Humans evolved through nature, and human principles in the Anthropocene can be found in evolved norms that reflect, or are found in, human nature. Insights derived from Darwinian evolution can inform the search for legal principles.[23]

Evolved Norms: Foundations for Legal Principles

With an additional two billion humans trying to make sense of their lives amidst the Anthropocene, is there not some comparative advantage in promoting ways for humans everywhere to agree to cooperate and share experiences about how best to cope in the difficult coming adaptations? Tools to enhance cooperative action exist; innovations in telecommunications, computing and social networking techniques provide the means. What are the principles and norms to guide humans to deploy these tools for a collective core objective, to recover from disruptions and change and promote societal wellbeing, or happiness? Can humans tease out of human nature a set of shared, fundamental values that "ring true" because they are already accepted?

As communities adjust to the Anthropocene, evolutionary biology, the social sciences, engineering, the law, and all other disciplines will each make contributions to understanding human behaviour and proposing new policies and laws. There may not be a consensus about an epistemology for how humans arrive at shared perceptions. There are different evolutionary paradigms between socio-biology and evolutionary psychology. After assessing the perspectives of five competing schools seeking to explain human nature,[24] Kevin N. Laland and Gillian R. Brown observe:

> *[S]ocial learning is the key process underlying the difference between these evolutionary paradigms… Are we prepared to learn what is currently adaptive, guided by proximate motivational cues such as hunger or fear as the human behavioural ecologists maintain? Or, is our brain set up to prioritise learning that which was important in the past, as the evolutionary psychologists suspect? Do we acquire whatever behaviour or information just happens to be locally prevalent as cultural evolutionists would have it? Or is our learning dependent partly on evolved dispositions and partly on cultural processes, as the gene-culture co-evolution theorists suggest? In fact, it is not inconceivable that all these perspectives could be correct to some degree. That is, each of these views could be true for different learned behaviour patterns or on different occasions.*[25]

The projected pace of change throughout the Anthropocene will leave little time for the debate between competing schools of the study of human nature. It may be impolitic in a conference of social scientists to urge that we temper any on-going debates about socio-biology, and make common cause with Edward O. Wilson on matters about which we agree. Ecologists make clear that human wellbeing is advantaged by conserving as much biodiversity as possible. Worldwide, the emergence of new coastlines invites measures to plant new wetlands and re-create habitats, but people will have to move out of the way and proactively become restorative forces of nature. We shall have to use foresight and ecology, but we shall also have to understand what motivates or inhibits such efforts, and here the social sciences have exceptionally important studies to undertake. Many legal reforms have died from the lack of public support. Environmental law needs the social sciences.

In terms of seeking to promote shared legal principles and norms that can guide adaptation in the Anthropocene, we do *not* need to ultimately select one theory of socio-evolution over another. It is not likely that the debate about "nature *v.* nurture" will be resolved in the near future, and adaptation amidst the Anthropocene will proceed anyway. Human cultural evolution, probably premised on an evolved biological capacity in human brains for learning, with instincts for cooperating to promote wellbeing, all would seem to predispose humans to acknowledging some basic principles that are shared. Amidst the exigencies of the Anthropocene, humans can cooperate together to enhance their wellbeing, and agree on a core set of principles to guide their collaboration. They will have little choice but to suspend their disagreements over evolution or religion, and pragmatically adhere to principles that in turn promote practical norms that help people realise social wellbeing and happiness.

Our inquiry, therefore, is to identify basic principles that can be found in each culture and legal system around the world, which once found would be acceptable as components of a universal normative paradigm appropriate to guide human cooperation in the Anthropocene. Here are possible candidates for scholars and policy-makers to consider.

Legal Principles

Human societies adopt norms or principles to provide order, achieve fairness, and secure peaceful relations among individuals. Revulsion against the warfare of the

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19th century produced the principles of humanitarian law. In the aftermath of the Second World War, the principles of human rights law, including the rights of the child, of women, and of indigenous peoples, were framed. Concerned about the environmental degradation of Earth's natural systems, principles of nature conservation and environmental rights have emerged. Among nations, general principles of international law are identified and form a basis for State conduct.

When principles have a strong consensus behind them, laws provide sanctions to compel observance of the principles, although most people will adhere to such principles because they have already accepted them, rather than because sanctions exist. If a principle deeply reflects an element of human nature, it is more likely to be accepted wherever humans dwell. It is predicted, then, that the next generation is going to accept the norms.

What basic principles can we debate in this conference, as a first step toward examining the principles and norms for the Anthropocene? Some core principles are already contained in the wide-ranging human rights declarations, covenants on political and civil rights or social and economic rights, the 1982 UN World Charter for Nature,[26] or in the civil society's "Earth Charter", in which several concepts from the World Charter are elaborated, and which UNESCO and IUCN have endorsed.[27] Others will be self-evident, and hitherto were taken for granted. Some belong to more than one field of human behaviour.

This article tentatively offers seven possible principles in order to spark a debate. Debating these principles furthers the quest for a new paradigm, for a firmer foundation for environmental rights, and progress toward a goal of social wellbeing (happiness) for people wherever they are or may end up during the Anthropocene.

The Principle of Cooperation

Humans instinctively cooperate with one another, in the family, community and more widely. Human laws recognise the duty to cooperate in order to promote conscious measures to better their conditions. Human beings have long recognised reciprocity, an evolved norm for cooperation with each other. The recognition is ancient. For example, in *The Analects* of Confucius (Book 15, chapter 23), it is written: "Is there one word which may serve as a rule of practice all one's life?" The Master said, "Is not reciprocity such a word?" Religions invoke this in the "Golden rule" to treat one another as one would wish to be treated.

Cooperation is both an ethical norm and a duty of good neighbourliness, acknowledged to be a customary norm in all legal systems (*e.g.*, *droit de voisinage*).[28] When a neighbour's barn burns, others rally together to help build a new barn. The worldwide relief work of the International Federation of Red Cross and Red Crescent Societies is premised on cooperation. Among nations, treaties of friendship have expanded to embrace collective security in the Charter of the United Nations.[29] Cooperation is a basic rule of international law, which was celebrated by the United Nations in its "International Cooperation Year" (1965).

The duty to cooperate is a universally accepted principle of international law, reflected in Articles 55 and 56 of the United Nations Charter. Humans seek to maximise the trait of "cooperation" and make more pervasive use of this principle. Within local communities, humans cooperate not because they are ordered to do so but because doing so is fulfilling – because they wish to do so. As societies cope with the accelerating physical changes in the Earth's biosphere, cooperation can make it possible to muddle through successfully. Governments and individuals alike instinctively cooperate when providing mutual aid for disaster relief, for example amidst the intense storm impacts induced by climate change. Mutual-aid agreements, as in forest-fire protection, provide the basis for fighting fires and supplying sister governments in times of great need.[30] Mutual hospitals and insurance agencies and universities all work effectively because of cooperation.

The evolutionary foundations for cooperation are thoroughly described in socio-biological scholarship by Samuel Bowles and Herbert Gintis,[31] who find that the human capacity for cooperation is an evolved human characteristic, and by Enrico Coen.[32] Mark Pagel's history of cooperation corroborates this view,[33] as does the earlier study by Matt Ridley.[34] Since humans are "hard-wired" to cooperate, environmental law can draw on cooperative instincts to further its remedial provisions. Laws are made more robust by relying explicitly on cooperation – on this ancient rule of reciprocity. In the future, environmental law will need to do more to frame procedures to promote cooperation, promote trust and expand human awareness of reciprocity to include other animals and ecosystems. Cooperation stems from compassion. Cultural ethics can broaden the scope of compassion, and laws can encourage a needed collective vision: "We are all in this together". Darwin cherished the "wonder" that all life is related.[35] This principle, when envisioned to encompass its widest scope, as Leopold conceived in the "land ethic", can foster cooperation with the community of life.

Cooperation can be cultivated. Strong reciprocity, a willingness to apply rules to punish those who do not cooperate, reduces the likelihood of "free-riders", and institutions and corporations can co-evolve to build cooperation.[36] Designing laws to give primacy to cooperation is not always easy. The UN Convention on Biological Diversity (CBD) decisions reflect strong cooperation based on shared concerns for nature and the securing of life on Earth,[37] while the UN Framework Convention on Climate Change illustrates weak cooperation, in which nations are more concerned with securing what they deem their fair share of economic growth, and the objectives are "business as usual".[38] Moreover, within a country or community, corruption, greed and bias can work to undermine cooperative instincts. Cooperation may be extended narrowly, to one's immediate clan or nation and may not be applied when needed, as when a State denies access to refugees, environmentally displaced persons or other migrants. Systems of common property rights can engender cooperation;[39] as when councils of stakeholders manage the cooperative use of resources.[40] Cooperation is fostered by ensuring access

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to environmental information and public participation in environmental decision making.[41]

As Enrico Coen observes:

> [Humans learn to cooperate through] *the double feedback loop between reinforcement and competition, with success both promoting itself and bringing about its own limitations. These loops are filled by a balance of population variation, which continually generates new ideas and juxtapositions, and persistence, which allows achievements to be maintained and spread through the population. Cooperation also plays an essential role by allowing people to benefit from each other's skills. This both promotes achievements within groups and leads to further levels of competition among them. By bringing people and ideas together, cooperation also leads to an enormous number of combinatorial possibilities, creating a vast cultural space through which our species can move*.[42]

Admittedly, cooperation may not always work in sustainable ways. Humans also may cooperate well to perpetuate business as usual. So, what further principle should guide the natural tendency in humans to cooperate in ways that sustain life on Earth? Enduring cooperation for humans with natural systems emerges when the bonds between humans and nature are acknowledged. Recalibrating how we apply our values about nature during the disruptions of the Anthropocene requires flexibility and being open to accepting what the biologist Edward O. Wilson calls "biophilia".[43]

Biophilia: The Nature Stewardship Principle

If humans are innately prone to cooperate, why in particular should people cooperate together to enhance their stewardship of nature? How can a country or community be stimulated to design laws for enduring, long-term cooperation? Explicitly recognising a legal principle of biophilia can do so. Humans already enact laws implicitly based on biophilia.

Natural resource laws, and fish and game laws, are based largely on what science learns about ecological conditions. On one level, these may be regarded as merely utilitarian, to ensure sustained yields of renewable species for their annual harvest. But the expansion of wildlife refuges and strict nature-protection areas, and laws providing absolute protection for endangered species, reflect a regard for nature that is profound, not instrumental. Humans adopt such laws because of the inspiration they find in nature. Humans establish parklands not for economic growth, but for recreation, spiritual pleasure and ecological study. Governments establish wildlife refuges to safeguard places for animal reproduction, not consumption, and fish and game seasons are set to strictly ration any culling of species. Legal sanctions include criminal penalties, and other indicators of strong cooperation.

Humans delight in nature. As Gordon Burghardt explains, humans evolved to appreciate "play", and evolved norms for "fair play" as they did their languages or arts.[44] Laws encourage play in nature by designating parks, protected areas, trails, and other places for recreation and nature appreciation. Laws dedicate or enhance parks, plant trees, establish walking paths, save habitats, and carve out space for animals conveniently to cohabit watersheds with humans.[45] In doing so, humans reinforce their positive instincts about nature.

Biophilia is a human instinct. Stephen Kellert observes that "all our biophilic values emerged as universal tendencies hammered into our genes because they reflect adaptive functions that advanced our health, fitness and wellbeing over the course of human evolution and development".[46] Much of nature conservation law grows out of this principle of biophilia. It has as much claim on the political discourse as does the right to life. Biophilia sustains the right to the environment, acknowledged in Supreme Court decisions in India,[47] the Philippines[48] and elsewhere. It underpins the first legal wilderness in the world, New York State's "forever wild" Forest Preserve in Article XIV of the NYS Constitution, described below.[49] It provides the foundation for every local, state, provincial, national or transnational park worldwide. No international law mandates the establishment of parklands. Human nature does.

As Wilson observes, "An enduring code of ethics is not created whole from absolute premises but inductively, in the manner of common law, and with the aid of case histories, by feeling and consensus, through an expansion of knowledge and experience, influenced by epigenetic rules of mental development, during which well-meaning and responsible people sift the opportunities and come to agree on norms and directions". Nature conservation societies in every part of the world insist on new laws in furtherance of biophilia; some 80 nations and 1,000 non-governmental organisations constitute IUCN, whose mission is to secure "A just world that values and conserves nature".[50] IUCN's World Commission on Environmental Law is responsible for having persuaded the United Nations to adopt the World Charter for Nature and the CBD, among other laws.[51] Amidst the challenges of the Anthropocene, humans will expand *ex-situ* preservation of species in botanical gardens and zoological parks and wildlife sanctuaries, as habitats are lost. Since 2008, the Svalbard Global Seed Vault in Norway conserves the seeds and DNA of plants worldwide.[52] For *in-situ* protection, humans consciously will expand wetlands and other habitats, reversing previous actions as sea levels rise.

Evolved norms of biophilia are found in religious stewardship of God's creation and reverence of life as theological themes.[53] Each great religion provides for respecting and loving God's creation in nature. This universal acceptance of a biophilic norm in religions is well presented in Mary Evelyn Tucker's studies.[54] Biophilia's religious foundations reflect evolved norms that humans hold toward nature. Like secular law, religion provides a basis for humans to care for nature in the exigencies of the Anthropocene.

The human need for having a religion is itself an evolved norm. Robert N. Bellah finds that each religion reflects evolved human instincts toward a human quest for religious belief.[55] Human evolution has produced a human capacity for nature appreciation. From an evolutionary

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perspective, each religion's injunctions for the faithful to be good stewards of God's creation support a principle of biophilia. Apart from religious expression, environmental ethics reflects this same search for a belief-based set of values about nature.[56]

Wilson advanced the human foundations for this principle of biophilia, bonding humans and nature, as follows:

> *We are human in good part because of the particular way we affiliate with other organisms. They are the matrix in which the human mind originated and is permanently rooted, and they offer the challenge and freedom innately sought…The more the mind is understood in its own right, as an organ of survival, the greater will be the reverence for life for purely rational reasons. … The drive toward perpetual expansion – or personal freedom – is basic to the human spirit. But to sustain it we need the most delicate, knowing stewardship of the living world that can be devised.*[57]

Practical applications of the biophilia principle can supplant the business-as-usual practices that undermine nature appreciation, in areas such as building design[58] or land-use planning, for example.[59]

Recognising biophilia as a legal principle would magnify concerns for humans and nature in allied fields. For example, public health, veterinary science, and wildlife conservation are each concerned with zoonoses. As kindred mammals, humans share many diseases with animals. Human medicine and veterinary science take measures to prevent transmission of diseases and heal diseased individuals. The pandemic in HIV/Aids and repeated epidemics of avian influenza and SARS resulted from diseases leaving the animal world for human realms. The Wildlife Conservation Society has called for greater preventative measures to avoid animal diseases appearing among human settlements.[60] The principle of biophilia can foster use of foresight and adaptation to maintain resilient and healthy conditions in both human and animal domains.

The fear of nature – a legitimate worry about contracting diseases, an ancestral instinctive fear of snakes or a prudent fear of hurricanes – does not detract from biophilia. When scientific knowledge about the objects of the fear is shared and understood, the fears can be put in perspective. Anthropomorphic projections of human traits on nature will complicate perspectives of biophilia, but not negate the love of nature itself.

Biophilia motivates humans to conscientiously nurture life around them. The basic objective of this nurture is to ensure that humans and nature alike can be as healthy and resilient as possible. The trait of human nature known as resilience is more profound that many think. As an evolved norm, resilience can also be recognised as a principle of law.

The Principle of Resilience

As noted, the principle of biophilia stimulates strong cooperation among humans toward nature, in order to enhance capabilities of resilience so that humans and nature alike can rebound from the disruptions of the Anthropocene. The work of doing so is elaborated through the principle of resilience. Society implicitly recognises the values of resilience in its laws to protect wetlands or provide for coastal zone management.[61] Communities and countries can magnify their resilience capacities, through all socio-ecological systems, since resilience is an innate trait of human nature.[62] Deep (multi-layered) resilience will be needed amidst the surprises and disruptions of the Anthropocene.[63]

Some will argue that resilience is a condition or phenomenon and not an instinctive part of the human or an inherent part of an ecosystem. Admittedly, much more study of resilience is required, but this should not negate the use of resilience as a core principle to guide social behaviour in adapting to the conditions of the Anthropocene.

Resilience is a human instinct. Maxims, such as "saving for a rainy day" or rules such as the Precautionary Principle, function to enhance resilience. Physicians promote resilience in patients to enhance medical treatment, and ecologists study resilience in natural systems under disturbance.[64] The biological roots of resilience are deep, and relate to capacities to adapt and evolve. In human communities and countries, laws to foster resilience would design redundancy into all socio-economic activity,[65] especially in environmental management systems and fire and other emergency services. Laws would identify risks and eschew practices that exacerbate risk-prone situations. Conserving renewable natural resources takes on added importance as it enhances resilience and reduces risks.

The principle of resilience is reflected in insurance laws, which provide financial compensation for disaster losses. Insurance builds resilience and provides a self-reliant foundation to sustain cooperation for helping humans cope. Acting according to this resilience principle, humans have long banded together to organise mutual aid insurance systems.[66] Establishing insurance, including micro-insurance for poor regions, promotes honest, transparent, affordable and effective adaptation to casualties. However, most of the world lacks a system of casualty insurance to pay expenses associated with severe storm events. Existing governmental systems, such as Federal flood insurance in the USA, all lack sufficient resources to cope with mega-storms, such as Hurricane Sandy in 2012.

Resilience is also at work in the social order that perpetuates great cities, whose roots predate the nations in which they are found today. Cities compare and adapt by adopting each others' successful attributes. Resilient systems learn how to practice adaptation.

Encouraging a collective memory is a part of being resilient. Societies forget at their peril. In Fukishima, Japan, in 1611, humans raised one-metre-high stone tablets to warn about tsunami wave heights but, in the 20th century, those tablets were ignored and coastal developments were built behind the false security of erected sea walls.[67] The year 2011 witnessed the Fukishima Daichi disaster, with earthquakes, a tsunami, breach of sea walls, and nuclear power plant destruction. Resilient systems compensate for human tendencies toward complacency.

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Resilience can become a conscious objective for all planning. Resilience laws build redundancy and buffers to facilitate recovery from disruptions, but the deployment of programmes based on the resilience principle requires use of foresight, which is also an evolved trait of human nature.

The Principle of Foresight

Foresight is an evolved human capacity. The trait was already well advanced during the Agricultural Revolution and the beginning of urban settlements, as humans learned how to plan for the future. Darwin described humans planning animal breeding and botanical hybridisation.[68] A clear exposition of human instincts to anticipate, plan and exercise self-restraint is found in the address on nature conservation by Theodore Roosevelt in 1908 to the first conference of the Governors of the United States at the White House:

> *We have become great in a material sense because of the lavish use of our resources, and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone…when the soils shall have been further impoverished and washed into the streams, polluting the waters, denuding the fields …These questions do not relate only to the next century or to the next generation. One distinguishing characteristic of really civilized men is foresight; we have to, as a nation, exercise foresight for this nation in the future; and if we do not exercise that foresight dark will be the future! We should exercise now, as the ordinary prudent man exercises foresight in conserving and wisely using the property which contains the assurances of well-being for himself and his children…We need to exercise it in some fashion for ourselves as a nation for the next generation.*[69]

Acting on the principle of foresight, Roosevelt launched some of the first systematic legal regimes for nature conservation and environmental protection.

The evolved norm of foresight is evident in laws to anticipate and avert environmental harm. The duty to anticipate the needs of future generations tacitly acknowledges this principle. It underpins the duty to observe the Precautionary Principle[70] and the principle of EIA.[71] While some other species instinctively exercise some capacity for foresight, only the human species consciously and elaborately does so. Planning to sustain public health programmes, avert natural resource degradation, and build transportation systems and other socio-economic infrastructure derives from this evolved norm of foresight.

Foresight can be compromised, as when short-term goals preclude consideration of long-term interests. When resources are abundant, complacency forestalls planning. Droughts drive planning for new inter-generational water supply systems. In most nations, laws have been enacted requiring the use of EIA, to institutionalise foresight. Acting on the maxim of human nature to "look before you leap", EIA laws were endorsed for universal use by the 1992 Earth Summit. Formal declaration of a principle of foresight would motivate robust use of EIA, rather than the casual and inconsistent implementation evident in many nations. EIA is a tool ready to deploy for mitigation and adaptation to climate change.

Exercising foresight also stimulates another human instinct, hope. But planning for resilience is enhanced by a further principle, the human instinct to share. As two billion more people are born in the coming decades, and supply systems are disrupted by severe weather events, humans will marshal resources sufficient for their collective adaptation.

Sharing: A Principle of Sufficiency

Humans instinctively come to assist others in times of need. There will be much need in the Anthropocene. Empathy for others is an evolved capacity in humans for sharing and caring. Darwin noted how humans are impelled by a wish to aid others.[72] Man is a social animal and will share and even go without, in order to help others in need. Darwin rejected the theoretical logic of J.S. Mills' utilitarian theories as being contradicted by what humans actually did:

> *Under circumstances of extreme peril, as during a fire, when a man endeavours to save a fellow creature without a moment's hesitation, he can hardly feel pleasure; and still less he has the time to reflect on the advantage or satisfaction which he might subsequently experience if he did not make the attempt, …When a man risks his life to save that of a fellow-creature, it seems also more correct to say that he acts for the general good, rather than for the general happiness of mankind.*[73]

One aspect of evolved human capacities is specialisation. This grows out of the instinct to cooperate. As a species, humans share skills and exchange services, benefiting thereby. As evolutionary biologist Matt Ridley observes, "There is no other animal that exploits the law of comparative advantage between groups".[74] Specialisation furthers efficiency as a means to avoid waste. Treating efficiency as a goal in itself can have the effect of reducing resilience, or can serve to delay or deny sharing among humans. The principle of resilience would inspire the other ways to eliminate waste. Thomas Princen recognises a norm in each human's capacity to gather what is sufficient to meet needs, while sharing so that others can do the same. Princen also finds that humans can magnify their observance of this instinct. It can be acknowledged as a "principle of sufficiency",[75] reflecting the evolved human norm for sharing.

Sufficiency focuses on each human's instinct for attaining a "sufficient" return, while avoiding "over-consumption". On a personal level, over-consumption affronts others and is pilloried as the sin of gluttony. In nature, it compromises ecological integrity. The 1992 Earth Summit sought to end "unsustainable patterns of consumption and production".[76] Within countries, laws to attain distributive justice allocate goods and services to ensure sufficiency.

Recognising a principle of sufficiency would motivate efforts to sustain natural resources to provide long-term and continuous productivity rather than depletion and

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short-term gain. Practicing sufficiency obliges humans to share space with other species, so that there also may be enough to share with other humans. Humans need to exercise ecological constraint as their creatively advanced technologies impact the Earth. Extracting the last possible yield from nature reduces resilience, lacks precaution, and risks collapse of ecosystems and extinction of species. Acting on the evolved norm of sufficiency would discipline humans to avoid this fate. Princen would engage biophysical and social systems together: "The science of ecological rationality – complexity theory – is one that leads to very unscientific notions like humility and caution, much as the experiential knowledge of long-standing resources users does".[77]

Without a sufficiency principle, humans are apt to take imprudent risks, producing losses, for nature and humans alike. As Coen observes, "From an evolutionary point of view, it doesn't pay to be satisfied. It is better to continually search for actions that might increase the chance of survival and reproduction".[78] In the Anthropocene, survival and social wellbeing will require social understanding of sufficiency for anticipated needs, and provision for contingencies (through insurance and "back-up" systems). Current patterns of accumulating "more", especially in over-consuming nations, are phenomena of the Holocene. Stephen R. Kellert terms over-consumption "an inordinate fondness for materialism".[79] In place of seeking ever to hoard more, advancing adherence to a principle of sufficiency can induce humans to use foresight and strive to share. Without it, attaining the UN MDGs and/or eradicating poverty become ever more elusive.

The norm for sharing, combined with a constitutional right to the environment, can remake "business as usual". Currently, transportation in a nation like the Philippines is problematic. On a two-lane road with no sidewalks, pedestrians share space with bicycles and tricycles, and with cars, buses and trucks. Only two percent of Filipinos own motor vehicles, but the 98 percent who walk, bike or use buses, are denied safe roads. Their air is polluted and accidents are rife. This system is described by the Philippine "Road Sharing Movement" as follows:

> *For those who commute every day, the roads represent the deepest dungeons of hell. The severe traffic congestion, the air poisoning, road accidents, floods, high costs of transportation, urban hunger, and a host of other urban-related problems in our cities will not get any better. On the contrary, they will only get worse unless we change the way we think of the transportation and road system.*[80]

Attorney Tony Oposa and others are commencing legal actions against the Barangay (local council) to declare this road system unlawful under the Philippine right to the environment and several statutes.[81] The remedies are to make safe, healthy spaces for pedestrians and human-powered transit, and restrict space for vehicles in order to promote provision of mass-transit alternatives. Use of a continuing *mandamus* order can begin the transformation of this system. The principle of sharing, of sufficiency, has applications in many contexts.

Sufficiency reflects evolved norms about fairness and equity. In the Anthropocene, distributive justice will take on new meaning amidst widespread environmental dislocations. Wellbeing, as in the Philippine road-sharing example, is often denied by governments. For this reason, the constitutional provision of Bhutan, that the State shall strive to provide happiness to its people, needs to be recognised as a principle. Such a norm guides application of the norm of sufficiency.

The Principle of Wellbeing (Happiness)

Social order and contentment depend on equity and fairness among the different sectors of human society. Human contentment varies depending on individuals and their perspectives, but it is possible to determine the elements of basic wellbeing, or social happiness. Norms of social human rights seek to provide some aspect of this, as do the civil liberties norms in other human rights. Perceiving that economic metrics were neglecting measures for social indicators of wellbeing, Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi have advocated new socio-economic metrics "because there appears to be a gap between the information contained in aggregate GDP data and what counts for common people's wellbeing".[82]

Finding principles in the Anthropocene requires more than reconfiguring the metrics for economic growth. The assumption is that the economy should serve human wellbeing. The economy that was shaped in the Holocene has shortcomings, not least being the externalities that inaugurated the conditions of the Anthropocene. There are a number of efforts by social scientists to project happiness as the foundation for frameworks of decision making.[83] What still is missing in the fundamental platform for these efforts is the acceptance of a fundamental principle of happiness that would guide societies in enabling people to attain balance in their lives. Promoting holistic wellbeing provides purpose to principles of foresight, sharing and cooperation, and supports rationales for resilience.

Happiness can be described and measured in different contexts. For example, Bhutan has promulgated nine domains (and 33 indicators) for its metrics and norms of happiness: psychological wellbeing, health, education, culture, time-use (having ample time for family, cultural pursuits, sleep and work), good governance (public participation, political freedom and government performance), community vitality, ecological diversity and resilience, and living standards (assets, housing).[84] Under a principle of happiness, the priorities for government and community alike are to promote these nine priorities. Of course, the context for these will vary from place to place, and time to time. A principle of happiness would guide efforts to ensure that these components of societal wellbeing are met ahead of endeavours that do not serve these components.

As the Note of the United Nations Secretary General on "Happiness: Towards a Holistic Approach to Development"[85] reports, Japan, Qatar, the United Kingdom, France and Italy have all taken national decisions to assess how to use happiness metrics. The European Union and

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the Economic and Social Commission for Asia and the Pacific (ESCAP) have both held conferences on the happiness approach. The Organisation for Economic Co-operation and Development (OECD) currently profiles its 34 Members, plus Brazil and Russia, based on 11 subjects that contribute to social wellbeing.[86] The foundations for recognising a happiness principle are becoming explicit. Framing a legal principle of happiness will oblige nations to examine their own cultural and social definitions for wellbeing as they adapt to the Anthropocene.

The Principle of Justice for Humans and Nature

A thirst for justice is an evolved norm. Laws worldwide acknowledge that societies are grounded in justice and have a legal duty to provide justice. Civilisations have created courts and concepts of human rights to ensure justice. The emergence of environmental rights illustrates how the principle of justice is adapting to the conditions of the Anthropocene. Humans must be just among and within their societies in order for the human world to attain a just or ecologically balanced and harmonious stewardship between humans and nature.

The Anthropocene will require more than just the realisation of human rights. Conceptions of the rights of nature, apart from humans, are now being advanced by Andean nations in their Declaration of Mother Earth, or Pachamama. Andean nations continue to advance the adoption of a Universal Declaration on the Rights of Nature.[87]

Environmental law recognises that, without a forum for enforcing environmental rights, justice is denied. Principle 10 of the Rio Declaration on Environment and Development[88] mandated procedural justice in environmental decision making. The courts in most nations have been instrumental in promoting the effectiveness of environmental law.[89] Recently, more than 50 nations (in Brazil, China, India and elsewhere) have established some 400 environmental courts and tribunals to adjudicate environmental rights.[90] These courts are designing new remedies to restore nature and vindicate environmental rights.[91] Judicial experience with environmental issues illustrates how justice provides legal application for evolved norms such as biophilia. Courts have articulated a number of environmental legal norms.[92]

Environmental justice is often grounded in constitutions.[93] One of the earliest judicial precedents affirming a constitutional right of nature to be preserved in a "wild" state arose in the State of New York. Since 1894, New York's Constitution has provided that the State's Forest Preserve in the Adirondack and Catskill mountains shall be "kept as forever wild forest land".[94] The Constitution authorises any citizen to enforce this provision. Faced with a decision by NY Governor Franklin Roosevelt to allow destruction of wild forest to construct a bobsled run for the Winter Olympics, citizens sued to enforce the Constitution's "forever wild" provision. The courts upheld the Constitution.[95] The decision resounds of the principle of biophilia, and is grounded in the rule of law and concepts of justice. The New York court decision includes the following rationale:

> *Giving to the phrase 'forever kept as wild forest lands' the significance which the term 'wild forest' bears, we must conclude that the idea intended was a health resort and playground with the attributes of a wild forest park as distinguished from other parks so common to our civilisation. We must preserve it in its wild nature, its trees, its rocks, its streams. It was to be a great resort for the free use of all people, but it was made a wild resort in which nature is given free rein. Its uses for health and pleasure must not be inconsistent with its preservation as forest lands in a wild state. It must always retain the character of a wilderness. Hunting, fishing, tramping, mountain climbing, snowshoeing or skating find ideal setting in nature's wilderness. It is essentially a quiet and healthful retreat from the turmoil and artificialities of a busy urban life. Breathing its pure air is invigorating to the sick. No artificial setting is required for any of its purposes. Sports which require a setting that is man-made are unmistakably inconsistent with the preservation of these forest lands in the wild and natural state in which Providence has developed them.*[96]

L-R: Parvez Hassan, Wolfgang Burhenne and Nicholas Robinson

Justice for humans and nature in this context rested on the principles of biophilia, resilience, foresight and sufficiency.[97] The bobsled run was built on private lands and the Olympics were held. The "forever wild forest" remains.

Comparable norms affording just relations for humans and nature are found in contemporary applications of the public trust doctrine, an ancient Roman law concept which safeguards access to navigable water bodies. Courts have extended the public trust doctrine to parklands. Under the doctrine, the State holds lands as a trustee, for the benefit of the public and cannot compromise the public's uses of the waters or lands.[98] Public trust rulings can be found from courts in New South Wales[99] to courts in India.[100] In the latter case, Justice Kuldip Singh invalidated the Himachal Pradesh government's transfer of a large area of land on the bank of the River Beas, from the state to a company owned by the former Minister of Environment

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for use as a hotel. The Court ruled "The aesthetic use and pristine glory of natural resources, the environment and the ecosystems of our country cannot be permitted to be eroded for private commercial or any other use unless the courts find it necessary, in good faith, for the public good and in public interest to encroach upon the said resources".

Laws continue to expand application of justice to include recognition of nature in different settings. Most complete is Ecuador's constitutional recognition that the government must afford the rights of nature comparable treatment to human rights. Ecuador's revised Constitution provides a right for nature, independent of the realm of human activity,[101] as well as providing an environmental right for humans.[102] A temporary Judicial Council held proceedings in all of Ecuador from 2010–12 to engage all sectors of society and government in discussion on how to observe a right of nature. Courts in Ecuador have begun to recognise the right to nature to have humans respect natural integrity.[103]

One basis for ever-widening recognition of environmental rights is provided by the Supreme Court of the Philippines in *Oposa v. Factoran,*[104] referred to above. This case, brought on behalf of children and future generations, alleged that the government's timber concessions violated the Constitution's provisions on "balanced and healthful ecology in accord with the rhythm and harmony of nature". Chief Justice Hilario Davide Jr found that this Constitutional provision was grounded in concepts of nature deeper than the Constitution:

> *While the right to a balanced and healthful ecology is to be found under the Declaration of Principles and State Policies and not under the Bill of Rights, it does not follow that it is less important than any of the civil and political rights enumerated in the latter. Such a right belongs to a different category of rights altogether for it concerns nothing less than self-preservation and self-perpetuation – aptly and fittingly stressed by the petitioners - the advancement of which may even be said to predate all governments and constitutions. As a matter of fact, these basic rights need not even be written in the Constitution for they are assumed to exist from the inception of humankind. If they are now explicitly mentioned in the fundamental charter, it is because of the well-founded fear of the framers that unless the rights to a balanced and healthful ecology and to health are mandated as state policies by the Constitution itself, thereby highlighting their continuing importance and imposing upon the state a solemn obligation to preserve the first and protect and advance the second, the day would not be too far when all else would be lost not only for the present generation, but also for those to come – generations which stand to inherit nothing but parched earth incapable of sustaining life.*

Other Principles

There will doubtless be many perspectives on each of these proffered principles. They can be broken into component elements, as additional principles or corollaries. Some can be deleted, if it is deemed that they do not already vest in human nature as evolved norms that need to be encouraged or cultivated. Each needs a definition – a task to which the deliberations at the Conference can contribute. There are doubtless additional principles that need to be explicitly identified and debated to help humanity cope with events in the Anthropocene.

At the end of the search, however, new principles will emerge. The many, independent and re-iterative efforts to frame new statements of "rights" illustrate the human quest for such guidance. Religion has often provided it; secular civil rights or socialist proclamations address this need. The Anthropocene begins the search all over again, in a new time and under new conditions.

Muddling Through the Anthropocene Epoch

Living in the Anthropocene, humans will draw on their evolved norms to adapt. Living within nature's resilience will let humans recall or rediscover their own biological interdependencies. As Leopold observed,[105] "The shallow-minded modern who has lost his rootage in the land assumes that he has already discovered what is important… all history consists of successive excursions from a single starting point, to which man returns again and again to organise yet another search for a durable scale of values". Evolved norms coexist in the human brain with other instincts and culturally evolved patterns of behaviour. The role of explicit principles is to promote reliance on evolved norms that help humans to attain wellbeing. While doing so, such principles can advance ecological security, social order, and recognition of fundamental human rights and environmental rights.

In selecting principles based on evolved norms, the inquiry needs to be to determine which principle expresses and reflects an accepted part of human nature. As traits of human nature, the agreed evolved norms and principles will be mutually reinforcing. Declaring these principles will, in turn, promote their further application and refinement. While humans maximise adherence to their evolved love of nature, focusing their shared interests in the principle of biophilia, they instinctively maximise their adherence to the principle of cooperation and apply their principle of foresight to perceive environmental risks to the resilience of nature on which they depend, their own resilience. Observing the principle of resilience induces additional undertakings to enhance human resilience and health. To muster the resources to act, humans cooperate to share, consistent with the principle of sufficiency. The object of sharing is to fulfil the principle of happiness, or social wellbeing. The principle of justice for humans and nature respects the domains of nature and of humans, through environmental rights that reinforce all these other principles. Humans instinctively have affinity for these principles.

Amidst the perils of the Anthropocene, it will be difficult to know how to invoke these principles in context. Different times and places will reveal different patterns of implementation. How can they operate to avert ecological degradation? In what circumstances do the principles govern? How do these principles guide other instincts?

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For example, fear of nature, another evolved trait, can help induce an interest in averting danger.[106] Would the fear of suffering repeated extreme weather events combine with other evolved norms to magnify and accelerate adherence to these principles?

Determining whether the hypotheses behind each of the above seven principles "ring true", or require reassessment, is the challenge that the social sciences, ecology, environmental law and international law, and all other disciplines need to examine. In the interim, these fundamental principles can be applied in local neighbourhoods and small communities, as well as on the scale of countries and regions. Individuals need not wait for governments to act to accept these principles as personal guidance, since each person instinctively responds to these evolved norms. Will they? Ecologist Steve Jones notes: "As Charles Darwin himself insisted, evolution is not a predictive science. Natural selection has no inbuilt tendency to improve matters (or for that matter make them worse). For *Homo sapiens,* some nasty surprises no doubt lurk around the corner. Someday, evolution will take its revenge and we may fail in the struggle for existence against ourselves, the biggest ecological challenge of all".[107]

Recovering from the tragedies of natural disasters, humans seek ways forward and ask for guidance. This reaction is only natural. Why not, then, seek consensus about the evolved norms inherent in human nature? Cognitive science, and all social sciences, indeed all disciplines, have much to learn about how humans will adapt during the Anthropocene. Human history suggests that coming years will produce laws and governing systems quite different from those we know today. In contemplating the Anthropocene, we must admit that we actually know rather little about how humans and nature will coexist. A new paradigm and new legal principles will be like a hypothesis, ready to be put to use, but open to learning and rethinking when experience and learning calls into question the working theory of the day.

Human nature appears alike wherever humans live, whether in deserts, islands, Arctic tundra or Amazon forest, mountains or lowlands. Face to face with the landscapes of their Anthropocene Epoch, humans are obliged to make new adaptations. Evolved norms endow humanity with the capacity to do so, and humans have an innate capacity to create legal systems just as they create languages. Probably, not all individuals can or will avail themselves of the opportunities to adapt using legal principles. Humans in some communities and countries will rise to the occasion, and others will not. The thesis of this paper is that shared legal principles can help all humans to help each other during uncertain times to come. This paper suggests that humanity's instinct to make law can be applied to strengthen evolved norms as principles, in turn to guide the intergenerational journeys through the Anthropocene.

The Anthropocene invites a critical reassessment of the principles that guide environmental law. The principles espoused here are offered to contribute to that reassessment.

Notes

1 Gillis, J. 2013. "Heat-Trapping Gas Passes Milestone, Raising Fears". *N.Y. Times*, at 1, 11 May 2013.

2 See www.quaternary.stratigraphy.org.uk; and the essay by Steffen, W., Crutzen, P.J. and McNeill, J.R. 2007. "The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?" *Ambio* 36(8): 614–621.

3 See the 5th Assessment Report, Terms of Reference, at www.ipcc.ch.

4 Clark, P. 2013. "Global Literary Circles Warming to Climate Disaster Fiction". *Financial Times*, at 4, 1–2 June 2013.The Association for the Study of Literature and the Environment in the UK notes more than 150 works published in the past eight years, notwithstanding the push-back from "climate sceptics".

5 Kuhn, T.S. 1996. *The Structure of Scientific Revolutions*. 3rd edition. Chicago: University of Chicago Press.

6 Kuhn concludes his essay, *ibid.*, by conceiving scientific method and inquiry as analogous to or part of human evolution. In 1962, scientists were not yet aware of the facts of the Anthropocene. He could conclude that the articulation and specialisation of scientific knowledge would reach new understandings, new scientific revolutions. He concludes, at 173, "Any conception of nature compatible with the growth of science by proof is compatible with the evolutionary view of science developed here. Since this view is also compatible with close observation of scientific life, there are strong arguments for employing it in attempts to solve the host of problems that still remain".

7 When nations cannot agree on the definition of "sustainability", it is not hard to see why international policy making becomes confused and less effective. In 1972, the Stockholm Conference focused on the "human environment", and at least humans were deemed included in the environment. This concept was allowed to fade over time. For the decade after the Rio "Earth Summit", national implementation of *Agenda 21* was uneven and often slow. To encourage international cooperation toward sustainable development, the UN General Assembly convened another summit meeting, the 2002 Johannesburg UN World Summit on Sustainable Development (WSSD), useful recommendations for national laws on energy were agreed, and this omission from *Agenda 21* was corrected. The nations further agreed in the Declaration of Johannesburg, that sustainable development rested on three pillars: the economic pillar, the social pillar, and the pillar of environmental protection. Little note was taken of the fact that each of these three pillars was vastly different in size and priority. The Brundtland Commission's foundational premise, based on inter-generational equity, was not focused upon at the WSSD. Principles of law were generally ignored in the debates; indeed, the sentence in the Johannesburg Plan of Implementation that states "Ethics are fundamental to sustainable development", had been expunged by the drafting Bureau of UN Member States from each of the preparatory draft texts, until the final plenary, where it was re-inserted and adopted, thanks to Colombia's former environment minister Juan Mayr, who was present as an IUCN delegate in Johannesburg.

8 The World Commission on Environment and Development. 1987. "Our Common Future". Oxford: Oxford University Press.

9 It is significant to note that the Rio Principles were drafted in 1991 and never renegotiated by the Plenary of the UN Conference on Environment and Development. They were not mentioned in *Agenda 21*, nor explicitly ever related to the recommendations of Agenda 21. They were very important in helping shape national legislation and building consensus toward adoption of environmental rights. However, at the international level, they have not been powerful in constraining economic development to become "sustainable".

10 Holdren, J.P. 2008. *Meeting the Climate-Change Challenge*. Washington DC: National Council for Science and the Environment, at http://ncseonline.org/sites/default/files/Chafee08final.pdf.

11 Robinson, N.A. 2012. "Beyond Sustainability: Environmental Management for the Anthropocene Epoch". *Journal of Public Affairs* 12(3): 181–194.

12 See Robinson, N.A. (Ed.) 1992. *Agenda 21: Earth's Action Plan*. New York: Oceana Publications; and the six volumes of the *traveaux préparatoires* of the UN Conference on Environment & Development (UNCED), Robinson, N.A. *et al*. 1993. *Agenda 21 & The UNCED Proceedings*. New York: Oceana Publications.

13 Swaminathan, M.S. 2012. *In Search of Biohappiness – Biodiversity & Food, Health & Livelihood Security*. Singapore: World Scientific Publishing.

14 Constitution of The Philippines, Article 2, section 15. Many other constitutions employ similar language.

15 Rules of Procedure for Environmental Cases, AM No. 09-6-8-SC (effective 29 April 2010), at www.lawphil.net/courts/supreme/am/am_09-6-8-sc_2010.html.

16 See http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf.

17 See symposium on "Environmental Courts and Tribunals: Improving Access to Justice and Protection of the Environment Around the World". *Pace Environmental Law Review* 29(2), at http://digitalcommons.pace.edu/pelr/vol29/iss2/; see also a prior symposium on judicial practice published in the *Journal of Court Innovation* 3(1).

18 Ura, K., Alkire, S., Zangmo, T. and Wangdi, K. 2012. *A Short Guide to Gross National Happiness Index*, at 4. Thimpu: The Centre for Bhutan Studies, at www.grossnationalhappiness.com.

19 Preliminary Report. UN Doc. A/HRC/22/43 (24 December 2012).

20 UN Doc. A/67/697 (16 January 2013).

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21 *Supra*, note 13.
22 *Supra*, note 18, at 6.
23 A sociobiological and cultural evolutionary basis for such evolved norms is set forth in Robinson, N.A. 2013. "Evolved Norms: A Canon for the Anthropocene". In: Voigt, C. (Ed.) *Rule of Law for Nature: New Dimensions and Ideas in Environmental Law.* Cambridge: Cambridge University Press. This essay also examines the principles of cooperation, biophilia and resilience.
24 Human sociobiology, human behavioural ecology, evolutionary psychology, cultural evolution, and gene-culture co-evolution.
25 Laland, K.N. and Brown, G.R. 2011. *Sense & Nonsense: evolutionary perspectives on human behaviour.* 2nd edition, at 218. Oxford: Oxford University Press.
26 UN General Assembly Resolution 37/7 (1982), at http://www.un.org/documents/ga/res/37/a37r007.htm. The UN World Charter for Nature acknowledges that "the human species is part of nature and life depends on the uninterrupted functioning of the natural systems".
27 In 2000, the Earth Charter was approved by 23 personalities after a process of consultation with civil society in different regions of the world led by Prof. Steven Rockefeller, the principal draftsman of the Charter. The Earth Charter is an international declaration of principles, proposals and aspirations for a just, sustainable and pacific world society in the 21st century. The Earth Charter principles provide human norms for respect and care for life in all its diversity with understanding, compassion and love. It promises to protect and restore the integrity of the ecological systems of the Earth and to proceed with caution when knowledge is limited. It also sets forth the adoption of modes of production, consumption and reproduction that safeguard the regenerative capabilities of the Earth; see http://earthcharterinaction.org/content/.
28 Hand, J.P. and Smith, J.C. 1988. *Neighboring Property Owners.* New York: Shepard's/McGraw Hill; annual updates published by Thomson West.
29 Articles 55 and 56 in Chapter IX of the United Nations Charter.
30 Robinson, N.A. 2001. "Forest Fires as a Common International Concern: Precedents for the Progressive Development of International Environmental Law". *Pace Environmental Law Review* 18(2): 459–504.
31 Bowles, S. and Gintis, H. 2011. *A Cooperative Species: Human Reciprocity and Its Evolution.* Princeton: Princeton University Press.
32 Coen, E. 2012. *Cells to Civilizations – The Principles of Change that Shape Life.* Princeton: Princeton University Press.
33 Pagel, M. 2011. *Wired for Culture: The Natural History of Human Co-operation.* London: Allen Lane.
34 Ridley, M. 1996. *The Origins of Virtue: Human Instincts and the Evolution of Cooperation.* New York: Penguin.
35 Darwin, C. 1859. *The Origin of Species*, at 106. London: John Murray.
36 *Supra*, note 31, chapters 7 and 9.
37 See the "Strategic Plan for Biodiversity 2011–2020, including Aichi Biodiversity Targets". Conference of the Parties of the Convention on Biological Diversity, at http://www.cbd.int/sp/default.shtml.
38 See the Copenhagen Accord, UN Framework Convention on Climate Change, Decision 2/CP.15 (18 December 2009), at https://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php.
39 Ostrom, E. 1999. *Governing the Commons: The Evolution of Institutions for Collective Action.* Cambridge: Cambridge University Press.
40 This sort of environmental law innovation is being established in England and Wales through the *Commons Act of 2006*. It has existed in the Adirondack Mountains of New York through the Adirondack Park Agency Act, at www.apa.ny.gov/Documents/Laws_Regs/APAACT.PDF, codified in the NYS Executive Law, and the earlier establishment of the Forest Preserve of the State in 1894, Article XIV of the NYS Constitution, around which conservationists, recreationalists, property owners, mining and timber interests, all gather to engage in decisions on land stewardship.
41 Principle 10 of the Rio Declaration on Environment and Development, 1992, later codified in the Aarhus Convention, *supra*, note 16.
42 *Supra*, note 32, at 264.
43 Wilson, E.O. 1984. *Biophilia: The Human Bond with Other Species.* Cambridge MA: Harvard University Press.
44 Burghardt, G. 2005. *The Genesis of Animal Play: Testing the Limits*. Cambridge MA: MIT Press.
45 See Lausche, B.J. 2011. *Guidelines for Protected Area Legislation*. EPLP No. 81. Gland: IUCN.
46 Kellert, S.R. 2012. *Birthright: People and Nature in the Modern World*, at 195. New Haven CT: Yale University Press.
47 See the several cases brought by M.C. Mehta in the Supreme Court of India.
48 *Oposa v. Factoran*.
49 See *Association to Protect the Adirondacks v. MacDonald*, in the NYS Court of Appeals.
50 Holdgate, M 1999. *The Green Web: A Union for World Conservation*. London: Earthscan. IUCN was founded in 1948.
51 Lausche, B.J. 2008. *Weaving a Web of Environmental Law.* Berlin: Erich Schmidt Verlag.
52 Heatherton, T. 2012. "From Ecocide to Genetic Rescue: Can Technoscience Save the Wild?", at 50–3. In: Sodikoff, G.M. *The Anthropology of Extinction: Essays on Culture and Species Death.* Bloomington IN: Indiana University Press.
53 Berry, T. 1999. *The Great Work: Our way into the future*. New York: Bell Tower.
54 See the studies of the Forum on Religion and Ecology at Yale, "World Religions and Ecology Series", published by the Harvard Divinity School Center for the Study of World Religions, studies on Indigenous Religions (J. Grimm), Hinduism (C.K. Chapple and M.E. Tucker), Jainism (C.K. Chapple), Buddhism (M.E. Tucker and D.R. Williams), Confucianism (M.E. Tucker and J. Berthrong), Daoism (N.J. Girardot, J. Miller and Liu Xiaogan), Judaism (H. Tirosh-Samuelson), Christianity (D.T. Hessel and R.R. Ruether) and Islam (R.C. Foltz, F.M. Denny and A. Baharuddin). See http://fore.research.yale.edu/publications/books/book_series/cswr/index/html.
55 Bellah, R.N. 2011. *Religion in Human Evolution.* Cambridge MA: Harvard University Press. He also references Gordon Burghardt's insightful studies on the human capacity for play.
56 See, *e.g.*, *supra*, note 34, at 211.
57 *Supra*, note 43, 139–40.
58 McHarg, I. 1969. *Design With Nature.* Garden City NY: Natural History Press.
59 Kellert, S.R., Heerwagen, J.H.and Mador, M.L. 2008. *Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life.* Hoboken NJ: John Wiley.
60 See the 12 Manhattan Principles of the Wildlife Conservation Society's "One World, One Health" programme, at www.OneWorldOneHealth.org; and also http://www.wcs.org/conservation-challenges/wildlife-health.aspx.
61 See the Freshwater Wetlands Act and the Tidal Wetlands Act of the State of New York, Articles 24 and 25, Environmental Conservation Law, 17 1/2 McKinney's Consolidated Laws of New York.
62 See the many papers and lectures from different disciplines, available through the Resilience Center at the University of Stockholm, Sweden. See, *e.g.*, B. Nykvist, "Social Learning in the Anthropocene: Governance of natural resources in human dominated ecosystems" (Doctoral Thesis in Natural Resource Management, Stockholm University), available as one of the publications of the Stockholm Resilience Center, at www.stockholmresilience.org.
63 Resilience is required in and after responses to disasters. See Kolmannskog, V. and Trebbi, L. 2010. "Climate Change, Natural Disasters and Displacement: A Multi-track Approach to Filling the Protection Gaps". *International Review of the Red Cross* 879, at http://www.icrc.org/eng/resources/documents/article/review-2010/irrc-879-kolmannskog-trebbi.htm.
64 See Walker, B. and Salt, D. 2006. *Resilience Thinking: Sustaining ecosystems and people in a changing world*. Washington DC: Island Press.
65 Consider the analogy to the precautionary principle, and the maxims about saving for a rainy day.
66 Wright, J., Wadsley, V. and Artandi, J. 1994. *The History of the National Association of Mutual Insurance Companies: A Century of Commitment, 1895–1995*. Indianapolis IN: National Association of Mutual Insurance Companies.
67 Fackler, M. 2011. "Tsunami Warnings, Written in Stone". *NY Times*, 20 April 2011. It has been suggested that the capacity of humans to forget unpleasant times or events is an evolved instinct, but humans also have capacities to remember and fashion ways to counteract forgetfulness.
68 Darwin, C. 1868. *The Variation of Animals and Plants Under Domestication.* London: John Murray.
69 Theodore Roosevelt, Address by the President, "Proceedings of the Conference of Governors of the United States, The White House, May 13-15, 1908" (printed by Act of Congress, 1908), at 8.
70 The "precautionary principle" is set forth in Principle 15 of the Rio Declaration, *supra*, note 41.
71 Environmental Impact Assessment is set forth in Principle 17 of the Rio Declaration, *ibid*.
72 Darwin, C. 1874. *The Descent of Man*, at 635, and Chapter 5 on "Moral Sense". London: John Murray.
73 *Ibid.*, at 135–6.
74 *Supra*, note 34, at 209–10.
75 Princen, T. 1995. *The Logic of Sufficiency.* Cambridge MA: Massachusetts Institute of Technology Press.
76 Paragraphs 4.3 and 4.26, *Agenda 21* (1992), UN Doc A/CONF. 151/4 (1992).
77 *Supra*, note 75, at 44–45, citing with favour political theorist Dryzek, J.S. 1987. *Rational Ecology: Environment and Political Economy.* Oxford: Blackwell.
78 *Supra*, note 32, at 268.
79 *Supra*, note 46, at p.63.
80 The Road Sharing Movement (2013), urging that "those who have less in wheels must have more in roads". Information available at roadsharing.phil@gmail.com.
81 Executive Order 774 (2008) directed transportation departments and local authorities to transform the roads using the principles of road sharing; The Code of Conduct of Public Officials (Rep. Act 6713); Article 27 of the Civil Code (holding public officials liable for damages for non-performance of a duty resulting in moral or material damage to a citizen); and several environmental and air pollution statutes.
82 "Report by the Commission on the Measurement of Economic Performance and Social Progress", at www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.

83 Helliwell, J., Layard, R. and Sachs, J. (Eds) 2012. *World Happiness Report*. New York NY: Earth Institute, Columbia University.
84 *Supra*, note 18, at 13–41.
85 UN Doc. A/67/607 (16 January 2013).
86 See www.oecdbetterlifeindex.org.
87 On 22 April 2009, Evo Morales Ayma, President of the Plurinational State of Bolivia, proposed to the General Assembly of the United Nations the elaboration of a Universal Declaration of Mother Earth's Rights, to acknowledge Mother Earth's right to live, the right of its bio-capacity to regenerate, the right to life free of contamination and the right to live in harmony. Thereafter, the Presidents of the member nations of the ALBA-TCP (Bolivarian Alliance for the Peoples of Our America-Peoples' Trade Treaty), in the 2009 VII Summit that took place in Bolivia, approved the "Special Declaration for a Universal Declaration of The Rights of Mother Earth", which sets forth the proposition that a legal regime that recognises human rights alone generates imbalances. Rights of Nature are required to re-balance the relationship of humans and nature.
88 Principle 10 of the Rio Declaration, *supra*, note 41.
89 These experiences are well analysed in Kotzé, L.J. and Paterson, A.R. 2009. *The Role of the Judiciary in Environmental Governance – Comparative Perspectives.* Mechelen: Wolters Kluwer, which examines the strengths and weaknesses of environmental adjudication in 19 nations.
90 Professors George (Rock) Pring and Catherine (Kitty) Pring (University of Denver Strum College of Law) conducted an empirical survey of many of these new courts; see Pring, G. and Pring, C. 2009. *Greening Justice: Creating and Improving Environmental Courts and Tribunals.* Washington DC: The Access Initiative, housed within the World Resources Institute.
91 *Supra*, note 17. Pace University School of Law and the State of New York's Judicial Institute have published the first scholarly commentaries about the substantive and procedural aspects of environmental judicial adjudications, by environmental courts and tribunals.
92 Justice Brian Preston, Chief Judge of the Environment Court of New South Wales (Australia), has summarised these as falling under five topics: (a) substantive justice, (b) procedural justice, (c) distributive justice, (d) restorative justice, and (e) therapeutic justice. *Ibid.*
93 Boyd, D.R. 2012. *The Environmental Rights Revolution.* Vancouver: University of British Columbia Press.
94 Article XIV, Constitution of the State of New York.
95 *The Association for the Protection of the Adirondacks and Another v. Alexander Macdonald, Conservation Commissioner of the State of New York and Another*, 228 AD 73, 239 NYS 31 (App. Div 1930), affirmed 253 NY 234.
96 *Ibid.*, at 40.
97 The decision was affirmed by the Court of Appeals; see 253 N.Y. 234 at 238 (1930).
98 See Leisch, K.R. 2010. "A Trusting Public: How the Public Trust Doctrine Can Save the New York Forest Preserve". Research paper posted on line by the Pace Law School Law Library.
99 *Willoughby City Council v. Minister Administering the National Parks & Wildlife Act* (1992), 78 LGRA 18 (Austl.).
100 *M.C. Mehta v. Kamal Nath and others* (1977), SCC 388 (India).
101 Article 71 of the Constitution of 2008 provides: "Nature or *Pachamama*, where life is reproduced and exists, has the right to exist, persist, maintain and regenerate its vital cycles, structure, functions and its processes in evolution. Every person, people, community or nationality will be able to demand the recognitions of rights for Nature before the public organs. The application and interpretation of these rights will follow the related principles established in the constitution".
102 Article 397 of the Constitution of 2009 provides " … To permit any natural person or legal entity, human community or group, to file legal proceedings and resort to judicial and administrative bodies without detriment to their direct interest, to obtain from them effective custody in environmental matters, including the possibility of requesting precautionary measures that would make it possible to end the threat or the environmental damage that is the object of the litigation. The burden of proof regarding the absence of potential or real danger shall lie with the operator of the activity or the defendant".
103 Daly, E. "Ecuadoran Court Recognizes Constitutional Rights to Nature". *Widener Law School blog*, at http://blogs.law.widener.edu/envirolawblog/2011/07/12/ecuadorian-court-recognizes-constitutional-right-to-nature/. See *Arco Iris v. Ecuador Mineral Institute* (1993), and *K.F. Wheeler and E.G. Huddle v. Attorney General of the State of Loja* (2011).
104 GR 10[illegible]3 (6 July 1993).
105 Leopold, A. 1949. *A Sand County Almanac*, at 200. New York NY: Oxford University Press.
106 *Supra*, note 46, at 34.
107 [illegible]es, J. 2008. *Darwin's Island: The Galapagos in the Garden of England*, at 286. Boston MA: Little, Brown and Co.
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