Band 6

UNIVERSITY
SOCIETY
INDUSTRY

Beiträge zum lebensbegleitenden
Lernen und Wissenstransfer

Nino Tomaschek, Dario Unterdorfer (Hrsg.)

Veränderung

Der Wandel als Konstante unserer Zeit

WAXMANN

University – Society – Industry

Beiträge zum lebensbegleitenden
Lernen und Wissenstransfer

herausgegeben vom
Postgraduate Center der Universität Wien

Band 6

Nino Tomaschek, Dario Unterdorfer (Hrsg.)

Veränderung

Der Wandel als Konstante unserer Zeit

Waxmann 2017
Münster · New York

Bibliografische Informationen der Deutschen Nationalbibliothek
Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über http://dnb.dnb.de abrufbar.

University Society Industry, Band 6

ISSN 2194-9530
Print-ISBN 978-3-8309-3670-1
E-Book-ISBN 978-3-8309-8670-6

www.waxmann.com
info@waxmann.com

Umschlaggestaltung: Anne Breitenbach, Münster
Umschlagbild: © gyn9037 – shutterstock.com
Satz: Stoddart Satz- und Layoutservice, Münster
Druck: Hubert & Co., Göttingen

Gedruckt auf alterungsbeständigem Papier,
säurefrei gemäß ISO 9706

Inhalt

Dario Unterdorfer und Nino Tomaschek
Vorwort 7

I Unternehmens- und Arbeitswelten im Kontext der Digitalisierung

Velina Tchakarova
Global System Transformation: What to Expect from System Transition? 11

Karl F. Dörner und Gabriele Traugott
Wird die Planung und Steuerung in der Produktionslogistik durch die Renaissance der autonomen Multi-Agenten-Systeme revolutioniert? 29

Thomas Grisold und Markus F. Peschl
Change from the Inside Out
Towards a Culture of Unlearning by Overcoming Organizational Predictive Mind 45

II Neue Formen der Unternehmensfinanzierung und der Wandel des Finanzwesens

Ilona Orthwein
Veränderungen im Bereich Unternehmensfinanzierung durch Crowdfunding-Modelle 67

Kuno Haas
Das bankenunabhängige Finanzierungsmodell von Grüne Erde 85

Beat Weber
Geld (neu) erfinden? Bitcoin, Blockchain und die Geheimnisse des Währungs- und Finanzwesens 91

III Sozial-ökologische Transformationen in einer Postwachstumsgesellschaft

Ulrich Brand
Veränderung jenseits des Wachstumszwangs: sozial-ökologische Transformation als gesellschaftspolitisches Projekt 105

Ulrich Brand und Markus Wissen
Veränderungen unter Bedingungen der „imperialen Lebensweise“
Zur Ausbeutung von Mensch und Natur im globalen Kapitalismus 117

IV Regionalentwicklung im Wandel

Martin Heintel und Norbert Weixlbaumer
Regionalentwicklung 4.0
Widersprüche, Trends, Handlungsfelder und Thesen
für ländlich periphere Regionen 129

Thomas Eisenhut
What Empirical Experience is there with PPP Projects
and Policies in Europe?
The Interplant Cooperation of Small and Medium-Sized Enterprises
in the Cross-Regional Context: The Solid Case of a PPP Project
between European Regions 147

Autorinnen und Autoren 163

Herausgeber 165

Vorwort

Dario Unterdorfer und Nino Tomaschek

Getrieben durch technologischen Fortschritt sehen wir uns in der heutigen Zeit mit weitreichenden Veränderungsprozessen konfrontiert, die sich auf das alltägliche Leben, die Arbeits- und Wirtschaftswelt als auch auf gesellschaftliche Rahmenbedingungen auswirken. Einerseits stellen diese Veränderungen eine große Herausforderung für unser Zusammenleben dar und bieten andererseits Potenziale zur Weiterentwicklung und Verbesserung gegebener Verhältnisse.

Im Rahmen von Lectures und Workshops haben wir uns im sechsten Projektjahr intensiv mit dem Metathema „Veränderung" auseinandergesetzt und Veränderungsprozesse aus interdisziplinären Blickwinkeln beleuchtet.

Im unternehmerischen Kontext auch als vierte industrielle Revolution oder „Industrie 4.0" bekannt, sollen neue Technologien Produktionsprozesse und Kommunikationsmuster optimieren sowie neue Investitionsmöglichkeiten und Absatzmärkte erschließen. Die sogenannte „Digitalisierung" eröffnet Spielräume in der Gestaltung des Wirtschafts- und Arbeitslebens und verändert Arbeitszeiten, -organisation und -verhältnisse. Digitalisierung ermöglicht auch neue Formen der Unternehmensfinanzierung. Im Zuge von „Crowdfunding"-Modellen suchen (Jung-)UnternehmerInnen nach privatem Kapital, um ihre unternehmerischen Ideen umzusetzen. Wirtschaften ist zudem nicht mehr nur ausschließlich auf quantitatives Wachstum ausgerichtet. In einer Post-Wachstums-Ökonomie werden gewohnte Strukturen sowie Hierarchien hinterfragt und es entstehen neue Wirtschaftskonzepte, die auf ökologisch und sozial nachhaltigen Formen des Wirtschaftens sowie auf Teilhabe ausgerichtet sind.

Das vom Postgraduate Center der Universität Wien im Jahr 2011 initiierte Projekt „University Meets Industry – uniMind" verfolgt das Ziel, Wissenschaft und Praxis zu vernetzen und durch den Austausch von Wissen und Erfahrung einen Beitrag zu einer positiven wirtschaftlichen und gesellschaftlichen Weiterentwicklung zu leisten.

Als größte Bildungs- und Forschungseinrichtung in Österreich nimmt die Universität Wien damit eine wichtige gesellschaftliche Verantwortung wahr und ist bestrebt, das an der Universität gewonnene Wissen in die Gesellschaft hinauszutragen. Interaktiv gestaltete Workshops und interdisziplinäre Lectures bieten WissenschafterInnen und Personen aus Unternehmen sowie öffentlichen Institutionen einen Raum für kooperatives Lernen und fördern gezielt die Entstehung eines Netzwerks zwischen Universität, Unternehmen und öffentlicher Verwaltung. Auf diese Weise unterstützt uniMind die nachhaltige gesellschaftliche Entwicklung hin zu einer fortschrittlichen Wissensgesellschaft und innovationsbereiten Unternehmenskultur.

An dieser Stelle möchten wir uns herzlich bei unseren ProjektpartnerInnen, der Wirtschaftskammer Wien, dem Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft und der Initiative Wachstum im Wandel bedanken. Ohne ihre finanzielle und inhaltliche Unterstützung wäre die Initiative „University Meets Industry" in dieser Form nicht durchführbar.

Ganz besonders möchten wir uns bei allen Vortragenden und ExpertInnen des vergangenen Projektjahres bedanken: den WorkshopleiterInnen Florian Brand, Gerhard Fehr, Yvonne Franz und Jean-Robert Tyran sowie Ulrich Brand, Jörg Flecker, Hermann Schichl und Jürgen Schneider, die in den uniMind|Lectures einen praxisorientierten Einblick in ihre Forschungsprojekte gaben.

Für die Publikation gilt unser besonderer Dank allen Autorinnen und Autoren. Mit ihren Beiträgen unterstützen sie die interdisziplinäre Auseinandersetzung mit dem Jahresthema und leisten einen wertvollen Beitrag zu einer hochaktuellen wissenschaftlichen Diskussion. Darüber hinaus gebührt Marisa Tasser, Mareen Anders und Julia Lengers ein großes Dankeschön für die redaktionelle Unterstützung und die ausgezeichnete Zusammenarbeit.

„University Meets Industry“ wurde von der UNESCO-Komission als UN-Dekaden-Projekt „Bildung für nachhaltige Entwicklung“ ausgezeichnet. Die Auszeichnung erfolgt für Projekte, die einen Beitrag zur Profilierung einer nachhaltigen Bildungsarbeit leisten und dabei alle drei Nachhaltigkeitsdimensionen – Ökonomie, Ökologie und Soziales – gemeinsam berücksichtigen.

Ausgezeichnet von der
Österreichischen UNESCO-Kommission

I
Unternehmens- und Arbeitswelten im Kontext der Digitalisierung

Global System Transformation: What to Expect from System Transition?

Velina Tchakarova

1. Introduction

At the beginning of the 21st century, the Global System is undergoing a major transformation in its substantial subsystems – be it the natural or socio-economic ones. Following Heraclitus' wisdom that the only constant in life is change, it is safe to assume that changes are good for systems in terms of adapting to new realities. Nowadays, however, the Global System is facing changes of unpredictable speed and scope, whose sum creates complexity of higher order. Global finance, monetary policy, economy, trade and energy represent the main domains of man-made socio-economic systems and have the most significant impact on the Global System through intertwined processes and structures. In contrast to the natural systems, they do not possess "the same high level of sophistication and coordination" (Dixon, 2017, p. 79). Furthermore, non-linear dynamics are triggered by growing complexity and interconnectivity. These are rather dynamic than static transformational processes, which is why they are difficult to predict. While the interconnectivity of the main components of the Global System is boosted by globalisation and thus is a product of the diversity of multiple networks along the value-adding and production chains, the complexity results from the unprecedented speed and scale of changes that take place in the man-made systems. Given their simultaneous impact on the surrounding environment, this creates a network of immediate effects at global level, which constitutes a whole set of implications, much bigger than its elements taken together.

One could better understand transformational processes by looking at the Global System in its essence and by exploring changes of systemic character. The following paper aims to examine the current Global System from a theoretical and analytical point of view by outlining systems thinking as well as the modern approaches of systems science. Furthermore, it introduces a conceptual framework of the Global System, based on a network of interconnections between its most significant subsystems, while providing an approach how to track back substantial changes faced by the man-made systems. Thus, the analysis of the interconnections between the five man-made systems mentioned above gives a revealing insight into the ongoing changes as well as their impact on the Global System. The paper concludes by offering a perspective on possible outcomes of system transition regarding the Global System and, respectively, its subsystems.

2. Systems Theory and the Global System

There is a growing body of literature that recognises the importance of systems theory, which has been developed for quite some time and is generally being applied in various fields, starting with mathematics, engineering and physics to biol-

ogy to social sciences and humanities, and even to psychology (Parsons, 1951; von Bertalanffy, 1968; Luhmann, 1994, 2013; Maturana & Varela, 1980; Checkland, 1999 et al.). Essentially, systems theory encompasses scientific disciplines, interdisciplinary fields as well as theoretical approaches that explore and explain complex systems. One of its founders is the author of the General Systems Theory – the Austrian biologist Ludwig von Bertalanffy, who defines a system as a set of elements in mutual interactions, whereas the whole is more than the sum of its parts (1968, p. 18). Furthermore, it is noteworthy that the elements of a system can be described and studied as systems themselves, which is why the analysis of their interactions and connections is an insightful perspective of observation as well. Moreover, the system is in a relationship with both its elements (subsystems) as well as with its environment (Suprasystem) by receiving and giving back feedback through constant input and output.

Understanding the complexity of the Global System is vital and can be achieved by exploring system change within its subsystems as well as along the interconnections between them. The research to date has progressed on both the natural and socio-economic subsystems. Natural systems are main elements of the Global System and transformation has been extensively explored under the guise of the Earth System science (Lovelock & Margulis, 1974; Lovelock, 2001; Margulis, 1998; Gunderson & Holling, 2002; Stanley, 2005; Margulis & Sagan, 2007; Martin, 2011). In this regard, the Earth system science has identified nine planetary boundaries, which are aimed at avoiding major human-induced environmental change on a global scale (Rockström et al., 2009). More importantly, universal resilience patterns in complex networks have been studied, offering a perspective on how a collapse of ecological, biological or economic systems could be prevented (Gao, Barzel & Barabási, 2016).

Apart from that, a branch of systems research has explored and evaluated the socio-economic subsystems as it is the case with the World-systems theory and its application (Wallerstein, 1974; 1993). Furthermore, the research of man-made systems has extensively progressed, particularly concerning the globalisation and the 2008 financial crisis. The past few decades have witnessed rapid advances in the field of system research regarding the global finance, monetary, economy, trade and energy systems, which will be discussed in the individual chapters below.

However, few writers could draw from the research on the Global System from the perspective of combined natural and socio-economic systems or with respect to their interconnectedness to track back signals of system change. Carl Folke et al. (2002) argue that natural and man-made systems cannot be treated independently as they behave in a dynamic way. Moreover, the authors reveal "the tight connection between resilience, diversity and sustainability of socio-ecological systems" (2002, p. 37). In addition, Jianguo Liu (2007) has made the case for coupled human and natural systems. Furthermore, Bruckmeier (2016) has delivered a social-ecological theory, which outlines a sustainable transformation of interacting social and ecological systems.

To summarise, this paper emphasises the need for a combined approach regarding the connection between natural and socio-economic systems. It claims that the Global System cannot be equated with the Earth System, which encompasses only natural systems, nor with the Worlds-system, which focuses on man-made systems.

Rather, the Global System is to be understood as the system of all natural and man-made systems, which is surrounded by its natural environment, the space. In this regard, Costanza et al. offer a good rationale for the need of a Global System concept as they claim in a study that the relationship between natural and socio-economic systems is intertwined because of the "multidirectional connections between environmental stress and social change" (Costanza, Graumlich, Steffen, Crumley, Dearing, Hibbard, Leemans, Redman & Schime, 2007, p. 522).

3. The Global System as the System of all Systems

3.1 Conceptualising the Global System

Following the General Systems Theory of Bertalanffy, the Global System can be characterised by the interactions of its natural and socio-economic subsystems and the nonlinearity of these interactions (Walonick, 1993). The Global System is defined as a closed system following thermodynamics laws, which show that it only exchanges energy with its surroundings (sun) but no matter. The sun is the source of energy for Earth's biosphere, while the Global System returns energy through the natural cycle of photosynthesis. If only the cycle of energy exchange were considered, the Global System could indeed be classified as an open system. Furthermore, it is a complex system because of the constant interaction with its Suprasystem (space) as well as with its subsystems (natural and socio-economic), but it is also dynamic as it is exposed to interactions, whereas a change occurring in one of the subsystems induces a change in the other subsystems. Altogether, the Global System is highly complex due to the nonlinearity of the interconnected changes in its components, and thus it is exposed to random, complex and chaotic behaviour by all main subsystems.

Following the General Systems Theory (von Bertalanffy, 1968), the Global System can be characterized by what is applicable to systems in general, following the characteristics summarised by Mele et al. (2010, p. 129–130):

- Wholeness and interdependence means that the Global System is more than the Earth System of natural systems or the Worlds-system of socio-economic systems and thus it is comprised of interdependent natural and socio-economic subsystems;
- Suprasystem (space) and subsystems (natural and socio-economic subsystems);
- Self-regulation and control (particularly with respect to the natural subsystems, but not so much the socio-economic ones);
- Goal-oriented (the main goal is self-preservation);
- Input (energy, information) and output (constant flows of goods, services, capital, labour, data);
- The need for balance/homeostasis (through sustainability);
- Change and adaptability (constantly ongoing transformation);
- Equifinal (in natural subsystems the goal is to achieve a balance through the planetary boundaries of natural subsystems, while in socio-economic ones the goal is to achieve sustainability);

– Hierarchy and polarisation (unipolarity vs. bipolarity/multipolarity in the global order);
– Chain of influence (interdependence between all natural and socio-economic subsystems).

Based on these main characteristics, the Global System can be conceptualised as seen in Figure 1. The Global System receives a constant input from the natural subsystems, which generate energy from the sun. Multiple interactions then transmit the information through the energy system to the socio-economic subsystems and the exchange between them takes place. The outcome from these transactions results in the form of constant flows of goods, services, capital, labour and data, which then can be again improved via feedback, which is necessary for the balance of the Global System.

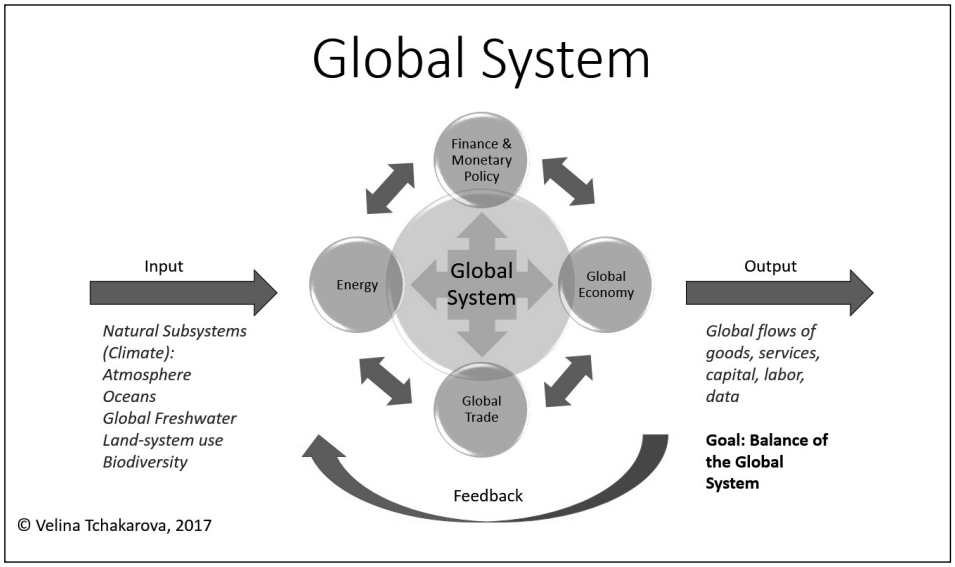

Fig. 1: Global System Concept

3.2 Natural Subsystems and the Planetary Boundaries of the Global System

In 1972, the Club of Rome carried out a study in which the interdependent components of the Global System were identified as systems of economic, political, social and natural character, but did not elaborate further on the concept of the Global System. Rather, the aim was to identify significant factors that could provoke a system collapse, which were found in the exponential growth of population and growth as basic behaviour of the world system (Meadows, 1972, p. 142). In this regard, the differentiation between natural and socio-economic subsystems seems necessary due to divergent system characteristics. The natural systems have been excessively analysed with respect to dynamic changes, interactions, and thresholds, where-

as nine planetary boundaries regarding the Earth system processes have been identified, among which climate change, ocean acidification, and biodiversity loss come to the fore (Rockström et al., 2009). Significant changes have already been shaping some of these natural subsystems such as biogeochemical flows or biosphere integrity, whereas others have been in the zone of uncertainty with an increasing risk for the Global System as it is the case with the climate or land-system change. There are, however, a few still stable systems such as fresh water use, ocean acidification or stratospheric ozone depletion (Steffen et al., 2015). It looks like some of these natural subsystems have additionally been exposed to man-made impact as in the case of climate change or biodiversity loss, but they still possess self-regulation mechanisms, which means that the intensity of intertwined changes does not threaten them with a collapse yet.

While changes in natural subsystems of the Global System can be observed through the concept of the planetary boundaries and even quantitatively estimated, there is still a strong need for a similar analytical conceptualisation of the main socio-economic systems, which would enable the analysis of their interconnectedness through a qualitative description in the first place.

3.3 Interconnectedness of Natural and Socio-Economic Systems

One of the main obstacles is to conceptualise the interconnection between natural and socio-economic systems as interdependent components of the Global System by bringing together the Earth System and the World-System science into an intradisciplinary framework. There is an urgent need to address this necessity as changes have become too comprehensive. Exposure to systemic risks (e.g. the 2008 financial crisis) has been proven to be related to adverse effects of Global System transformation and will be explained in the next chapters. In this context, one of the significant discussions in natural and socio-economic systems is related to the changes caused by human-related impact or decisions, however, little is yet known about the interconnectivity of systemic risks within the Global System.

Derived from the theoretical as well as the analytical part of the Global System, there is obviously a need for a comprehensive framework of the interconnectedness of man-made systems. It appears to be of utmost importance to analyse the transformation processes within these subsystems, particularly regarding the triggering effects of the Fourth Industrial Revolution as well as those of modern globalisation.

A primary goal of the Global System is balance through transformation, which is understood as an adaptation to changes that are systemic. Otherwise, one or more of its components could become dysfunctional and thus lead to system collapse. Given that the subsystems of the Global System – namely global finance, monetary policy, economy, trade, and energy – are facing interconnected changes, the options before the Global System remain reduced to system transformation (building resilience, sustainability) or collapse.

4. Main Socio-Economic Subsystems of the Global System

Natural systems have self-regulation mechanisms, man-made socio-economic systems not so much. They require a human problem solving approach as they were established through human intervention. Since the feedback these systems receive about dysfunctionalities only relates to a single system – be it economy, trade, finance, monetary policy or energy – and not to the combined effects of interconnected systemic risks, the human response is rather inadequate and thus cannot be systemically effective. Unlike in nature, where the balance is being preserved due to comprehensive feedback encompassing interconnected problem solving, the human intervention remains marginal. Under current circumstances, complexity results from the emergence of simultaneous systemic risks, which became quite apparent after the 2008 financial crisis.

Socio-economic systems have been established by the developed economies of the G-7 countries for several decades, flourishing with almost universal acceptance after the collapse of the Soviet Union and the end of the bipolar global order in 1990. Developing economies such as China and India, but also post-communist countries such as Russia, have integrated into and adapted their national regulation to these global networks of economy, finance, trade, monetary policy and energy. Thus, the following transformational processes of the socio-economic systems will be considered from the perspective of changes occurring in the developed economies due to their most apparent systemic significance.

In the following, the paper will explore the warning signals of major shifts and transitional changes within the most significant socio-economic subsystems. By doing so, it will identify relevant changes that might trigger a comprehensive Global System transformation if any of its subsystems becomes progressively dysfunctional or is even threatened with a collapse. In this regard, the analysis relies on the concept of signals (Malmgren, 2016) based on identifying triggering effects or major changes, which would require a system adaptation or might provoke a collapse.

4.1 Global Finance and Monetary Policy

The global monetary system consists of components, which regulate the exchange of world currencies and thus are essential for the existence of the global trade system, as traded products require a payment service. Furthermore, the global financial system resembles all financial legislation and institutions – public and private banks as well as international bodies such as e.g. the International Monetary Fund (IMF), the Bank for International Settlement, the World Bank et al. – conducting financial operations worldwide. Both the finance and monetary policy are closely intertwined and do substantially interact with the socio-economic systems of global economy and trade.

The most significant changes that the global finance system has been facing over the years after the 2008 financial crisis are linked to phenomena such as the systemically important financial institutions, particularly referred to as TBTF (*too big to fail*), the finalisation of global economy as well as a network of additional systemic risks resulting from the first two phenomena.

Global finance developments have been observed, particularly regarding the Big Banks (Popper & Eavis, 2016), which were becoming even bigger after the 2008 financial crisis, as well as the special role of the Central Banks – such as the US Federal Reserve (FED), the European Central Bank or the Bank of Japan – in coping with the post-2008 financial and economic crisis by launching low or negative interest rates, quantitative easing and other so called stimulus measures. In fact, the Central Banks have taken on the task of stimulating the global economy in a manner unthinkable before the financial crisis. However, they were also facing the negative effects from low rates as the chances of increasing their international reserves were drastically reduced, whereby even government bonds were no longer a safe asset. Profound changes were the result from Central Banks' policy, because they have put stability first by "capital preservation and a high level of liquidity of their reserves – at the expense of the return on their investments." (Bacalu, Fleuriet & Qureshi, 2017) Furthermore, it is apparent that even a small interest rate hike by the FED might generate dynamic changes within the financial and monetary networks nowadays.

The concentration of global corporate control following the 2008 financial crisis is another major concern in terms of systemic risks as it has explicitly shown that it had been predominantly concentrated in circa 50 corporations, among which the financial organisations represent by far the most control-holders of the network (Vitali, Glattfelder & Battiston, 2011). The ultimate consequence is that the network of financial organisations, which has largely contributed to the emergence of the 2008 financial crisis, is still existent, and the systemic risks arising from this network have not been reduced since then. On the contrary, systemic actors such as financial institutions or TBTF banks continue operating and even worse – they produced a larger concentration through mergers, becoming even bigger than they were back in 2008. Essentially, the network of systemic risks remains unchanged, generating a high degree of interconnection between the major global financial institutions. For example, Deutsche Bank, HSBC Holdings Plc and Credit Suisse Group AG were outlined as the greatest contributors to systemic risks in global finance in 2016 (IMF, 2016b). Furthermore, IMF determined that medium-term risks to global financial stability keep growing, while financial institutions in developed economies are adapting to low growth and low interest rates (IMFc, 2016).

The financialisation of economy emerged as another major phenomenon of the global finance system over the last few decades and is directly connected to the systemic risks embedded in the financial markets. It implies, as Turbeville (2013, p. 5) claims, a "process by which the volume and significance of financial instruments and contracts has grown relative to the economy as a whole." Turbeville (2015) sees financialisation as the leading cause of stagnating growth and increasing inequality of income and wealth due to capital allocation between financial and non-financial sectors of the economy. Even though these systemic problems have existed before the 2008 financial crisis, it is worth noting that they were significantly accelerated afterwards.

Global monetary policy rests predominantly on the confidence in the money economy, particularly in the US Dollar as the global leading currency since World War II. The monetary system has been facing challenges as trust in the system of national fiat money that has been established globally started shrinking since the 2008