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# DISRUPTIVE EVENTS AND HOW POLICIES CAN DEAL WITH THEM



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## Executive Summary

This article on disruptive events is the result of creative experimentation. This concerns both the subject as well as the process. Although disruptive events are also dealt with in the subject oriented chapters of *Austria 2050* or in various foresight processes<sup>1</sup>, we tried here to throw overboard the traditional thematic limits based on which this publication is also structured. Instead, we focused on the things that were not contemplated or possibly not sufficiently discussed in other articles of *Austria 2050*: natural catastrophes, laboratory accidents as well as all the possible unintended or intended disruptive events caused by humans. Often it is more about the interdependencies, trends, hard to perceive developments than about factually clearly defined areas. The nature of these events can and should be quite speculative. In addition, it was an attempt to leave the smaller circle of experts and to engage a broader public in the process.

The process was thus open to everyone who was interested, and was open to participation throughout its full duration. It was divided into three phases. In phase 1, as part of an open, collective brainstorming on the web-based discussion platform [www.oesterreich2050.at](http://www.oesterreich2050.at), 53 disruptive events were uploaded by 152 registered participants (see table 1). These were analysed by the project team – that is, the authors of this article, summarised in a document and then again put up for discussion (phase 2). The document received exactly 300 comments and was voted on almost 600 times. In phase 3, opinions on controversial points were given in a survey, the results of which assist with the prioritising of potential disruptive events. In total, about 2,500 people visited the site and followed the discussion.

The focus of these 53 disruptive events clearly focused on those caused by humans – unintended or intentional. According to the views of the participants, the events may be recognisable but are either not tackled or are approached using largely ineffective instruments. Classic disruptive events (e.g. earthquakes, asteroid impact) only played very minor roles.

The focus of the evaluation here was not on the interpretation of individual events (e.g. asteroids, climate change, lack of resources), but on developing solutions and principles for dealing with disruptive events in general. As part of this work, we were also attempting to define what disruptive events are and to demonstrate the most integral problems in dealing with them, to analyse the results of the collective brainstorming from a meta-perspective and to draw conclusions from them. Through this process, four components points for dealing with disruptive events were found based on the results of the discussion process:

**Crises and emergency strategies:** As long as the disruptive events do not involve creeping effects, they require rapid intervention in a crisis scenario. In order for this to be possible, emergency plans, strategies

for dealing with critical infrastructures, civil protection measures etc. are needed, which, in an ideal situation, have all been elaborated on and played out.

**Dealing with complexity:** one central element, which was also addressed in many comments, is the complexity of the systems – this affects the human-created systems as well as the ecosystem. Common to them all is that the cascading effects of a creeping but also a spontaneous change of system parameters as it often turned out could only be modelled with difficulty or not at all. It is thus necessary to focus more strongly on a reliable analysis of the signs of such disruptive events and to increase research activities. Fortunately, certain optimism was shown about the fact that it is basically possible to have an adequate understanding of complex processes and systems.

**Improved social decision-making processes:** In relation to social decision-making processes, there were three dominant problems: 1. Social constellations, in which an elite group skims the surpluses from the system thereby lowering the incentive for the development of individual talents and the introduction of innovations (extracting political and economic institutions or systems), 2. The influence of special/particular interests on decisions and 3. The dominance of short-term decision-making that leads to long-term irrational decisions. The fundamental decision-making capability of policies was not questioned. What helps against these developments are only decision-making processes that are more transparent, more participatory and thus more open, and which allow participation for all. Although this is obvious, it isn't necessarily easy in practice. Here, social innovations are necessary in order to change decision-making processes and to provide a broader base.

**Taking system limitations into account:** one point that resonated in the discussion but was not always clearly addressed was the system limitations of our ecosystem. It is adequately known that the earth represents a closed system and thus all resources are limited. In addition, on this level, the issue of distribution becomes conspicuous: who consumes how much of the limited resources? Both dimensions are currently not being taken into account enough in policy decisions. It is precisely the attempt to create an internationally binding set of regulations (Copenhagen 2009, Rio +20) that show the influence of vested interests. The most recent policy change in Europe i.e. lower energy prices to increase competitiveness – shows that we haven't yet understood this particular aspect. The probability that disruptive events will occur has thus significantly risen.

## Definition and dimensions of disruptive events

Disruptive events permanently change our lives<sup>2</sup>. The term "disruptive" means to break apart, to throw into disorder, to destroy. "Events" in this context are isolated events as well as ones that de-

velop over a longer period of time. Disruptive events, then, are those that destroy or disintegrate existing things and replace them with something new. This can have negative as well as positive consequences. But what is significant is that they are difficult to predict and thus through ex ante measures can only be partly influenced (cf. Taleb, 2008).

The American legal theorist and economist Richard Allen Posner (2004) divides negative disruptive events into four categories:

1. Natural catastrophes (epidemics, volcano eruptions, meteorite impact, etc.)
2. Scientific accidents or laboratory accidents (e.g. release of bacteria)
3. Unintended man-made catastrophes (climate change, nuclear accidents, social upheavals, economic crises, corruption, political structures, food shortages, "alien species", etc.) and
4. Intentional, man-made catastrophes (cyber wars, terrorist attacks, etc.).

This division can be generalised because all disruptive events can be described based on three dimensions (in table 1, see the comments by users "serol 1971" (in DE no. 29), "Pynchon" (DE no. 8, 11, 15) and "Johann" (DE no. 15):

**Length:** Isolated event or longer lasting development

**Cause:** Man-made/human-caused or natural events

**Intention:** Intentional or unintended events

Evaluating whether a disruptive event is man-made and a development manifested over a longer period of time furthermore depends heavily on individual values and life circumstances. This is naturally also the case particularly when social developments are being evaluated. So, for example, an increasingly unequal distribution of income can be considered as destabilising for a society, or as an incentive to try harder and to likewise become richer through it.

Unintended events are – especially in the early phase – perceived differently. This applies to science, in which it often takes longer for alternative interpretations to be possible (see, for example, Kuhn's studies on the paradigm shift, 1976), as well as also for individual perceptions. Some people have a pronounced sensitivity for new developments and changes in society.

Due to the varying assessment and recognisability of disruptive events, by all means, reacting adequately is a huge social challenge.

According to the American evolution researcher Jared Diamond (2005), in this context four categories can be identified:

1. The group/society fails to anticipate a problem before it appears.
2. The group/society fails to perceive a problem when it does appear.
3. The group/society fails to try to solve the problem after it is perceived.
4. Failure to solve the problem after attempting to do so.

## The process

The process of collective brainstorming and the public discussion was, for its entire duration, participatory and virtual. All interested parties were able to take part in the process on the internet using the web-based discussion platform [www.oesterreich2050.at](http://www.oesterreich2050.at). Participants were asked to identify and to describe disruptive events, to evaluate and comment on the analysis based on those and, finally, to take part in a survey on controversial themes. The following steps were carried out in detail during the process:

In the first phase, a collective brainstorming session was held to collect ideas on disruptive events. On the one hand, what we were looking for were subjects that lay outside the scope of the discourse on the well-known grand challenges and which are usually forgotten in public discussions. On the other hand, the idea was to open to discussion in order to collect new ideas from a broad circle of interested parties. As part of this process, fifty-three disruptive events were identified (see table 1). Three of them did not represent events in the proper sense and were therefore not used for further analysis.

In the second phase, the uploaded disruptive events were analysed and divided into the outlined theoretical categories. The results of this analysis and the resulting deliberation about how to deal with disruptive events were summarised in a document. This was then also put to the public for discussion as a critical commentary and supplement to the analysis results.

In the third phase, a survey on controversial questions was carried out in order to reach mutual, consensual conclusions. This served primarily to clarify controversially discussed subjects and also to prioritise events according to their disruptive potential and probability of occurrence.

This article is the result of a revised reworking of the text based on comments and discussions as well as the results of the survey.

Table 1: Disruptive events, as suggested by the users

Nr.	Disruptive Event (DE)	User	Probability
1	Disruption of global supply networks	alfred_t	very probable
2	Massive cyber attack	alfred_t	probable
3	Extortionate shortage of raw materials	alfred_t	improbable
4	Pension expenses as a ticking time bomb	ziggy stardust	very probable
5	Small dose, high effect?	Finstergrün	probable
6	Financial meltdown, the second	STefanT	probable
7	Medicine 2.0	Phil	probable
8	New forms of investments – Are they allowed to do that?	Finstergrün	probable
9	26 letters – the solution for everything?	Finstergrün	very improbable
10	Nature hits back	herodot	very probable
11	Meteorite impact	herodot	probable
12	Demographic change in Europe	Mantschilein	probable
13	New infectious diseases	jo	probable
14	What is the world's path, or the course of events?	Skalicky	–
15	Corporate foresight for more disruptive innovations and as orientation for disruptive events???	AktienGesellschaft	very probable
16	Political revolutions and upheavals	AktienGesellschaft	very probable
17	Atomic fusion instead of division and oil	Werner Engel	probable
18	Consequences of inequality	ziggy stardust	probable
19	Confluence of knowledge	Firehorse	very probable
20	Food supply	Fritz Gloxer	improbable
21	Breakdown of information sources in the Internet	Fritz Gloxer	probable
22	Change of dietary habits (change to vegetarian diet)	MOMUS	probable
23	Avarice becoming ever cooler ...	Werner Engel	very probable
24	Third world war	Hardy Hanappi	probable
25	Austrian university crisis	M.	very improbable
26	Information overload foundation for new superstition and de-socialisation	Rupert Puntigam	very probable
27	Economy constantly needs to be RESET!	Rupert Puntigam	very probable
28	Breakdown in the global food supply chain	JE	very probable
29	Raw materials oil US competition	Fred	very probable
30	Public institutions lose credibility	Mantschilein	probable
31	Energy turn-around	Rupert Puntigam	very probable
32	Electro-mobility	Rupert Puntigam	very probable
33	EU fracture	DIPo	–
34	Electricity becomes economically storable in high storage density	DIPol	probable
35	Networking leads to collapse	Keal	very probable

Nr.	Disruptive Event (DE)	User	Probability
36	Social revolution through automisation	ziggy stardust	probable
37	Renaissance totalitarian dictatorships. NEW: Technological power becomes world power	Hubertus H.	very probable
38	Universal language English	Rupert Puntigam	very probable
39	STOP reinventing the wheel in education	Rupert Puntigam	improbable
40	Mobility urgently needs liquid fuels with extremely high energy density - 40000000 J/kg and more	Bruno Lindorfer	–
41	Water conflict	Nelson	very probable
42	Huge deceleration of the world from 2050	Bruno Lindorfer	probable
43	What can Austria learn from disruptive technologies from the famous book by Prof. Clayton Christensen <i>The Innovator's Dilemma</i> ?	Bruno Lindorfer	–
44	England could introduce slavery again	M.	probable
45	2050 advanced civilisation in Africa and separatism in Europe	M.	very probable
46	Fearful and conservative currents see a boost and hinder innovation	unbequeme Stimme	probable
47	Corruption destroys state	unbequeme Stimme	very probable
48	Ubiquitous computing and synthetic biology change "humanism"	hochgerner	very probable
49	Online trade needs greater control	M.	probable
50	Return of the wolves and bears to Upper Austria, Lower Austria, Salzburg	M.	–
51	Migration influx from the south	healthup	probable
52	Migration influx from the south Youth changes and creates NEW THINGS – old ...	Rupert Puntigam	–
53	Intellectual property theft	M.	very probable

## Results and interpretations

The disruptive events uploaded on [www.oesterreich2050.at](http://www.oesterreich2050.at) were sorted into a matrix, which, on the vertical axis, distinguishes between natural catastrophes and man-made, intentional and unintentional events based on Posner's classifications (2004). The horizontal axis distinguishes between the respective decision-making situations according to Diamond (2005) (see table 2). Each event has a unique number shown in table 1.

As can be seen in table 2, the disruptive events are distributed widely over the categories. Significant focuses can be seen with the unintended and intentional, human-caused/man-made, disruptive events (vertical). These may be recognisable but were either not addressed or dealt with using largely ineffective means (horizontal). The main cause for disruptive events is, therefore, humans. This is also verified by the British astronomer Martin Rees (2011): the main threat to the human species is no longer nature – as has been previously assumed – but humans and the highly complex systems created by humankind.

"Unintended events", which describe processes that tend towards being diffuse, creeping processes and the evaluation of which is strongly dependent on individual values and perceptions, were frequently uploaded. The main issue here is not so much the disruptive events in the form of an ultimate escalation, but more the perception of a "potentially disruptive development", the consequences of which are preponderantly evaluated as being negative. So, for example, the user "ziggy stardust" in Disruptive Event (DE) no. 36 (table 1) refers to the possibility of successive changes in the employment and also the social structure due to the process of automatisation. A subject, which among others, has also been outlined using the catchword the "20:80 society" (or "Tittytainment") and brings up the question of how society would react to a development where, as a last resort, only a small part of the employable population could be employed. DE no. 12, by user "Mantschilein", fittingly points out the challenges of demographic change in Europe. Both are, then, processes that are currently being well documented and, furthermore, are not independent of each

**Table 2: Matrix from disruptive events and dimensions of decision-making processes (according to Diamond, 2005, Posner, 2004)**

	<b>Failure to anticipate a problem before it appears</b>	<b>Failure to perceive a problem when it appears</b>	<b>Failure to try to solve the problem after it is perceived</b>	<b>Failure to solve the problem after attempting to do so</b>
Natural catastrophes				11, 10
Unintended, human-caused events	45, 20, 16, 13	48, 35, 26	51, 50, 42, 39, 38, 37, 36, 33, 28, 25, 23, 8	47, 46, 41, 40, 30, 21, 18, 12, 6, 5, 4, 1
Intentional, man-made events	44	49	53, 52, 29, 27, 24	34, 32, 31, 22, 19, 17, 15, 7, 3, 2

Source: own survey, n = 50  
 Note: the disruptive events corresponding with the numbers are listed in table 1.

other. This and other rather process-focused presentations of disruptive events with negative prospects thus clearly evoke basic scepticism about existing decision structures or about the instruments used as part of these developments. There are, then, recognisable doubts as to whether decision-makers and institutions can adequately deal with the initial challenges and whether their decisions will be rigorous enough. This assessment is underlined by the thematic grouping of the disruptive events (see table 3).

Table 3 illustrates that the majority of disruptive events represented are genuinely political or social in nature and are thus clearly within the influence and decision-making areas of socio-political institutions. Disruptive events that were categorised as "political change", "collapse – war", "change of power distribution" belong to this area. Of course there are also other areas of results that are connected to the social or political system, because it is clearly about (intentional or unintended) events caused by humans. Natural catastrophes on the other hand, do not seem to play a role, even though, during the period of the first part of this process an asteroid flew by the earth at an unusually close distance, and another one exploded over Russia. Such events can simply occur and seem to be accepted. The results show, therefore, a very pragmatic, anthropocentric and enlightened character. The users primarily described events which society can clearly influence.

The partly explicit, partly implicit evaluation of disruptive events is also depicted in table 3: 42 of 50 scenarios are clearly connoted as "negative". On the one hand, this could indicate a fundamentally rather pessimistic assessment of future developments. On the other hand, it may also be related to the question of disruptive events, or

the term itself, which tends to have negative connotations. Nevertheless, this representation also underscores the dissatisfaction with existing structures and the latent distrust of the adequacy of current instruments for dealing with disruptive events.

One central characteristic of six of the eight positive responses is the importance of technical innovations such as energy storage, e-mobility and atomic fusion.<sup>3</sup> This very clearly reflects the hope or conviction that positive changes can be brought about using technology. This again shows that scientific and technical innovations are seen as being very important elements in solving social problems. Currently, great hope is invested in them, while political developments tend to be more sceptically evaluated. The subject of "social innovations", on the other hand, was almost not brought up at all, even though the implicit demand for it is clearly shown as an important element in the results.

The disruptive events raised in the collective brainstorming were condensed to 15 subjects based on a qualitative content analysis (cf. Mayring, 2007), and examined as part of a survey on their disruptive potential as well as on the possibility of their occurrence. As evidenced in figure 1, the disruptive potential and the possibility of the occurrence of the various events shown are clearly correlated. We can assume from this that the participants did not differentiate between these dimensions. Nevertheless, a certain prioritisation can be deduced from the results, according to which interventions regarding the growing divide between poor and rich, the climate change, the finitude of fossil fuels, the generation conflict and also the continuing financial and economic crisis are particularly urgent.



**Table 3: Thematic categories and evaluations of disruptive events**

Category	Number	Negative	Positive
Political and social change	11	52, 47, 48, 46, 42, 39, 37, 36, 33, 30, 25, 18, 12, 4	
Collapse – war	9	32, 27, 26, 24, 21, 20, 16, 2, 1	
Innovation – technology – knowledge	8	7	34, 32, 31, 19, 17, 15
Change of balance of power	7	53, 49, 45, 44, 38	
Resources	6	41, 40, 29, 28, 3	22
Climate	3	51, 50, 10	
Science-induced events	3	23,6	8
Illness – epidemics	2	13, 5	
Natural catastrophes	1	11	
<b>Total</b>	<b>50</b>	<b>42</b>	<b>8</b>

Source: own survey, n = 50  
 Note: the disruptive events corresponding with the numbers are listed in table 1.

The gap between rich and poor in particular and also the issue of distribution or the question of social justice once again particularly stands out from the other categories. The “quantitative” in the initial responses of the weakly represented climate change also stands out more significantly in this representation. Basically, the subjects that have consistently been covered in the media in the last few years are given particularly high disruptive potential or a particularly high probability. Cyber attacks, pandemics, the ungovernable European southern states, fracturing of the EU or a new world war may be allotted certain disruptive potential, but the probability of it happening is ranked rather low. Increased vegetarian nutrition is considered both less disruptive as well as not very probable.

From the structure of the disruptive events, two areas of activity can be identified, each having specific characteristics and needs, and are discussed in the following sections

- Dealing with complexity
- Social decision-making processes

Of course, one also has to formulate strategies for dealing with singular disruptive events (natural catastrophes, laboratory accidents, pandemic, terrorist attacks, etc.), which can be applied at any time. This line of action will not be further discussed here, but will be picked up again in the conclusion.

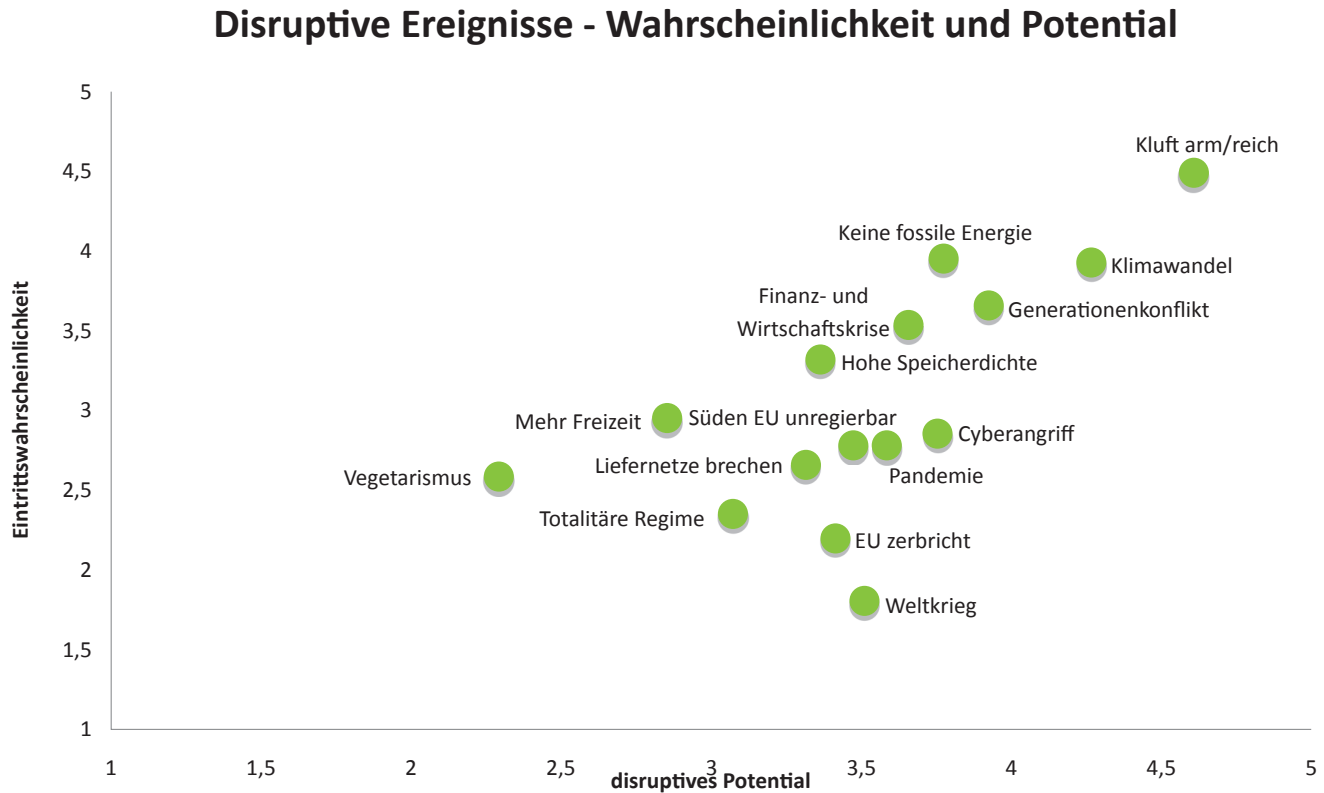
### Complexity, system dynamics and forecasting

Dealing with the results of collective brainstorming as well as with

disruptive events in the first place poses great challenges for decision-makers. It is primarily difficult because disruptive events usually occur in very complex systems, the interdependencies and the resulting system dynamics of which can only be partly understood and taken into account. Not to mention the impossibility of forecasting long-term prognoses. Such forecasting can only be seen as a high-class thought process. Yet, dealing with the complexity and the system dynamics of potential disruptive events still seems unavoidable. In its 2011 report “Future Global Shocks: Improving Risk Governance”, the Organisation for Economic Co-operation and Development (OECD) explicitly expressed this and noted that political and business decision-makers need to rethink and re-evaluate their strategies for dealing with unforeseen events such as the financial crisis, unforeseen political upheavals, virulent security problems in cyberspace, etc. This is essential in a globally connected and increasingly more complex world.

According to Rees (2011), the high complexity of man-made systems leads to the fact that a few individuals, consciously or unconsciously, being capable of bringing the entire society to the brink of chaos. This is because our present world is based on complicated networks in various differing areas: electronic distribution networks, air-traffic control, international finance, “Just-in-time” production, social media, etc. This assessment corresponds largely with the results of the collective brainstorming presented in table 2, in which significant focal points in unintended and intentional, of human-caused disruptive events can be recognised.

Figure 1: Disruptive events – probability and potential



Source: own survey, n=41

Large circles of the world population have benefited greatly from these networks, however possible negative effects haven't been observed adequately. Many and undeniably positive aspects of these networks can also quickly – and to a large degree – have negative effects: within minutes, social media can trigger mass panic; threats of cyber attacks or terrorist attacks have been the focus of the world media for some time; Wikileaks showed us the security loopholes of the internet. User "alfred\_t" broached the issue in DE no. 2, referring to the high probability of disturbances of the network, which has in the meantime through cyber attacks come to affect all possible areas of life. The US National Intelligence Council (2012) classified "cyber attacks" as events with huge disruptive potential.

In DE no. 35, the user "keal" also addresses the aspect of threat through the increasing network: "Due to the enhanced network the speed of the diffusion as well as the number of affected systems (energy, navigation, telecommunication, traffic and finance, etc.) and thus the number of people is increased. Which means that one event (the development of a virus) can put one person in the position to influence the course of action of numerous people. The complexity of the systems could lead to undesired effects."

According to the OECD (2011), evidence suggests that these phenomena will likely increase over the next few years. The drivers are, for example, technological advancement, higher mobility, networked production and supply chains or advancing urbanisation. The possible further development of these complex systems could also absolutely contain "nightmare scenarios", such as the independence of the processes underlying all artificial intelligence. The merging of new possibilities in information and communication technologies with synthetic biology was addressed by our user "hochgerner" in DE no. 48. One doesn't have to go as far as Ray Kurzweil (2006) with his theory about trans- or post-humanism to deduce a change in our concept of man as a realistic possible consequence.

One particular challenge is seen in the fact that the effects of disruptive events in complex systems will not spread in a linear way (cf. von Foerster, 2002). The systemic connections allow cascade-like effects over the various stratifications of the global system – whether it involves health risks, climate or finances. In the collective brainstorming, ideas were also posted about these issues. DE no. 1 posted by user "alfred\_t", for example, talks about the possi-

ble disruption of global supply networks; two others focus on the breakdown of the global food supply – caused by the increasing instability of the complex global system (DE nos. 20 and 28). As the second of a total of five so-called “Drivers of future global shocks”, this topic is given high priority by the OECD (2011).

Another phenomenon in this context is “reinforcing effects”, which increase effects in other systems or extend these to very different systems. Foot-and-mouth disease in Great Britain not only had consequences on agriculture but also on tourism. The effects of a power plant outage can, in this context, can be seen to affect various levels right down to the freezers of households. The effects of the global financial crisis could also be observed in the real economy and ultimately in individuals in the consequential developments of the ailing economies ... Last but not least, in DE no. 21, user “Fritz Gloxer” addresses the economic impact, which could result in the breakdown of information sources in the internet. A drastic example is given by user “Hardy Hanappi” in the DE no. 24 “Third world war”, the cause of which lies “in the dynamics of a bundle of processes”, from which one leads to another or which are connected to one or several.

To analyse complexity phenomenon, various approaches have been developed. In the last few years, the terms “extreme events” or “x-events” have gained certain popularity (Casti, 2012a). These are used to describe extremely improbable events, which precipitate as “shocks” in our globalised world. They are so rare that no sufficient data exists to calculate any useful probability of occurrence. X-events are, however, not only rare but also unexpected. And they have huge effects on society (e.g. asteroid strikes or a nuclear super-GAU). In order to predict these X-events in the best possible way, the American mathematician John L. Casti (2012b) brings the “Theory of Surprise” into play. Because X-events always arise from a combination of context and coincidence (one just has to think of the fall of the Berlin wall, for example). The context sets out the framework while the coincidence causes the concrete event. Because this cause doesn’t usually follow a pattern and therefore can’t be predicted, the “Theory of Surprise” focuses on the context and searches for possible accelerators and triggers for possible X-events. User “Pfliegl” points out that investing increasing resilience, among other things, could also be useful because many events cannot really be predicted.

As early as 2008, financial mathematician Nassim Nicholas Taleb had a similar point of view when he developed his theory of the “black swan”. This term describes very improbable and unforeseeable events with immense consequences. The term “black swan” originates from the time when, until they were discovered in the 17th century, black swans were thought not to exist. Taleb argues that black swans come up more often than we think: the astounding success of Google is among them; the 9/11 terror attacks, but

also the great success of the internet. This stems from the fact that we are used to seeing the past as a model for the future; to believe in statistics, to connect facts logically and to build rational arguments – which fit with our thought processes. Taleb became famous when, in 2007 – shortly before it actually hit – he warned about the global financial crisis and criticised the mutual dependencies of banks. It remains to be seen as to whether a second, much more dramatic global “financial meltdown” will arise, as addressed in DE no. 6 by user “STefanT”.

For the analysis of complex phenomena, insights from system theories can be further used. Systems change quickly between various states of equilibrium – things are less “fixed” than one assumes (Thompson, 2008). So a complex system can collapse when disturbances from a sufficient number of hubs of the networks arise. The example of the disruption of global supply networks can be taken as an example here (DE no. 1): Businesses today represent “vital nodes in global networks”, which is why they can be directly or indirectly affected by arising disruptions from somewhere else, if, for example, “the demand of the clients consequently come to a halt due to breakdowns in other parts of the network”. And so it is even more important consequently to identify the most vulnerable hubs in these complex systems. Apart from that, models can be developed on these in order to better predict possible consequences.

The question is thus justified as to how, today, it is possible to reduce complexity at all. The aforementioned 2008 financial crisis was a nice example of how the efficiency of the market, which functioned in theory, was levered by the too large complexity of security, ratings, etc. A possible approach in such a situation could be to reduce complexity using technological solutions: two European scientists have suggested increasing banking transparency using computer technology and making the information available to the public (see Buchanan, 2013). But can a new network using technology of this kind really reduce the complexity?

In summary, we can say that the complexity expressed implicitly or explicitly in the great majority of the 50 disruptive events and the related hard-to-predict system dynamics can be considered absolutely as central challenges for decision-makers. And so it is all the more important to also take into account, in context with disruptive events, the issue of the social and political decision-making processes. As part of the survey in phase 3 of the consultation process, appropriate solution proposals were demanded. The results are reflected in figure 2.

Figure 2 shows that the participants emphasised the following strategies with reaction options for dealing with complex systems: a better, more detailed analysis of the first signs of the emerging changes (3,9), more resources for the analysis of more complex systems (3,8), the establishment of specialised institutions for these

events (3,7) and more speculative and experimental research (3,6). Clearly rejected was the view that the systems surrounding us are so complex that they cannot be meaningfully analysed.

The article on multidisciplinary research approaches is viewed very controversially: Here there are those for and against it so that, with the degree of generalisation used here, the statements about this subject cannot be meaningfully interpreted. Here we have to go a bit deeper into the material in order to filter out where multidisciplinary approaches make sense.

### Social decision-making processes

Disruptive events are connected to high degrees of insecurity. It is often not clear whether they will happen at all or when, whether they do not already exist and what effects they might have on business, society and the environment. Because they could potentially affect the status quo, they are in any case part of public discourse, cause reactions and are – explicitly or implicitly – dealt with in social decision-making processes.

The insecurity and complexity of disruptive events are just one side of the problem. The other side is represented by the related collective decision-making processes. This does not mean that one inherently makes the wrong decision with complex and unsecure decisions, but that the decision process as such doesn't lead to the correct result because certain constellations hinder a decision that is ideal for society. There are rational and irrational reasons for this.

Diamond (2005) identifies seven problems with collective decision-making processes, which are also used here to classify the entries by the users. About half of the suggested disruptive events show problematic collective decision-making processes. In about a third, fear is expressed about the elite enriching themselves at the expense of the general public and – using technical jargon – can establish extracting political and economic institutions (Acemoglu/Robinson, 2012). In their book *Why Nations Fail* (2012), economist Daron Acemoglu from the Massachusetts Institute of Technology (MIT) and political scientist James Robinson from Harvard University describe how through this, the interests of the reigning elite fall into conflict with the interests of the rest of society (also see Diamond, 2005, and Olson, 1982). Based on historical and current examples, it is easy to understand that societal paths of development independent of their institutions can be completely different.

In societies with extracting political and economic institutions it is possible for the elite to skim off the surplus from the system and to thus also decrease the incentive for investments and innovations. An attempt is made to hinder innovation because, through them, the balance of power could also be changed. On an individual level there is likewise less incentive as all surpluses are being skimmed

off the investments and innovation. In a society characterised by extracting political and economic institutions it makes sense for the elite to hold onto this system, even if suboptimal decisions are met for society, which in turn increase the probability for disruptive events<sup>4</sup>.

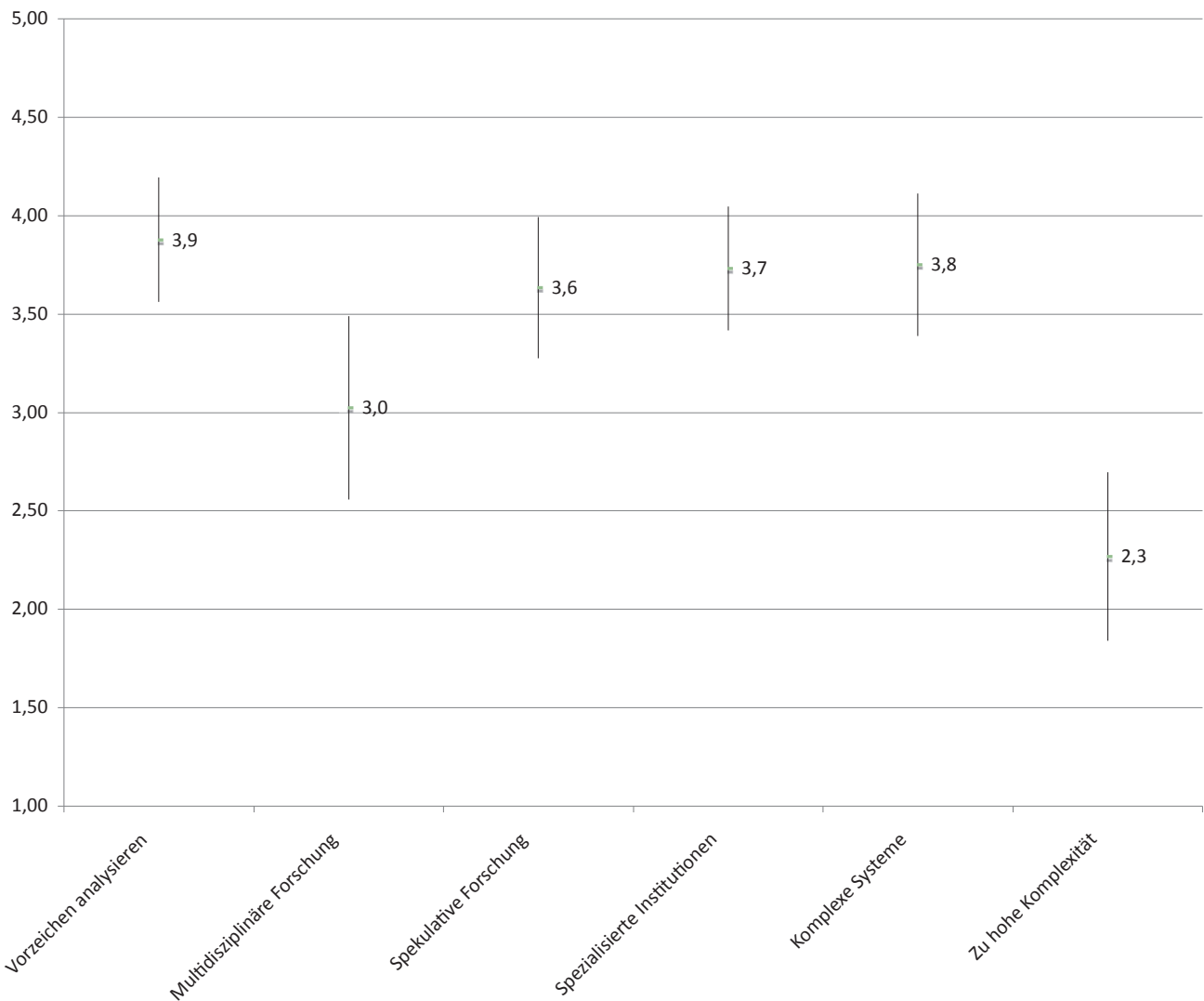
Societies with inclusive institutions become wealthy because they make it possible for people to develop their talents, to use them and to "harvest the fruits of their work". In these societies it makes sense to invest in education, innovation and enterprising activities.

The following areas were addressed by different users: the effects of increasing income inequalities ("ziggy stardust", DE no. 18); the increasing influence of totalitarian regimes ("Hubertus H", DE no. 37); education topics ("Rupert Puntigam", DE no. 39); corruption ("unbequeme Stimme", DE no. 47); and generation conflicts ("ziggy stardust", DE no. 4). In DE no. 44, user "M" thinks it possible to have a modern form of slavery, in which "destitute people who don't have the opportunity to secure their existence through their own work could fall into absolute dependency of businesses and an once neo-liberal elite." Closely connected to this problem is the perceived influence of vested interests<sup>5</sup>, which, for example, manifest themselves through successful lobbying. These currently include the support of the bank sector and measures for regulating this area ("STefanT", DE no. 7).

The problems with the production of public goods (including clean air, public safety, an intact ozone layer, education, a stable climate or also the traffic control through traffic lights) are not discussed under this title, but underscore many of the uploaded disruptive events. Normally, one assumes a shortage of public goods, because nobody can be excluded from consumption, and there is also no rivalry in consumption and – due to these characteristics – only the state can provide them. It is astonishing that the participants do not consider the state to uphold its duty as either producer or guarantor for public goods. The shortage of public goods – for example, climate stability – is considered to be a coincidental product of power struggles in which the actual question of the individual interests remains secondary. What is missing is a social consensus to produce public goods and to then use this as a benchmark for the affect of the measures on policies.

In concrete terms, this means that CO<sub>2</sub> emissions are used as a binding target and possible measures are selected accordingly to achieve their target. Economic practice of the last few decades saw, above all, an attempt to increase the production of private goods, i.e. attempting to stimulate growth, while attention on these public goods was kept low-key. This shift in importance has in the meantime been so internalised that no more decisions can be made that could slow down growth or reduce it and would thus hinder the production of private goods. When in doubt, the production of

Figure 2: Solution strategies for dealing with complexity



Source: Own survey, n=41 | Question: Please describe which strategies are especially suitable for dealing with complexity? (1= not at all suitable to 5 = very suitable)

private goods always takes precedence. To put it polemically: climate change still has to wait a bit before we have grown enough to be able to finance the necessary measures.

These outlined decision-making problems are described by Diamond (2005) as rational because for influential groups they are absolutely rational, even if they could be fatal to society. The interests of the individual are thus given precedence above the common good. The opposite are irrational collective decisions in which short-term instead of long-term goals are prioritised, old-fashioned ideas are used, a group makes irrational decisions ("groupthink") or imminent decisions are put off.

The disruptive events described by the users primarily refer to the importance of short-term decision calculi ("Mantschilein", DE no. 12, "Firehorse", DE no.19, "JE", DE no.28, "Robert Puntigam", DE no. 32, "M", DE nos. 45, 49 and 50, and also "healthup", DE no. 51). "Outdated values" have certain significance. "Groupthink" and procrastination on a societal level are not listed as triggers for disruptive events.

This model does not express the otherwise much discussed decision-making capability of policies. It is also does imply that the decision-makers are incapable of making decisions. Rather, it is assumed that short-term retention of power is at the forefront and not long-term decisions that are optimal for society. Achieving short-term goals is therefore the priority (see figure 3).

Figure 3 illustrates that, above all, there is a demand for more transparency when dealing with collective decision-making processes (4.4). Here the participants are largely united. Likewise important is a rethinking of the decision structures on a European level. From today's perspective, they are considered by many to be less effective (3.8). Citizen participation on the other hand is evaluated positively (3.6). There is little doubt as to the fundamentally positive characteristics of democracies (2.0). Here it is clearly implied that they do not only serve the powerful.

## Conclusions

The question of potential disruptive events is relevant because it leads directly to the upcoming, major problems independent of the otherwise conventional classification of policy areas or areas of responsibility. Given the considerable challenges, it is less about technology and innovation, environmental or education policies, etc., than about solving skills and the ability to find basic societal consensus on the most pressing issues.

The majority of the identified and potentially disruptive events described in the public discussion process are man-made in origin: It is no longer natural events but highly complex systems that can lead to undesired events, or decision-making processes, that do justice to individual interests, but do not solve the pending challenges or are simply irrational. From the structure of the uploaded events, three fields of action can be identified, each having specific characteristics and needs:

- Reactions to "classic" disruptive events through crisis and emergency strategies,
- Dealing with complexity,
- Improvement of social decision-making processes

In particular, the results of the survey brought up a further dimension that needs to be considered as a cross-sectional issue when dealing with complexity and better collective decision-making processes: the world as a closed system with limited resources. This is a fact which is still given far too little consideration in policy decisions. This affects the capacity of the global ecosystem (keywords: climate change, shortage of resources), but also the unequal distribution of the consumption of these resources between developed and developing countries. These issues must be given consideration if decisions are to be made to prevent disruptive developments.

## Reactions to "classic" disruptive events

Contingency plans, dealing with critical infrastructures, civil protection measures, etc., which are not discussed here since established structures already exist which were not analysed are some of the possibilities to react to classic disruptive events. This much can be said: this is not an abstract theoretical discussion; it is only a matter of time before an event occurs in which these precautions will be urgently needed. The development of crisis intervention plans, contingency plans and training of the population – also traditional civil protection measures – as well as dealing with critical infrastructure are by no means obsolete.

Building up a social "resistance" (see Gunderson – Hollings, 2002, Thompson, 2008, among others) is another more important area. This could mean the preventative protection of vulnerable populations (such as pensioners or people who live in particularly high-risk areas) or simply the strengthening of civil society. Just as important is also the strengthening of globally acting institutions for overcoming disruptive events. Establishing the World Health Organisation (WHO), which could play a co-ordinating role in the event of a crisis, is an example. On a national level, institutions could be strengthened or established, which permanently deal with certain, potentially disruptive issues on an ongoing basis.

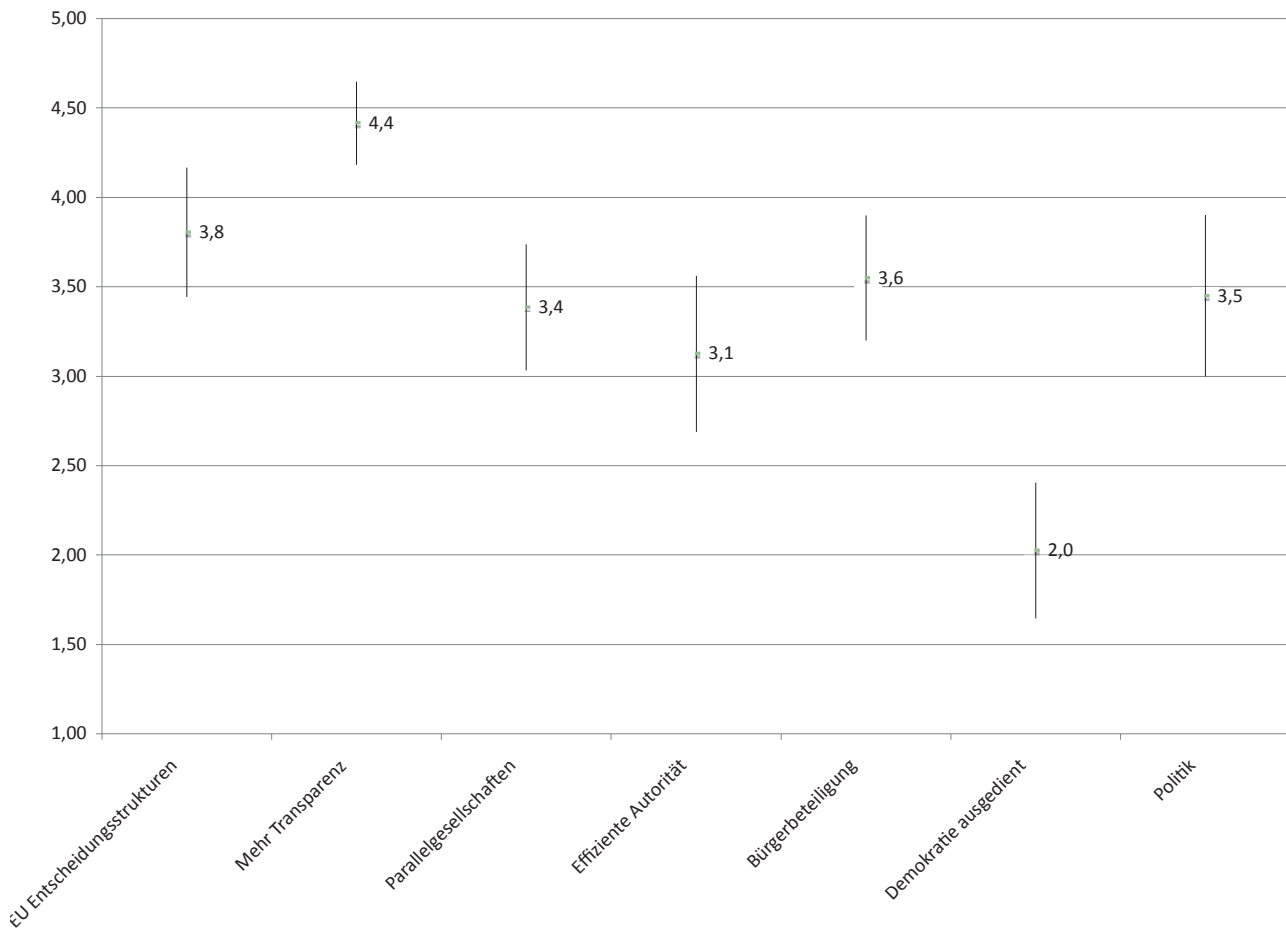
## Dealing with complexity

The survey results and comments of the participants can be summed up in the principle statement that great complexity can basically be dealt with in a meaningful way. But this requires a change in perspective, the focus of which should be more on the analysis of the interdependencies and interconnections. The common practice of regarding individual policy areas independently of one another is thus increasingly questioned.

Given the now ubiquitous complex systems, policy makers should seek to strengthen the positive effects of the different networks that characterise our world today. At the same time, measures must be implemented against the vulnerability of these systems. State authorities continue to play the central role in risk management. But civil society is challenged and also plays an important role.

As with all man-made phenomena, it is also possible to counteract complex systems. In general, this can work in two ways: on the one hand, policies could invest in better predictions in order to detect early signals of a possible disruptive event. On the other hand, existing systems could be effectively strengthened to deal with the events that occur.

Figure 3: Solution suggestions for dealing with collective decision-making processes



Source: own survey, n=41 | question: Please describe which strategies in your opinion help to improve society's collective decision-making processes? (1= not helpful to 5 = particularly helpful)

Therefore, a first political approach might be to accelerate national and international efforts to better understand and predict potential risks. For this, initiatives and investments in complex systems research are needed – also from an Austrian perspective. On an international level, movement can already be seen in this direction, which includes the Cambridge Project for Existential Risks or the Oxford-based Institute for New Economic Thinking and the Future of Humanity Institute. These institutes were founded only recently. There are also numerous think tanks that deal with complex systems. In Austria, for example, the department for complex systems at the Medical University Vienna or the International Institute for Applied Systems Analysis (IIASA) in Laxenburg.

A second approach could entail increasing the focus on the multi-disciplinary design of research projects. This should be the rule, not the exception, and should be accordingly implemented by research-support organisations.

### Improving the societal decision-making processes

The following three dominant problems arose in regard to societal decision-making processes:

1. Extracting political and economic institutions – a situation where the elite extracts the surplus from the system and thus the incentives for development of individual talents and the introduction of innovations decreases.
2. The influence of special interests on decisions.
3. The dominance of short-term decision calculi, which leads to long-term irrational decisions. The fundamental decision-making capability of policies is not questioned.



There is no standard recipe for these problems, which are also of course discussed in other contexts. Nevertheless, it would still make sense to launch a discussion on some issues that seeks a general social consensus. These need to be organised by institutions outside day-to-day politics. This would have the effect that certain topics – potentially disruptive developments – would stay on the agenda in the long term and that the policies would not be all too erratic.

A social consensus – which, for example, was possible in the use of nuclear energy in the past – also allows long-term priorities to be set and the broadening of the decision horizon – a central task set by the project "Austria 2050". Thus, the priority of short-term planning horizons could be pushed back.

Fighting extracting political and economic institutions is an economic and socio-political necessity, if long-term prospering development is to be supported. The only groups that could be against this would be those that have managed to install extracting arrangements and fear losing them or those that have already managed to accommodate their interest in the policy process.

The only decision-making processes that help against both these developments are those that are more transparent, more participatory and thus more open, as well as make it possible for the participation of everyone. This may be obvious, but in practice it is not necessarily easy. Here we need social innovations that change decision-making processes and provide a broader base. The critical point here is the influence on the decisions ultimately taken. Even now, we can "discuss everything", get many involved in it, but still fully negate the results of the discussions in the actual decisions. This approach makes the disruptive developments all the more likely.

A serious reform effort towards long-term and participatory decisions could correct the impression that politics, on the one hand could tackle the problems, but on the other hand are unwilling to take the right decisions because they are far too considerate of powerful groups with vested interests. ■

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## Notes

<sup>1</sup> The process of indentifying disruptive events ties in with international developments. Projects such as iKnow (<http://community.iknowfutures.eu/>), SESTI (<http://sesti.info/>) or the UN Millennium Project (<http://www.unmillennium-project.org/>) show that there are numerous methods and approaches to the subject. See also the comments by user Pynchon on this subject, DE no. 20 (table 1).

<sup>2</sup> User Elfriede Fuhrmann noted that disruptive events occur not only on a social level but also, of course, on a personal level. Disruptive events often already leave deep marks in childhood.

<sup>3</sup> Both of the other posts see positive developments due to a largely resource-related shift to vegetarian nutrition and alternative financial products as a consequence of the economic crisis.

<sup>4</sup> "Lust for power is the most flagrant of all passions" (Tacitus).

<sup>5</sup> For the most part, these events were ascribed to both categories – extracting institutions and special interests.

<sup>6</sup> E.g. Kuratorium sicheres Österreich (KSÖ), an organisation that deals with cyber security and cyber-crime.

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