

1 Framing, de-framing and reframing the Anthropocene

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3 **Abstract:** Publishing in *Ambio* and elsewhere, geoscientists distributed across several disciplines have
4 both created and substantiated the Anthropocene concept since the turn of the millennium. Epochal
5 and topically encompassing, the concept has served to focus academic and political attention on the
6 extraordinary scale, scope and magnitude of the human impact on the Earth. The concept serves as a
7 metaphorical 'roof' that allows a family of geoscientific terms to reside together harmoniously in the
8 same space. The four *Ambio* papers evaluated here helped to both build the roof and the family.
9 However, for all their merits, the papers form part of a wider scientific discourse that threatens to
10 colonise the imagination of Earth present and future. A scientific framing of the Anthropocene needs
11 to be de-framed and then reframed in terms of what science misses (e.g. diverse social values, needs
12 and wants, which imply alternate courses of possible future action). The papers assessed in this
13 commentary have, albeit unintentionally, helped inspire this de- and reframing in wider social
14 science, the humanities and the arts. Looking ahead, dissonant forms of knowledge and argument
15 about Earth present and future will be key to forging a 'good Anthropocene'. In future, *Ambio* can help
16 to foster this productive dissonance by loosening its own intellectual parameters while maintaining
17 its high standards of scholarship.
18

19 **Keywords:** the Anthropocene; Earth System; geoscience; coupled human and natural systems;
20 scientism
21

22 Twenty years ago 'the Anthropocene' was a neologism coined by Paul Crutzen
23 and Eugene Stoermer. Today, it's a keyword in the lexicon of environmental
24 research and, increasingly, in international environmental policy discourse too.
25 Its ascent to semantic prominence attests to the authority exerted by a variety
26 of geoscientists, even in conditions where deference to 'experts' has declined in
27 many countries. More broadly, it attests to the enduring power of the scientific
28 approach to understanding both people and nature. Unlike previous geoscience
29 concepts that became part of the *lingua franca* (such as 'acid rain' and the 'ozone
30 hole'), the Anthropocene idea is unusually grand. Of late, it's also become a
31 lightning rod for disagreement about the story of humanity's escalating impacts
32 on the planet. 'The Anthropocene' sits at the heart of a whole family of (not
33 always commensurable) concepts that increasingly frame people's
34 understanding of 'the age of humans'.
35

36 To speak about (and for) the Earth System is an extraordinary epistemological
37 privilege. It's also a burden of responsibility to be shouldered (Lovbrand *et al.*
38 2015). The four influential *Ambio* articles discussed here offer a very clear
39 window onto how that privilege and burden have played-out in the wider
40 world of global change research over the last two decades. Their impact, as
41 with most published research, needs to be seen in the context of an 'epistemic
42 ecosystem' comprising thousands of other papers, chapters, reports, conference
43 papers, and workshop presentations. The four articles have drawn upon and
44 enlivened this metaphorical ecology of knowledge, creating and connecting
45 new niches over time. Let's consider their specific contributions in turn, and in

46 context. I will then reflect on their double-edged legacy as a solid yet
47 incomplete foundation for future thought and action relating to the Earth.

48

49 The first two articles did not mention the Anthropocene. However, as we shall
50 see, they were important precursors to the two influential papers that did. At
51 first reading, 'Resilience and sustainable development: building adaptive
52 capacity in a world of transformations' (Folke *et al.* 2002a) is a rather slight
53 contribution. The text proper is less than 2 pages (4 with images, abstract and
54 2 boxes). Yet its citation impact is remarkably high, at over 3600 citations in
55 Google Scholar. Upon a closer reading it's quickly evident why. First, behind it
56 sits a substantial report, prepared for the World Summit on Sustainable
57 Development held in Johannesburg (Folke *et al.* 2002b). Second, the article
58 makes a plenary argument by presenting a number of important propositions
59 and concepts in a coherent, succinct and confident way. The article is not
60 cluttered with caveats and qualifications. Leading scientific researchers
61 authored it: the article's brevity was thus not to be taken as a sign it could
62 somehow be discounted.

63

64 The authors' trick, if I can call it that, was to link then relatively new ideas
65 about ontology to equally new ideas about environmental policy and pitch
66 them as globally (not just regionally or locally) relevant. The idea of coupled
67 socio-ecological systems was presented, along with a challenge to the notions
68 of stasis and progressive change as normal. Conjoined, complex systems can
69 and do alter in abrupt, unpredictable and uncontrollable ways: that was the key
70 ontological message. It follows, the authors argued, that sufficient resilience has
71 to be a key management goal for environments undergoing human forcing. This
72 requires a new management paradigm based on adaptiveness that reduces
73 vulnerability and looks for early-warning signs of unwanted regime shifts. In
74 short, in a world of accelerating change, the best way to arrest *run away* change
75 is, the authors argued, to shift to a flexible, anticipatory approach geared to
76 promoting socio-economic systems able to withstand constant pressure or
77 sudden shocks. This challenged a century old management paradigm
78 predicated on reliable knowledge of, and control over, a putatively asocial
79 nature bequeathed by evolution.

80

81 Five years later, and the paper by Jianguo Liu *et al.* (2007a) comprehensively
82 summarised what was, by then, emerging as a well-developed alternative to
83 older ideas of a stable nature amenable to rational management (see also Liu *et al.*
84 *[2007b]* in *Science*). Their paper offered a very complete vocabulary to make
85 analytical sense of what, to use their memorable acronym, they called CHANS
86 ('coupled human and natural systems', the title of their paper). While it echoed
87 Folke *et al.* (2002a), the paper went beyond them in nine conceptually crisp
88 pages of text. Its integrative framework discussed CHANS in terms of

89 complexity, feedbacks, direct effects, indirect effects, emergent properties,
90 resilience, vulnerability, and thresholds. It then tracked these key
91 organisational features through to spatial couplings and ever larger and long-
92 lived temporal couplings – providing a fairly granular toolkit of terms to do so.
93 The latter part of the paper went on to consider how the realities of CHANS
94 necessarily change the realities of environmental management, at *all* scales.
95 CHANS, the authors argued, call for new modes of research, new training for
96 scientists and new training for aspiring environmental managers who must
97 somehow manage the potentially unmanageable. Rising to the challenge, Liu *et*
98 *al.* acknowledged, was both necessary and yet formidably difficult. Their paper
99 carried authority by virtue of its impressive author team (which included
100 climate scientist Stephen Schneider, political economist Elinor Ostrom &
101 ecologist Jane Lubchenco) and exhaustive referencing (to over 160
102 bibliographic items). It signalled a determination to avoid ‘boxing’
103 environmental challenges in terms of ‘climate’, ‘biodiversity’, ‘water resources’
104 and so on.

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106 The two papers discussed above were among several of this ilk published
107 around the turn of the millennium. Often, the same authors (e.g. ecologist
108 Stephen Carpenter) wrote variations on the principal themes for different
109 journals, thereby disseminating the new thinking widely across the geosciences
110 and, to a lesser degree, environmental social science. Inspired by research in
111 ecology, they broadened out from biological systems to convey an important
112 new message about understanding and governing a socio-ecological world that
113 was likely to be unruly. Without a tapestry of contributions like these, the
114 papers by Steffen *et al.* (2007) and Steffen *et al.* (2011) could not, arguably, have
115 been written in the ways they were – even though these papers contained very
116 important messages not found in Folke *et al.* or Liu *et al.* So, what were these
117 messages and why were they important?

118
119 ‘The Anthropocene: are humans now overwhelming the great forces of nature?’
120 is a modern classic (over 3100 citations in Google Scholar, and rising). Though
121 short (six and three quarter pages of text), it was among the first papers to
122 declare the Anthropocene a new reality, and to examine its causes (in an
123 historical context) and implications. Building on the important research by the
124 International Geosphere-Biosphere Program (IGBP), and a joint project with
125 the International Human Dimensions Program (the IHOPE project: integrated
126 history of people on Earth, which is ongoing within Future Earth), the paper
127 did a number of things. It replayed the theme of CHANS but now in terms of
128 the *whole Earth System* (still a relatively new concept 14 years ago); it replayed the
129 theme of threshold crossing, but now framed provocatively as the end of a
130 natural epoch; and it replayed the theme of biophysical surprises and unruliness
131 but in the evocative notion of human’s ‘overwhelming’ a relatively stable

132 Holocene system state. The paper periodized the human impact at a planetary
133 scale in a heuristically appealing ‘stages’ model and presented IGBP’s arresting
134 ‘Great Acceleration’ diagrams (now quite familiar to students of humanity’s
135 effects on the planet). Looking ahead, the paper outlined the main options
136 (business as usual; mitigation; and geoengineering counter-measures) and
137 floated the notion of whole Earth stewardship. While hardly new, the latter
138 idea was a reminder of the failure of nations to make real progress since the
139 Bruntland Report of 1987. Though it was a simple paper, relative to the
140 complexities of its topic, this was part of the appeal. The authors (two world
141 leading geoscientists and a respected environmental historian) threw a rope
142 around a set of important issues and tied them together very neatly.

143

144 The Steffen *et al.* paper helped to launch the Anthropocene concept to
145 prominence within and beyond geoscience (the citations to the term take-off
146 from 2007 onwards). But the later paper by Steffen, Jan Zalasiewicz and
147 fourteen other esteemed authors (Steffen *et al.*, 2011) is arguably, with hindsight,
148 of greater significance (this notwithstanding fewer, if still impressive, citations
149 at around 1400 in Google Scholar at the time of writing). A longer article, it was
150 the result of a Nobel Laureate Symposium (held in May 2011). As with Steffen *et*
151 *al.* (2007), it placed ideas from Folke *et al.* (2002a) and Liu *et al.* (2007a) in an
152 Earth System framework. But it also introduced the notion of Earth System
153 goods and services in order to sharpen the point that the ‘Holocene envelope’ is
154 precious and in need of preservation. It invoked the terms ‘crisis’ and
155 ‘civilizational collapse’, while flagging social equity as a key issue. There are
156 memorable lines in the article, such of the oft-quoted “We are the first
157 generation with the knowledge ..., the power and the responsibility to change
158 our relationship with the planet” (p. ?). The, at the time new, notion of
159 planetary boundaries was also used to set parameters around the exercise of
160 this power and responsibility (Johan Rockstrom was one of the paper’s
161 authors). Relatedly, the notions of bifurcation points and tipping elements
162 were introduced to warn of the dangers of entering planetary *terra incognita*
163 (Marten Scheffer was one of the co-authors). Additionally, having the head of
164 the new Anthropocene Working Group as a co-author signalled that some
165 geologists were taking seriously the otherwise ‘incredible’ idea that humans
166 were pushing the Earth System into a new regime state – something only
167 previously achieved by natural processes. Overall, the paper issued a sober
168 warning and flagged the necessity of pro-active, coordinated management of
169 human activities on the Earth. A stellar group of geoscientists lent their name to
170 it. Importantly, they did so in the lead-up to the second United Nations Earth
171 Summit (Rio+20), as part of a special issue of *Ambio* designed to sound the
172 alarm about humanity’s treatment of the planet.

173

174 The four papers discussed above helped to shift the discourse, in both academia
175 and the wider world, about people and the Earth. They were important parts of
176 patient, persistent work undertaken by thousands of researchers in fields like
177 climatology, ecology, oceanography and economics. This work has involved
178 numerous geoscientists, and not a few environment social scientists, stepping
179 off the usual academic tramlines. Steffen, Rockstrom, Crutzen and others have
180 variously used global environmental assessments, attendance at high-level
181 government meetings, the writing of declarations, news media releases and
182 other mechanisms to reframe collective understanding of global environmental
183 change. The Anthropocene concept, given empirical substance through
184 countless scientific articles since around 2010, has been at the heart of this
185 understanding. No longer a buzzword, it's become a keyword (at least in
186 academia). Encompassing in meaning, it has allowed a family of geoscience
187 ideas to be gathered together under one semantic roof. In research terms, it has
188 helped promote the move towards solutions-focussed transdisciplinary inquiry,
189 exemplified by Future Earth (<https://futureearth.org/>). Politically, it has
190 (especially through various United Nations fora) heightened our awareness of
191 the many failings of current protocols and agreements designed to reduce
192 humanity's global environmental footprint. More positively, it has accented the
193 need for integrated action, as aspired to by the Sustainable Development Goals
194 agreed in 2015.

195

196 As *Ambio* enjoys its 50th birthday, it is evident that the scientific representation
197 of the Anthropocene is both necessary and yet quite problematic. That science
198 has shown that anthropogenic climate change – perhaps the iconic
199 environmental problem of our time – is but one part of a larger, more worrying
200 problem (what many could label a global *crisis*, whose worst effects our
201 descendants will bear the brunt of). The authority enjoyed by science in general
202 has allowed Anthropocene science to be taken seriously beyond universities,
203 even if social deference to expert insight is much less than it once was. The
204 science, to echo Naomi Klein's (2015) well-known refrain, should 'change
205 everything' because it reveals that *everything is changing*, both *around us* and also
206 *because of us*. However, awareness of the high-stakes scientific messages is not
207 translating into significant inter-governmental action regarding mitigation and
208 adaptation. This 'knowledge-action gap' is long-standing and is complicated in
209 its causes. Some attribute the gap to the unavoidable uncertainty built-in to
210 scientific pronouncements about the Earth System. This uncertainty can
211 weaken policy makers' resolve to undertake expensive and politically
212 contentious socio-technical change (such as a Green New Deal and de-
213 carbonisation of energy and transportation). The uncertainty invites calls for
214 'more science' and for challenges (made in good or bad faith) to the quality of
215 the current science by non-scientists. Others note that policy makers' decisions
216 are affected by a myriad of key drivers, scientific advice being but one – and

217 rarely the decisive one (cf. the covid-19 pandemic, where science advice is
218 playing a very prominent role in determining government policy in many
219 countries at present).

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221 However, even if these other drivers did not exist, it turns out that the science
222 is not, in fact, an adequate basis for translation from knowledge to action.
223 Instead, we need a different language to motivate and guide planetary
224 stewardship. Here we have to acknowledge the limitations of thinking in terms
225 of planetary boundaries, Earth System regime shifts, complex and ramified
226 feedbacks, and so on. One obvious limit, noted by many commentators, is the
227 implicit invitation to some people to engineer the planet's environment – for
228 instance, through stratospheric aerosol injection as a thermostatic 'last resort'
229 (or Plan B). This is but one (potentially risky) 'ought' implied by the 'is' of
230 epochal planetary change. It should not be contemplated without full
231 consideration of several potential Plans A, most with a societal (not
232 environmental) focus. Another limitation is the lack of sufficient explanatory
233 detail (exemplified in the two Anthropocene papers discussed above) about the
234 nature of 'the human enterprise' driving us out of the Holocene. Depending on
235 how one characterises that enterprise (is it about market failure, poorly
236 regulated capital accumulation, anthropocentric materialism, a masculine will
237 to dominance ..?), the 'solutions' to avoiding a 'bad Anthropocene' look very
238 different indeed. As Simon Dalby (2015) notes, there is more than one way to
239 engender a 'good' Anthropocene, not just because several practical options are
240 available but also because these options' suitability must be evaluated
241 according to contestable value judgements about what *counts* as 'good'. These
242 judgements speak to the perennial and profound existential question 'how
243 should we live?'. Earth System change does not objectively mandate 'right'
244 answers to this question.

245

246 These, and many other limitations, have fuelled a lively effort to prevent
247 inadvertent science imperialism in the epistemic framing of the Anthropocene.
248 The effort has been led by critical social scientists and humanists (CSSH)
249 across a wide spectrum of disciplines, some of them former geoscientists
250 (notably Mike Hulme, at Cambridge University). These analysts have accepted
251 the seriousness of the scientists' insights, but they seek to change the narrative
252 about causes and responses. The way they depict the 'everything' being
253 changed by humans – and to be changed in future – varies hugely (see Bonneuil
254 & Fressoz, 2017). Far from being relativists, their insights reflect real and
255 significant differences in cognitive and normative perspectives about the
256 human condition, existing both in universities and the wider world. These
257 differences make a difference to the sort of scientific evidence, and technologies,
258 which will be deemed most relevant and legitimate to making the planet more
259 liveable. As yet, the CSSH perspectives have not garnered the wider attention

260 enjoyed by authors of publications like the four highlighted here (see Castree,
261 2017). That needs to change – for instance, through some of the Future Earth
262 projects and networks, and some initiatives within the UNESCO MOST
263 (Management of Social Transformations) programme
264 (<https://en.unesco.org/themes/social-transformations/most>). It will be
265 challenging, though. For instance, introducing normative expertise (e.g. moral
266 philosophy) into Earth System analysis could readily lead to the de-
267 legitimisation of the knowledge and arguments being presented – especially in
268 light of recent ‘post-truth’ and populist practices in politics and the media.

269

270 I have elsewhere suggested that a revised format for global environmental
271 assessments can provide a well-structured, and well-justified, mechanism for
272 bringing geoscience, social science, the humanities and even the arts into the
273 high-level ‘conversation of human kind’ that need urgently now to occur
274 (Castree, Bellamy & Osaka, 2021). This conversation will be deeply *political* and
275 requires protection from the short termism and hurly burly of every day
276 political discourse in the news media, parliaments and elsewhere. But we must
277 remember that the insights of geoscience about the Earth System only make
278 practical sense when set within a political horizon. And we should remember
279 too that political reasoning is not merely or only the realm of ‘preference’,
280 ‘opinion’ or ‘interests’: at its best, it involves the sort of textured arguments,
281 supported by evidence, that the CSSH (among others) are dedicated to
282 providing. Good quality, and socially legitimate, decision-making requires such
283 arguments. The future of the planet is too serious a matter to be predicated on
284 political sound bites, populist slogans and other maladies afflicting public
285 reason during the 2020s.

286

287 As we look ahead, there is a challenge for *Ambio* and interdisciplinary journals
288 operating in the same intellectual space. Can they move away from a largely
289 scientific framing of people and planet without, of course, diminishing the value
290 or quality of the science? Can they get beyond an assumption that
291 interdisciplinarity is about different experts collaborating so as to reveal a
292 single (total) picture of the world? We will know the answer in another 50
293 years when the centenary volume is published, but hopefully much sooner than
294 that. In its five decades so far, *Ambio* has done a great deal to trigger the
295 conversation about people and planet we desperately need to have across our
296 diverse and divided globe. The more democratic that conversation is, the better
297 chance humanity has of achieving a ‘good Anthropocene’, once we determine
298 openly and honestly what the ‘good’ is we should now be aiming for.

299

300 References

301 Bonneuil, C. & Fressoz, J-B. (2017) *The Shock of the Anthropocene* (London: Verso).

- 302 Castree, N. (2017) 'Speaking for the 'people disciplines': global change science and its human
303 dimensions', *The Anthropocene Review* 4, 3: 160-18.
- 304 Castree, N., Bellamy, R. & Osaka, S. (2021) 'The future of global environmental assessments:
305 a case for fundamental change', *Anthropocene Review* forthcoming.
- 306 Dalby, S. (2015) 'Framing the Anthropocene: the god, the bad and the ugly', *Anthropocene*
307 *Review* 3, 1: 33-51.
- 308 Folke, C. (2002a) 'Resilience and sustainable development: building adaptive capacity in a
309 world of transformations', *Ambio* 31, 5: 437-40.
- 310 Folke, C. *et al.* (2002b) *Resilience and Sustainable Development* (Stockholm: The Swedish
311 Environment Advisory Council).
- 312 Klein, N. (2015) *This Changes Everything* (New York: Simon & Schuster).
- 313 Lovrand, E. *et al.* (2015) 'Who speaks for the future of the Earth?', *Global Environmental Change*
314 32, 2: 211-218
- 315 Liu, J. *et al.* (2007) 'Coupled human and natural systems', *Ambio* 36, 8: 638-49
- 316 Liu, J. *et al.* (2007b) 'Complexity of Coupled Human and Natural Systems', *Science* 317,
317 issue 5844: 1513-1516.
- 318 Steffen, W., Crutzen, P. & McNeill (2007) 'The Anthropocene: are humans now
319 over-whelming the great forces of nature?', *Ambio* 36, 8: 614-20.
- 320 Steffen, W. *et al.* (2011) 'The Anthropocene: from global change to planetary stewardship',
321 *Ambio* 40, 7: 739-61.

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328 *Humanities*, a notion that encompasses geoscience, social science and the humanities.