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CHAPTER 3

GOVERNANCE

The overwhelming growth in the complexity of our global societies and their interactions with the other three earth systems has obfuscated our attempts to find a clear guiding framework for internal policymaking and conducting international relationships. Historically, we have experienced many forms of governmental management systems. A common goal of these management systems is that it should represent and stably meet the needs of its citizenry, whether on a family or global scale. It is true that we are zigzagging and step-wise progressing on social and environmental issues, but with inhibiting oscillations between peace/cooperation and conflict/oppression. When the progress slows or fails we experience burst of public protests, which sometimes can initiate policy changes. This variability occurs because our needs and security are not controlled just by the executive and legislative branches, but by our economy, our wiliness to corporately participate, on our cultural worldviews, and on our general level of social responsibility. Too often policymakers await damaging social or environmental trends to change policy to fix an issue until a majority of policymakers are affected personally. The science-policy interface must be strengthened to provide precautionary options that result in preventive solutions. Climate change is an excellent example that the growing risk should convince us to pursue sustainable development in all sectors of society, and appreciate the benefits of a livable world. Meanwhile we are running very low on resources and time. Only the pursuit of sustainable development offers pragmatic path on common ground for guiding our future. Why make dangerous zigzags instead of incremental precautionary steps on a shortcut to a common goal that is comprehensible and attainable with the right attitude?

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C.1. DO OUR POLICYMAKERS CONSIDER SUSTAINABLE DEVELOPMENT?

It seems unimaginable that, in a rapidly expanding civilization, we do not have a common goal or a plan to guide our governances.

1.1. DO OUR POLICYMAKERS CONSIDER SUSTAINABLE DEVELOPMENT?

1.1a Are We Improving Governance by Trial and Error? The evolution of better management of human societies has been, and still is, a very long

14 rocky road, and it will go on being rocky. Humanity is now facing the
15 challenge of wider-scaled instabilities in the financial, political, environmental,
16 and social sectors that are inhibiting any further evolution towards global
17 peace and sustainability. With the second and third industrial revolutions
18 (electric power, computerization, and the Internet) and with global population
19 growth, our societies are increasingly interdependent even as they remain
20 profoundly unequal, notably in the division between Developed and Lesser
21 Developed nations. The result is social turmoil in the form of interethnic and
22 inter-communal conflicts, riots and uprisings, armed religious-zealot groups,
23 violent repression, terrorism, civil and resource wars, global waves of
24 refugees, and even genocides. Thus, we are witnessing simultaneously both
25 a growing codependence and a friction on a global scale that requires a
26 greater force and direction for global political cooperation, Yet such
27 cooperation is outside our historical experience and is also still beyond our
28 ability to implement even through the United Nations.

29
30 In sum, our increasing consumption and population have outstripped
31 our ability to sustainably manage the human system. In every country, but
32 especially in the global north, we must change our overarching goal, from
33 that of protecting national sovereignty and
34 increasing 'economic growth', which almost
35 always depends on the exploitation and
36 extraction of resources of poorer nations by
37 the richer nations, to that of a cooperative goal of shared resources and
38 conservation of the human habitat and the ecosystems that support us. The
39 basis for this transition requires a clear understanding that global social
40 management inevitably has only two potential end-points:

**To Sustain or Extinguish
That is the question!**

41 **1) Oligarchic governments** dominated by the 0.01% of the wealthiest and
42 by large corporations that are negligent environmentally and unjust
43 socially, increasingly unstable, and dependent on state violence and
44 environmental looting to remain in power, thereby accelerating the
45 human species on the path to extinction; or

46 **2) Federations of sustainable democratic states** that facilitate the
47 maintenance of symbiotic global networks; that balances interregional
48 resource needs and conflicts; that ensures that each state balances its
49 social and individual needs through internal self-regulation; that each
50 state ensures justice and social equality, allows cultural diversity, and

51 protects human rights; and that each state preserves the function and
52 production of their natural ecosystems (cf. Ch. 4).

53 Our current situation could be described as a struggling, complex mix
54 of these two tendencies. On the one hand, most states that have not failed
55 (as an increasing number are doing because of military interventions aimed at
56 "regime change") are tending through the application of neoliberal economic
57 policies toward increasing inequality, economic exploitation, racial or ethnic
58 dominance, internal and external militarization, and environmental
59 degradation. On the other hand, there are growing social movements—local,
60 regional, national—and global networks pushing for sustainability through
61 multi-pronged efforts to enlarge or restore democracy, protect human rights,
62 conserve natural resources, address climate change and environmental
63 destruction, to form larger collective organizations and cooperative
64 international agreements that will struggle for better and more equitable
65 education and health services.

66 **1.1b. The need for Goal-oriented, Pragmatic Policy.** Most modern
67 democracies have neither a binding long-term goal for sustainable
68 development, nor a collective agreement to work for the survivability of
69 human societies (cf. Ch. 4-SC). For the last
70 four decades, the dominant short-term
71 goal of the ruling elites has been ever-
72 greater wealth for the few rather than
73 prosperity for all. Globally, we are in an
74 open power struggle between the haves and have-nots, with the rich wanting
75 to maintain and expand their wealth no matter what the social and human
76 costs to the overwhelming majority of poor and low wage workers struggling
77 to maintain their lives. The platitude: "*This is history repeating itself*" implies
78 an historical fatalism: humans will always be organized in unjust and conflict-
79 ridden hierarchies and will never be able to achieve democratic cooperative
80 governance. Laissez-faire neoliberal exploitation of resources and "free-
81 market" looting of public goods and the social wage, backed by state
82 repression, are fast approaching a dead end. This socioeconomic and
83 political model must be superseded because social and environmental
84 conditions have changed to the degree that they have formed a roadblock to
85 any further gradual improvement. Moreover, it is true that historically human
86 behavior has been difficult to change and that conflicts will continue as long
87 as social injustice and governmental oppression do. The question is whether
88 or not emergent movements and organizations are capable of slowing and

GOAL?
Wealth for a few or
a just, sustainable
life for all?

89 eventually reversing these damaging trends—and whether they and can
90 continue to do so in the face of global resource per capita constriction and
91 climate change (cf. Ch. 1). The answer is in gaining the willingness to make
92 the required changes.

93 Sustainability is often perceived as an unreachable, idealistic goal.
94 Perfect sustainability, yes, is a long process, but one in which the benefits
95 increase progressively, like a gigantic jigsaw puzzle: it's slow to assemble the
96 framework and increasingly easier to find solutions as the picture fills in.
97 Blanket cynicism toward grand goals, which slows the initial process, begins
98 to wither when action is directed towards more limited goals that can be
99 achieved via pragmatic strategies with tangible results. The supposedly
100 idealistic goal of sustainable development is in fact far more pragmatic than
101 the extant goal of growing the GDP, which is touted as good for all, even
102 though its growth comes on the backs of most of the world's population and
103 its ecosystems, and the new wealth being created flows away from the
104 working people who create it and into the hands of the wealthy few and their
105 professional servants.

106 We see this; for example, when MDCs and DCs justify not pursuing
107 sustainable goals with the rationale “We have to wait until we have our economy
108 gets better.” This statement is fallacious: as a species, we absolutely do not
109 have either the time or the resources to continue with a business-as-usual,
110 trial-and-error approach, especially when this approach makes societies
111 increasingly unstable and moves them further from sustainability. The
112 argument is self-serving for DCs especially, because more than two-thirds of
113 the world's population (in the LDCs) is not satisfied with their present status.
114 This does not mean that the richer one-third of the global population is
115 hostile sustainable development; they may be ignorant of the global situation
116 and/or confused about what sustainability means¹. Most important is that
117 LDCs and DCs do not follow the historical development trajectories of the
118 MDCs by copying or buying obsolete and ecologically destructive
119 technologies from them instead of leapfrogging to newer, more efficient, and
120 more sustainable ones. For example, while North America and Europe are
121 replacing their old coal-fired plants with new more efficient natural-gas plants
122 and solar and wind power, they are selling their old plants to LDCs and DCs.
123 Through this practice these nations are investing in an obsolete and polluting
124 energy future, and generating a greater burden for all nations, instead of
125 investing in solar and other renewable energy sources.

126 This behavior reflects a lack of governmental knowledge—or a willful
127 ignorance—of what sustainable development has to offer, why it is an
128 essential gateway to a better and more secure life, and why it is so urgently
129 needed. Corporate interests retard the development of this knowledge and
130 the willingness to act on it. The stubborn problem remains that the time it
131 takes to change the opinions of the public and their leaders (two to three
132 decades) can be slower than the current rate of decreasing resource-wealth
133 per person, which gives us less than a generation to stop this trend. Our
134 global situation is analogous to a mutiny aboard a sinking ship, even though
135 none us want to drown.

136 The good news is that given the information channels now available
137 outside the oligopolistic mainstream media (cf. Ch. 2) the public can be rather
138 easily informed, and policies can easily be guided by sustainability criteria,
139 rather than by variations on the status quo, which is upheld and enforced by
140 particular financial interests. The potential exists and could be realized via
141 sufficient political will, increased collective agreements, and a public-
142 awareness campaign, all of which would then greatly accelerate the self-
143 organizing effect through available innovations, methodologies, and
144 supportive policy strategies.

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C.2. EXTENDING REPRESENTATION

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148 The responsibility for governance, in the full sense of the word, needs to
149 expand via the representation at all levels of authority in society. This is the
150 most effective way to achieve an integrated awareness of the necessity that
151 all participate in a transition to sustainability through individual and collective
152 social responsibility.

153

154 **2.1a. Improving Social Participation.** The concept of self-organization²
155 requires a more comprehensive definition of governance: that is, it should
156 encompass all major mechanisms that exert authority or influence our social
157 behavior, including the executive, legislative, and judiciary branches of
158 government, corporate lobbying, social norms, cultural paradigms, peer
159 pressure, and economic pressures of income, tax structure, market prices,
160 investments, and advertising. These non-governmental components are
161 diverse in **scale** (individual to leader), in **structure** (legal, corporate,
162 institutional, religious); and in **function** (providing information, enforcing laws,
163 offering social support, creating security, and living-wage employment). All of

164 these play different roles in determining personal involvement in governance,
165 which can be expressed into three loose domains of control:

166 **1) Direct Governance.** This domain consists of elective branches and
167 their appointees, which are responsible for executing, legislating, and
168 judging laws and regulations for the electorate. Individuals express
169 control through the process of voting, one vote per person.

170 **2) Indirect Governance.** This domain consists of the many components
171 other than direct governance that influence social capital² positively or
172 negatively: corporate influence on legislation, governmental or
173 corporate corruption, banks and interest rates, advertising and market
174 power, news and opinion media, and special-interest groups or cultural
175 organizations, social media, and personal world-views. In this domain,
176 individuals have little or no control over the damage or misdeeds: unjust
177 policy decisions, poor law enforcement, environmental impacts, and
178 health hazards. The citizenry can only counter these damaging
179 influences through mass protests, advocacy groups, or through class-
180 action lawsuits or voting referenda that often are unsuccessful, delayed,
181 or too expensive.

182 On the one hand, these counter-actions provide a shield to the
183 elected officials responsible for correcting the problems. On the other
184 hand, the counter-actions indicate misdirected policies or criminal
185 corporate behavior that expose the citizenry to social injustice, health
186 damage, financial or material loss, and environmental harm until the
187 responsible governance components recognize and act to change
188 them. For example, in the US there have been and are continuing to be
189 many violations of civil rights caused by negative actions of both direct
190 and indirect components, separately or in collusion. One example is the
191 weakening of the 1964 Civil Rights Act⁴ by a recent Supreme Court
192 decision, which has led in a number of states to laws and administrative
193 decisions that make it harder for poor people and people of color to
194 vote. Another is the destructive feedback loop between the privatization
195 of prisons that benefits the companies that run them and the prison
196 guards' unions that use their wealth to buy the votes of politicians that
197 support them. This arrangement favors profit for the prisons and
198 neglects for the rights of prisoners in the form of constructive
199 rehabilitation for re-entry into society. This situation links with the larger
200 societal cycle of income inequality (cf. Ch. 4) in the form of

201 unemployment and social marginalization, where in poor communities,
202 especially those of color, are exposed to continuing cutbacks in public
203 education, and other public services, which then feeds an incarceration
204 cycle of young felons, which when released back into the communities
205 they came from are unable either to vote or to find legitimate
206 employment and so turn back to crime and re-incarceration.

207 Because these components are so deep-rooted economically and
208 culturally (by institutional biases and ideological racism), their damaging
209 actions remain relatively shielded from enforcement. For this reason, the
210 indirect category of governance is the most prone to generating social
211 injustices and environmental instabilities and it will be the most difficult
212 to transition to sustainability criteria. It will need guidelines and
213 innovative social strategies to ensure that all components express
214 social responsibility throughout all their activities.

215 **3) Individual Governance.** Individuals also contribute either positively or
216 negatively to Social Capital via their interactions according to their
217 education, organized religion, social norms, cultural paradigms,
218 employment, and their personalities. As individuals, they can influence
219 society by their actions, words, lifestyles, participation, and advocacy.
220 Those who demonstrate social responsibility are, obviously, the most
221 effective in moving society incrementally towards sustainable
222 development. We note that attributes of orderliness, conscientiousness,
223 and cooperation are fortunately socially contagious. An example of this
224 dynamic was demonstrated by D/ S. Wilson through the Binghamton
225 Neighborhood Project⁴. An important, even dominant, aspect of
226 individual governance is the individual's world-view derived from one's
227 family, ethnic, and cultural background that is formed in early childhood,
228 forms a background reference that is weakened or fortified by exposure
229 to experiences that through maturation, cf. George Lakoff⁵.

230 With the diversity of cultural backgrounds, in a democracy - the mix
231 tends to crystalize our views and on how we understand the nation and
232 why the population polarizes between 'conservatives' and
233 'progressives' that metaphorically represent into two types of family
234 authority; strict- father or the nutrient mother. Where the thinking
235 process for solving problems also divides in to two opposites – that of
236 linear connection between cause and effect or of complex (non-linear)
237 connections between cause and effect. The latter requires

238 considerations of the side-effects generated during the process that can
239 make the consequences of the process different than expected.

240 In sum, to avoid that our societies are not over-regulated from the
241 top down, all three of these domains of governance need to possess a
242 critical level of social responsibility. Accompanying the establishment of
243 limits to wealth inequality will allow a cultural-political shift toward
244 enhancing social benefits and greater economic mobility between
245 income levels. Sustainable Development as a world view offers a
246 pragmatic approach to governing based on validated scientific methods
247 and universal human values

248 **2.2b. Improving Environmental Representation.** The current poor
249 representation in governance of environmental values inhibits its efficacy in
250 moving society toward sustainability and social prosperity. That is, the
251 unconscionable exploitation of natural resources (Natural Capital⁶) is already
252 curtailing the use of those resources to sustain us (Ch. 1, Fig. 1). National
253 governments must place environmental values at or near the top of their
254 budget priorities or cause further costly resource degradation (cf. Ch. 4-NC).
255 Currently corporate interference, cultural conflicts, and policy inaction are all
256 halting the conservation of environmental resources, and thereby are
257 destabilizing all nations, regardless of whether they are democracies or
258 autocratic regimes. It appears that the majority of the public does not yet
259 recognize the need to change our goal from economic “development”
260 (unlimited GDP growth accompanied by inevitable degradation) to
261 sustainable development.

262 **2.2c. Improving Political Representation.** The ideal of democratic
263 governance is to represent the needs of the entire electorate and secure its
264 future interests and to peacefully mediate conflicts between nations. Proper
265 representation is partly a scale and communication problem. A growing
266 population increases the number of citizens represented by one member of
267 Congress. At the Constitutional Convention, George Washington suggested
268 keeping districts small, at about 30,000 each. That population, if it were a city
269 such as Monterey, California, would be considered manageable on a human
270 scale. However, the average district has now increased by a factor of 23 to a
271 population of about 700,000⁷ (as in the State of Virginia) and is far beyond
272 human scale—specifically, beyond the capacity of a Representative to
273 familiarize her or himself closely enough with this population’s mix of issues.

274 After each decadal census, U.S. State legislatures have the
275 responsibility of redrawing their congressional districts, but how they do this
276 is left to them, without a strict constitutional or legislative mandate. Through
277 the process of gerrymandering, the incumbent party can redraw district
278 boundaries so as to give themselves more representatives per district for
279 Congress than the opposing party, a practice that has become egregiously
280 distorted during the last three decades especially. President Obama, in his
281 2015 State of the Union Speech, called on lawmakers and the public "to end
282 the practice of drawing our congressional districts so that politicians can pick
283 their voters, and not the other way around"⁸. An appropriate constitutional
284 standard for the process remains elusive; despite the fact that the Supreme
285 Court has held that partisan gerrymandering violates the Equal Protection
286 Clause (Davis v. Bandemer, 1986). Actually, an impartial solution is
287 technically simple. For example, Brian Olson⁹ has created a simple algorithm
288 that generates optimal compactness and equal population districts that
289 match the census data. It also allows that district boundaries can be
290 specified to reflect actual neighborhoods without arbitrarily cutting through
291 somebody's property.

292 **C.3. Challenging Instabilities.**

293 **3.1 UNINTENDED CONSEQUENCES OF GOVERNANCE.**

294
295 Incomplete or inappropriate governance of complex social issues can result in
296 unintended consequences that eventually trigger severe instabilities and threaten
297 social survival. The following subsections list important instabilities that must be
298 addressed by corrective policies in conjunction with a strategic plan for sustainable
299 development. They are only characterized here but are further discussed elsewhere
300 in the document (cf. Ch. 5).

301
302 **3.1a. Instabilities with large physical momentum.** The first global
303 policy aspect of Sustainable Development is to identify those causes and
304 practices that are destabilizing our planetary habitat (cf. Ch. 1, Fig. 2). As a
305 system loses its resilience caused by large disturbances, it becomes more
306 and more unstable and exhibits wobbling variations in its behavior. For
307 example, the now ever wider annual swings in weather patterns are an
308 indicator of the climate system trying to adjust to a future stable state—which
309 it cannot complete because the disturbance created by Green House Gas
310 emissions and by destruction of CO₂ absorption are still increasing. An
311 analogous situation of this stalled resolution can be made by the current the
312 downscaling of world wars to regional conflicts, which indicates a policy

313 transition away from war and towards diplomacy, as a preferred mechanism
314 for resolution, but it cannot be completed because the root causes of war
315 have not been eliminated, and are instead growing more severe. Business-
316 as-usual in both of these cases only aggravates the risk of a greater
317 instability, which in turn is a larger-scale indicator of global unsustainability
318 (cf. Ch. 5).
319

320 **3.1b. Dealing with Overconsumption.** Global deterioration (Ch. 1, Fig. 2)
321 is being driven both by overconsumption (plundering for greed—an economic
322 dynamic: in the MDCs, and by overpopulation (plundering for survival—cultural dynamic) in the
323 LDCs, and by both dynamics in the DCs. The combined international rate of plundering is such
324 that we now consume 50% more goods and
325 services than the earth can produce annually (Ch.1, Fig. 1). Despite the efforts of
326 many nations to decrease their demand, the rate is still increasing: mostly in the
327 energy sector for the DCs (esp. BRIC¹⁰), and in both the material production and
328 the energy sectors for the MDCs. In addition, there is growing exploitive
329 dependence on mineral and biological resources by virtually all nations (Ch. 4.).
330 This exploitation is driven by the distorted assumption that increased
331 consumption leads to increased economic growth, and therefore to increased
332 wellbeing. Changing this assumption is essential to paving the path of
333 sustainable development. A simple way to show that nearly all nations are
334 consuming resources at unsustainable rates, almost as if to distance them from
335 the goal of sustainable development, is by comparing the Ecological Footprint
336 with the Human Development Index¹² Fig. 1.
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338

**Enjoying & Suffering
Life Outside the
Sustainability Box?**

339

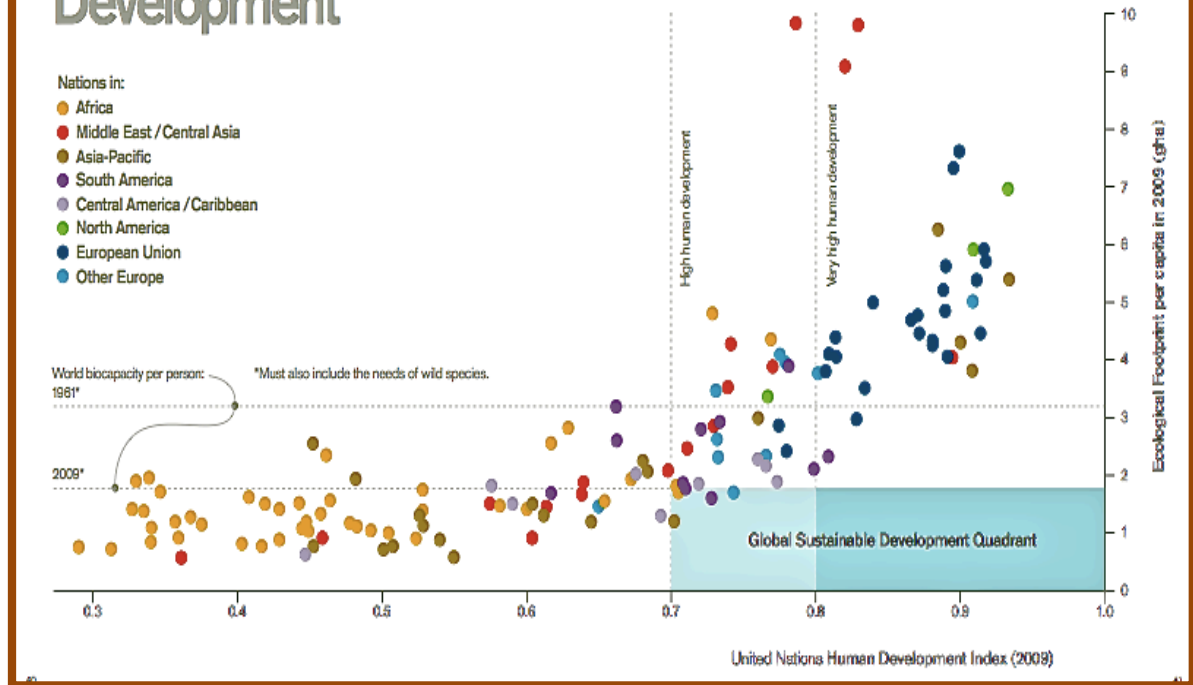
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Ecological Footprint and Human Development

A low average Ecological Footprint and high score on the UN Human Development Index are the minimum conditions for global sustainable human development. By learning to "think inside the (blue) box," we can strive toward a world where everyone lives well, within the means of one planet. At Global Footprint Network, we believe this is humanity's shared goal.



343

344 **Fig. 1 Scatter diagram of Ecological Footprints (EF) versus their Human**
 345 **Development Index (HDI) based on calculations from 2009.** The data points
 346 are colored according to region. The bottom axis represents the HDI values (scale of
 347 0 to 1), and the vertical axis represents the EF values on a scale of 1 to 10. The two
 348 dashed horizontal lines are the levels of World Biocapacity, the higher for 1961, and
 349 the lower for 2009. The two vertical dashed lines (barely visible) indicate the
 350 acceptable window of human development between the levels 0.7 to 0.8 for HDI.
 351 The blue shaded box in the right bottom corner represents the envelope of values
 352 necessary for global sustainable development. Most African, Middle Eastern, Central
 353 Asian, and Asian-Pacific nations are too low in their values of HDI, and most North
 354 American and European nations are too high in their EF. Moving all nations into the
 355 blue box area should be our global goal, allowing everyone to live well and within the
 356 planet's biocapacity to support them.

357 **3.1c. Dealing with Overpopulation.** Arresting population growth is
 358 essential to the transition to sustainability. In fact, global population growth is
 359 an enormous impediment for erasing global inequalities. Any policies that
 360 support population growth in nations inevitably increase their EF and lower
 361 their HDI, making them less sustainable. Yet population growth is welcomed
 362 by our economy from a growth standpoint, for example, the often-cited need
 363 for more consumers to grow the economy, and for more young tax-paying
 364 workers to support the growing elderly population. The harm caused by
 365 these imperatives is disguised by our use of the GDP as a more measure of

366 financial growth rather than of growth in human wellbeing and ecosystems
367 health (cf. C.2.2a).

368 Generally, discussions of population control are avoided as inevitably
369 involving a breach of human rights, or because the form of control is
370 awkwardly implemented from the top down. For example, the social anxiety
371 that China's one-child rule created might have been avoided if the focus had
372 been instead on encouraging longer generation times. The birth rate can be
373 slowed by nearly half by implementing several humane policy options, such
374 as by incentives aimed at delaying the age at which a mother has her first
375 child (including a low-to-no-cost for female as well as male contraception),
376 utilizing reproductive health services like Planned Parenthood, supporting
377 continuing education and health services for women, and securing
378 employment for both women and men. Such options result in a healthier and
379 more productive citizenry (cf. Ch. 5.2.1).

380 There are other important population dynamics that need greater
381 recognition as they confound efforts to stabilize global population:

382 **1) Momentum.** Since population growth depends on itself, the total
383 population continues to grow and only plateaus when the combined
384 birth rate and infant mortality rate is lower than the death rate. *Note:*
385 *This is can be accelerated by slowing the birth rate via the measures*
386 *mentioned above.*

387 **2) Gender difference.** Mothers are biologically restricted, in the number of
388 births they can have. Fathers, however, are restricted neither
389 biologically nor culturally in the number of births they can have. *Note:*
390 *This is a particularly a strong cultural problem when the wealth or power*
391 *of a man is connected to having many offspring.*

392 **3) Deaths.** The death rate is restricted, biologically, to one per person,
393 whereas the birth rate is not. The birth rate of a population generally
394 increases (in a "baby boom," see below) following a large death event
395 (such as war). *Note: This implies that simply killing people in large*
396 *numbers is not an effective population control for the society afflicted.*

397 **4) Baby Booms.** A period of high birth rates puts stress on the succeeding
398 generation in the form of inadequate provision for: childhood health and
399 education services, adult employment, and old age care services..

400 **3.1d. Dealing with Climate Change.** The CC threat itself offers a
401 catalytic opportunity for seriously initiating sustainable development at all
402 levels of governance. Since CC threatens change to every facet of global
403 habitation any progress on reducing its rate acts as a bellwether for our
404 global self-organization. Only full-scale nuclear war poses a quicker way to
405 destroy this self-organization potential by devastating our planetary
406 population and habitat. Only by starting now and following through on a
407 consistent commitment to confront Global Change issues wisely, will we
408 have a last chance to create a strong rationale and a strong mandate for
409 humanity to cooperate for planetary survival. Just reversing the momentum of
410 these major instabilities will take at least a decade, and focusing on CC alone
411 will not automatically resolve other global problems.

412 **C.3. THOSE INVOLVING LARGE STRUCTURAL MOMENTUM.**

413 **3.1a Dealing with our Growth Economy.** Steering global progress only
414 by economic interests leaves out many of the needs and benefits of the
415 social and environmental sectors that are not directly connected with the
416 economy and are therefore treated as being ‘external’ along with many as are
417 the social sector (cf. Ch. 4-SC). For example, the total-cost of fossil-fuel
418 exploration, mining, and waste is not accounted for in policy decisions to
419 mine or not to mine. That this is aspect is costly and remains hidden from the
420 general public (cf. Ch. 4-NC). Because we continue to use the wrong
421 parameter, the GDP, to measure of our growth of human wellbeing, and by
422 so doing, we badly deceive ourselves). How often we hear the comment: “*the*
423 *country’s economy might be growing, but I don’t experience growth where I*
424 *live*”? This pseudo-growth reflects the fact that the financial sector of the
425 economy) can grow independently of social and environmental capital, and it
426 is the difference in the growth momentum between these three sectors that
427 acts to distort and differentiate our society.

428 We know better but are not shifting to a different measure for growth,
429 such as the GPI (cf. Ch.4). We know how to objectively valuate social and
430 environmental capital and how to incorporate them into cost-benefit analyses
431 to make sure that these supposed externalities are included in policy or
432 corporate decisions. These evaluations should be used as real progress
433 indicators to guide policymakers; instead, financial interests dominate, and
434 the separation grows. We also know how to evaluate precautionary options
435 (cf. C. 3.1a), but these skills are not built into the economic or legislative
436 processes. For large complex systems, such valuation can be extremely

437 complicated and should not be calculated piecemeal by costing one
438 component at a time without using a holistic approach that includes each
439 component's primary connections to other components.

440 In addition, the costs of a damaged system's recovery are commonly not
441 evaluated in conventional economic assessments. Consequently, the long-
442 term costs of recovering a damaged system's benefits are not well
443 represented in comparison with the short-term benefits received. For
444 example, a forest's trees can be clear-cut directly for cash, whereas the
445 costs of losing the indirect benefits of the forest ecosystem are only regained
446 gradually as the forest system's benefits (such as its soil condition, carbon
447 absorption, water retention, animal habitats, existential value) recover
448 decades later. In many cases, when a system's resilience has been seriously
449 damaged, its recoverability is put at risk, and becomes a 'humpty-dumpty'
450 problem, such that it is not reversible within many human generations, as
451 with climate change, sea-level rise, loss of glaciation, or ocean acidification.

452 Policymakers should consider the total integrated costs and benefits of
453 the interconnected components of policies that address environmental and
454 associated social impacts. Methodologies for making such valuations for
455 sustainable policy options are available and improving. For example, the
456 Systems-Approach Framework¹² has successfully demonstrated that, with
457 sophisticated simulation software, accurate social and environmental
458 valuations, available data, and stakeholder participation, the appropriate
459 policy options, decision thresholds and implementation guidelines can be
460 successfully prescribed (Ch. 4-SC).

461 **3.2b Dealing with Corporate Interference.** Many corporations play a
462 dangerously excessive role in impeding fair governance by damping
463 regulations and doing their best to suppress truths contrary to their interests.
464 They do this alongside contributing greatly to financial inequality and social
465 deterioration by circumventing already weak and insufficiently progressive
466 tax laws, lobbying against regulations to protect workers, consumers, and
467 the environment, and producing unsustainable and unhealthy products.
468 Corporations also, especially since the Citizens United decision, are able to
469 pour enormous amounts of cash into the electoral campaigns of U.S.
470 politicians while helping to ensure that campaign promises are not subjected
471 to a truth standard similar to that used for scientific results), or for
472 professional journalism (cf. Ch. 2). The recent installation of fact-checkers is a
473 step in the right direction because these falsehoods feed doubts that are

474 difficult to erase—doubts about the reality and human causation of CC being
475 the most damaging and egregious example. The expanding role of corporate
476 money in controlling our choices and the opinions of politicians represents a
477 growing critical obstacle for progress on reducing CC and sustainability
478 issues. George Soros¹³ recently commented: “*The American public has*
479 *proven remarkably susceptible to the manipulation of truth, which increasingly*
480 *dominates the country’s political discourse. Indeed, a whole net-work of*
481 *publications, some of which manage to parade as mainstream media, is*
482 *devoted to the task.” He continues by “the supremacy of critical thought in*
483 *political discourse cannot be taken for granted. It can be ensured only by an*
484 *electorate that respects reality and punishes politicians who lie or engage in*
485 *other forms of deception”.*

486 **3.2.d. Dealing with Unrest and Conflicts.** Civil unrest at a certain scale
487 is a direct indicator of inadequate or oppressive governance, which through
488 social neglect of basic needs and services generates conditions perceived as
489 injustice, inequality, and intolerance. Improper governance of environmental
490 resources can cause or amplify these social conditions, for example, by
491 carelessly destroying or polluting beneficial ecosystem services (water, soil,
492 air) or by exporting resources and not redistributing the profits gained. The
493 accumulation of these actions inevitably results in unsustainable conditions
494 that can lead to social protest and civil conflict. In an attempt to quell social
495 unrest, governments conventionally resort to stronger repression, and
496 thereby accelerate the degradation cycle. Such situations inevitably arise
497 when the priority of the government is to conserve its rule (and the wealth of
498 an elite) instead of to serve its population.

499 Although poor governance is directly at fault for such deteriorating
500 spirals, the conditions for the spiral often already exists at the time of a
501 change in government. They then worsen when a succeeding government
502 does not recognize the symptoms, does not know how to stop the spiral, and
503 has other priorities. Some examples of such symptoms are: the carrying
504 capacity of the nation may have already been exceeded, the population lacks
505 trust in the government, racial and ethnic minorities (or in some cases
506 majorities) are treated unjustly, the culture of an advanced democracy may
507 not have been sufficiently developed, the political-economic infrastructure is
508 inadequate to provide the population with basic goods and services, or to
509 resist foreign exploitation.

510 The capacity to resolve such situations of spiraling social unrest are a
511 necessary resilience characteristic for a sustainable society. This is especially
512 so because internal resolution becomes more difficult as the spiral of
513 deterioration progresses. As a nation surpasses its internal capacity to arrest
514 the spiral, the civil structure breaks down and civil war can result. If the
515 destructive spiral continues further, such as internal military oppression and
516 often-external intervention by those nations that are connected to it through
517 treaty, ethnic bonds, or economic interests. The Syrian situation is a case in
518 point.

519 Syria is a tragic example of pre-existing issues and continuing poor
520 governance. Prior to 2011, Syria was already immersed in political and
521 economic problems. The Syrian government had been promoting an
522 unsustainable agricultural program to grow crops for export of wheat and
523 cotton that require heavy irrigation by drawing down the already scarce
524 supplies of ground water. In 2011 an unprecedented drought began and has
525 continued in response to a long-term warming trend (aggravated by Climate
526 Change¹⁴) in the Eastern Mediterranean that crippled local food production.
527 The combination of decreasing water supplies and poor agricultural
528 management practices caused about 1.5 million farmers to migrate internally
529 to already overpopulated cities, which caused increasing poverty and food
530 insecurity. In 2012 FAO studies¹⁵ estimated that 3 million people were in
531 urgent need of food, and as of July 2015, 4 million Syrian refugees had fled
532 the country because of hunger and severe and widespread civil violence
533 between armed rebel groups and the government¹⁶.

534 Social unrest is avoided or minimized by recognizing and correcting the
535 underlying symptoms. Reversing the spiral of unrest requires reversing the
536 causal linkages with precautionary policies (C.3.) that build resilience at each
537 link in the chain so that the spiral can be stopped. Of course, this isn't
538 actually done, because in practice, if the total governance structure is weak
539 except for armed enforcement, then the government resorts violent
540 repression, which should be the last corrective action and not the first. Many
541 of these problems are directly related to bad policies in which the division of
542 land and other key resources follows ethnic divisions, for example the Israeli
543 settlements in the Occupied Territory of the West Bank, which are often
544 preceded by violent and illegal expropriations of Palestinians. Successful
545 societies grow in accordance with government assuring provision of the

546 population's basic goods and services, and they deteriorate if these are
547 neglected.

548

549 **C.4. Directing Policies towards Sustainable Development.**

550 History does provide us with strong evidence that humans can build great
551 civilizations but that they cannot sustain them for a lack of a flexible
552 governance that could readily adapt to changing environmental or social
553 realities, for example the Mayan Empire and the Norse Settlements¹⁷ in
554 Greenland. This reluctance to act is rooted in the elite controlling class who
555 benefit most and promote the status quo, and in the society's reluctance to
556 adapt to new the cultural habits necessary for its survival¹⁸.

557 **4.1 POLICIES FOR REVERSING INSTABILITIES.**

558 **4.1a. Why not Integrate Science and Policy?** Of paramount
559 importance is that the scientific community assists the citizenry and
560 government policymakers to understand the science and consequences of
561 observed trends, and how these trends cause instabilities that threaten
562 human civilization and the earth's ecosystems. The long history of the
563 concept of sustainability as being essential to societies took a startling jump
564 into public awareness with the Club of Rome's publication *The Limits to*
565 *Growth*²⁰ in 1972. Despite its many critics, it remains a clear and recently
566 confirmed message (Ch. 5), yet the US government has still not recognized
567 the message, let alone responded to its reasoning or to its conclusions.
568 Today with the additional global stress of CC, there remains further larger pill
569 to swallow, which is that CC and GC are inviolably connected and must be
570 dealt with in con conjunction.

571 **4.1b. Facilitating Resolution of Instabilities.** Throughout history,
572 widely separated human societies often relied on scouts and messengers to
573 bring back information from distant places. There was no quick or reliable
574 way to verify the messages: rulers might disbelieve their messengers and
575 even kill them. Today, economic scouts predict the stock market,
576 weathermen predict the weather, and climatologists predict the future
577 climate. The analyses used to forecast the macro economy (though not the
578 short-term movement of stocks or derivatives) are much less complicated
579 than those needed to predict climate change, yet we tend to accept
580 uncertainty from Wall Street pundits more readily than from scientific
581 spokespeople. Presumably, this is because we more familiar with a financial

582 crisis, than an atmospheric crisis, with which we are unfamiliar and which is
583 unprecedented in human history.

584 Three mechanisms that facilitate political will for resolution of an issue
585 concerning a perilous instability are the perception of the issue as a threat,
586 the knowledge of its dynamics, and the resources for its solution. Generally,
587 the popular, business, and political sectors all have different perspectives on
588 threats and different levels of knowledge required for the solution.
589 Specifically, individual perceptions of a threat within each of these categories
590 will also vary wildly. This makes effective advocacy for resolution very
591 difficult, and requires communications to be tailored to different audiences
592 (cf. Ch. 2). In any case, to create consequential and widespread familiarity
593 with an issue, it is important to express clearly and repeatedly the reality of its
594 consequences and offer clear options for its resolution. If the options are
595 clearly understood, resolution will be delayed and in risk of failure.
596 Furthermore, we must also consider how to successfully communicate. For
597 example, the discussions must begin: with an acknowledgement of the
598 audience's perspective, must avoid the use of political labels that categorize
599 individuals or groups, and hinder effective dialogue, and it must not interfere
600 with the cooperative exchanges needed of new ideas and to implement
601 solutions.

602 **4.1c. Monitor Progress to Apprehend and Understand.** In a rapidly
603 changing world, national governments and their citizenries need to monitor
604 the progress of existing instabilities in order to understand their functionality
605 and rate of change and to anticipate how they will degrade aspects of our
606 movement towards social prosperity.

607 Many individual experts and organizations, and most of all the United
608 Nations, recognize the need and the difficulties that confront a nation trying
609 to reestablish stability, if not yet advancing toward the further goal of greater
610 sustainability. At the 1992 Earth Summit conference 179 nations voted for the
611 Agenda 21²¹, that is a non-binding, voluntarily implemented action plan for
612 sustainable development. The UN has steadily paved the way for national
613 implementation of sustainable development, but because the US Congress,
614 has steadily resisted empowering the UN since the late 1970s and has
615 consistently refused to pay its fair share of dues, the UN still lacks the
616 authority and funding to get commitments from many nations in order to rise
617 to a level of effective global leadership. Despite the fact that George H. Bush
618 eventually signed the agreement, the US Republican Party has since

619 remained opposed to adopting it as a national policy on the grounds that it is
620 threatens national sovereignty.

621 Despite the disapproval of the present US congress, a significant
622 number of US cities (528) are participating through the ICLEI²² at the
623 municipal level by implementing Agenda 21 on sustainable development (cf.
624 Ch. 5.4). Concurrently, many countries are already participating and showing
625 success and some have been quite successful, such as Sweden. On the
626 global scale the greatest obstacle still remains: that of understanding those
627 causes of the Global Change impacts, such as climate change,
628 environmental degradation, increasing social inequalities and civil turmoil,
629 that most contribute to instabilities, and addressing them though collectively
630 through an holistic approach. The urgency of collectively confronting these
631 causes was made ever more obvious by the dedication expressed by the
632 Paris Summit agreement. The '*need to act before it's too late*' becomes a
633 haunting mantra for many concerned citizens.

634 The effort to jump-start this transition following the Paris 2016
635 agreement presupposes knowledgeable leadership and improved initial
636 conditions, such as a strong
637 consensus on targets and actions
638 between OECD²³ and other
639 volunteer countries. The CC issue
640 deserves paramount priority for
641 directly focusing on preventive solutions, such as phasing out fossil fuel
642 combustion and increasing CO₂ absorption in agriculture and forest
643 ecosystems. Because of its global scale, the CC issue can provide a
644 cooperative framework that can simultaneously facilitate addressing other
645 Global Change issues. These include reducing climate impacts on freshwater
646 availability, stimulating conversion to sustainable agriculture, increasing the
647 resilience of coastal and inland areas to flooding, restoring wetlands,
648 increasing efficient generation of renewable energy, protecting, replanting
649 forest ecosystems, extending marine protected areas, and so forth.

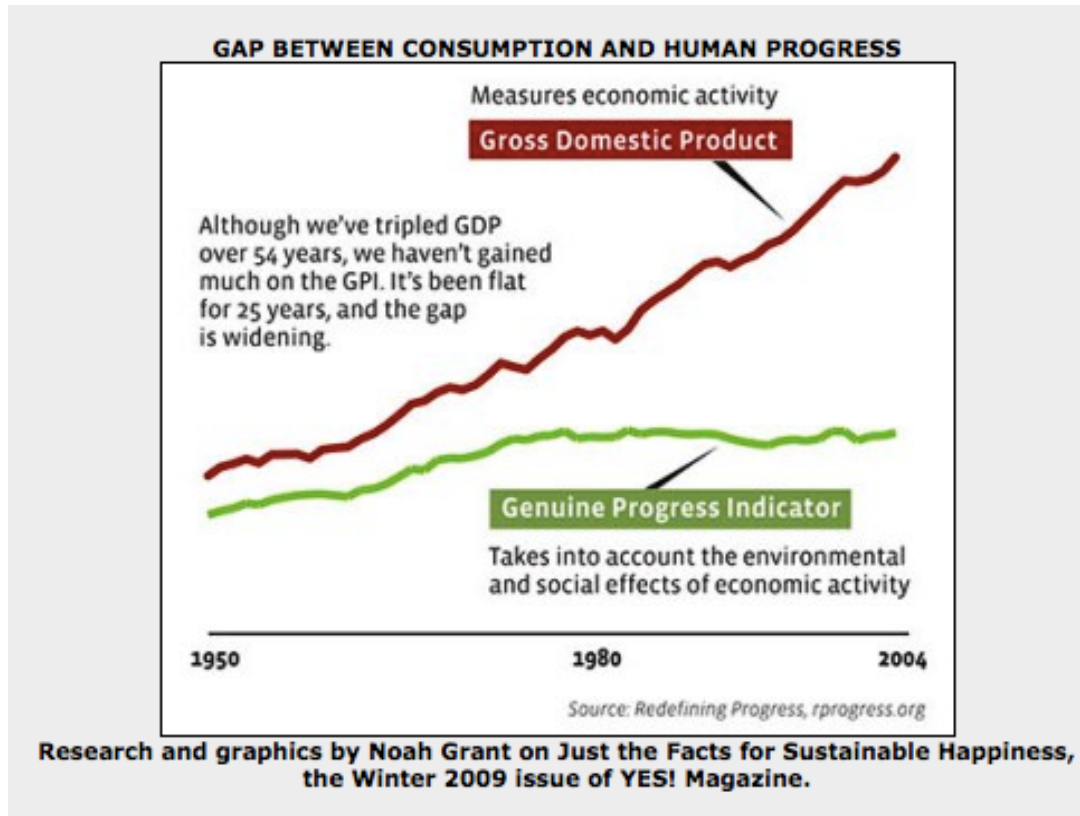
**Climate Change can worsen
or lessen Global Change
Issues – *take your choice?***

650 **4.2 PRECURSORY METHODOLOGIES ASSIST POLICY MAKING.**

651 **4.2a. Goal-less Policies Generate Side Effects.** Money-driven
652 political motives tend to create hollow or trivial political policies tailored to
653 benefit the interests of the donor or policymaker instead of filling a need to
654 address a public issue. Crisis-policies created to address an unexpected

655 issue are often ineffective, particularly when the damage cannot be reversed
656 policy make when these generate ad revenue and donations, respectively. As
657 a result, many policies are based on uninformed, money-biased personal
658 opinions that are not objectively vetted to support long-term social and
659 environmental goals. These result in slow, wandering, distorted and
660 unpopular actions counteractive side —or at times an actual regression away
661 from original goals, such as has been recently occurring in post-2016 US
662 election with the deregulation of environmental safeguards. In the age of
663 universally available scientific information and enormous computational
664 power, policymakers have no excuse for not employing appropriate
665 methodologies and analyses to facilitate greater objectivity in decision-
666 making on complex issues. In the following subsections, we describe some
667 essential types of policy instruments that can assist policymakers for
668 sustainable development.

669 **4.2b. Performance Indicators.** We must stop gauging our progress by
670 the GDP, which accounts changes in the total dollar value of all goods and
671 services produced or circulated within a nation, but omits changes in the
672 natural and social capital that affect human wellbeing. This is especially
673 egregious when we have already more sophisticated methods to measure the
674 real progress of human wellbeing and environmental health. For example, the
675 Genuine Progress Indicator (GPI²⁴) is such an indicator and has been used
676 and refined over the last several decades, but has not yet replaced the GDP
677 in the parlance of most economists and policy makers, when describing the
678 prosperity and wellbeing of a nation. Whereas the GDP accounts for the total
679 monetary value of the goods and services produced by a nation over time,
680 the GPI corrects the GDP by subtracting the cost of damage generated in
681 producing these goods and services (Fig. 2).



683 **Fig. 2 Comparison of the Adjusted global GPI/capita & GDP/capita.**
 684 GPI/capita was estimated by aggregating data for the 17 countries for which GPI
 685 had been estimated, and adjusting for discrepancies caused by incomplete
 686 coverage by comparison with global GDP/capita data for all countries. All estimates
 687 are in 2005 USD. From Kubiszewski et al. 2013²⁵.

688 The “Environmental Performance Index” (EPI)²⁸ another important
 689 indicator that helps a nation identify its direction of progress relative to
 690 sustainable development or relative to other nations with similar social and
 691 environmental issues. The EPI ranks how well countries perform on nine high-
 692 priority environmental issues in two broad policy areas: protection of human
 693 health from environmental harm and protection of ecosystems. Thus, EPI
 694 serves as a scorecard for sustainable development. Comparisons among
 695 nations illustrate the areas needing improvement or gains, in any of
 696 categories, and serve as specific examples of how other nations are making
 697 progress. The latest report (2014)^{ibid} ranks the United States 33rd out of 178
 698 countries, between Belarus and Malta and lower than most of the EU and
 699 other Developed Countries. The US fares worst in the categories of forest
 700 and fishery conservation (Fig. 3). For the directly health-related categories

701 (Health Impacts, Air Quality, and Water & Sanitation), the US and other
 702 developed countries are doing better. Many of the environmental impacts
 703 being neither as evident at a personal day-to-day level nor as readily
 704 recognized by citizens become a lower priority among policymakers. The EPI
 705 thus provides a type of scorecard for a nation's management of its
 706 environmental resources, which, if widely and aggressively publicized, could
 707 raise both public and policy awareness of them. Another UNEP index
 708 measures the Environmental Vulnerability Index²⁹(EVI) of 234 nations and
 709 territories by categories of Resilient, At Risk, Vulnerable, Highly Vulnerable,
 710 and Extremely Vulnerable. The United States places 115th in the vulnerable
 711 category. The EVI should help prioritize where policy-makers can place effort
 712 to improve environmental resilience and social conditions.
 713



714

715 **Fig. 3. The USA Environmental Performance Index (EPI).** The EPI ranks
 716 nations on how they manage natural and social capital. The US ranks 33rd (red
 717 vertical line). The nine categories are displayed by color in a clockwise sense:
 718 starting with orange for health impacts, yellow for air quality, for dark orange for
 719 water & sanitation, purple for water resources, dark blue for agriculture, light blue for
 720 forests, blue green for fisheries, light turquoise for biodiversity & habitat, and ending
 721 with green for climate & energy.

722 **4.2c. Precautionary Policy.** The way we manage our societies is slowly
 723 evolving from older methods that still exist and that are often mixed into the
 724 present more sophisticated humane forms of governance. This sequence
 725 suggests that human governance is also undergoing a slow self-
 726 organizational process. However, the direction of this self-organization is still
 727 critically unclear: is progress toward the goal of governing for sustainable

728 development, or towards a stronger plutocracy?. By hesitating to initiate
729 policies for sustainable development, a nation is acting to increase its
730 instabilities and to increase the difficulty of recovering stability. For example,
731 if beginning today the U.S. would reference policy decisions to a National
732 Strategy for Sustainable Development (NSDS), we could greatly accelerate
733 the transition, instead of exposing our nation to greater environmental and
734 social impacts, many of which are irreversible. Voluntary Sustainable
735 Development³⁰ has in fact begun spontaneously in a patchwork pattern
736 throughout the U.S. in over 550 cities and local communities but it lacks
737 integrated assistance at higher levels, where the transition has not yet even
738 become a public policy talking point. Meanwhile, many other countries are
739 implementing their NSDSs (cf. Ch. 5).

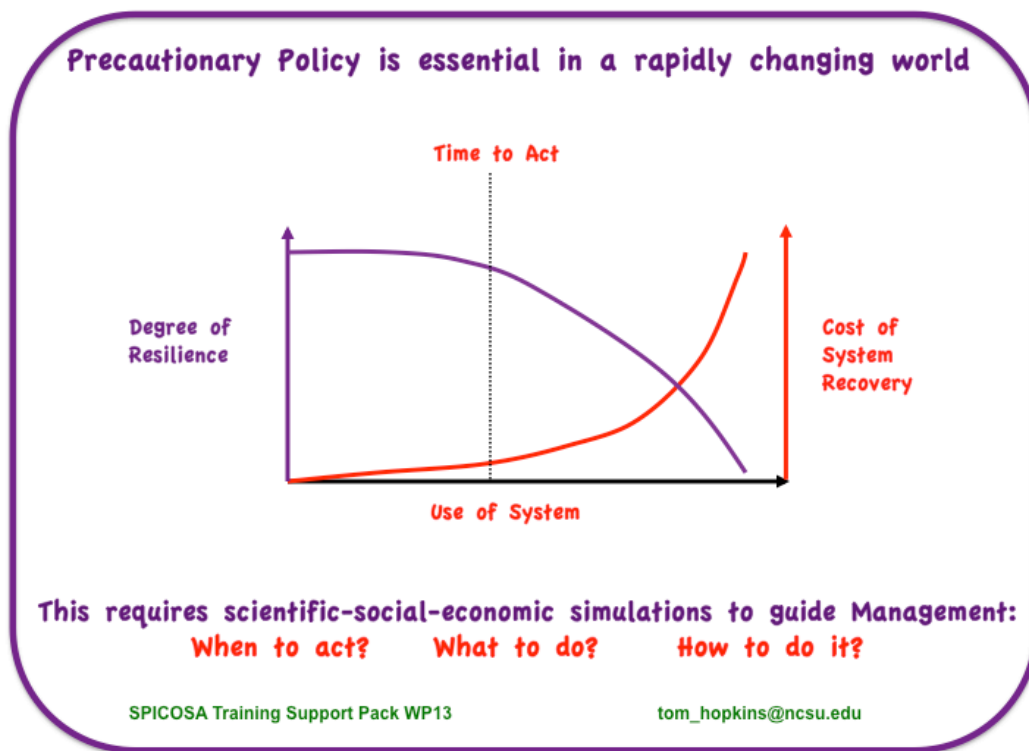
740 Much of our current US policy suggests that we use crisis management
741 rather than precautionary management (Fig. 4). Our Constitution set
742 guidelines for a stable and fair society (within the conceptual limits of its
743 framer's in a then male-dominated, slaveholding society), but could not, and
744 likely should not, have anticipated the complexity of our present social,
745 environmental, and economic problems. As we have already discussed,
746 crises in these three sectors frequently arise because the social and
747 environmental sectors are externalized by the economic sector (cf. Ch. 4). In
748 addition, since the economy is not self-regulating, policy is forced to regulate
749 it, analogous to a Troika carriage that has only the middle one (economy)
750 reined by the driver (policy).

751 The public's level of familiarity with a serious issue plays an important
752 role in supporting corrective policies that are expensive or will threaten public
753 safety or health. Likewise, policymakers may be reluctant to inform the public
754 of pending consequences of
755 serious, complex issue, for fear
756 they may lose voter credibility or
757 corporate support. Instead of
758 hesitating, they should seek expertise so as to correctly analyze information
759 for precautionary actions and policy options, which can help them present
760 policies use to the public.

**Monitor, Analyze, & Plan
before it's too late to act!**

761 This is why the monitoring of natural and social capital and the
762 evaluation their changes in monetary terms becomes a key exercise to
763 facilitate the science-policy dialogue for sustainable development. As
764 illustrated in Fig. 6, when complex natural or social systems are degrading, a

765 most important cost (effort) to consider is that of recovery. The costs of
 766 recovery for environmental and social systems are often the largest and the
 767 most difficult to realize, because of the irreplaceable damage or of the lost to
 768 key components of the system. The best prevention is to intercept the
 769 degradation process early, to work to reduce the cause, and while the
 770 system's resilience. An initial interception of the problem is the best time to
 771 development an action plan for its resolution. Taking action, without a plan or
 772 not knowing what to do, results in expensive mistakes. In practice, such
 773 haphazard, trial-and-error policy are too late and give way to crisis-
 774 management of minimizing losses, financial, environmental and social.



775 **Fig.4. Precautionary Policy** requires anticipating changes are damaging the
 776 structure and resilience of a complex system. As we stress a system by polluting,
 777 harvesting, or destroying it, we need to monitor its state of equilibrium lest it passes
 778 its resilience-threshold for recovery. After this threshold, the resilience decreases
 779 exponentially and the cost of recovery increases exponentially. The time to act with
 780 preventive measures is before this threshold is exceeded. [Author generated) ³¹.

781 **4.2d. Avoiding Major Decision Errors.** There is always a risk of not
 782 making the right decision at the right time. There is also the problem of not
 783 understanding an important, but controversial problem well enough to make
 784 a sound decision. In these cases, it is helpful to start with a preliminary risk

785 analysis of the two opposing policy options surrounding a major controversial
786 issue to avoid making Type I or Type II errors³² (Fig. 5). A Type I error is
787 assuming that a hypothesis is real and responding to it accordingly, when
788 instead the hypothesis turns out to be false. Type II is the symmetrical
789 opposite: the threat is assumed to be false and is ignored when it is in fact
790 real. The process involves an approximate type of risk assessment. That is,
791 one estimates the cost of making a Type I or Type II error, and then one
792 compares the difference in each case between the products formed by the
793 (probability of being true) x (the cost of being true) with the (probability of
794 being false) x (the cost of being false). For example, treating Climate Change
795 as *false* even at low probabilities of it being true at 33% but with inestimable
796 costs if indeed it is *true*, would be a far more grievous error than accepting
797 Climate Change as real and paying for the up-front costs of converting to
798 non-fossil fuel energy sources. This should be intuitively clear with the CC
799 impact of sea-level rise, which poses the threat of inundating the world's low-
800 lying coastal zones (Fig. 6). For example, by 2030 more than 800 million
801 people living in the Low Elevation Coastal Zone (LECZ) will be displaced and
802 agricultural and commercial infrastructure will be radically. By gambling the
803 falsity of CC and ignoring the urgency for strong policy plan to combat CC is
804 tantamount to global homicide. and allowing coastal populations to be
805 submerged is tantamount to global homicide. To take just one instance, New
806 York City, it would be overwhelmingly more expensive to move to higher
807 ground than the cost of a transition from fossil fuel energy to renewable
808 energy, which something that is already underway.

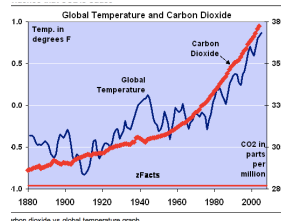
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ERRORS IN DECISION MAKING

Type I: One rejects a true hypothesis - *e.g. I'm not going to believe in Global Climate Change.*

Type II: One accepts a false hypothesis - *e.g. The Titanic can't sink, Full speed ahead!*

Risk Assessment: One must multiply the probability of being wrong on these decisions with the cost involved in being wrong,
e.g. would you board an airplane that a pilot refused to fly? - - Lose my ticket or lose my life?



Similar mistakes?



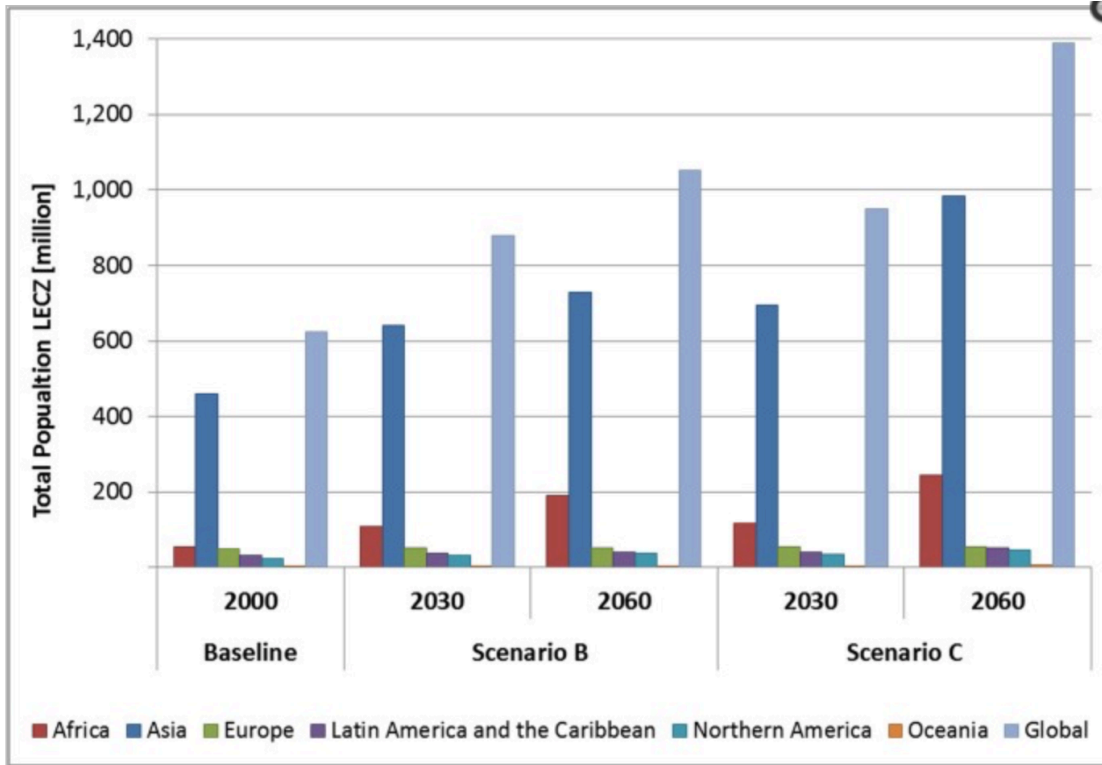
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811 **Fig 5. Type I or Type II Errors.** All major controversial decisions should be
812 evaluated to avoid Type I or Type II errors that is, rejecting a true hypothesis or
813 accepting a false hypothesis, respectively. To compare the cost risk between the
814 two types of errors, one calculates the difference between the products formed by
815 the (probability of being true) x (the cost of being true) with the (probability of being
816 false) x (the cost of being false). Author generated SPICOSA.

817

818

819



820

821 **Fig. 6 Projected populations living in Low Elevations in Coastal Zones**
 822 exposed to sea level rise and coastal flooding. The four projections to 2060 are
 823 shown in reference to values in 2000³³.

824 The kind of Type-Type II risk assessment calculation provides a
 825 valuable precautionary check on the possible magnitude of a wrong policy
 826 decision and on what information would be needed to make the estimates of
 827 costs more accurate. a Cost-Benefit Analysis (CBA) is vulnerable to
 828 manipulation due to uncertainties and errors in the factual data used for input
 829 for the calculation. On the other hand, if these uncertainties are carefully
 830 assessed with transparency and scientific review, using environmental and
 831 social values whenever possible, they can greatly increase the effectiveness
 832 and efficacy of policy making by including uncertainty envelopes of the
 833 probabilities of the outputs of the calculation. Properly applied in this way, a
 834 CBA analyses of CC impacts can be very informative instruments for public
 835 awareness and policy decisions.

836 **4.2e. The Everglades Example.** The Everglades provides an expensive
 837 example of policies gone wrong. In early 1900s, plans to humanize the
 838 Everglades took about seven decades and billions of dollars by a “Damming,
 839 Ditching, Draining, Diking, and Developing” approach before it was realized in
 840 the 1970s that the approach was more damaging than helpful. Subsequently,

841 a number of restorative projects have had mixed success, but the
842 ecosystem-wide damaging impacts remain as multiple issues, such as
843 flooding and improperly conducted industrial agriculture (mainly sugar) with
844 its pollution, habitat destruction, and species loss. In essence, the policies for
845 development were easier to pass and implement than those targeted for
846 ecosystem restoration³⁴ and preservation, which were also strongly lobbied
847 against by agricultural and urban development interests in Congress. The
848 latest big project is the Comprehensive Everglades Restoration Plan³⁵, which
849 had considerable support and public demand and has been well formulated
850 at a projected cost about \$10 billion and to take until at least 2035. Most of
851 the support, however, was based on hydrological issues and less on
852 restoring of the health of everglades ecosystem. About \$2 billion has been
853 spent and the remaining funding is stuck in Congress. Moreover the city of
854 Miami is taking little precautionary measures risks against being flooded by
855 both land and sea; that is, sea level rise at the coast will also raise the water
856 level and salinity within the Everglades, damaging freshwater wells. In fact,
857 rising sea-level and salinity are irreversible threats. Miami is caught between
858 undertaking vigorous development to accommodate greater tourist income
859 and is enacting beach restoration projects, on the order of hundreds of
860 millions of dollars, and risking these investments may be wasted due higher
861 sea levels and erosion from increasing storms. Already, the city's storm-drain
862 and sewage systems are regularly being inundated with seawater from high
863 tides.

864 **C.4. DEVELOPING STRATEGIES FOR LARGE-SCALE INSTABILITIES**

865 Strategies for large-scale environmental-social problems require a sound
866 scientific base. The following section outlines some factors that encumber
867 the enactment of sustainable-development strategies and some potential
868 improvements that might make them more appropriate.

869 **4.1a Types of Behavioral Responses.** From a behavioral perspective,
870 humans already have built-in ways to deal with threats according their level
871 of familiarity with the problem they are facing and its solution. When choosing
872 how to react when confronted with a serious threat, humans tend to respond
873 with one of the following options:

874 **Acceptance:** let it happen—no or wrong response—panic—problem
875 continues, - the impacts worsen, and risk of Type I error with little short-
876 term cost but very high long-term cost.

877 **Adaptation:** defend against impact—short-term costs low—some short-
878 term benefit—problem continues—impacts continue to grow – cost of
879 adapting to increase.

880 **Mitigation:** short-term costs moderate—delayed short-term benefit—
881 problem reduced somewhat—but cause and impacts remain—long-term
882 costs and risks continue.

883 **Prevention:** short-term costs high—long-term benefits high—impacts
884 decrease in response to decreases in the cause.

885 Figure 7 helps to understand why familiarity through public awareness is a
886 critical factor in deciding which option to use in responding to a problem: that
887 is, the higher the level of experience with the problem, the quicker and better
888 the choice for its resolution. If humans are unfamiliar with either the threat or
889 the solution, consensus is difficult to obtain in time to deal with the problem
890 effectively. For groups of humans with no or diverse experience with a
891 problem, consensus for action will often coalesce on the least preventive
892 action (acceptance), with the justification that doing something is better than
893 doing nothing. If humans are mostly unfamiliar with a slowly developing but
894 very threatening problem or its solution, a consensus is even more difficult to
895 obtain in time to effectively resolve the problem without prohibitive costs. For
896 the general public, the familiarization process relates strongly to the level of
897 truth about it in the media and is slowed or prevented by the misleading
898 propaganda generated by opposing interests: as has been demonstrated in
899 the case with both the tobacco and climate issues.

Decisions in Response to Threats

Familiar Threat: Your Roof is starting to Leak!

Panic/Ignore: Move out.

Acceptance: Let it happen.

Adaptive: Put buckets under the leaks.

Mitigative: Put plastic on the roof.

Preventive: Repair the roof.

Unfamiliar Threat: Your Climate is about to change!

Panic/Ignore: Do nothing

Acceptance: Let it happen.

Adaptive: Try to live with the damage.

Mitigative: Disperse dust in stratosphere.

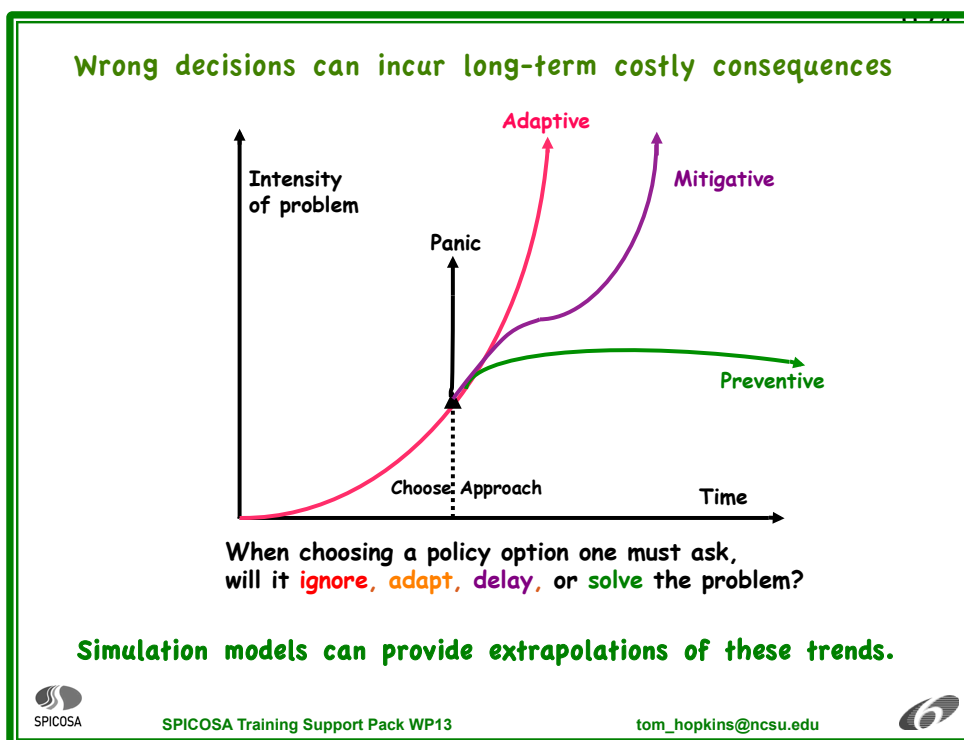
Preventive: Phase out fossil carbon combustion.

Making people familiar with a problem encourages auto-correction!

900 **Fig. 8. Responses to Threats.** This figure emphasizes the importance of
901 familiarity with a problem and its solution before reacting to it. Author
902 generated, based on Schneider.³⁶

903 Generally, lower-level response strategies become similar to crisis
904 management, which must rely only on the information and resources
905 available specific to the problem. Such responses often lead to corollary
906 problems that require specific follow-up measures to correct. Obviously,
907 better management of any situation requires specific anticipatory action
908 plans for each of the strategies (Fig. 8). This saves time for responding to
909 urgent problems, and it saves long-term costs, to have well-studied
910 responses on hand for a management's particular set of potential problems.

911 For example, existing US governmental agencies, such as the US EPA,
912 NOAA, and NIH³⁷, monitor existing problems and conduct interpretive
913 analysis to generate, adaptive, mitigative or preventive strategies for major
914 social or environmental problems, but their strategies often meet resistance
915 from legislative bodies, mostly for political reasons. Climate Change is a case
916 in point. Industries often have contingency plans for expected types of
917 emergencies that threaten them, though less so for emergencies that
918 threaten the public or its activities, such as the British Petroleum oil spill in
919 the Gulf of Mexico, or the 2012 Richmond, CA Chevron refinery explosion
920 and fire, both of which caused environmental and public-health damage. The
921 military and emergency responders also mock up and train for a suite of
922 dangerous sudden events. All these anticipatory plans, however, must also
923 aim to improve the sustainability of the causal source.



931 **Fig. 8 illustrates the time projection of how a problem evolves** with
932 each of the different strategies. Hastily chosen strategies are often easier to carry
933 out than to undo, because they can lead to unintentional consequences that delay
934 the resolution process and incur more costs. Author genera

935 **4.1b. Choosing Strategies for an Action Plan.** Developing a way to
936 deal with a complex issue involving multiple impacts requires a lot of
937 homework before it can be translated into to a coherent multiple-faceted
938 action plan. Policymakers need an information chain that can systematically
939 translate a problem into their perspective and parlance so they can prioritize
940 responsive actions based on precautionary checks. Their goal should be to
941 determine the most effective, efficient, and complementary actions needed to
942 successfully reduce a problem. There are four major requirements to
943 generating such a strategic action plan for a complex issue (Fig. 9).

944 **1)** The first is to create a **TRANSDISCIPLINARY TEAM**³⁸ of scientific, social, and
945 economic experts and participating stakeholders that are capable of
946 designing a systems approach framework³⁹ (SAF) specific to the policy
947 issues of concern.

948 **2)** The team would first specify the **INFORMATION** need, that is, a
949 scientifically documented description of the system that encompasses
950 the issues of concern, its functioning, causal linkages, its interactions
951 with the resident society, and preliminary estimates of its social-
952 economic costs and benefits of potential solutions.)

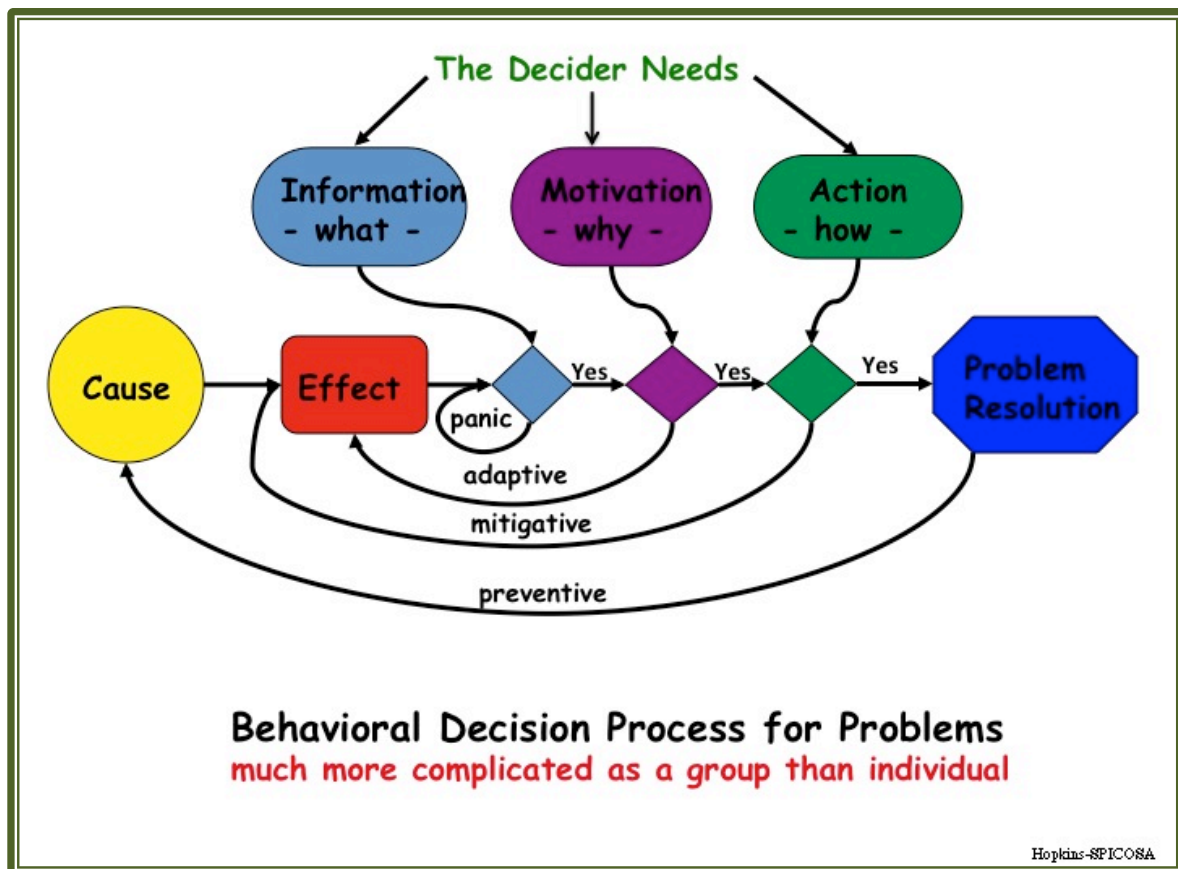
953 **3)** The third is to concurrently secure the **MOTIVATION** on the part the
954 policymakers and stakeholders, their commitment to assisting in
955 designing sustainable policy options for analysis.

956 **4)** The fourth is to generate a comprehensive integrated **ACTION PLAN** using
957 all the garnered information after formulating, modeling, and testing the
958 efficacy of relevant policy options. Responsibility for implementation and
959 monitoring results must be “hard-wired” to capable scientific research
960 and social agencies that can implement solutions with maximum
961 efficiency and with minimal social stress. Past the point of an action plan,
962 the responsibility is mostly on the political process of passing through
963 several hoops, such as its constitutionality, legality, funding, and political
964 approval before becoming a law.

965

966 d.

967 Incorporating versions of the systems approach framework (SAF) to
 968 sustainability science⁴⁰ is essential for sustainable development and should
 969 be the highest global priority because this flexible methodology can be
 970 applied to resolving any of the Global Change Issues (e.g. Ch. 1, Fig. 2). The
 971 SAF is a type of holistic framework that can include a pragmatic suite of
 972 adaptive and mitigative actions so long as they act as precursors and can
 973 coalesce into a preventive resolution. Since sustainable development is a
 974 bottom-up process, its implementation at any political level must gain the
 975 cooperation of lower political levels, and it must ensure the noninterference
 976 of higher levels within their existing legal constraints. This allows for
 977 addressing local-scale issues that can be confronted and resolved
 978 separately, and potentially contribute to the evolution of a database on
 979 implementation methodology by providing examples of success for other
 980 complex applications (cf. Ch. 5). The eventual implementation of sustainable
 981 development at higher levels must avoid the over-regulation of lower ones,
 982 but nevertheless must assist them with meeting certain acceptable
 983 thresholds, such as meeting social, environmental, and economic standards
 984 (cf. Ch. 5).



985 **Fig. 9. Behavioral Decision Process.** This schematic depiction illustrates the
 986 resolution trajectories between cause, effect, and resolution for each of the different

987 decision strategies. Wrong decisions made without sufficient information can make
988 the problem worse or create additional problems. Having some information and weak
989 motivation can result in adaptive measures to lessen the effect of its impacts. Having
990 sufficient information and motivation but lacking support for a preventive action can
991 result in temporary mitigative reduction of the problem and its impacts. Having good
992 information, motivation, plus a comprehensive action plan that will reduce the cause,
993 can resolve the problems causing the impacts. From SPICOSA.

994 **4.3d. US Climate Change Example.** Currently, the US is bogged down
995 between the strategies of acceptance and adaptation, due to lack of political
996 will and corporate interference. Any transformational plan will require starting
997 with a mix of adaptive and mitigative strategies that can lead to essential
998 preventive strategies. The growing recognition of CC's potential irreversibility
999 and its severe global impacts has upped the urgency for international
1000 cooperation and stimulated the need to transform our interactions with the
1001 earth systems so as to reestablish more beneficial equilibriums. The US has a
1002 very large, comprehensive knowledge base along with various forms of
1003 action plans. This need to be organized and integrated so that experts can
1004 sort out what is missing to better resolve some of the remaining uncertainties
1005 in the functionality between the three Earth Systems and the Human System.
1006 Preliminary assessments of the economic and social costs and the risks of
1007 CC also exist to help in drafting policy options to be tested.

1008 Recently, President Obama's administration expressed a 'long-
1009 awaited' motivation for the US to take a leadership role in globally addressing
1010 climate change by presenting the CC issue to the public personally and
1011 through his administration. Early in 2014, the US submitted its Climate Action
1012 Report⁴¹, including its Biennial Report requested for the 2015 UN Climate
1013 Summit Conference in Paris, which "outlines how U.S. action on climate
1014 change puts the United States on a path to reach the ambitious but
1015 achievable goal of reducing U.S. greenhouse gas (GHG) emissions in the
1016 range of 17% below those of 2005". Also in 2015, President Obama and the
1017 Chinese President Xi reached an important CC agreement, which had been
1018 an obstacle for the cooperative global progress of shared commitment that
1019 each nation could formulate their own policies towards cutting GHG
1020 emissions, and that the richer countries would help developing countries
1021 accelerate the transition to low-carbon, renewable-energy programs. Also in
1022 2015, President Obama submitted to Congress a Clean Power Plan⁴² that
1023 sets a national limit on carbon emissions from power generation. It would
1024 require states to develop flexible compliance plans that would increase the
1025 efficiency of and reduce the emissions of new and existing power plants.

1026 With these decisive commitments on the part of the President, the
1027 support of two-thirds of the country on the CC issue, the vast reservoir of
1028 expertise resident in Universities, Institutes, NGOs, and government
1029 Agencies, the required information and motivation would have been more
1030 than sufficient to enact a US national CLIMATE CHANGE ACTION PLAN that could
1031 be translated into an implementable set of policies. However, the present US
1032 President and the Republican-controlled Congress is strongly opposed to
1033 this, has voted against the Clean Power Plan, and disapproved of his
1034 international commitments made on dealing with CC. That said, the President
1035 could have used his prerogative of executive action to take some temporary
1036 measures against CC. However, unless the next elected president and
1037 congressional majority favor CC action, the national commitment and the
1038 leadership to realize the commitment and strengthen the momentum of the
1039 Paris Agreement are effectively postponed; and if support is not gained in the
1040 2016 election, the US response could be postponed for two to four more
1041 years.

1042 For this reason, the immediate goal for CC advocates is to achieve
1043 political will for action and concomitant public awareness and acceptance of
1044 the issue with the next election cycle. Corporations dependent on fossil fuel
1045 constitute an additional ‘third-party’ resistance to CC policies—one that, via
1046 now virtually unlimited campaign contributions to compliant politicians willing
1047 to continue mouthing the worn-out falsehoods of CC denial, is actually
1048 driving the resistance to action. Obviously, these companies fear having to
1049 change from their business-as-usual course which now to do so would
1050 jeopardize their profit margins. Unfortunately, if they had begun to move out
1051 of fossil fuels and into clean energy when their own scientists warned them of
1052 the CC threat, they would not now be facing the problem of an abrupt shift.
1053 Instead, they are continuing to resist changing and are retaining their favored
1054 influence on politicians through lobbying and buy-offs. Big Oil ads and
1055 advertorials continue to send ambiguous messages to the public, claiming
1056 their commitment to ‘green energy’, without explaining to the public that their
1057 conventional oil production has been declining for decades. Instead, they are
1058 protecting their core industry by further investing in new extraction
1059 technologies for the scarcer “unconventional” oil reserves, such as lateral
1060 drilling and fracking for natural gas in shale layers, and extracting oil from
1061 shale and tar-sands deposits. These new mining techniques impose very
1062 high environmental and social costs, and most have a much lower energy
1063 EROEI⁴³ than conventional oil (cf. Sect. 4.5). Thus, by expanding their

1064 production to shale and tar-sands, they intend to preserve their market and
1065 favorable subsidies. In fact, they have glutted the market, which has lowered
1066 oil prices, reduced public concern for renewable energy sources, and
1067 forestalled investment in renewables (cf. Ch. 4-NC). But this has had the
1068 blowback effect, via a global price war between oil companies in an effort to
1069 maintain their sales, of driving many of the unconventional oil producers out
1070 of business, because the extraction costs are now too high in relation to the
1071 price.

1072 The primary obstacles holding back policies promoting alternative energy
1073 technologies are: cultural and corporate resistance, lags in developing
1074 supporting infrastructures, and problems in
1075 obtaining subsidies equal to or greater than those
1076 offered to the Fossil Fuel industry. By
1077 demonstrating a resistance analogous to that of
1078 tobacco industry, the FF industry indicates that
1079 will not voluntarily allow a shift away from FF while they still are maintaining
1080 profits from the enormous existing market that is supported by the
1081 momentum of an immense infrastructure. They are holding ransom the
1082 stability of the economic sector by means of their 'ownership' of enormous
1083 assets in unconventional oil reserves two-thirds of which would have to
1084 remain untapped to meet the internationally agreed target thresholds for
1085 carbon emissions. The transfer to use or rescind these (oil) assets for public
1086 use is mere conjecture, but the argument has a convincing moral aspect, i.e.
1087 conserving an underground resource to preserve the natural environment and
1088 hold for future emergency benefit has a far greater value than exploiting them
1089 now to prolong private profit of an obsolete resource.

**Does Big Oil
think its'too
big to quit?**

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1090 The sudden devaluation of these assets would seriously destabilize the
1091 market—in fact, the devaluation underway is already doing so, causing
1092 severe economic problems and social instability in petro-states from Nigeria
1093 to Russia and even Saudi Arabia, and the downward spiral of Venezuela
1094 toward total chaos. This is a big obstacle, not to mention Big Oil's contention
1095 that they even have the right to exploit these geological reserves (paying the
1096 unwarrantedly low fees of public lands) without public consent under the
1097 claim that doing so promotes economic growth. If indeed they were truly
1098 considered public assets (and if the Department of the Interior had not
1099 suffered near-total regulatory capture by the FF companies) the government
1100 might decide to preserve them as future public goods and partially transfer
1101 them to fund to support the essential renewable energy infrastructure.

1102 An important tactic of CC advocates is to make obvious that a fair share
1103 of the government subsidies for FF should be redirected towards efforts to
1104 facilitate the transition to renewable energy sources. For example, the
1105 proposed bill for a ‘carbon fee-and-dividend’ approach advocated by CCL
1106 and others is an example of a supporting government action for which there
1107 are no costs to the voting public but puts an increasing cost on FF energy
1108 sources to speed this transition. This is good example of a pragmatic first
1109 mitigative action and much better than pricing emissions as they spew out of
1110 billions of exhaust pipes, i.e. trying to catch the cat after it gets out the door.

1111 **C.5. Instruments for Policymaking.**

1112 **5.1 INPUT REQUIREMENTS FOR THE POLICY CYCLE.**

1113 The political process for converting issues of environmental, social economic
1114 concern into appropriate action is complicated and is often a weak point in
1115 our democratic governance.
1116

1117 **5.1a Policy Cycle.** A ‘policy cycle’ is a loosely defined tool for the
1118 development of a policy item. It is conventionally structured as a rather
1119 sequential, cyclic process of policymaking from the conversion of ideas or
1120 action plans into viable policies. It is often structured as a framework of
1121 sequential, overlapping steps (Fig. 10), which has the following steps⁴⁵

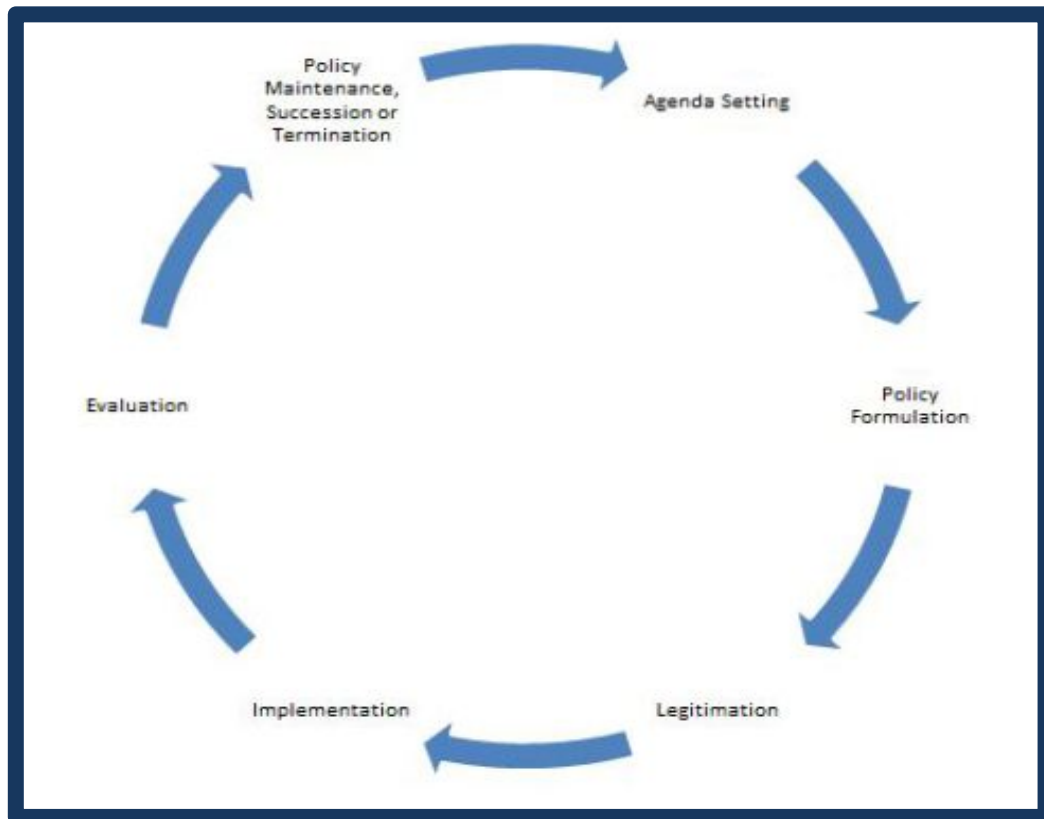
- 1122 **1) Agenda setting.** Identifying problems that require government
1123 attention, deciding which issues deserve the most attention, and
1124 defining the nature of the problem.
- 1125 **2) Policy formulation.** Setting objectives, identifying solutions, estimating
1126 their costs and likely effect, choosing from the resulting list of potential
1127 solutions, and selecting policy instruments.
- 1128 **3) Legitimation.** Ensuring that the chosen policy instruments have
1129 support. This can involve any one or a combination of: legislative
1130 approval, executive approval, seeking consent through consultation
1131 with interest groups, and referenda.
- 1132 **4) Establishing responsibility** for employing an organization to conduct
1133 the implementation, ensuring that the organization has the resources
1134 (such as staffing, money and legal authority) to do so, and making sure
1135 that policy decisions are carried out as planned.

1136 **5). Assessment** of the extent to which the policy was successful and the
1137 policy decision the correct one, whether it was implemented correctly
1138 and, if so, if it had the desired effect.

1139 **6) Policy maintenance, succession, or termination.** Considering
1140 whether the policy should be continued, modified, or discontinued.

1141 Admittedly, this description grossly simplifies some aspects of the
1142 policy cycle process, in particular for complex global-scale problems. In fact,
1143 the process according to Bridgman and Davis⁴⁶: *“It is intentionally normative
1144 and not meant to be diagnostic or predictive. Policy cycles are typically
1145 characterized as adopting a classical approach, and tend to describe
1146 processes from the perspective of policy decision makers. Accordingly, some
1147 post-positivist academics challenge cyclical models as unresponsive and
1148 unrealistic, preferring systemic and more complex models. They consider a
1149 broader range of actors involved in the policy space that includes civil society
1150 organizations, the media, intellectuals, think tanks or policy research
1151 institutes, corporations, lobbyists, etc.”* For our discussion, here of complex
1152 and large-scale problems, the process should include a transdisciplinary
1153 team approach with diagnostic and predictive capabilities (cf. Ch. 6).

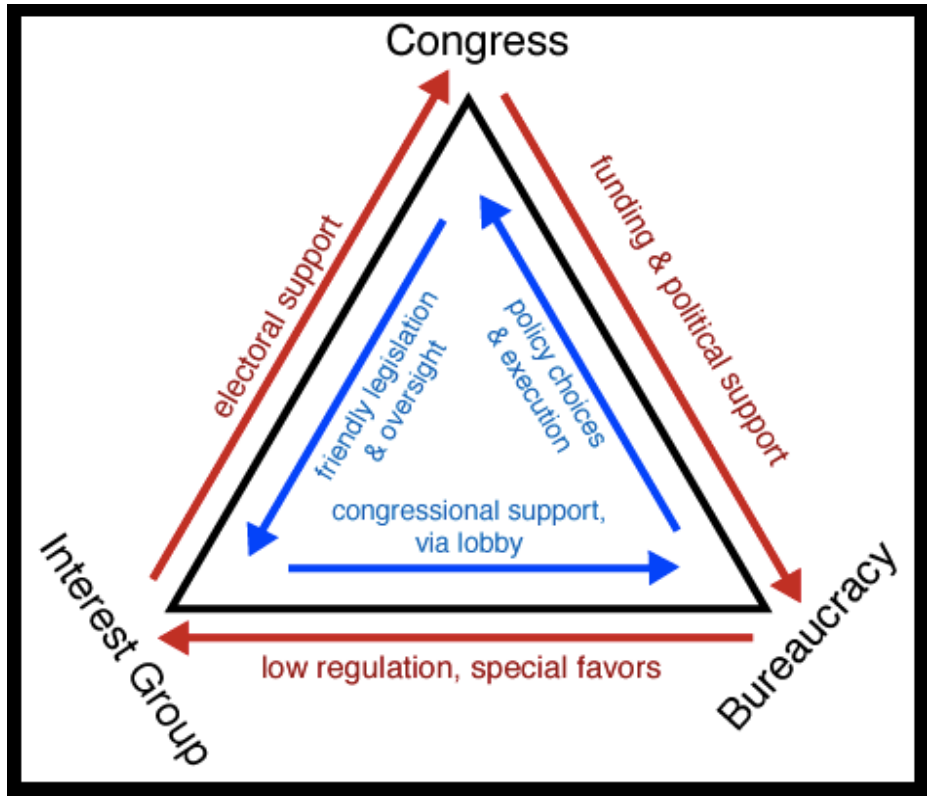
1154



1155 **Fig. 10 The policy cycle.** The sequence of steps (or stages) for processing,
1156 implementing and maintain a policy item. [From *ibid.*]

1157 **5.1b The Iron Triangle.** The triad is composed of representatives from
1158 the appropriate government agencies, congressional committees, and
1159 special-interest advocacy groups form a policymaking triangle surrounding a
1160 potential legislation (Fig. 11). It negotiates a policy item into a bill for
1161 congressional approval and implementation through the appropriate
1162 governmental agency. A public issue that arises from outside the government
1163 structure, must pass the first two steps (agenda-setting and policy
1164 formulation) of the Policy Cycle before it is processed by the policy triangle.
1165 Also, a policy originating from within the government body can be processed
1166 independently of the public interest body solely through a negotiated
1167 agreement between congressional committee and a governmental agency on
1168 the basis that they both directly represent the public interests. The triangle
1169 negotiation is facilitated by a type of mutualism between any of the three
1170 bodies indicated by the arrows in Fig. 11. Depending on the political
1171 composition of the triangle bodies and on the political issue addressed, the
1172 triangle can act as variable buffer that delays or accelerates the policymaking
1173 process. Influencing the buffer are the political views of either the executive
1174 or congressional body's viewpoint, which vary with the election cycle. Also
1175 contributing to the mélange of views are those of the nonelected members of
1176 the advocacy group, some of who may have alliances with members of the
1177 two government groups. These alliances can be constructive, if they are
1178 genuinely objective, but can also exert undue bias if they are chosen for
1179 reasons of gaining money or power. Such situations create a potential for an
1180 inappropriate blocking or passing of a policy item, without full and fair
1181 considerations. Hence, a dysfunction— bias—can arise when strong political
1182 or financial alliances form between participants in at least two of the three
1183 bodies. These produce biases against those proposed policies that happen
1184 to counter the interests of an alliance. Thus, the triangle can become rigid or
1185 'iron' and distort its presumed responsibility to function on the public's best
1186 interest. Once a proposal to resolve an issue has failed to become a bill, its
1187 chances of getting further attention decrease.

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1199 **Fig. 11. The Policy Iron Triangle.** The executive agencies (bureaucracy),
1200 legislative subcommittees (congress), and advocacy interest groups form a triangle
1201 for developing governmental policy. The triangle acts as both a buffer and a
1202 negotiating space for special interest groups to propose policies that meet the
1203 requirements and/or gain the favor of the relevant congressional subcommittee and
1204 government agency for approval and implementation, respectively. Each of the three
1205 entities negotiates a mutual give-and-take relationship with the other two in order to
1206 approve the proposed policy. The metaphor “iron” is applied when self-serving
1207 alliances generate biases in the negotiation, making it rigid or oppositional in certain
1208 policy areas. [From Wikipedia.]

1209 **5.1c Special Interest Advocacy.** A political interest or advocacy group
1210 is an organized collection of people who support a particular issue and who
1211 want to influence political decisions and policy without seeking election to
1212 public office. These groups arise out of a perception that certain public
1213 policies are missing, or need to change to be more reflective of their
1214 interests. For example, important issues often get lost in the election process
1215 and campaign promises are not realized, leaving a portion of the population
1216 still wanting them to be considered. Advocacy groups can use numerous
1217 media methods to promote their cause and to generate enough public
1218 attention to support a policy proposal. Before entering into the triangle, large
1219 advocacy groups try to gain recognition from members of congress and/or

1220 the interest of a governmental agency. To facilitate processing in the triangle,
1221 it is also important to provide clear, concise information on the agenda
1222 setting and formulation steps of the policy cycle. Advocacy groups often
1223 even hire a professional advocate (a lobbyist) to help represent their cause in
1224 the policy-making triangle.

1225 Unfortunately, the lobbying aspect of the advocacy process is too often
1226 asymmetric when an issue is controversial between political parties or
1227 between corporate interests and public interests. The latter occurs when the
1228 public-interest advocacy is funded by contributions from non-profits and
1229 individuals, whereas corporations have much larger source of funds and legal
1230 support, and thereby can exert much more influence on the policymaking
1231 process in their favor. As income inequality has increased and corporations
1232 increasingly dodge taxation by offshoring their headquarters and assets, this
1233 problem continues to worsen.

1234 Recent examples are the well-known and well-funded resistance of
1235 tobacco companies to anti-smoking laws proposed by medical-health
1236 groups advocating restrictions on smoking in public places as a hazard to
1237 public health. Similarly, oil companies fund misinformation about the decline
1238 in conventional oil reserves (cf. Ch. 4-NC) and denying that fossil fuel
1239 combustion is changing our climate. Both of these examples illustrate the
1240 concept of an entrenched “policy monopoly,” whereby a an interest group
1241 forms a semi-clandestine bargained agreement with both elected officials
1242 and government administrators over a general policy area that resists policy
1243 changes counter to their interest. In these cases, a paradoxical rationale is
1244 used: a policy is claimed to be essential to the country’s economic interests
1245 (non-specified), even if it is not good for the public interest, and is more likely
1246 to pass. This returns us to one of our original questions: which is more
1247 important: securing the profit of a few or securing the prosperity, health, and
1248 security of the many? In fact, the mere argument that “national” economic
1249 well-being can run counter to the needs of the majority is an admission that
1250 the “national interest” is a myth, because different the different economic
1251 levels of within the nation have inherently divergent and often opposed
1252 interests—notably, the interests of workers (for living wages) versus the
1253 interests of employers (for company profits).

1254 **5.3 PRECAUTIONARY CONSIDERATIONS FOR SUSTAINABLE POLICIES.**
1255 By way of further clarification, here are some additional points that should be

1256 considered in policymaking for the extensive policy changes needed for
1257 Climate Change and Sustainable Development.

1258 **5.3a. Complexity.** It is inherently difficult to create an interface between
1259 the political decision-making system and the scientific knowledge system
1260 because of several striking differences: their language (subjective vs.
1261 objective) their functional behavior (human behavioral practices vs. natural
1262 laws), their structural scales (from earth-system to microbes vs. from political
1263 economies to individual citizens), and their compositional scales (human
1264 societies vs. geo-bio-chemical-physical processes and systems). Since it is
1265 human behavior that is causing CC by disrupting the atmosphere, then
1266 human behavior must change to create a benign relation with the atmosphere
1267 or suffer the consequences. However, any policy interfacing human behavior
1268 with natural systems must be carefully crafted with tradeoffs between optimal
1269 efficacy in reducing the problem and minimal disruption to society. But
1270 because of the inflexible limits characteristic of natural systems and of the
1271 flexible limits of humans, the tradeoffs should not be based on money-capital
1272 concerns alone, but on total capital concerns by including natural and social
1273 capital in the deliberation.

1274 **5.3b. Policy Scale.** According to sustainable development
1275 requirements, any long-term policy options should be dealt with through
1276 some bipartisan, objective plan independent of the election cycle. Decisions
1277 with international implications should be dealt with similarly, with
1278 representation of all stakeholder nations involved. At the city-to-individual
1279 scale, organizations should have the freedom to design their own action
1280 plans for sustainable development, subject to review and assistance (for
1281 scale-dependent transitions) from larger-scaled governance. More details are
1282 in Ch. 5).

1283 **5.3c. Cost-Benefit Analysis.** CBA assessments for policy decisions,
1284 planning and risk management are particularly necessary and difficult for
1285 issues affecting natural and social capitals. Essentially, they weigh the costs
1286 and benefits expected of a policy option. The difficulty is in the valuation of
1287 both environmental and social capitals of a policy implementation and its
1288 maintenance. These valuations involve many different variables that do not all
1289 have sufficient or concomitant databases to draw on. They are so difficult
1290 that they are not considered or are underestimated in the calculation. For
1291 example, future (long-term) impacts are customarily projected linearly from
1292 'business-as-usual' trends and are consequently underestimated by the

1293 accepted practice of financially discounting ‘future values’. This aggravates
1294 the inaccuracy caused due to the additional omission of damage or benefit to
1295 the social and natural capital affected (cf. Ch. 4-NC). However, business-as-
1296 usual projections are useful for comparing policy options.

1297 If a local law does not require a more comprehensive CBA valuation,
1298 such as an Environmental Impact Report, whose recommendations are
1299 binding, the physical “development” of an area, which typically destroys
1300 natural capital and causes problems for inhabitants, can legally proceed.
1301 These poor practices and misrepresentation of future, environmental, and
1302 social values must be abandoned in favor of the much-improved
1303 methodologies that are available and already used in scientific, business,
1304 civic-management sectors.

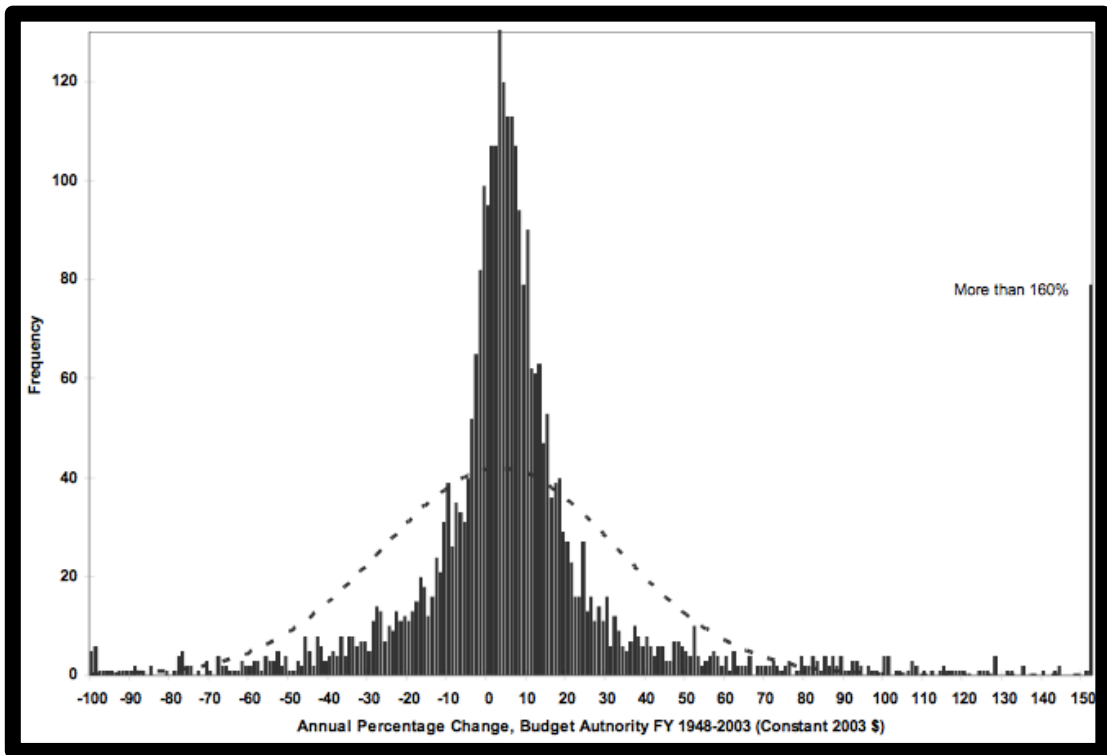
1305 Fundamental to such new methodologies is the ability to simulate the
1306 trajectory of various policy options. There are now scientifically credible
1307 methods for simulating complex systems that include valid social-
1308 environmental assessments and the representation of those potentially
1309 impacted by the policy options (stakeholders)⁴⁷ Also essential, is that these
1310 emerging-methodology-based models conduct cost-benefit analyses in
1311 comparing different policy options to determine whether they will realize a net
1312 benefit or net cost for future generations. Any such analytical procedures and
1313 their monitoring technology must be validated and periodically upgraded. If
1314 appropriate monitoring is in place, precautionary assessments can be
1315 extended to include the cost of delaying decisions on impacts that are
1316 increasing exponentially with time, as illustrated in Fig. 8.

1317 **5.3d. Public Awareness.** Any long-term decision concerning CC issue
1318 has the potential to impact a wide range of world populations to varying
1319 degrees and in varying ways. Consequently, maximum possible participation
1320 at all levels of society is a global necessity. Although such extensive
1321 participation is the primary objective of this document and essential to
1322 sustainable development, it is not an absolute requisite to implementing a
1323 comprehensive, integrated policy Plan A for preventive solutions. Since the
1324 policy cycle tends to bottleneck at the third level of Legitimation (in the Policy
1325 Cycle), a Plan B is also needed so as to minimize the risk of delay and
1326 unintended consequences. A combination of strategies, then, should already
1327 be formulated so that some mitigative or adaptive strategies of the
1328 comprehensive plan can be enacted. However, this too can be risky if the
1329 public or the opposition considers an Adaptive Plan as a quick fix, which then

1330 acts to relax the public pressure and reduces the effort towards a Mitigative
1331 Plan. For example, a focus on cutting CO₂ emissions may seem to the public
1332 a sufficient measure, so that there is less pressure to pursue an equally
1333 essential measure—that of improving plant and soil absorption of CO₂.

1334 **5.3e. Policy as Punctuated Equilibrium.** Statistical analyses of US
1335 budget expenditures in the decades following WWII indicate that the
1336 distribution of federal expenditures
1337 changed; a predominance of small or
1338 incremental changes were punctuated
1339 with large outliers, or bursts, of budget
1340 changes, as shown in Fig.12. Since
1341 policy changes require budgetary
1342 changes, the distribution of budget
1343 changes can be used as a measure of the distribution of policy changes.
1344 Hence, the small deviations from the mean value imply periods of relatively
1345 stable policy, and the large deviations at the wings of the histogram indicate
1346 large standard deviations. Political scientists⁴⁴ attribute the stable periods of
1347 small policy changes to several factors: slow approval of large changes due
1348 to policy monopolies, political bottlenecks within the Congress and between
1349 the Congress and the White House, or a lack of strong public pressure on
1350 issues that might need new policies or major modifications of existing ones.
1351 In fact, Paul Cairney⁴⁷ describes the latter reason as dependent on an
1352 alternating combination of ‘agenda setting’ and policy communities. That is,
1353 agenda-setting demands policy attention to major issues or crises that
1354 require immediate and significant policy changes, whereas policy monopolies
1355 tend to dampen proposed changes that would upset business-as-usual
1356 stasis. In other words, it might also be described as long periods of laissez-
1357 faire, where problems are more or less ignored or successfully blocked, until
1358 they build to a public crescendo sufficient to gain a major policy change,
1359 which is often compromised down to a mitigative (temporary fix) instead of
1360 preventive solution.

Why can't we find a more efficient way to judge our policies, like requiring a 'Proof of Sustainability' criteria?



1361

1362 **Fig. 15. Annual Percentage Change in US Budget Expenditures.** The
 1363 histogram of annual US budgetary changes (in percent) is overlain with a
 1364 normal distribution (dotted line) as would conform to a random distribution
 1365 about a mean value (bell shape). Instead, the distribution has a very strong
 1366 central peak, indicating the great number of very small changes; weak
 1367 shoulders, indicating fewer than normal moderate changes; and the long
 1368 tails, indicating more than normal radical departures from the previous year's
 1369 budget. Outliers in excess of 160% occurred 75 times during the period
 1370 1948–2003 (Jensen, C.⁴⁸).

1371 This description of a punctuated equilibrium is analogously similar to the
 1372 controversial theory in evolutionary biology⁴⁹ which argues that species tend
 1373 undergo evolutionary change in response to swift, major, often catastrophic
 1374 environmental changes (“punctuations”) rather than gradually over long
 1375 periods of relative stability (“equilibrium”). This interpretation suggests that
 1376 US governance is conducted by protecting the status quo and by changing
 1377 only in case of a crisis generated in most cases internally (social), but also
 1378 externally in the form of environmental feedback. The difference is that since
 1379 we have created these crises, apart from catastrophic geological events, we
 1380 should have the capacity to avoid them. Our Constitution has given us a
 1381 durable foundation for guiding policy that has been amended for the most

1382 part in order to guarantee basic civil and political rights to the entire adult
1383 populace. But we don't have a similar guide for geological, biochemical,
1384 astronomic distrubances, even those generated by societies, for example,
1385 Climate-Change

1386

1387

Chapter 3 End Notes

1388 **1. Growing Public Support for sustainability, 2011.** Huffington Post, Breen
1389 Blob. [http://www.huffingtonpost.com/steven-cohen/growing-public-support](http://www.huffingtonpost.com/steven-cohen/growing-public-support-fo_542600.htm)
1390 [fo_542600.htm](http://www.huffingtonpost.com/steven-cohen/growing-public-support-fo_542600.htm)

1391 **2. Self-organization** This is a spontaneous process of ordering that arises
1392 within a system from local interactions between parts of its initially
1393 disordered state. The process is not controlled by any external agent.
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3. Social Capital The World Bank defines Social capital as referring “*to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions . . . Social capital is not just the sum of the of the institutions which underpin a society – it is the glue that holds them together*” See, Ch. 4-SC.

5. Wilson, D. S. The Binghamton Neighborhood Project. The project demonstrated that a neighborhood community could improve its condition based on applying an approach based on evolutionary theory which requires integration across disciplines, from molecular biology and neurobiology to history, sociology, cultural..

6. Lakoff, G. In the 1996 book *Moral Politics*, Lakoff being influenced by the "strict father model" as a central metaphor for such a complex phenomenon as the state, and liberal/progressive voters as being influenced by the "nurturing parent model" as the folk psychological metaphor for this complex phenomenon. According to him, an individual's experience and attitude towards sociopolitical issues (are) influenced by being framed in linguistic constructions. From Wikipedia.

7. Natural Capital. Natural Capital refers to the total value we derive from the planet, that is, the natural goods and services derived from the environment that we use, consume, and appreciate. It represents the ecological assets that we use freely and on which the economy depends. (cf. Ch. 4)

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8. **Linbeck, Leo III.** 2012. Why Congress doesn't work. Lawmakers' avoidance of accountability undermines self-government. <http://www.theamericanconservative.com/articles/why-congress-doesnt-work/>
 9. **President Obama, 2015.** State of the Union Speech.
 10. **Ingraham, Christopher.** 2014. "This computer programmer solved gerrymandering in his spare time" (Brian Olson, MIT). The Washington Post, June 3, 2014.
 11. **BRIC**, Brazil, Russia, India, and China
 13. **Hopkins, T. S., D. Bailly, R. Elmgren, G. Glegg, A. Sandberg, and J. G. Støttrup.** 2012. A systems approach framework for the transition to sustainable development: potential value based on coastal experiments. Ecology and Society 17(3): 39.
 14. **Soros, G.** 2007. <http://www.project-syndicate.org/commentary/from-karl-popper-to-karl-rove---and-back>
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 16. **AO, 2012.** Syrian Arab Republic Joint Rapid Food Security Needs Assessment (JRFSNA). FAO Rep., 26 pp. [Available online at http://www.fao.org/giews/english/otherpub/JRFSNA_Syrian2012.pdf.]
 17. **United Nations High Commissioner for Refugees (UNHCR)**
 18. **Mayan Collapse.** <http://www.history.com/news/what-caused-the-maya-collapse-archaeologists-uncover-new-clues>
 19. **Norse Collapse.** <http://icelandmag.visir.is/article/what-happened-viking-settlement-greenland-new-research-shows-cooling-weather-not-a-factor>
 20. **Taintner, J.** 1988. The Collapse of Complex Societies. New York & Cambridge, UK: Cambridge University Press, ISBN 0-521-38673-X,
 21. **Diamond, J,** 2005. Collapse. Viking Books
 22. **Meadows D.H, D.L. Meadows, J. Randers, and W. W. Behrens, 1972.** The limits to Growth. "If the present growth trends in world population,

industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity”.

23. Agenda 21 “is a non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development. It is a product of the Earth Summit (UN Conference on Environment and Development) held in Rio de Janeiro, Brazil, in 1992”-Wikipedia.

24. ICLEI, International Council for Local Environmental Initiatives, or Local Governments for Sustainability is an international association of local governments and national and regional local government organizations that have made a commitment to sustainable development. It provides technical consulting, training, and information services to build capacity, share knowledge, and support local government in the implementation of sustainable development at the local level. ICLEI's basic premise is that locally designed initiatives can provide an effective and cost-efficient way to achieve local, national, and global sustainability objectives, Wikipedia. The US is the lead participant, also see: <http://icleiusa.org>

25. OECD on 14 December 1960, 20 countries originally signed the Convention on the Organization for Economic Co-operation and Development. Since then, 14 countries have become members of the Organization.

26. Genuine Progress Indicator (GPI) is designed to take a fuller account of the health of a nation's economy by incorporating the values of changes in natural and social capitals that are not included in the GDP.

27. Kubiszewski, I., Costanza R., Franco C., Lawn P., Talberth J., Jackson T., Aylmer, C. 2013. Beyond GDP: Measuring and Achieving Global Genuine Progress. Ecological Economics Journal home page: www.elsevier.com/locate/ecolecon.

28. Environmental Vulnerability Index. The 2004 Environmental Vulnerability Index (EVI) portion of the Compendium of Environmental Sustainability Indicator Collections contains 111 variables for 235 countries and territories. This index is designed to be used with economic and social vulnerability indices to provide insights into the processes that can negatively influence the sustainable development of countries.

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- 29. Restoration** of a dynamic system may not imply that the system is restored to its former structure and function. Rather it is used to imply that a damaged system can reorganize to a different structure and function that may produce similar goods and services. (cf. Ch. 6).
- 30. ICLEI, International Council for Local Environmental Initiatives, or Local Governments for Sustainability** is an international association of local governments and national and regional local government organizations that have made a commitment to sustainable development. It provides technical consulting, training, and information services to build capacity, share knowledge, and support local government in the implementation of sustainable development at the local level. ICLEI's basic premise is that locally designed initiatives can provide an effective and cost-efficient way to achieve local, national, and global sustainability objectives, Wikipedia. The US is the lead participant, also see: <http://icleiusa.org>
- 31. SPICOSA Science and Policy Integration for Coastal Systems Assessment.** EU Environment FP6 project. Conducted from @007 to 2011 on 18 coastal zone experiments using the Systems Approach Framework (SAF) to simulate policy options for sustainability.
- 32. Type I & Type II Errors.** In statistical hypothesis testing, a type I error is the incorrect rejection of a true null hypothesis (also known as a "false positive" finding), while a type II error is incorrectly retaining a false null hypothesis (also known as a "false negative" finding).Wikipedia.
- 33. Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding - A Global Assessment.** PLoS One. 015;10(3):e0118571.
- 34. Restoration** of a dynamic system may not imply that the system is restored to its former structure and function. Rather it is used to imply that a damaged system can reorganize to a different structure and function that may produce similar goods and services. (cf. Ch. 6).
- 35. Comprehensive Everglades Restoration Project (CERP).** <https://www.nps.gov/ever/learn/nature/cerp.htm>
- 36. Schneider, S.H. and P.J. Boston (Eds.) 1991.** Scientists on Gaia, MIT Press, Cambridge, Massachusetts.

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- 37. NIH, Nation Institutes of Health.** The US National Institutes of Health (NIH). NIH is one of the world's foremost medical research centers. An agency of the U.S. Department of Health and Human Services, the NIH is the Federal focal point for health and medical research.
- 38. Transdisciplinary Team** is a team composed of experts that represent all the relevant disciplines pertaining to a problem together with the stakeholders involved in the problem, who cooperate to find a viable solution to the problem. The participation of the stakeholders differentiates Transdisciplinary from a multidisciplinary team of experts.
- 39. Systems Approach Framework (SAF)** is the methodology developed by the EU SPICOSA Project. Spicosa.eu.
- 40. Sustainability Science.** Sustainability Science investigates the dynamics, components, and social processes required for a society to improve its state of sustainability. Sustainability is a physical condition of a society, one that maintains equitable balances between the three types of capital (natural, social, and economic), which are not always replaceable not always reversible, and each differing in their optimal scale of sustainability.
- 41. U.S. Environmental Protection Agency. 2014.** Climate change indicators in the United States, 2014. Third edition. EPA 430-R-14-004. www.epa.gov/climatechange/indicators. CAR 2014
- 42. Second US Biennial Report Under the United Nations Framework Convention on Climate Change.**
https://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/2016_second_biennial_report_of_the_united_states_.pdf
- 43. Clean Power Plan, 2016.** The Clean Power Plan is a policy aimed at combating anthropogenic climate change (global warming) that was first proposed by the Environmental Protection Agency in June 2014, under the administration of US President Barack Obama. The final version of the plan was unveiled by President Obama on August 3, 2015.
<https://www.epa.gov/cleanpowerplan/clean-power-plan-existing-power-plants>.
- 44. Hein, J.F. June 16, 2015,, Washington Post.** “. . . oil, gas and coal from public lands – including offshore leases – still account for 25 percent of total U.S. fossil fuel production. Coal production on federal lands, alone, accounts for 40 percent of the U.S. total. While the \$2 minimum bid for federally auctioned oil and gas leases is only the starting price, about 40 percent of

existing leases were sold at that level. Further, annual rental fees for onshore oil and gas leases – \$1.50 per acre during the first five years and \$2 per acre each year thereafter”. Institute for Policy Integrity at NYU School of Law.

45. **Clean Power Plan, 2016.** The Clean Power Plan is a policy aimed at combating anthropogenic climate change (global warming) that was first proposed by the Environmental Protection Agency in June 2014, under the administration of US President Barack Obama. The final version of the plan was unveiled by President Obama on August 3, 2015. <https://www.epa.gov/cleanpowerplan/clean-power-plan-existing-power-plants>
46. **EROEI.** Their ratio of Energy returned on Energy Invested. Energy return on investment (EROI) is a means of measuring the quality of various fuels by calculating the ratio between the cost of the energy delivered by a particular fuel to society with the energy invested in the capture and delivery of this energy. Customarily, the social and environmental cost are not included.
47. **Paul Cairney,** *Understanding Public Policy: Theories and Issues*, 2011, Ch. 9, Palgrave Macmillan.
48. **Jensen, C. 2009. Policy Punctuations in Mature Welfare States.** *Journal Public Policy*, 29 3, 287-303. Cambridge University Press.