

1 **Time for a paradigm shift towards a restorative culture**

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14 concept developed by KD.

15

16 **Abstract**

17

18 The United Nations' recent declaration of a Decade on Ecosystem Restoration (2021–2030) conveys the

19 immense scales of degradation we face and the urgency of ecological recovery. Yet it speaks predominantly

20 to productivity-based approaches that may poorly balance conservation and development goals. As a result, it

21 overlooks or distorts the very real potential for the holistic restoration of natural and cultural ecosystems to

22 achieve lasting social and human health and wellbeing benefits, and help stem the grotesque loss of

23 biodiversity and ecosystem health in these times There is need for a profound paradigm shift to address the

24 prevailing economic and political climate that is keeping our world and biosphere on their current ominous

25 trajectory. Such a paradigm shift could be based on the idea of a ‘restorative culture’. Practically, this could
26 proceed by coupling the foundational philosophies and *modus operandi* of restoration ecology with public
27 health medicine. The outcome would be an era of more healthy and more science- and knowledge-driven
28 sustainable restoration and local redevelopment. A restorative culture would recognise the fundamental
29 linkages between ecosystems and human health, and consider biodiversity as fundamental to personal,
30 community, and cultural well-being and resilience. This requires public-private and community and individual
31 partnerships at city, township and watershed scales, as well as progressive industry champions working in
32 collaboration with governments and the U.N.

33

34 **Keywords** ecological economics, ecological restoration, ecosystem health, human health, restoration ecology,
35 sustainability.

36

37 **Implications for Practice** A socio-ecological approach to public health incorporating environmental
38 sustainability and ecological restoration is needed and requires:

- 39 • Stronger links among education, culture and policy related to nature-culture interactions.
- 40 • Development of customs, laws and social standards underpinned by sustainable development and
41 environmental recovery principles that place primary emphasis upon biodiversity and resilient
42 ecosystems as a fundamental requirement of public health and wellbeing.
- 43 • Incentivisation of policy and regulatory frameworks designed to create a culture of continuing
44 improvement in land and resource management. Public-private partnerships are crucial but with
45 oversight to prevent still further income and wealth inequities.
- 46 • Green business models reflecting the extended time frames required to mature restoration outcomes
47 and maximise social and ecological benefits.

48

49 **Running head** Towards a restorative culture

50

51

52

53 **Introduction**

54

55 On March 1st, 2019, the United Nations (UN) General Assembly declared 2021–2030 the UN Decade on
56 Ecosystem Restoration. The Declaration reflects and embodies the fertile interface among the UN Sustainable
57 Development Goals (SDGs) and the overlapping ambitions of the three ‘Rio Conventions’ (Convention on
58 Biological Diversity [CBD], Convention on Combatting Desertification [CCD] and United Nations
59 Framework Convention on Climate Change [UNFCCC]), and proposes a target of 350 million hectares to be
60 restored over the next decade. For example, it emphasises the restoration of healthy, sustainable ecosystems
61 as a “*proven measure to fight the climate crisis and enhance food security, water supply and biodiversity*”.

62

63 The UN define ‘*ecosystem restoration*’ as “*assisting the recovery of degraded, damaged and destroyed*
64 *ecosystems to regain ecological functionality and provide the goods and services that people value*” (MARN,
65 2019). Though similar to ‘*ecological restoration*’ as defined by the Society for Ecological Restoration
66 (McDonald et al., 2016), by introducing “*goods and services that people value*” as a caveat to improving
67 ecological functionality, the UN definition portrays restoration as a predominantly anthropocentric tool to
68 achieve productivity-based models of environmental recovery. As a result, it fails to change the
69 anthropocentric focus and unbridled neoliberalism of the prevailing economic models that so clearly need to
70 be better informed by the biological and ecological limits to economic growth at global scale (Daly & Farley,
71 2004; Spash, 2012; Daly, 2019).

72

73 Although the new UN Declaration conveys the immense scales and urgency of ecological recovery that are
74 increasingly recognised, does it balance conservation and development goals in ways that offer real hope of

75 achieving long-term goals? It is a very welcome policy move indeed. However, we fear it will fall short of its
76 objectives for lack of a clear and broad vision of what is needed at the conceptual, socio-political, economic
77 and cultural assessment phase, long before engineers and technicians are asked to take over field operations
78 with focus on plants, soils and biophysical aspects of the work at hand.

79

80 Building on previous work (e.g., Aronson et al., 2007b; Blignaut et al., 2007; Milton et al., 2007), to define,
81 support and mainstream *holistic* ecological restoration (Clewell & Aronson, 2013) with strong economic as
82 well as ecological ‘legs’, we express concern that the Declaration does not adequately balance conservation
83 and development goals. We refer to ecological restoration and allied activities that deliver benefits to human
84 health and welfare through the maintenance and enhancements of critical natural capital, including native
85 biodiversity linked to restoration of social capital, and the explicit linkage of ecosystem ‘health’ and human
86 health (Aronson et al., 2016b; 2017; Goodwin, 2019) through action and policy aiming at profound and lasting
87 changes in policy and the mindsets driving it (de Groot et al., 2011; Neßhöver et al., 2011; de Groot et al.,
88 2013; Blignaut et al., 2014). We note that calls for a similar paradigm shift in the sister discipline of ecological
89 economics date to the mid-1990’s (Norgaard, 1995; Daly, 2019; Rees, 2019), and are being revived by the
90 current generation of ecological economists (Blignaut and Aronson, in press).

91

92 **The environmental-human health nexus**

93

94 Rio conventions have great merit but are silent on the environmental-human health nexus, despite compelling
95 evidence of public health benefits. Empirical support for these benefits is growing rapidly; for example,
96 urbanisation has been linked with human dietary shifts leading to reduced environmental health outcomes (the
97 diet–environment–health trilemma; Tilman & Clark, 2014), and to increasing human immune dysregulation
98 (Mills et al., 2017). In addition to providing economic services in the form of material goods and food diversity,
99 above- and below-ground biodiversity increases personal, community and cultural resilience through

100 mechanisms such as buffering against the spread of infectious diseases, and improves physical and mental
101 health, quality of life and wellbeing across many indicators (Bratman et al., 2012; Sandifer et al., 2015;
102 Liddicoat et al., 2016). Even a minor role of biodiversity in improving mental health outcomes will result in
103 significant economic benefits, with mental health predicted to become the leading global cause of disease
104 burden by 2030 (Clark et al., 2014; Nesse, 2019).

105

106 Indigenous communities, whose socioeconomic lives are among the most intrinsically linked with nature
107 (Sangha et al., 2015), provide strong examples of the environmental-human health nexus. For example, the
108 Nyoongar people of Western Australia, who have practiced a rich culture intrinsically tied to the region's
109 exceptional biodiversity and landscape for over 45,000 years, are the most disadvantaged community based
110 on key socio-economic and health indicators (Cooke et al., 2007). Levels of Nyoongar community
111 disadvantage are correlated with environmental degradation rates in Western Australia, and have not improved
112 in recent decades despite numerous policies aimed at addressing indigenous social wellbeing (Mitrou et al.,
113 2014). Policy inadequacy has been strongly attributed to a failure to consider the role of biodiversity in
114 indigenous well-being (Sangha et al., 2015). The inclusion of traditional ecological knowledge in the
115 environmental-human health nexus, and the participation of indigenous peoples and communities in
116 landscape-scale ecological recovery projects (e.g., Bradby et al., 2016; Long et al., 2016), is vital. A major
117 drive is required to increase the study and mainstreaming of research, development and the application of work
118 in this area.

119

120 Ecological recovery should facilitate the development of stronger positive human relationships with
121 ecosystems, and increasingly address social justice within the restoration framework. In semi-natural systems
122 particularly, defined as "*landscapes that have developed under the joint influence of natural processes and*
123 *human organization and resource use*" (Aronson et al., 2017), durable ecological recovery requires synergy
124 between science, culture and policy (Higgs, 2005). Martinez (2019) suggests that 'ecocultural restoration', a

125 term first coined by Rogers-Martinez (1992), should be an essential part of effective ecological restoration
126 from reference site selection to project completion. Ecocultural restoration involves the recovery of key
127 historic pre-contact or pre-industrial ecosystem structure, composition, processes, and function, recognizing
128 the traditional, time-tested, ecologically appropriate and sustainable Indigenous cultural practices that helped
129 shape ecosystems, while simultaneously building in resilience to future rapid climate disruptions and other
130 environmental changes in order to maintain ecological integrity in a way that ensures the survival of both
131 Indigenous ecosystems and culture (Martinez 2019). A thorough literature search to help inform and orient the
132 incorporation of these foundational considerations into the mainstream restoration equation is underway at this
133 time, in the context of the newly formed EcoHealth Network (provide weblink before publication). This is an
134 interdisciplinary organization that will help advance the science and practice of **ecohealth**, in our sense of the
135 term, that is *the process of linking ecological restoration and allied activities (i.e., ‘restorative activities’) to*
136 *public health interventions and related activities in a practical and resilient way.*

137

138 **A missed opportunity to champion profound change instead of business as usual**

139

140 Productivity-based approaches to environmental ill-health and disrepair are insufficient and, indeed, wrong-
141 headed, if the next decade – and the coming century - are to be defined by ecological repair and a paradigm
142 shift at the multinational and global scales. They constitute more of the same thinking only at bigger scales, a
143 procedure often referred to as ‘technofix’. Overt focus on productivity-based outcomes overlooks potential for
144 achieving lasting social and human health benefits associated with the restoration of natural ecosystems
145 (Aronson et al., 2007a; 2016a), and risks misuse of the Declaration (e.g., the misrepresentation of commercial
146 silviculture or single-ecosystem service-focussed activities such as carbon storage as *bona fide* ecological or
147 ecosystem restorative activities).

148

149 We, and the EcoHealth Network (see above), propose a new direction for the future of global society during
150 the Decade on Ecosystem Restoration. By coupling the foundational philosophies of restoration ecology,
151 ecological economics, and associated disciplines including medical science and public health (Aronson et al.,
152 2016a), we can move towards an era of globally-connected and science-driven sustainable development that
153 has a dual focus – ecosystem health and human health. This requires a new mind set or paradigm shift towards
154 what we term a ‘restorative culture’.

155

156 **What would a restorative culture look like, and how would it work?**

157

158 A restorative culture will exist when the principles, ethics, and standards of holistic ecological restoration are
159 embedded in all aspects of human existence and endeavor (Figure 1).

160

161 **FIGURE 1**

162

163 ‘Restoration ecology’ has evolved from an academic field at the intersection of ecology and conservation
164 biology in the late 1980s to a modern transdisciplinary science focused upon multiple outcomes of *biodiversity*
165 *maintenance, ecosystem functionality and resilience, and the delivery of ecosystem services at local to global*
166 *scales* (Clewell & Aronson, 2013; Blignaut et al., 2014; McDonald et al., 2016). It has matured concomitantly
167 with historically discrete sister disciplines ‘ecological engineering’ and ‘ecological economics’, and newer
168 fields including ‘sustainability science’, ‘ecosystem services science’, and, last but not least, ‘Ecohealth
169 science’ (Aronson et al., 2016b; 2017).

170

171 The vitality of any science depends upon adaptive capacity and responsiveness to internal feedbacks,
172 particularly in responding to new unions stemming from the development of trans-disciplinary relationships.
173 Restoration ecology is at this juncture. We propose that rather than the current paradigm of discrete disciplines

174 forging complementary but separate paths to the goal of a sustainable future, global society must strive towards
175 the development of a culture of integrated restoration-driven adjustment and improvement. This restorative
176 culture emphasises that restoration is a process of perpetual self-organization, adaptation and renewal, in
177 contrast to the flagrant and unsustainable ecological overshoot likely to result from the influence of current
178 economic models.

179

180 Sustainability and flexibility underpin the ‘success’ of ecological restoration (i.e., its effectiveness and
181 longevity), and there is increasingly wide social acceptance that the responsibility to address ecological
182 degradation should be borne by all elements of society (McDonald *et al.* 2016). A paradigm shift to a
183 restorative culture therefore requires:

- 184 1. A socio-ecological approach to public health incorporating environmental sustainability built from
185 collaboration among restoration researchers and practitioners, as along with primary health, social
186 services, urban design and planning, and environmental management sectors (*sensu* Maller et al.,
187 2006).
- 188 2. Stronger links among education, culture, and policy, ensuring that nature is an intrinsic component
189 of culture as reflected in daily lives. The value of biodiversity and the value of ecological
190 restoration must be introduced in the earliest stages of education, and traditional and local
191 ecological knowledge should be incorporated into environmental education to support and
192 conserve indigenous cultural heritage.
- 193 3. Development of customs, laws, and social standards underpinned by principles of sustainable
194 development and environmental recovery that place primary emphasis upon biodiversity and
195 resilient ecosystems as a fundamental requirement of public health and wellbeing.
- 196 4. Nurturing cross-disciplinary links among and beyond the environmental sciences towards
197 transdisciplinary science-and ethics-driven sustainable development outcomes.

- 198 5. Incentivisation of policy and regulatory frameworks to create a culture of continuing improvement
199 in land and resource management, facilitating a global process focused upon a net gain in natural
200 environmental and social-ecological values and processes (see Goodwin, 2019; Rees 2019).
- 201 6. Green business models reflecting the extended time frames required to mature restoration outcomes
202 and maximise social and ecological benefits (e.g., Nevill et al., 2018), where industry champions
203 are willing to step up and achieve ambitious goals and aim for lofty targets without immediacy of
204 economic return. This is a context in which public-private partnerships can truly work for the good
205 of all – something which is not always the case.

207 **Concluding remarks**

208

209 Transitioning to a restorative culture requires that society embrace the growing sophistication and increasingly
210 impressive development and outcomes of the intertwined science and technology of ecological restoration and
211 the corresponding practice and policy in terrestrial, coastal, and marine ecosystems. This also requires support
212 for due diligence and – as appropriate - rapid acceptance of the outcomes from ongoing research in areas such
213 as soil microbiome studies and the importance of contact with ‘nature’ for human health. Restoration will be
214 a central part of the needed paradigm shift in the approach to global ecosystems and human health, in urban
215 and rural areas alike. Achievement of this shift will require cross-disciplinary links beyond the life sciences,
216 social sciences, medicine, and economics, to facilitate science-and ethics-driven sustainable development,
217 recognizing biodiversity and resilient ecosystems as fundamental requirements of public health and wellbeing.
218 Global land and resource management should focus on achieving net gains in natural environmental and social-
219 ecological values and processes. This requires regulatory and industry champions willing to achieve ambitious
220 goals without immediate economic return, as has been pioneered in the United Kingdom (Adams et al., 2004)
221 and elsewhere. A restorative culture revitalises the nature and culture union that is then embedded into the
222 social, political, and educational fabric, developing stronger links between education, environment, culture,

223 and policy. Although biodiversity conservation is frequently characterised by complex and intrinsically
224 challenging trade-offs (McShane et al., 2011), a restorative culture recognising the fundamental linkages
225 between environmental, cultural, and human health may represent the only future in which both our biosphere
226 and species can co-prosper.

227

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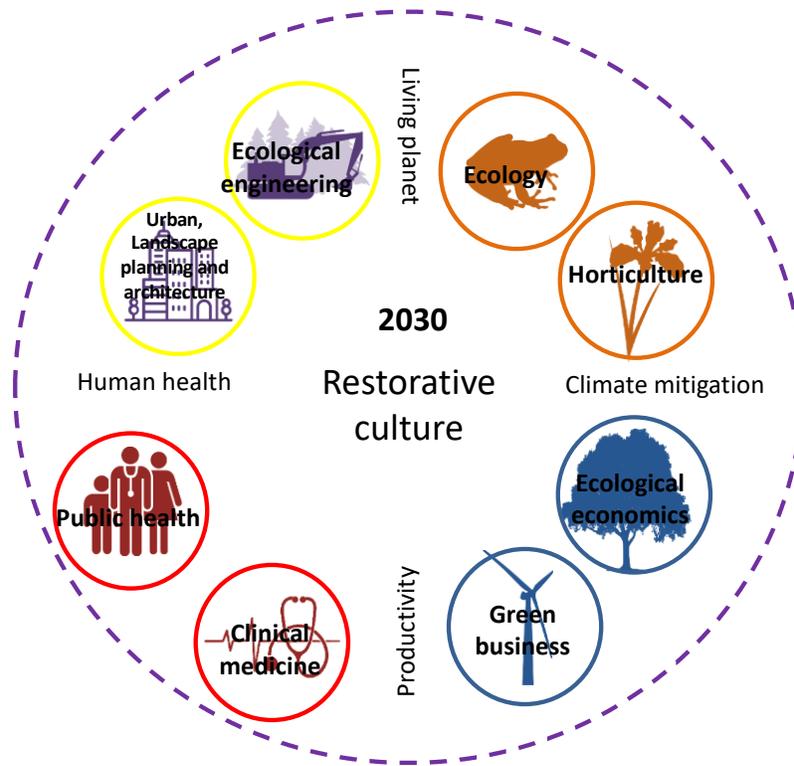
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372

373 **Figure 1.** Components and approximate contours of a restorative culture that, for the sake of sanity and
 374 sustainability, 'should' be set in place by 2030. Note that the philosophical and ethical foundations and
 375 practical principles of holistic ecological restoration depicted here increasingly embrace and are embraced by
 376 other key sustainability disciplines at all levels of society. This progressive incorporation of holistic restoration
 377 into the social fabric, and its union with key sister disciplines in areas such as social development (yellow),
 378 human health and wellbeing (red), ecologically sound economics and business practice (blue) and ecological
 379 science (brown), will yield significant improvement in key human and environmental indicators and should
 380 become a fundamental tenet of human society. Vast and 'wicked' problems remain to be addressed as well,
 381 such as social injustice in the form of the growing chasm between the very rich and poor.