

1 Article

2 Behind the scenarios: world view, ideologies, 3 philosophies

4 An analysis of hidden determinants and acceptance 5 obstacles illustrated by the ALARM scenarios

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13 **Abstract:** In situations of uncertainty, scenarios serve as input for evidence-based decision making.
14 However, past experience shows that not all scenarios are treated equally, and we hypothesise that
15 only those based on a world view shared by decision makers are perceived as credible and receive
16 full attention. While intuitively plausible, this hypothesis has not been analysed by quantitative
17 correlation analyses, so instead of drawing on quantitative data the paper analyses the archetypical
18 scenarios developed in the ALARM project to substantiate the plausibility by a comparative
19 analysis of world views, value systems and policy orientations. Shock scenarios are identified as a
20 means to explore the possibility space of future developments beyond the linear developments
21 models and most scenario storylines suggest. The analysis shows that the typical scenarios are
22 based on mutually exclusive assumptions. In conclusion, a comparison of storyline and empirical
23 data can reveal misperceptions, policy failures and the need to rethink world views as a necessary
24 step to open up to new challenges. Deeply held beliefs will make this a transition unlikely to
25 happen without severe crises, if not dedicated efforts to reveal the role of world views for scenarios
26 and policies are undertaken.

27 **Keywords:** Scenarios, world views, values, policies, models and modes of science

28

29 1. Introduction

30 Recent forecasts predict that the world economy is set to grow by 238% by the year 2060 and the
31 rich OECD countries by 146%, as compared to 2014 [1]. Air transport will nearly double by 2036 [2].
32 Biotechnology could contribute by 2030 to 50% of primary production, 80% of pharmaceutical
33 production and 35% of industrial production in sectors where biotechnology has potential
34 applications. And Peter Johnson, SAP Marketing Strategy and Thought Leadership predicts that in
35 the future digital economy by 2020, the average person will have more conversations with bots than
36 with their spouse, by 2030 organs will be biologically 3D-printed on demand, and the 'Internet of
37 Everything' could be worth \$19 trillion over the next decade thanks to cost savings and profits for
38 businesses and increased revenues for the public sector while 5G data speeds will be 1,000-times
39 faster than today, offering ubiquitous connections across the 'Internet of Things', engagement across
40 virtual environments with only millisecond latency, and whole new Big Data applications and
41 services [3].

42 At the same time we know that if the Earth warms by three degrees Celsius (which is the
43 trajectory under the current climate pledges), extreme events could become the normal state in the
44 future, with the drought regions in Europe doubling from 13 % to 26 % of the total area and the

45 largest droughts in Europe lasting three to four times longer than in the past, affecting up to 400
46 million people. Lasting almost half of the year (in Spain up to 7 months), water availability will be
47 reduced by 35,000 m³ H₂O/km² of land [4], making large areas virtually uninhabitable. Most
48 European cities will see increases not only in heat and drought, but also in river flood risks. Over 100
49 cities are particularly vulnerable to two or more climate impacts while the magnitude of impacts
50 exceeds earlier expectations [5]. In the last two decades, one-tenth of the earth's total wilderness
51 areas have been lost, an estimated 3.3 million km² [6] and today, 28.5% of the species analysed by
52 IUCN have been classified as in risk of extinction.

53 In the social domain, in the affluent countries GDP per capita has increased roughly 1,000%
54 since the 1970s, but average worker pay has increased just 11%, essentially stagnating while CEO
55 pay has risen 1,000%. Little wonder then that only 13% of employees worldwide are engaged,
56 meaning that the other 87% are not involved in, enthusiastic about, and committed to their work and
57 company. This is set to intensify: 75% of Millennials would take a pay cut to work for a socially and
58 environmentally responsible company while in a study of 100 variables, seeing purpose and value in
59 work was the single most important factor that motivated employees, more than compensation. It
60 even makes business sense: organizations in which employees perceive meaning at work are 21%
61 more profitable [3].

62 All these prognoses are based on scenarios, and they are virtually irreconcilable: rather
63 obviously, the rosy economic prognoses, the environmental catastrophe emerging and the social
64 challenges do not fit together, in particular when taking the economic impacts of the social and
65 environmental developments into account. Deserted countries do not grow economically, starving
66 populations do not consume (and least so consumer electronics), and a bioeconomy without
67 biodiversity is unthinkable. Nonetheless all these scenarios are promoted in a "let's have the cake
68 and eat it" attitude, these contradictions are ignored. Such incompatible prognoses can even be
69 found in (different sections of) the same newspapers and homepages, but no sobering effect has
70 emerged.

71 However, there is one big difference between these forecasts: those promising an extended and
72 up-graded status quo where products and consumption patterns change but limits do not exist,
73 receive billions of dollars, euros, yen and yuan in investments, while those calling for damage
74 limitation receive miniscule funding even by governments not known for their problem denial and
75 scientific illiteracy. Most firms fail to take the negative trends into account (except they spot a market
76 niche there). For instance, Renault invests billions of euro to employ virtual reality and immersive
77 simulation technologies to allow its design team, partners, and suppliers to experience, interact with,
78 and test-drive new car designs without any physical prototypes, while car sharing could reduce the
79 number of cars needed by 90% already in 2035, resulting in only 17% as many cars as there are today
80 (Millennials are keen to share) [3].

81 Given that global change scenarios represent the best available knowledge of the best informed
82 and educated generation in the history of humankind, how can these discrepancies be explained?
83 Why is the world closely following the most pessimistic of the scenarios presented by the "Limits to
84 Growth" report almost 50 years ago [7,8]? Why always "Late Lessons From Early Warnings" [9, 10]?
85 Environmental ignorance of economics, sociology and development theory has been accused, but if
86 a scenario exercise offers a doomsday variant based on incremental change and a transformation
87 based rescue variant, both based on the same disciplines, why is the rescue scenario lauded and the
88 doomsday scenario realised by decision makers in politics and business? Why is progress measured
89 in metrics which tell us nothing about the emerging catastrophes? [11, 12] Why do
90 "modificationists" do not learn from or at least listen to "transformationists" and take the hard
91 environmental and social facts on board? Economic interests and short term thinking may explain
92 part of the phenomenon, human inertia and loss aversion (the preference for the "known evil" when
93 facing transaction cost, i.e. change is long known, see [13] another bit. The European Environment
94 Agency found that even well-crafted scenarios can fail to have their intended policy impact if they
95 present irrelevant information, lack support from relevant actors, are poorly embedded into relevant
96 organisations or ignore key institutional context conditions [14]. Our hypothesis is that the world

97 views held by decision makers are key context conditions which – often unconsciously – make
98 scenarios of deep transformations appear strange, unreal, utopic. They make them appear as
99 expressions of illusions or idealism (as was Thomas Morus “Utopia” in 1517 [15] – but it influenced
100 policies) but not as real policy demands, depriving them of support from relevant actors however
101 good their scientific backing, the relevance of information and the embedment into relevant
102 organisations may be.

103 In section 2 we briefly describe the concepts we use in this paper (scenarios, world views,
104 welfare regimes) and introduce the ALARM scenarios we will use to illustrate the link between
105 scenarios and world views in section 3. Section discusses the results and draws some conclusions.

106 2. Method and Building Blocks

107 As so far analyses regarding the impact of underlying world views on the perception and
108 appeal of scenarios are missing, we focus on making the world views underlying scenarios, as well
109 as their social and economic implications explicit, using three archetypical scenarios from the
110 ALARM project [16,17]. As adopting a world view is driven by deeply held beliefs and convictions,
111 not least in the case of decision makers, it appears plausible that the implicit basis of scenarios
112 influences their perception. We will illustrate the plausibility of this hypothesis by explicating the
113 world views and their implications for different scenarios in section 3 to underpin out hypothesis.
114 As there are no quantitative data regarding the correlation of world views and the acceptance of
115 scenarios, our approach is limited to scenario analysis and common sense based reasoning,
116 illustrating the plausibility of the hypothesis. Discussing the results and drawing some conclusions,
117 in chapter 4 we will also suggest empirical testing the hypothesis as a means to improve
118 environmental decision making in Europe. First, however, we try to clarify what “world views” are
119 in the context of our paper, drawing on philosophical discussions, before turning to scenarios in
120 general and to ALARM in particular.

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122 2.1 World Views

123 World views are comprehensive systems of perceiving reality; which challenges are recognised,
124 is-sues are emphasised, policies suggested and changes endorsed in order to approach sustainable
125 development depends on the world views held by the respective agents. They have also been
126 described as ‘pre-analytic visions’, e.g. by Herman Daly et al. [18], and are similar to metaphysics. A
127 worldview can be expressed as the fundamental cognitive, affective, and evaluative presuppositions
128 a group of people make about the nature of things, and which they use to order their lives.
129 According to Michael Lind, a worldview is a more or less coherent understanding of the nature of
130 reality, which permits its holders to interpret new information in light of their preconceptions [19].

131 The elements constituting a world view are its ontology including an anthropology, its
132 epistemology and its axiology including a societal vision [20,21]. Ontology is a section of philosophy
133 dealing with questions concerning what entities exist or may be said to exist and how such entities
134 may be grouped, related within a hierarchy and subdivided according to similarities and
135 differences. Epistemology is the branch of philosophy dealing with the theory of knowledge; it
136 studies the nature of knowledge, justification and the rationality of belief. Axiology is another
137 branch of philosophy, encompassing a range of approaches to understanding how, why, and to
138 what degree humans should or do value objects, whether the object is physical (a person, a thing) or
139 abstract (an idea, an action), or anything else. The Dutch World Views Research Group [22] gives a
140 slightly different definition, including as here an ontology (and an explanation of where the world is
141 heading), an epistemology, and values (the axiology) but adding a praxeology or theory of action
142 and an etiology, reflecting on its origins and construction. We leave out the latter (although there are
143 good arguments for including it) as despite the emergence of a ‘reflexive modernity’ reflecting on
144 world views is a rare case in both scenario development and decision making – the modernity is
145 reflexive, but not reflective.

146 World views cannot be proven right or wrong but can be assessed and compared regarding
147 their plausibility, based on their 'fit' with logical conclusions and with observations. Thus clashes
148 among worldviews cannot be ended by a simple appeal to facts. Even if rival sides agree on the facts,
149 people may disagree on conclusions because of their different premises [19]. Different value systems
150 shape the perception of what is important in reality: from an objective value perspective, there are no
151 instrumental values, only means to things which may be valuable; the means may be valuable in
152 themselves but not by their mean function. From an instrumental perspective, all values are
153 described in instrumental terms, bequest and existence value included (instrumental for enhancing
154 one's own life satisfaction – a 'feel good' or 'warm glow' effect, and moral nihilism). Different world
155 views are associated with different value systems and different political philosophies which are
156 appealing to one audience but can be appalling to another [23]. Accordingly, not only different
157 decision makers, but also different scholars (and the scenarios they develop) hold and express
158 different world views, consciously or unconsciously.
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160 2.2 What are "scenarios"?

161 First of all, it appears useful to clarify what are scenarios and how they are distinct from
162 predictions. The latter deal with certainty, requiring at least probabilistic knowledge about all
163 possible outcomes of an event. Prognoses can be exact (A determines B with no ambiguity), or fuzzy
164 (A determining a distribution of B), but are deterministic in both cases. Scenarios are needed when
165 certainty is missing, which is the case for most of the phenomena relevant to economic, social and
166 environmental development. Scenarios are based on assumptions: we assume that an accident will
167 end our ability to work, and buy an insurance against the ensuing economic impacts; that is the case
168 of risks. Or we know the impacts of an event (nuclear war causing global winter, greenhouse gas
169 emissions causing climate change), but we cannot say now if the event will be happening (the
170 nuclear war) or if an ongoing process will continue or be terminated (the case of climate change).
171 This is the situation of uncertainty, requiring not insurance but prevention. Then there is ignorance,
172 a situation where we know neither the probability of the event nor its potential impacts. For
173 instance, we do not know yet if nanoparticles from plastic waste will enter the human food chain
174 and accumulate in our bodies, and if so, which would be the resulting health impacts – this is the
175 case for precaution. Forecasting scenarios are used to both better understand the probability of an
176 event happening, under certain assumptions, and to explore the potential impacts, under even more
177 assumptions; backcasting scenarios start from normatively setting a desired or feared result and
178 analyse how it could be achieved or avoided. Thus scenarios do not predict events but are analytical
179 tools giving indications how, again under certain assumptions e.g. regarding the policies adopted, a
180 system will develop under status quo conditions and what can be done (and what should be
181 avoided) to redirect the development trajectory. While in a situation of certainty predictions can be
182 made, in cases of risk, uncertainty and ignorance we have to compare different plausible but not
183 necessarily probable options, asking "what would happen if ...?" Thus scenarios are heuristic
184 explorative tools. Unlike predictions, they do not claim to outline the future that will be, but describe
185 a future which might become reality. These futures must be possible and inherently plausible, but
186 not necessarily probable as under uncertainty and ignorance probabilities cannot be quantified, by
187 definition.

188 Building a scenario requires simplification to characterise the processes under analysis and
189 support understanding them. Borrowing a phrase from Albert Einstein, scenarios should be as
190 simple as possible, but not simpler. This poses the challenge to find a level of complexity simple
191 enough to be comprehensible but complex enough to adequately accommodate the different options
192 to be compared and generate answers which are relevant in a real-world context. For this behalf, a
193 scenario is based on a narrative, a storyline which can accommodate values, subjective motivations
194 and other qualitative elements, which is often supported by computer models to illustrate certain
195 aspects of the scenario quantitatively. However, models are constrained to dealing with the
196 quantifiable parameters and linear developments their equations can handle. Thus the quantitative

197 results always have to be interpreted – and sometimes corrected – by embedding them into the
198 narrative context [24-26].

199 Unfortunately, both academic literature and press releases and media coverage often lack a
200 clear distinction between predictions, projections, probabilistic forecasts and scenarios. Predictions
201 are often referred to as scenarios, while certain scenarios, such as economic growth forecasts, are
202 habitually presented as (probabilistic) predictions. Misinterpreting its scenarios as predictions was
203 one of the main mistakes in the economists' profession rejection of the "Limits to Growth" report
204 almost half a century ago. Ironically, some of its worst case scenarios have turned out to be rather
205 accurate predictions, against the best hopes of their authors [7,8] and in 2014, The Guardian
206 published an article showing that data collected since the report's publication supports the accuracy
207 of the 1972 projections [27]. In the end, of course, as the world consists of different systems with
208 different degrees of predictability, predictions and scenarios will ultimately need to come together to
209 guide our decisions.
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211 2.3 The ALARM Scenarios

212 Developing effective strategies for biodiversity preservation requires analysing all major
213 pressures affecting biodiversity and their interaction. Scenarios developed for this behalf must be
214 broadly based, addressing production, consumption and administration patterns and attitudes alike.
215 This requires scenarios which deal with the effects of physical and social, of quantitative and
216 qualitative factors in an integrative way. In the ALARM project [16], scenarios were based on
217 storylines, and included model simulations with a range of different models to assess the impacts of
218 multiple pressures on biodiversity.

219 The ALARM storylines represent a set of possible development directions, all starting from the
220 status quo but representing different policy orientations, leading to diverging policies and results. In
221 doing so, they illustrate that human societies have options to choose from, that biodiversity loss can
222 be minimised, but that this requires political decisions now and in the future. The three ALARM
223 storylines cover social, economic, environmental, agricultural, foreign, and other policies (see Table
224 1 and the supplementary material):

- 225 • "Business As Might Be Usual" (BAMBU) is a policy-driven scenario, i.e. a scenario
226 extrapolating the expected trends in EU decision making and assessing their intended
227 sustainability and biodiversity impacts materialise. Policy decisions already made in the EU
228 are implemented and enforced. However, BAMBU is no business as usual scenario, based on
229 trend extrapolation, since recent or upcoming changes in EU policies would have been ignored
230 that way. At the national level as well, deregulation and privatisation continue except in
231 "strategic areas". Internationally, there is free trade. Environmental policy is perceived as
232 another technological challenge.
- 233 • "GRowth Applied Strategy" (GRAS) is a coherent liberal, growth-focussed policy scenario. It
234 includes deregulation, free trade, growth and globalisation as policy objectives actively
235 pursued by governments. Environmental policies will focus on damage repair and limited
236 prevention based on cost-benefit calculations, with no emphasis on biodiversity beyond the
237 preservation of ecosystem services ESS.
- 238 • "Sustainable European Development Goal" (SEDG) is a backcasting (inverse projection)
239 scenario, and as such it is necessarily normative, designed to meet specific goals and deriving
240 the necessary policy measures to achieve them, e.g., a stabilisation of GHG emissions. It aims at
241 enhancing the sustainability of societal development by integrated social, environmental and
242 economic policy. Policy priorities under SEDG are a competitive economy and a healthy
243 environment, gender equity and international co-operation. SEDG represents a precautionary
244 approach, taking measures under uncertainty to avoid not yet fully known future damages.
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248 **Table 1:** Selected policies in the ALARM core scenarios. Source: [16]

Scenario	GRAS	BAMBU	SEDG
Climate envelope	fits to the IPCC SRES-A1FI storyline and its assumptions	SRES A2 (the best fitting available SRES scenario at the time of calculation)	SRES-B1 scenario (lowest SRES scenario available, 450 ppm not in SRES. B1 and SEDG story lines differ significantly)
CAP	Dismantling payments for production and for 2nd pillar (rural development & environment)	Shift 1st to 2nd pillar results in polarisation: intensification of high yielding locations, neglect of low yielding ones	Spatially explicit support structure to maintain (organic) agriculture throughout the landscape (only 2nd pillar transfers)
EU Funds	Phasing out, considered as subsidies	Focussed on infrastructure development and growth in poor regions	Focussed on local green development and opportunities, education and employment
Energy Policy	Efficiency, some renewables based on cost Calculations	Efficiency, aiming at 20 % reduction of GHG emissions by 2020, 80 % 2080. Increase nuclear and renewables	Aiming at ¾ reduction of CO ₂ -emissions by 2050 through savings, changing consumption patterns and renewables
Transport Policy	Increased efficiency due to market pressure, no policy to shift the mode or even reduce transport	Technological improvements and changing the share of different modes of mobility (walking, biking, trains, cars, boats, planes: modal split)	Transport reduction priority, plus modal split change (through pricing and infrastructure supply), technical improvements
Chemicals Policy	Focus on innovation and competitiveness. REACH not consequently implemented	REACH implemented	REACH plus; filling gaps e.g. for metals, nanomaterials, endocrine disruptors
Trade Policy	Strong support for WTO and free trade	Promoting free trade except in “strategic areas”	Global sourcing reduced due to cost reasons; phytosanitarian controls

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Developing these three options can be considered archetypical for sustainability-related scenario exercises: comparing a “muddling through” or business as usual scenario and one each representing a primacy of economic or environmental - and sometimes social - criteria, is a frequently used approach. It results in relatively similar, at least comparable scenarios based on interpretations of a set of two or three ‘standard’ world views, as table 2 illustrates. „Tools such as scenario archetypes, that is, grouping scenarios together as classes based on similarities in underlying assumptions, storylines, and characteristics, can then be used to integrate visions, thus highlighting conflicts and convergences across scales.“ [28]. Thus we consider the conclusions we will draw from analysing the ALARM scenarios as not case specific but most probably more generally applicable.

In illustrating the ALARM storylines, we combined, for each of them climate scenarios from the set used by the IPCC, selected to offer the best fit with the expected climate development under the respective scenario [29]; a narrative-specific run of MOLLUSC [30], a spatially explicit land use scenario generator; and a specific set of parameters for runs of GINFORS, a highly endogenised econometric input-output model [31]. In an iterative process, the outputs and inputs to and between the models were harmonised, based on the narratives.

266 **Table 2:** Comparison of ALARM scenarios with other structurally similar global scenarios (adapted
267 from an unpublished report for the Millennium Ecosystem Assessment)

ALARM	SRES	GEO-3	Millennium Assessment	Ecosystem Roads from Rio+20
2100	2100	2032	2100	2050
GRAS	A1FI	Markets First	Global Orchestration	Global Technology
BAMBU	A2	Security First	Order from Strength	
SEDG	B1	Policy First	TechnoGarden	Decentralized Solutions
	B2	Sustainability First	Adapting Mosaic	Consumption Change
Settele et al. 2005	IPCC et al. 2000	UNEP 2002	Millennium Ecosystem Assessment 2003	Kok et al. 2018

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2.4 The Shocks

270 However, assuming a gradual development, i.e. no surprises, is probably the most implausible
271 vision of the future. Thus in ALARM a methodological innovation was introduced by developing
272 scenarios reflecting potential shocks, assuming disturbances with widespread consequences
273 considered extreme at the time of writing. In each of the three dimensions used for sustainability
274 concepts, the environmental, the economic and the social one, one shock is defined. A shock is any
275 event that comes unexpectedly and has the capability to change the development trajectory of a
276 system. The shock scenarios serve to illustrate that there can be a significant divergence of
277 real-world developments from what linear scenarios suggest; consequently the shock scenarios
278 could only partially be simulated in computer model runs.

279 The three shocks are indicated in figure 1 together with the core scenarios from which they
280 diverge:

- 281 • *Cooling Under Thermohaline collapse* (GRAS-CUT) is the environmental shock. It describes a
282 collapse of the Atlantic ocean water circulation (the most familiar part of it being the Gulf
283 Stream) and the resulting relative cooling of Europe; indications observed by now.
- 284 • *Shock in Energy price Level* (BAMBU-SEL) describes the economic shock of a permanent
285 quadrupling of the energy price, as expected when Peak Oil, the global maximum of oil
286 production, occurs or political or other influences limit the supply significantly and
287 permanently. We had a flavour of that in 1972, 1978 and 2008.
- 288 • *Contagious Natural Epidemic* (BAMBU-CANE) is the social shock, a pandemic out of control.
289 Again, we had a flavour of that, with the Chinese bird flu in 2006 and the Mexican swine flu in
290 2009 which permitted to observe the political and psychological mechanisms at work,
291 regardless of their relatively limited global health impacts. In 2018, the WHO and Bill Gates, as
292 chairman of the Bill and Melinda Gates Foundation, warn of such a pandemic being
293 unavoidable if not imminent.

294 As a climate shock is most probable under the scenario generating the highest greenhouse gas
295 emissions, it is assumed to happen under GRAS. The economic shock is attributed to BAMBU as
296 SEDG is assuming a reduction of resource consumption which would make such a shock less
297 probable. The social shock of a pandemic is essentially possible under all scenarios, but probably less
298 so under SEDG which assumes a reduction of global exchange for cost reasons (see figure 1).

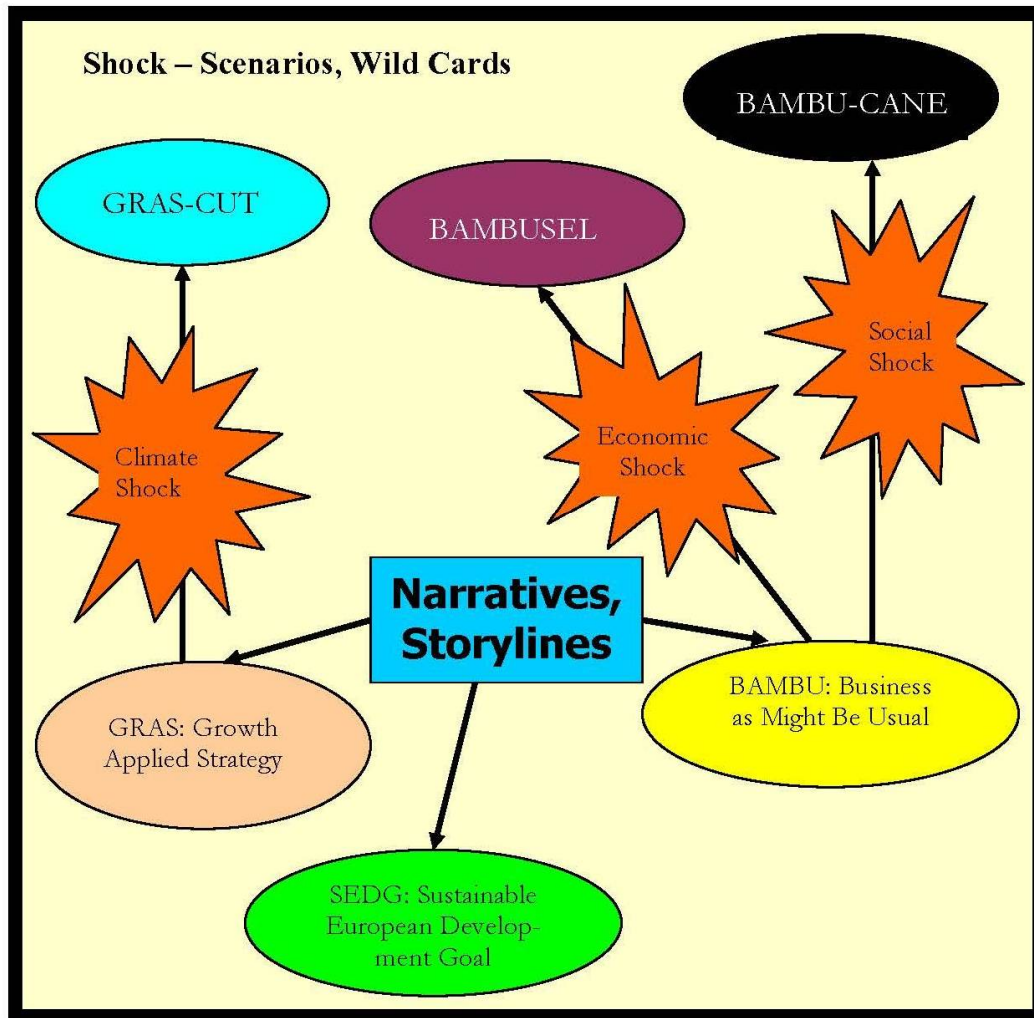


Figure 1: The ALARM core and shock scenarios

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302 3. Results - Comparing the Scenarios and their Background Assumptions

303 The model runs, complemented by biodiversity model analyses [32] and the results from a
304 questionnaire addressing the biodiversity experts showed that:

- 305 • GRAS consistently provides the least desirable outcome for biodiversity in Europe – across
306 different biomes, and for most ecosystems and species.
- 307 • “Muddling through” along the BAMBU path, although probably slowing down biodiversity
308 losses, will systematically fail to meet the EU target to end the loss of biodiversity, by 2020 and
309 beyond.
- 310 • From a biodiversity point of view, SEDG represents a significant step in the right direction,
311 although not sufficient in every respect (in some biomes some species and ecosystems are still
312 lost).
- 313 • GRAS-CUT reduces the average European temperatures to the level of the early 20th century.
314 Minor declines in harvest can be compensated by imports or incremental diet changes.
- 315 • BAMBU-SEL is an immediate burden on the economy which however recovers after shrinking
316 significantly. More permanent damage is caused for the environment (by maximising biofuels)
317 and the levels of disposable income (money flows to oil exporting countries).
- 318 • BAMBU-CANE leads to a collapse of the economy if more than 20% of the population leave
319 their occupations to seek shelter in their countryside houses; it does not kick-start when they
320 return.

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322 3.1 Ideologies and the sustainability concept

323 Although all ALARM core scenarios represent attempts to reach sustainable development, due
 324 to their different more or less conscious but rarely explicit ideological orientations (see table 3) they
 325 diverge regarding how sustainability is operationalised.

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327 **Table 3:** Ideological orientation and institutional arrangements in the scenarios [34-36], modified)

	GRAS	BAMBU	SEDG
Ideological orientation	business as usual, sustained growth (macro) and profits (micro), quantitative, monetary criteria (no qualities)	ecological modernisation, qualitative growth, changes of aspects but not system basics, flexible adaptations	precaution, multi-dimensional objectives, limited win-win options, priority for justice, health and environment over net growth
Economic paradigm	Neoclassical	incoherent, neoclassical plus etatism, welfare state, technology, green growth	sustainability economics; ecological, evolutionary, institutional and political economics
Institutional arrangements	Institutions facilitating 'corporate globalisation' like IMF, World Bank, WTO	Focus on regional integration. EU a strong player in international institutions, modifying but not altering rules	Subsidiarity principle. e.g. strengthening the UN, evaluating where the EU needs more and where it could have less competences, and similarly so on the members state level

328 Ideology is here understood in the sense of Söderbaum as praxeology [33], an understanding
 329 how means cause results. Whereas GRAS seeks to realise what is known as weak sustainability
 330 based on substitutability between capital stocks, BAMBU considers a minimum critical natural
 331 capital indispensable, and SEDG foregoes the notion of capital stocks altogether. This has immediate
 332 implications for the understanding of sustainable development – while all scenarios pursue this
 333 objective, they define it differently (table 4).

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335 **Table 4:** Diverging concepts of sustainability in the three ALARM scenarios (own compilation)

GRAS	Three to four capital stocks, non-declining sum, mutually substitutable (weak sustainability), the economy considered as having primacy. Processes incl. overshoot are reversible. Assumption that once the economy works properly, all other parts of the puzzle will fall in place, i.e. social and environmental problems will be solved automatically (see e.g. the Kuznets- and Environmental Kuznets Curve discussion). Focus on adaptation (managing impact), optimal solutions by <i>Maximisation</i> .
BAMBU	Three to four capital stocks, non-declining sum plus critical natural capital, mostly comparable and commensurable, attempts to go "beyond GDP", weak to reasonable protection standards. Precautionary principle, safe minimum standards, some ambitious protection standards set but not enforced, focus on innovation so that that the market will deliver the desired goods or fully equivalent substitutes. Focus on mitigation (reducing pressures) and restoration (stabilizing the state), optimal solutions by <i>Optimisation</i> .
SEDG	Co-evolution of four sub-systems, with each having its own reproduction criteria and mechanisms, plus demands to the impacts of each other. Earth closed system with limited resources, no permanent growth possible. Precautionary principle, addressing drivers of environmental and social crises, focus on prevention (redirecting drivers) and mitigation (overcoming pressures) limiting human impact, long term resilient/healthy ecosystems providing ecosystem services. Assessment is only possible by MCA/MCDS, (socially) optimal solutions by <i>Legitimation</i> .

336 According to the GRAS *ontology*, nature and society are part of an extended definition of the
337 economy, being described as social and environmental capital and valued as production factors.
338 Those parts of both domains that do not contribute to production are left aside, while those that do
339 deserve protection by policy measures, in particular the ecosystem services ESS. In the SEDG
340 ontology, the environment is not part of the economy, but vice versa, the economy is a subsystem of
341 society which itself is embedded in the environment. One of the direct implications of the differing
342 ontologies is that in the first case, corresponding to the neoliberal approach, the laws of economics
343 apply to society and the environment, while the laws of nature do not necessarily apply to the
344 economy. This is a necessary assumption to legitimise the ignorance of the entropy law, the second
345 law of thermodynamics, in economics.

346 On the other hand, if the economy is a subsystem of society which itself is a subsystem of the
347 environment, not only the laws of thermodynamics apply to the economy just like the laws of
348 gravity, but this is also true for the laws – or rather the rules – identified by sociology and
349 psychology. Then enterprises are social constructs, with a lot of processes, going far beyond
350 management, shaping their functioning and outcomes, constrained by the laws of nature [21].

351 Regarding the *anthropology*, GRAS follows the neoclassical approach of assuming rational
352 decisions of the homo economicus (a necessary assumption to make equilibrium models work),
353 complemented by a belief in the problem solving capabilities of technology: the market, and human
354 ingenuity, will bring about the right solutions at the right time to permit frictionless development
355 and growth. The humans populating SEDG are different, with reflection, doubt, some selfishness
356 but also concern for others and keen to maintain the public goods and capable of sharing instead of
357 owning.

358 In terms of values (*axiology*), while stressing the contributions to the quality of life as the basis
359 for business' 'social license to operate' [42,43]. SEDG citizens are open to diverse definitions of what
360 people may consider to be contributing to their respective quality of life, with value pluralism and
361 ideas of justice as enabling all inhabitants to lead a dignified life, including fair participation in the
362 respective society which presupposes a needs-based distribution to achieve more social equity
363 (*iustitia universalis* and *iustitia distributiva* in the Aristotelian *Nicomachean Ethics*). Amongst
364 GRAS inhabitants instrumental values dominate; they identify the value of an object according to its
365 contributions to one's own wealth and well-being. Equity of outcomes is no moral objective – justice
366 is done when people are rewarded based upon what they contribute (meritocratic concept, *iustitia*
367 *communitativa*). The three shock scenarios, when motivating demands for more ambitious
368 precaution draw philosophically on the 'imperative of responsibility' by Hans Jonas: "Never must
369 the existence or essence of man as a whole be made a stake in the hazards of action" [44](p 12). He
370 argued: "In order to ascertain the indubitable truth, we should, according to Descartes, equate
371 everything doubtful with the demonstrably wrong. Here on the contrary we are told to treat, for the
372 purposes of decision, the doubtful but possible as if it were certain, when it is of a certain kind", i.e.
373 when violating the 'imperative of responsibility' [44](p. 37),[45].

374 3.3 *The economic orientations*

375 As a result the social visions differ, with stakeholders in GRAS relying on the market to deliver
376 environmentally optimal solutions once externalities have been internalised. They trust in solutions
377 to environmental problems and scarcity through better and more efficient technologies necessarily
378 emerging in a competitive and growing market economy, while SEDG citizens call for sufficiency to
379 complement efficiency (and make it effective by skimming off rebound gains), for respecting
380 nature's limits and for fair distribution of access to societal participation including to nature's
381 contributions to people. In SEDG the assumption prevails that economic instruments can offer
382 incentives complementing and dynamising regulations, but that the market as such is not the a
383 reliable means to achieve environmental sustainability.

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Table 6: ALARM Economic orientations

	GRAS	SEDG
Source of profit	Share value, speculation	Dividend, payment to owners
Ownership	Temporary, share-based	Permanent, individual
Level of profit	Fixed management objective, predetermined	Residual, after material, labour and finance costs
Perception of corporate success	Achievement of management and providers of finance (shareholders), at the expense of jobs and salaries	Achievement of partners, sharing of results
Salaries	Residual after material and finance costs, plus profit	Negotiated costs, based on productivity increase plus inflation compensation
Relation management/staff salaries	Management increasing with profit or more, salaries stagnate or decline to generate profit	Increasing in line
Industrial relation	Exploitation	Partnership
Sustainability ethics	Utilitarianism	Fairness, procedural justice

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Consequently, substituting regulation for green taxation (the Pigouvian approach) and the privatisation, definition of unambiguous property rights and deregulation (the Coasean approach) are both part of GRAS, such instruments play a secondary role in SEDG and are used on a case by case basis – here no silver bullet exists, and each bullet can cause dangerous damages to vulnerable groups, target or not [46]. Mobilising private capital is important in both scenarios, but the means of doing so differ: while in GRAS public seed money and public-private-partnerships PPP dominate, in SEDG private investment occurs due to the necessity to react to legal standards (e.g. for emissions), regulations regarding waste treatment and recyclability standards for products. As a result, investment in GRAS follows profit maximising criteria, while the obligation driven investment in SEDG can be oriented towards investment into public goods.

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The economic orientations are defined accordingly (see table 6). GRAS is a market and competition society imaginary representing a typical liberal capitalism approach while SEDG – including markets and competition, but embedding them into a social frame – pictures a postmodern, sustainability oriented society. Nonetheless it incorporates many elements of the more traditional model of “Rhenish Capitalism”, which is in line with the welfare state to etatistic socio-economic type underlying the scenario. BAMBU follows no coherent orientation but, representing EU policies, a compromise between different approaches (with the balance changing from time to time).

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3.4 The social models

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As social policies are part of the narratives and where appropriate the modelling, the attitudes towards social justice used in the scenarios have been based on those present in the EU. According to Opielka at the time of developing the scenarios three attitudes were dominant [36]:

- *The liberal model:* if interview partners supported state responsibility for securing individual income levels in at least two of the three case "illness", "old age", and "unemployment", but not beyond. These preferences were implemented in GRAS.
- *The welfare state model:* if in addition interviewees saw state responsibility for "reduction of income disparities", or "provision of jobs", or both. This corresponds to the BAMBU scenario assumptions.

417 • *The etatistic model*: if in addition they supported the control of salaries by law (implying a
 418 redistributive tax system), or a legally guaranteed general, tax financed basic income. No all but
 419 some elements were included in SEDG.

420 Table 7 illustrates that the three models indeed represent the attitudes of the vast majority of the
 421 European population which are significantly different from the USA (and justify a recommendation
 422 of caution when drawing conclusions from US empirical data before applying them to Europe).
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Table 7: Attitudes towards social justice in Europe Data source: [36]

	No state responsibility	liberal	welfare state	etatistic	unclassified
EU 15 member states	0.5	8.9	29.8	56.5	4.4
Sweden	0.7	20.2	40.9	34.5	3.7
UK	0.2	15.1	32.5	46.7	5.6
France	1.9	8.5	23.9	56.0	9.7
W.-Germany	0.8	13.7	46.8	34.0	4.7
CEE EU member states	0.5	4.7	21.8	69.1	3.9
E.-Germany	0.0	2.8	13.9	80.7	2.6
Czech Republic	2.2	12.1	24.2	54.8	6.8
Poland	0.4	3.1	17.2	76.7	2.6
Hungary	0.1	5.1	30.8	61.0	2.9
Bulgaria	0.0	6.7	12.1	76.7	4.6

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 426 Despite significant differences between old and new EU member states and within each group,
 427 there is still a broad consensus that either the welfare state or the etatistic approach are what citizens
 428 want, across the political spectrum. The differences between West and East Germany were rather
 429 pronounced in the polls, but there were also important commonalities. For instance, the statement
 430 "The state must take care that everybody has a good livelihood/ a decent life ("ein gutes
 431 Auskommen") in cases if illness, need, unemployment and old age" was supported by more than 77
 432 resp. 86% of citizens in West resp. East Germany, across all party preferences, with the liberal party
 433 FDP scoring lowest [36]. Today, with more than decade of economic development, neoliberal policy
 434 and migration, the data might be different, although the patterns probably still prevail. Gerhards
 435 and Hölscher, in their analysis of the ISSP (International Social Survey Programme) results identified
 436 the same pattern, calling the three models European Commission, social-democratic, and socialist
 437 [47].

438 The world views and their values shape the ways societies self-organise themselves, in
 439 particular their societal and political institutions, understood in the political sciences sense of being
 440 the rules by which political decision-making and implementation is structured (table 8). Systems of
 441 rules shaping behaviour include formal and informal value-based orientations, mechanisms to
 442 realise them and including the mechanisms for rule enforcement [48,49]. Political organisations
 443 encompass both: they are social entities, appearing as actors in political processes, as well as systems
 444 of rules, structuring political behaviour and facilitating societal orientations.

445 While GRAS and SEDG again are characterised by specific institutional settings shaped by the
 446 respective world views, BAMBU exhibits a mix of views due to its character as reflecting the
 447 real-world political compromises. The at least partially mutually exclusive suggestions regarding
 448 institutions on different levels confront each other in such processes – politics here often implies to
 449 reconcile the incommensurable, leading to contradictions or vagueness in policy formulations. This

450 was already the case for the Brundtland Report and the Agenda 21 adopted in Rio 1992, and is still
 451 true for the 2030 Agenda adopted 2016 [50,51].

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Table 8: ALARM Concepts of social justice and its institutional implementation. [36], modified

ALARM scenario	Concept of justice (in Aristotelian Nicomachean Ethics)	Institutional level involved			Famous representatives
		organisations	mechanisms	orientations	
GRAS	Equity based upon what people contribute (Iustitia Communitativa)	Market	Social relation, typology of reciprocity Instrumental association, exchange	Principle of justice (political) Performance	Robert Nozick
BAMBU	Equity of opportunity (no clear relation)	State (often serving business)	Citizenship	Equity	John Rawls
SEDG	Equity based on distribution, needs based (Iustitia Distributiva)	Community	Community Solidarity, communicative action	Need satisfaction, equality	Amitai Etzioni
	Equity based on enabling participation (Iustitia Universalis)	Legitimation	Political culture, human rights, communication of values	Participation, access, inclusion (N. Luhmann), global justice	Amartya Sen

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The attitudes to social justice have also shaped the welfare regimes which emerged in different parts of Europe. Esping-Andersen identified three different political economies of the welfare state (liberal, social-democratic and conservative), complex patterns of social policy, including labour market, community system, family policy and the mode of state regulation itself [52]. We used his systematique to specify the social dimension in the scenario narratives (see table 10). GRAS was designed to correlate to the liberal regime, and SEDG with some – mainly environmental – modifications to the (traditional) social-democratic (the naming chosen by Esping-Andersen pre-dates the New Labour version of social democracy). No scenario is directly related to the conservative regime as traditional conservatism has largely given way to liberal policies. BAMBU as a political compromise is again characterised by a mix of elements from different regimes.

As one result of all these divergences, some of the most politically relevant factors also diverge, such as the target groups of policy recommendations, and the justifications of the recommendations themselves, in particular the assumed resilience resp. vulnerability of the system, and the calculation off future cost and benefit (table 9). The difference in economic valuation mechanisms can be expected to contribute to and legitimate diverging policy priorities. The different ideas about dynamics, i.e. whether or not social and environmental developments are reversible, lead to different levels of precaution, and thus different policy recommendations. These are expected to appeal to different stakeholder groups – agents with a neoclassical economic background are expected to be more open for recommendations based on a similar world view, and the same applies

474 for proponents of other world views which are – other than the GRAS world view – today not
 475 hegemonic.

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Table 9: Additional policy shaping implications of the world views in GRAS and SEDG

	GRAS	SEDG
Future value	Exponential discounting, positive discount rates	Object dependent: no, hyperbolic or exponential discounting
Dynamics	Equilibrium with reversible deviations, series of equilibria, largely predictable, high inherent resilience	Nature and society are processes of continuous irreversible change, path dependent but unpredictable, with medium to high vulnerability
Resonance group of policy recommendations	Economic and fiscal policy makers, business	Policy makers, civil society

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Besides the implications for our research hypothesis formulated in section 1, in section 4 we will point to some additional policy relevant conclusions that can be drawn from the conceptual analysis and its comparison to the empirical data upon which the scenario designs have been based.

Table 10: Welfare regimes and social justice in Europe and their representation in the ALARM scenarios [36](p. 330), based on [52], modified.

Variable	Indicators	liberal = GRAS	Social = SEDG	BAMBU	Conservative
Decommodification: protection against market forces and income loss	Level of income substitution, % of previous income.	Weak	Strong	Medium	Medium
	Share of individual financing	High	Low	Medium	Medium
Residualism	Share of basic support in total social expenditure	Strong	Limited	Medium to strong	Strong
Privatisation	Share of private expenditure for health and old age as share of total	High	Low to medium	Medium	Low to medium
Corporatism/ etatism *	Number of social security systems for specific professions	Weak	Medium	Medium	Strong
	Share of expenditures for life-long employed government staff	Minimised	Increasing	Medium	Medium

Redistribution	Progression in (income) tax Equality of transfers received	Weak Weak	Strong Strong	Medium Medium	Weak Weak to medium
Full employment guaranty	Expenditures for active labour market policy Unemployment quota, weighted by labour force participation	Low Medium	Strong Low	Medium Medium	Medium Medium
Role of market in social security provision	Shares of transfers and recipients	Central	Marginal	Medium	Strong
Role of state in social security provision	Shares of transfers and recipients	Minimised	Central	Subsidiary to medium	Subsidiary
Role of family/community in social security provision	Shares of transfers and recipients	Subsidiary	Subsidiary	Marginal to subsidiary	Central
Role of human rights	Beyond legal status, respect in social life and employment	Medium	High	Medium to high	Medium
Dominant form of welfare state solidarity	Entitlement basis	Individual	Work focussed (in SEDG incl. unpaid work)	Labour focusses, tax support	Communitarian, etatistic
Dominant means of steering social policy	Agency and organising principle	Market, economic optimisation	State, equity principles for citizens/inhabitants	Mixed market and state, mixed ideas	Moral and economic
Underlying concept of social justice	As realised by institutional mechanisms	Equality of opportunity	Distributional justice	Opportunity & distribution	Fair participation, basic need satisfaction
Archetypical countries	Switzerland	USA	Sweden	EU	Italy, Germany

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486 **4 Discussion and conclusions**487 *4.1. The science implications*

488 Scenarios are scientific tools to support political and economic decision making. Consequently,
489 having undertaken a deeper look into their fundamentals than usual, we can draw conclusions
490 regarding both, science and politics.

491 In the scientific domain, each of the archetypical scenarios discussed comes with a specific
492 philosophy of science related to the overall philosophical basis of the respective world view and its
493 epistemology. While critical assessments are dominant in SEDG, in GRAS positivism dominates,

494 allowing scientists to claim superior truth and communicate that to decision makers. In SEDG,
 495 uncertainty is acknowledged, and the as the plurality of knowledge sources and their potential
 496 contradictions are acknowledged, legitimacy plays an important role. Hence the focus on
 497 participatory processes, discourses, participation and knowledge co-production (see table 11).
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499 **Table 11:** Science and science-society relationships in the scenarios. Mode 1 and mode 2 are terms
 500 from the sociology of science, coined by Gibbons et al., referring to the way (scientific) knowledge is
 501 produced [53]. Mode 1 is characterised by a co-operation between science and society without any
 502 change in working methods of either while mode 2 is defined as a partly descriptive and partly
 503 normative way to operationalise sustainability science. Funtowicz and Strand suggested a
 504 systematique of science-society relationship distinguishing five models [35]: 1. The initial 'modern'
 505 model (perfection/perfectibility), 2. The Precautionary model (uncertain and inconclusive
 506 information), 3. The Model of Framing (arbitrariness of choice and possible misuse), 4. The Model of
 507 Science/Policy Demarcation (possibility of abuse of science), 5. The Model of Extended Participation
 508 (working deliberately within imperfections). Post-normal science is a discursive model developed
 509 by Funtowicz and Ravetz [54].

	GRAS	BAMBU	SEDG
Theory of science, mode	Positivism Mode 1	Eclectic mix, positivism dominates, Mode 1 dominates	Social constructivism, subjectivism, hermeneutics, contextualism, Mode 2
Models of science-society relationship	The initial 'modern' model: perfection/perfectibility	The precautionary model, the model of framing & the Model of Science/Policy Demarcation	The model of extended participation: working deliberately within imperfections
Role of scientists	Outside, truth speaks to power	different attitudes, scepticism about truth and power	citizen scientist, post-normal science, sustainability science, discourse based. Participatory, multi-criteria and multi-perspective

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 511 As in science the mode of working, the choice of methods and the selection of research
 512 questions is not an individual free choice but co-determined by external factors such as the calls and
 513 funding conditions, the preferences of journal editors and the reviewers they choose, and other
 514 institutional settings determining careers in science, the world view of decision makers in different
 515 functions is crucial for the course the scientific endeavour takes, and the advice it generates to
 516 support policy processes. Currently, it appears to be the outside world, beyond the ivory tower,
 517 which pressurises those domains where the scientific establishment rules to open up to new thinking
 518 developed by heterodox scientists over the last decades [55,56].

519 4.2 From science to policy – some results

520 *What is evidence in evidence based/informed decision making?* The mechanistic thinking in equilibria
 521 inherent in GRAS has been criticised for its low level of complexity which makes it virtually
 522 impossible to generate recommendations suitable as the basis for decisions in managing such
 523 complex systems as the economy, society or the environment [25]. This world view, and the
 524 neoclassical economic thinking it incorporates turn out to be a kind of Procrustean bed; Julie Nelson
 525 considers it even dangerous: „Economists seeking to disguise their value judgements under a veneer
 526 of Cartesian objectivism [...] are dangerous” [57]. The reason is not least that deriving policy advice
 527 from linear extrapolation of past events in mechanistic systems can be described metaphorically as

528 being like driving a car not looking for the road ahead but trying to determine the course to follow
529 by extrapolating from what can be seen in the rear mirror.

530 *Social aspiration discrepancy:* As far as BAMBU is a realistic reflection of the current EU policies,
531 this comparison demonstrates the divergence of EU policies and EU citizen preferences as they are
532 obvious from table A1. Already this is an important result for European policy making, and it
533 underscores the preference of European citizens for a rather BAMBU-to-SEDG kind of policy
534 priorities – which of course has impacts beyond the social domain, for both economic and
535 environmental policies.

536 *Biodiversity conservation failure:* For the EU policies this implies that although certain species and
537 eco-systems may be stabilised under the EU policies as modelled in the BAMBU scenario, the
538 current policies will not be able to deliver on the 2020 target, not even with delay. The shock
539 scenarios indicate both the resilience of the socio-environmental system and its vulnerability beyond
540 certain tipping points; currently the EU institutions are not well prepared for such shocks.

541 *Explaining communication failures:* While in the ALARM scenarios, every inhabitant in one of
542 them shares her scenario's world view and interacts with other agents on this basis, in the real world
543 of course different groups endorse different world views, or, more precisely, different individuals
544 do, strongly influenced in their decision process by their social environment (family, household,
545 peers, colleagues, friends, role models,...). Reading the scenarios against this background also
546 illustrates why real-world agents despite articulating similar goals cannot agree, and sometimes
547 even enter fierce conflicts about the definition of the shared goals (rarely discussed openly) and the
548 way and means to get there – the latter dominating the public debate. The scenarios, read as mental
549 maps of different agents illustrate that what one may consider essential, another may perceive as
550 effective betrayal of the common goal, and as utterly obstructive.

551 4.3 Policies and world views – just one example

552 Limits to growth, the 1972 report of the Club of Rome [7], was perceived differently in the USA,
553 where politicians and the economics profession immediately and fiercely rejected it (Ronald Reagan
554 famously said "There are no such things as limits to growth, because there are no limits to the
555 human capacity for intelligence, imagination, and wonder"), while in much of Western Europe it
556 struck a chord with the public opinion and a part of the decision makers (to these days new reports
557 to the Club of Rome when published mention its name on the front page as this appeals to buyers in
558 Europe, but not in the USA). The most prominent endorsement of a new world view, stimulated by
559 the report, was probably the one of the then President of the Commission of the European
560 Communities, Sicco Mansholt, who said in a round table statement on Oct. 14th, 1973:

561 "To me, the most important question seems to be: how can we achieve zero growth in this
562 society? It is beyond doubt for me, that this zero growth must be achieved in our industrial
563 societies, in America, Western Europe and Japan. ... Should we not succeed in doing so, then
564 the distance, the tensions between arm and rich nations will become bigger and bigger....It
565 would be an illusion, and even a lie to pretend there could be no growth for the Third World
566 economies unless we were performing growth as well. I am worried however whether we will
567 manage to get those powers under control, which strive for a permanent growth. Our whole
568 societal system insists on growth – not only single companies, big business, multinational
569 giants".

570 However, times have been changing. To Mansholt, a GRAS scenario, its objectives and policies
571 would have been anathema due to its focus on GDP growth, with a secondary role for
572 environmental concerns, and even less dedication to overcome the tensions between the rich and the
573 poor nationally and internationally. Opposed to that, his successor Jean Claude Juncker holds a
574 GRAS world view, unshakable by environmental failures (biodiversity, climate) and social
575 hardships (Greece, Portugal,...) – to him, an etatistic development trajectory, let alone economic
576 degrowth are a priori unacceptable, even unthinkable. Instead "We need structural reforms [...], we
577 urgently need a boost in European investment. We need growth" describes his policy orientation,
578 and with him much of the ruling elites in Europe today [58].

579 While a reconceptualization of progress is already under way as “targets for human
580 development are increasingly connected with targets for nature, such as in the United Nations’
581 Sustainable Development Goals” [28] (p. 1416), most decision makers suffer from a cognitive
582 dissonance, an unpleasant and unstable state of mind caused by the political situation. On the one
583 hand, the threatening facts are well established, and every decision maker who does not duck to
584 reality for a wonderland of magic thinking recognises her responsibility (cynics claim that power is
585 the monopoly of speech and the freedom not to listen, learn and pay attention to feedback). On the
586 other hand, it is as well established that the established policy instruments fail to deliver on the
587 changes necessary, while few alternatives exist in the world view held so dear for so long. Bill Rees
588 summarises the cognitive dissonance as recognising that “The ecologically necessary is politically
589 infeasible, but what is politically feasible is ecologically irrelevant”. The current pursuit of Green
590 Growth by the EU, but also by the OECD and UNEP can be understood as an attempt to reconcile
591 the incommensurable [59-61] – a political approach which can succeed in conference resolutions and
592 conventions, but is bound to fail when the real-world implementation does not allow for the
593 vagueness of paper work anymore [62]. Some of the erratic and inconsistent policy making can be
594 plausibly explained by this constellation.

595 In a similar fashion, when the Great Recession hit the world’s economies in 2008, economists –
596 after an initial shock period as the crisis hit them unprepared – modified their stance, endorsing
597 selected elements of the long condemned Keynesianism, but it embedding into their own world
598 view. While reactivating the policy instrument of deficit spending, countercyclical policies were not
599 on the table, let alone the improvement of purchasing power by increasing salaries, both core
600 elements of Keynesian policies. Instead the Keynesian theory was declared to be a valid receipt in
601 times of crisis, justifying the use of heterodox instruments while declaring the own failed approach
602 as being the right one for ‘normal times’. That following their prescriptions in such normal times had
603 led to the disaster was fiercely denied, and the world view was thus saved from critical reflection.

604 4.4 Conclusion

605 World views do not manifest themselves as sets of axioms or deep analyses but as the stories
606 which are the means by which we navigate the world. They allow us to interpret its complex and
607 contradictory signals. We all possess a narrative instinct: an innate disposition to listen for an
608 account of who we are and where we stand. When we encounter a complex issue and try to
609 understand it, what we look for is not consistent and reliable facts but a consistent and
610 comprehensible story. When we ask ourselves whether something “makes sense”, the “sense” we
611 seek is not rationality, as scientists and philosophers perceive it, but narrative fidelity. Does what we
612 are hearing reflect the way we expect humans and the world to behave? Does it fit together? Does it
613 progress as stories should progress? A string of facts, however well attested, will not correct or
614 dislodge a powerful story and the world view it represents. The only response it is likely to provoke
615 is indignation: people often angrily deny facts that clash with the narrative “truth” established in
616 their minds (they reject the epistemology to protect their ontology). The only thing that can displace
617 a story is a story – a world view which is not able to present a comprehensive story is on the losing
618 side of societal battles for influence.

619 Thus, as their core worldview shapes how they frame their arguments, people chose one
620 scenario not for its outcomes but for the world view it represents, and the story told about it. While
621 not being a proof, we have presented a number of analyses of the archetypical scenarios which make
622 it more than plausible that switching the decision basis from one to the other requires a change of
623 world views, against deeply held beliefs, routines, habits and practices – an almost impossible step
624 as long as the world view held does not clash with reality (as is the situation today), and a difficult
625 one even then. This is probably a suitable explanation for the failure of so many sustainability
626 scenarios ever since the “Limits to Growth” to motivate the policy changes the recommended. If
627 even the Great Recession was not a shock significant enough to enforce rethinking (austerity policies
628 were reactivated soon after the first symptoms of crisis began to recede), it is hard to imagine what
629 could cause the shift to a different world view, except a change of leadership. Scenarios will most

630 probably not have more power than the 2008 economic shock and thus will not be able to initiate a
631 real change of course by the incumbents – rather they can empower those critical of the state of
632 policies and searching for better solutions. As far as a GREEN GRAS scenario is a contradiction in
633 terms, unearthing the hidden world views behind different policies and exposing them to the
634 scrutiny of reality may be the only chance to enable the public at large to rethink its acceptance of
635 policies not in line with their own world view, and support alternative positions differing from the
636 GRAS thinking in more than individual strategies and policy instruments.

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