SUSTAINABLE REASON-BASED GOVERNANCE AFTER THE GLOBALISATION COMPLEXITY THRESHOLD*

Andrei P. Kirilyuk
Universal Science of Complexity

Abstract

We propose a ***qualitatively new kind of governance*** for the emerging need to efficiently guide the densely interconnected, ever more complex world development, which is based on ***explicit and openly presented problem solutions*** and their ***interactive*** implementation practice within the versatile, but ***unified*** professional analysis of ***complex real-world dynamics***, involving both the powerful central units and the attached ***creative world-wide network*** of professional representatives.

This is the ***reason-based governance*** mode producing ***rigorously specified, objectively optimal problem solutions and progress directions*** for their ***recommended implementation*** by local and global actors involved, instead of obligatory, but poorly substantiated orders of the traditional, administrative kind of governance. While such reason-based governance provides the unique way to produce efficient solutions ***without conflicts*** with the existing governing structures, it is also flexible enough to form an ***efficient governance superstructure*** with respect to other governing bodies or models.

We provide ***fundamental and rigorous scientific arguments*** in favour of introduction of just that kind of governance at the modern development stage, after the ***complexity threshold*** in the real world dynamics evolution (sometimes intuitively designated as "globalisation"), where the traditional spontaneous-empirical kind of development and related administrative governance ***lose dramatically and inevitably their efficiency*** and the necessity of explicit consistent ***understanding and guidance of complex real-world dynamics*** becomes evident.

The ***main purpose*** of the proposed reason-based governance, underlying the evolving details of its structure, operation mode and efficiency control, is the historic ***transition to the genuine global sustainability***, i. e. permanent progressive development, without major crises, impasses and global catastrophes, which emerges as the ***only alternative*** to a quite probable catastrophic degradation regime and ***becomes real within the proposed governance model*** essentially based on the ***consistent understanding of unreduced real-world complexity and its objective laws***.

The ***sample concrete structure*** of reason-based global governance (subject to relevant efficiency-driven modifications) would include the unifying central unit of ***Global Complexity Analysis*** realising general strategy guidance, superior complexity level control (global intelligence, socio-ecological issues), and supervision of the constructive interaction of all units. The same central governance structure would contain also major units of ***Analytical Council*** (with the main governance output of consistent problem solutions and development directions), ***Practical Realisation Departments*** (for the resulting development monitoring) and ***Data Analysis System*** (computer data accumulation, analy-

* Work submitted for the Global Challenges Prize 2017.

sis and simulations for and within all units), all of them working in permanent constructive interaction with the ***world-wide network*** of ***Local Divisions*** (interactive solution realisation and monitoring), including local versions of the above central functions.

Those major units are subdivided into ***consistently specified*** directions around the ***unified sustainability purpose***, such as ***Sustainable Production Processes***, ***New Energy Sources and Power System Security***, ***Green Settlement and Sustainable Infrastructure Systems***, ***Sustainable Investment and Creative Governance Systems***, ***Human Capital Development***, ***Catastrophic Risk Analysis and the Global Security System***, and ***Efficient Knowledge Creation System***. They are chosen in accord with the causally complete understanding of the ***entire global system*** development and will evolve correspondingly.

The ***main result*** of all units' activity is the ***provably consistent solutions*** of all essential problems and the equally ***consistent choice of major development directions and accents***. These results are proposed ***openly*** to the entire world community and more specifically to all local governing bodies involved, thus ***strongly increasing global responsibility*** at all levels. In a longer perspective, traditional administrative governing bodies may be recognised as redundant and merged in their professional part with the world network of reason-based governance, while in the immediate future they should be interested in creative realisation of the proposed reason-based solutions (open to efficiency-driven modifications). These solutions specify major features of global importance, while many details of local importance can be specified by local governing bodies, in constructive interaction with Local Divisions of the global governance network.

The main principle of the ***global government work estimation, control and development*** is the ***practical efficiency*** of the proposed, ***properly personalised problem solutions and development accents***. Personalisation means concrete ***personal responsibility for the elaborated solutions***, where every accepted (and personally signed) general result of the contributing team can be accompanied by individual, clearly different versions from separate team members.

This well-specified personal responsibility is the ***important qualitative difference*** (including the ***superior level of equity***) of the proposed reason-based governance mode from the collective responsibility of traditional administrative governance. It involves the ***permanent rotation of reason-based governance contributors*** determined by the ***practical efficiency of the proposed personalised solutions***. There are no elections or major administrative decisions in the government personnel rotation, which is based instead on the quality (practically confirmed efficiency) of personalised solutions. This is also the criterion for the initial choice of global governance participants, where the efficiency of solutions is understood at the beginning as their internal consistency in terms of complex real-world dynamics.

The proposed governance structure and dynamics are compatible with the emergent ***new system of financial support and other resource distribution***, combining the intelligent central sources with business-like distributed models in local solution implementation and replacing the traditional administrative system by a ***unified system of various interactive enterprises*** (including NGOs), which naturally follows the demands of complex real-world dynamics in terms of maximum progress efficiency.

1. Reason-Based Global Governance and Risk Management: The Context, the Purpose and the Principles

Modern world has now definitely entered into a very special period of *intense and critically growing change*, including *practically all* aspects of planetary dynamics and spheres of human activity, from the physical and chemical features of the Earth system dynamics or new energy systems to socio-economic and mental processes in its human dimensions. Variously interpreted and referred to as *global change*, *global risks* and *challenges*, simply *globalisation*, or else *Singularity*, that critical amplification of all interactions and the resulting acceleration of changes is a widely recognised and well documented tendency (see e. g. [1-10]).

The related critical growth of old and emergent new problems of global scale in the age of equally huge technological power has stimulated the creation of *various world-wide initiatives* and *management bodies* supposed to efficiently tackle those global change problems in order to approach the ultimate desired purpose of *sustainable development*. They include both older, post-war initiatives of the middle of the 20th century, such as the United Nations or UNESCO organisations, and more recent, few decades old global initiatives and committees, such as the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP), the World Climate Research Programme (WCRP), Diversitas, Future Earth, the International Council for Science (ICSU), and the United Nations Environment Programme (UNEP), among many others.

However, although they have mobilised considerable amounts of efforts and resources world-wide and contributed to attenuation of many growing risks or even tentative solutions to particular problems, these conventional bodies of global governance were *unable* to approach the necessary level of universally efficient world management and related transition to the genuine global sustainability.

Therefore today's critically acute old and new problems call for creation of the superior level of *provably efficient world governance* and global risk management ensuring the definite sustainability transition in all spheres of planetary life and human activity. This qualitatively new level of real problem solution inevitably needs respective *essentially deeper, totally consistent, rigorously substantiated and universally applicable understanding* of the true origin of modern world criticality and ways of its transformation to stable global progress.

In *this report*, submitted for the Global Challenges Prize 2017, we emphasize such qualitatively extended understanding of modern world problems based on the emerging unified science of *unreduced dynamic complexity* (including dynamical chaos and self-organisation) and its application to *construction of a provably efficient structure of global governance* with the necessary problem-solving power and sustainability transition management efficiency (see e. g. [11-17]).

The *fundamental basis* of the proposed new level of global governance is the extended, *unified understanding* of the *genuine origin* of the current sustainability crisis as being due to the recent (global) transition through the *complexity threshold*, after which the always growing real-world complexity *cannot* be efficiently managed in traditional ways, either within the spontaneous-empirical vision of "invisible hand" dynamics or by the linear thinking of direct, or administrative, governance approach.

Below those recently attained critical levels of "globalised" world complexity (approximately until the end of the second millennium), the latter still could be generally efficiently managed within the traditional governance paradigm, with the resulting uneven, but persisting progress. However, starting from some invisible complexity threshold, attained just due to that previous successful development, progress becomes first more difficult, then globally unstable, and then turns rather quickly into growing degradation tendencies, *despite* the always growing and globally expanding technological power. This nontrivial and deeply rooted phenomenon of complexity threshold constitutes the *unified origin of critically growing global risks* and underlies the *objective* necessity of the *superior level* of global governance that should be based, both in its structure and activity, on the *consistent understanding of the unreduced real-world complexity dynamics*.

The ensuing major *principles* of the new level of global governance include therefore:

– the *unambiguous, consistent understanding* of major features and laws of the unreduced world complexity, leading to what we call *sustainable reason-based governance* (as opposed to incomplete, empirically guided vision of traditional government);

– respective *intelligent, reason-based governance mode* of the new level based on the *supreme power of the provided provably valid problem solutions*, rather than traditional formally imposed orders (unsuitable for efficient global governance in any case);

– respective *flexible and objectively efficient internal structure and operation* of the global management bodies of all levels guided by the *provably correct understanding* of real-world complexity development and related problem solutions;

– *distributed interactive hierarchy* of reason-based global management, ensuring the optimal "soft power" of permanently progressing understanding of real-world complexity and the *personal, concrete responsibility* for the proposed, objectively best problem solutions;

– *fundamentally absent factors of any subjective influences* in the reason-based governance and the related *permanent, dynamic rotation of participants* based on the *resulting efficiency of the proposed personalised problem solutions and development ways*.

It is important to emphasize that these principles and the underlying *purpose of genuine sustainability transition* are based on the *causally complete, mathematically rigorous understanding of real-system complexity* due to the *unreduced interaction analysis*, confirmed by successful applications at various complexity levels, including modern social

and ecological system development, biomedical problems, the origin of intelligence and consciousness, and complex computer and communication system dynamics (in addition to lower-complexity phenomena from fundamental physics) [11-17]. It naturally incorporates and extends other approaches to real-world complexity by providing the *unified* picture of *unreduced* complexity dynamics, beyond any approximate models.

This unified picture of real-world complexity includes useful general *laws and principles of real complex system behaviour* multiply confirmed by various applications, such as the universal symmetry (conservation and transformation) of complexity, the complexity correspondence principle, the complex-dynamical control principle, and the free interaction principle (the exponentially huge power of unreduced many-body interaction processes).

In particular, the complexity correspondence principle states that a system from a given complexity level can be correctly understood, simulated, or managed only within a *higher-complexity* system dynamics or vision, which provides the *rigorous fundamental substantiation* for the modern necessity of a *superior governance level* for efficient management of real world development beyond the complexity threshold.

In summary, the desired superior level of global governance objectively emerges as the unified, but distributed hierarchical complex system of reason-based, provably optimal, rigorously substantiated problem solutions, with highly interactive, but strictly personal responsibility of suitable real-world complexity professionals. Further details of real government structure and operation realising the principles of this section are considered below.

2. Efficient Global Governance Structure and Operation for Sustainable Management of the World Complexity Growth

The structure, composition and operation mode of the efficient global governance system are determined by the above *complexity correspondence principle*, according to which it should be the *properly designed complex system* itself, with its operational dynamic complexity *exceeding* that of the managed global system dynamics, while both of them necessarily *grow* in the course of global system evolution. The inability to satisfy this fundamental condition in the traditional governance system is the unified origin of modern *complexity crisis* and related catastrophically growing global risks (section 1).

It follows from this condition that the efficient system of global governance should be realised as a *unified, but hierarchically structured, multilevel and highly interactive system*, which issues *well substantiated*, *provably optimal* and *completely open recommendations* to local and global actors involved, in the form of *consistent and properly specified problem solutions* (explaining also the rigorously provable consequences of departure from the proposed solutions). Those recommendations and problem solutions must reflect the complex-dynamical nature of interconnected and hierarchical global system dynamics, including *various intrinsically related time scales*, from short-term to long-

term evolution dynamics. The underlying analysis can only be based on the *causally complete solution* to the *unreduced interaction problem*, obtained with the help of all available analytical and computer tools.

We emphasize the output kind in the form of well substantiated recommendations, instead of obligatory "administrative" decisions of traditional governance systems, which reflects both the intrinsic features of complex dynamics and the practical condition of independent decision-making power of various national and private actors involved.

The dynamical *structure* of the efficient world governance naturally emerges then as a *few-level central world unit* (issuing the above open recommendations) essentially supported and *closely interacting* with the *suitable hierarchies of local units*. The internal multilevel structure of both global and local system parts will consist of at least *two directly connected layers* of "Analytical Council" elaborating consistent problem solutions and "Practical Realisation Departments" dealing directly with the proposed solution application and various interactive practical details.

The latter layer of *Practical Realisation Departments (PRD)* is somewhat closer to (but also different from) traditional government bodies and can be further divided into sublayers, if necessary (depending on the real problem complexity for different activity directions). It does not issue orders, but follows real system development in all important directions and surveys the results of introduced changes, as well as public knowledge about these results and the system development. Similar to the Analytical Council, the PRD member rotation should mainly depend on the efficiency of their activity, estimated by the objective success of the accepted solution implementation and respective information exchange (in concrete parts of their direct responsibilities).

The former, *superior* layer of *Analytical Council (AC)* is the *totally new feature* reflecting the essential difference between the traditional and new kinds of governance. It is an interactive, but independent body issuing the recommended problem solutions, *directly and easily accessible to the entire global community*, and bearing the *well-specified personalised responsibility* for them. The individual responsible AC members have the right to their *individual amendments* to the proposed general solutions, and *their permanent rotation depends directly and exclusively on the practical success of all particular solutions they personally elaborate and support* (with a sufficiently low threshold for member replacement in the case of inefficient or no efficient solutions they proposed). By contrast with conventional governance bodies, the member rotation does not depend on any, internal or external, voting system or any other subjective, administrative decisions.

Although these central units of global governance can interact with all existing structures of local governments and information services (already through the open publication of the proposed and consistently substantiated problem solutions), the efficiency and coherence of global governance activity will be greater in the case of its *more direct and permanent support from respective Local Divisions (LD) of the same global governance structure*, which can be designed as local AC and PRD versions monitoring local sys-

tem development and its government actions in order to implement the global problem solutions proposed by the central units and provide the latter with all necessary information.

In addition to constructive exchange during elaboration of problem solutions and their implementation, the existence of Local Divisions (naturally favoured by local governing bodies) *solves the problem of interaction between the global and local (traditional) government bodies*, without violating the independence of the latter and the efficiency of the former. The advantages of such interaction, including the absence of any obligatory orders or pressures from the global governance bodies, should be clearly presented to local governments, with the expected result of their constructive collaboration.

The detailed *internal structure* of the global and local reason-based governance bodies (in both their AC and PRD layers) should reflect the *hierarchy of the unreduced dynamic complexity* within *the main sustainability purpose*, from lower-level physical aspects to (global) intelligence and socio-ecological development, and the related *hierarchy of most important problems and challenges*, with flexible changes properly following their ongoing evolution. Therefore this internal structure of contributing groups and divisions should not be fixed once and for all and can vary according to real-time necessities (with the permanent main rule of problem solution and progress direction efficiency). They also stay in permanent and direct interaction with each other, reflecting the connections between respective real-world systems and features, as well as their well-defined hierarchy (from less to more dynamically complex entities and levels).

For an example of suitable internal structure, one may start with the list of global challenges and problems mentioned in the reports of the Global Challenges Foundation and other existing organisations of global change monitoring, ordering them hierarchically by the dynamic complexity levels they reflect. In this case, the superior unifying department of *Global Complexity Analysis (GCA)* will preside the AC and PRD layers concentrating on the highest complexity levels of global intelligence and socioecology and also surveying the proper interaction within the whole hierarchy of world complexity, its problems and challenges (but without any administrative subordination system). Below there will be sustainability-oriented departments of *Sustainable Production Processes*, *New Energy Sources and Power System Security*, *Green Settlement and Sustainable Infrastructure Systems*, *Creative Governance Systems*, *Human Capital Development*, *Catastrophic Risk Analysis and the Global Security System*, *Efficient Knowledge Creation System*, and maybe some others, dealing with currently important problems and challenges, while all of them will rely on the unified information processing department of *Data Analysis System (DAS)* collecting and analysing the global dynamics data and provided eventually with the evolving artificial intelligence system (including "data mining", "machine learning", and other evolving complex digital technologies).

As a result, the ***tentative organisation scheme*** of the proposed ***complex-dynamical Global Governance System*** can be summarised as follows (with the noted interactively realised functions and output, in the form of *consistent problem solutions*):

Global Complexity Analysis (GCA): *global intelligence, socio-ecology, general guidance, unit interactions*

1. Analytical Council (AC): *consistent problem solutions and development directions*

1.1. Sustainable Production Processes
1.2. New Energy Sources and Power System Security
1.3. Green Settlement and Sustainable Infrastructure Systems
1.4. Sustainable Investment and Creative Governance Systems
1.5. Human Capital Development
1.6. Catastrophic Risk Analysis and the Global Security System
1.7. Efficient Knowledge Creation System
1.8. …

2. Practical Realisation Departments (PRD): *resulting development monitoring*

2.1. Sustainable Production Processes (local and global results)
2.2. New Energy Sources and Power System Security (local and global results)
2.3. Green Settlement and Sustainable Infrastructure Systems (local and global results)
2.4. Sustainable Investment and Creative Governance Systems (local and global results)
2.5. Human Capital Development (local and global results)
2.6. Catastrophic Risk Analysis and the Global Security System (local and global results)
2.7. Efficient Knowledge Creation System (local and global results)
2.8. …

3. Data Analysis System (DAS): *data analysis and computer simulations for all units*

4. Local Divisions (LD): *interactive solution realisation and monitoring with AC/PRD*

Note that a high degree of *interactivity*, *evolution* and omnipresent *creativity* (related to the *objective criterion* of efficient sustainability transition) is assumed for this global governance structure and operation scheme by the underlying principles of complex-dynamical system development (see section 1 and the next section 3).

As the described complex-dynamical global governance structure and operation generally resembles a living organism or a unified system of interactive enterprises, rather than a rigidly centralised administrative system, it should use the respective *flexible system of financial support and resource distribution* combining intelligent centralised sources (especially for global units) and interactive contributions from interested global and local players (including governments and NGOs), determined by particular project and problem solution successes.

3. Creative Reason-Based Governance Provably Solves Problems and Ensures Genuine Sustainability in the Post-Industrial World

The following *qualitatively new features* of the proposed reason-based global governance constitute its *qualitative difference* from traditional governance system and essential *advantages* for the *global sustainability transition*, the key task of our critical time:

– governance structure and operation at all levels ensuring *consistent understanding of complex development dynamics* with the ensuing *rigorously substantiated problem solutions* and *objectively optimal development directions* (as opposed to usual blind, empirically guided search and arbitrary guesses, becoming inefficient and globally risky now, above the complexity threshold in the global civilisation development);

– governance activity results in the form of *objectively correct, properly substantiated problem solutions* and *creative development proposals*, which are *openly* and widely presented for free application and practical use (instead of obligatory, but poorly substantiated and often subjectively motivated orders in the traditional governance practice);

– *intrinsically creative*, complex-dynamical governance structure and operation based on the rigorously substantiated picture of unreduced real system dynamics (instead of usual administrative rigidity and its linear thinking approach);

– superior and *personal responsibility and human rotation criterion*, in the form of explicit and provably efficient problem solutions (instead of diffuse collective responsibility);

– explicit emergence of the indispensable function of *planetary (global and local) social consciousness* of the human civilisation organism (instead of mere social instincts dominating and being generally successful before, but not any more now, above the complexity threshold);

– *unified, provable, and the only definite cure for global risks* by the intrinsically creative and *truly sustainable development* (optimal complexity growth, in accord with the universal, rigorous progress criterion);

– compliance with, and natural application of, the *universal, exact, and multiply confirmed complexity development laws* guiding and supporting sustainable development practice, even without error-prone sophisticated calculations (instead of simplified, but illusively "exact", and therefore always misleading formal "models" in conventional practice);

– in particular, compliance with the *complexity correspondence principle*, where the rapidly growing global system complexity above the recent complexity threshold can be efficiently managed *only* within the proposed *new kind* of higher-complexity governance structure, operation and methods oriented towards the *superior complexity level of genuine sustainability*;

– emergence of creative, open, permanently evolving, explicitly efficient and omnipresent *interaction network of global development agents* of all levels (instead of traditional irreducible separation of governing structures from the monitored system "volume" of people, enterprises, and development results);

– emergence of convincing, omnipresent, explicitly efficient and unifying *examples of successful reason-based behaviour everywhere*, serving as additional amplification of the proposed complex-dynamical development paradigm (as opposed to the traditional divides between promises and results, intentions and practices, formal law and real order, different prosperity groups, etc.);

– the unique possibility of *democracy preservation* in modern "saturated" world by its *qualitative development to the superior complexity level* of reason-based, explicitly conscious governance hierarchy (as opposed to fundamental limitations of usual, spontaneous-empirical and administrative governance of unitary democracy, now becoming critically insufficient and therefore increasingly unstable).

As a result, the proposed new level of global (and eventually local) governance leads not only to solution of accumulated problems, but also to the new, superior quality of life and intrinsically sustainable development of the entire planet (see also the next section).

4. Conclusion: Towards the Intrinsically Progressive World of Efficiently Guided Complexity Growth

As noted in previous sections, traditional empirically driven, spontaneous and administrative "symptomatic treatment" governance has definitely, *fundamentally* lost its efficiency today, after the global civilisation development has crossed the invisible complexity threshold (which is intuitively described by a general term of "globalisation").

Further *optimal development of civilisation complexity* resulting in the *genuine sustainability* is only possible within a *superior-complexity system of multilevel reason-based global governance*, outlined in previous sections, with the single alternative of inevitable catastrophic degradation (the destructive mode of entropy-complexity growth towards a "global chaos" regime), irrespective of the efforts applied at this fundamentally saturated complexity level of traditional administration.

Whereas this conclusion is rigorously substantiated by the universal *complexity correspondence principle* (see sections 1-3), it can be practically implemented by initiation of the global governance bodies and world-wide network of the new kind, where major development guidance and problem solution tasks are realised by the *new, superior-level structures* (GCA, AC, PRD, DAS, LD) *and their interactive operation modes* (section 2) based on the *unreduced understanding of complex real-world dynamics* and thus equivalent to the *emergent genuine consciousness* of civilisation organism (until now limited to separated instincts and respective low-level "animal" intelligence).

The operation principles of this governing "global conscious brain", including *explicit and openly presented problem solutions* with due justification by the *unreduced complexity analysis* and *personal responsibility*, *constructive interactivity* throughout the global network, and *intrinsically creative* (rather than protective or limiting) approach and operation mode (sections 1-3), realise the essential *complexity transition* from the traditional predetermined, rigid framework of imperative administration to the *progress-oriented, naturally creative and flexible enterprise* regime, leading to the *qualitatively new kind of intrinsically sustainable development*, liberated from periodic crises and impasses inherent in the traditional, effectively blind unitary system dynamics.

In other words, based on the *consistent understanding of the unreduced global system complexity* and its optimal evolution, we obtain here the *historic transition* from the traditional randomly forced, "difficult" kind of progress, with its numerous obstacles, negative consequences and inevitable painful crises (culminating today), to the naturally, provably and permanently sustainable progress avoiding both local negative outputs and global saturation crises or development impasses.

The proposed superstructure of the conscious global-governance "brain" of the world civilisation organism is a natural realisation of the variously expected transition to the global Noosphere led by superior complexity development and ensuring the unique sustainable progress way, with the objectively specified purposes and optimal complexity development.

We see that the emerging need for the *efficient* global governance *cannot* be satisfied by a simple change of scale of the guided system, but must include the above nontrivial transition to *superior governance complexity level*, exceeding and therefore mastering the one of planetary civilisation progress above the globalisation complexity threshold.

Assessment Criteria

The assessment criteria are satisfied for the proposed global governance model in the following way.

1. Core Values

"Decisions within the governance model must be guided by the good of all humankind and by respect for the equal value of all human beings."

– The proposed governance structure and operation are based on the *universal rigorous criterion of progress* as optimal growth of unreduced civilisation complexity, providing the *consistent and objective expression* of "the good of all humankind", *without which* all subjective and intuitive good promises or intentions are *inevitably broken* by omnipresent contradictions between individuals and population groups. In other words, we provide and practically use the unique, universal and *provably objective definition* of the (maximum) general good, which otherwise may be not evident and subject to various diverging interpretations, in line with traditional governance modes.

– As the structure, operation and personnel rotation of the proposed new level of governance depend explicitly and exclusively on the *objectively substantiated* output of *consistent* problem solutions and development accents, the equal respect for all human beings (and their natural environment) is *guaranteed par excellence*. Any deviation will be immediately detected as *objectively incorrect solution*, with the ensuing *changes* in that solution and the responsible personnel.

– At the proposed superior governance level the demand of equality and general good *does not contradict* the *equally necessary demand* of (sustainable) progress, as opposed to all versions of traditional level governance, with its inevitable (but now unnecessary) groups of "losers" and periodic general crises (becoming deep and permanent after the complexity threshold, see section 1).

– The universal observance of the core values is additionally supported in the proposed governance structure by its *omnipresent network* of local branches, obeying the *same* unified principles of *independent objectivity* and *personal responsibility* (actually realising the important kind of equality also *within* the governing structures themselves).

2. Decision-Making Capacity

"Decision-making within the governance model must generally be possible without crippling delays that prevent the challenges from being adequately addressed (e.g. due to parties exercising powers of veto)."

– In the proposed superior-complexity governance model any subjectively imposed negative influences, including formal and informal veto powers, *do not exist in principle*, since the proposed "decisions", in the form of *objectively consistent problem solutions* and development directions (including the clearly designated consequences of their ne-

glect or violation), are openly announced, but *not imposed administratively*, also in agreement with the principle of local government and sovereign state respect.

– The proposed structure, operation mode, and principles of global governance (see especially section 1) imply the *new level of omnipresent (though properly distributed and uneven) progress*, or intrinsic sustainability, which *includes* the efficiency and realism of the generated problem solutions based on the unreduced civilisation complexity analysis.

3. Effectiveness

"The governance model must be capable of handling the global challenges and risks and include means to ensure implementation of decisions."

– The effectiveness of the proposed governance operation is ensured by the explicit condition of its openly announced and widely distributed output in the form of consistent problem solutions and the principle of the personnel choice and rotation depending on those (personalised) solutions results.

– The effectiveness of the proposed solutions and their implementation is additionally supported by the world-wide network of local representatives and collaborators (including local governments or their close contacts).

4. Resources and Financing

"The governance model must have sufficient human and material resources at its disposal, and these resources must be financed in an equitable manner."

– The *main, provably most efficient resource* in the proposed reason-based governance approach is the *intellectual human power* applied, which should and can be carefully collected and renewed from the entire world (for both global and local work), based on the main principle of consistent problem solution capacity.

– Correspondingly, in the proposed reason-based governance model one does not need huge material resources for the government work as such, while the resources participating in implementation of the developed provably optimal solutions actually result from the *(objectively) best redistribution* of *all* existing resources (with their resulting conservation inherent in the key property of sustainability). It can be achieved practically by a combination of intelligent (and relatively small) centralised financial resources and the distributed system of various interactively unified, but independently creative enterprises with business-like financial support from all involved (mostly local) sources.

– *Objective equitability* and *efficiency* of resource use and distribution is provided by the demand of the proposed solution *consistency*, taking into account the *unreduced civilisation development complexity* and thus actually *including* the optimal distribution of related resources.

5. Trust and Insight

"The trust enjoyed by a successful governance model and its institutions relies on transparency and considerable insight into power structures and decision-making."

– The *total openness*, clear content, and widest possible distribution of elaborated problem solutions is a major feature of the proposed governance model and the basis of its efficiency.

– The power of the proposed governance insight is additionally guaranteed by the *dynamically unified*, *open*, and *interactive* character of the organisation and method applied (unreduced complexity analysis) underlying the necessary coherent realisation of multi-level sustainable solutions.

– The *world-wide network* of contacts and project participants ensures the efficient interaction with, and involvement of, local power structures, thus contributing essentially to the maximum transparency and trust features.

6. Flexibility

"In order to be able to fulfil its objectives effectively, a successful governance model must contain mechanisms that allow for revisions and improvements to be made to its structure and components."

– *Flexibility* (related here to the superior property of *creativity*) is an *intrinsic feature* of unreduced complexity dynamics underlying the structure and operation mode of the proposed governance model.

– A major manifestation of the proposed governance flexibility is the *personal responsibility* for the proposed problem solutions and respective permanent *personnel rotation* depending on the solution efficiency, without any subjective influences.

– The *very basis* of the proposed reason-based, superior-level governance operation assumes the possibility of its *efficient combination and interaction* with other, global and local, governing structures, e. g. with a more direct power of obligatory decisions, which should be stimulating for the reason-based governance efficiency in real-world conditions.

7. Protection against the Abuse of Power

"A control system must be in place to take action if the organization should overstep its mandate, e.g. by unduly interfering with the internal affairs of nation-states or favouring the special interests of individuals, groups, organizations, states or groups of states."

– Any major abuse of power is *naturally excluded* from the proposed reason-based governance operation mode, with its permanently controlled personal responsibility for the elaborated solution efficiency (and respective personnel rotation) and without any subjective profits of the administrative kind of governance.

– Any subjective deviations from the condition of optimal efficiency are additionally controlled by the *hierarchy of intense free interactions within the world-wide governance network*, liberated from any administrative pressures and obeying only the universal principle of personal responsibility.

– Protection against any subjective influence of the proposed governance mode is a natural feature of the underlying greater property of *intrinsic sustainability* (of both civilisation development and its efficient guiding), implying the explicitly dominating main purpose of *objectively optimal, openly estimated problem solutions and development directions*, with other, subjective inclinations having obviously minor importance.

8. Accountability

"It is a fundamental requirement of a successful governance model that it performs the tasks it has been charged with, and the governance model must include the power to hold the decision-makers accountable for their actions."

– Contrary to collective responsibility of the traditional, administrative governance mode, the proposed reason-based governance realises the principle of personal responsibility and respective personnel rotation, which is equivalent to the omnipresent automatic accountability at all levels, controlled and realised in real time by the main governance dynamics itself (with "accounts" in the form of explicitly proposed problem solutions and their implementation results).

– Being the effective conscious "brain" of the guided social organism of global civilisation (see Sections 2.2 and 2.3), the reason-based global government inevitably provides its major accountability by its very existence, since it is one of the basic properties of consciousness.

References†

1. L. Szombatfalvy, *The Greatest Challenges of Our Time* (Ekerlids, 2010). https://api.globalchallenges.org/static/files/the-greatest-challenges-of-our-time.pdf.
2. Global Challenges Foundation, https://globalchallenges.org/en/about/background.
3. J. Leyre (Ed.), *Global Catastrophic Risks 2017* (Global Challenges Foundation, 2017). https://api.globalchallenges.org/static/files/Global%20Catastrophic%20Risks%202017.pdf .
4. W. Steffen, J. Jäger, D. J. Carson, and C. Bradshaw (Eds.), *Challenges of a Changing Earth*, Proceedings of the Global Change Open Science Conference, Amsterdam, 10–13 July 2001 (Springer, Berlin Heidelberg New York, 2002).
5. J. Jäger, "Summary: Towards global sustainability", In: [4], p. 201.
6. J. C. Lillo, "Challenges and road blocks for local and global sustainability", In: [4], pp. 193–195.
7. M. Rees, *Our Final Hour: A Scientist's Warning: How Terror, Error, and Environmental Disaster Threaten Humankind's Future in This Century—On Earth and Beyond* (Basic Books, New York, 2003).
8. A. Toffler, *Future Shock* (Bantam, New York, 1984).
9. Vernor Vinge, "The Coming Technological Singularity: How to Survive in the Post-Human Era", originally in *Vision-21: Interdisciplinary Science and Engineering in the Era of Cyberspace*, G. A. Landis (Ed.), NASA Publication CP-10129 (1993), pp. 11–22. http://mindstalk.net/vinge/vinge-sing.html.
10. V. Burdyuzha (Ed.), *The Future of Life and the Future of Our Civilisation* (Springer, Dordrecht, 2006).

11. † A. P. Kirilyuk, *Universal Concept of Complexity by the Dynamic Redundance Paradigm: Causal Randomness, Complete Wave Mechanics, and the Ultimate Unification of Knowledge* (Naukova Dumka, Kyiv, 1997). arXiv:physics/9806002.
12. A.P. Kirilyuk, "Unreduced Dynamic Complexity, Causally Complete Ecology, and Realistic Transition to the Superior Level of Life", Invited talk at the conference "Nature, Society and History" (Vienna, 30 Sep - 2 Oct 1999), *hal-00004214* (2005), p. 1-15.
13. A. P. Kirilyuk, "Towards Sustainable Future by Transition to the Next Level Civilisation", Invited talk at the Symposium "The Future of Life and the Future of Our Civilisation" (Frankfurt am Main, 2-6 May 2005), In: *The Future of Life and the Future of Our Civilisation*, Ed. V. Burdyuzha (Springer, Dordrecht, 2006), p. 411-435. arXiv:physics/0509234; hal-00008993.

† References [11-17] were not included in the original version submitted for the Global Challenges Prize 2017 because of the competition rules.

14. A.P. Kirilyuk, “Universal Dynamic Complexity as the Basis for Theoretic Ecology and Unified Civilisation Transition to Creative Global Sustainability”, Report presented at the Global Change Open Science Conference (Amsterdam, 10-13 July 2001), *halshs-00068142* (2006), p. 1-9.

15. A. P. Kirilyuk, “Universal Science of Complexity: Consistent Understanding of Ecological, Living and Intelligent System Dynamics”, Invited talk at the International Conference “Describing Complex Systems 2006” (Brijuni Islands, 12-14 June 2006), *arXiv:0706.3219* (2007), p. 1-13; *hal-00156368*. In Russian: *Nanosystems, Nanomaterials, Nanotechnologies* **11** (2013) 679-700.

16. A. P. Kirilyuk, “Dynamic Origin of Evolution and Social Transformation”, *Nanosystems, Nanomaterials, Nanotechnologies* **11** (2013) 1-21. arXiv:1212.1939.

17. A. P. Kirilyuk, *Theory of Everything, Ultimate Reality and the End of Humanity: Extended Sustainability by the Universal Science of Complexity* (LAP LAMBERT Academic Publishing, Beau Bassin, 2017). vixra:1802.0168.