

# Chapter 6

## Conclusion: Smart Quintuple Helix Innovation Systems



The Lancet Commission (2017) has released a critical report on the ecological status of the world, with the following core assessment:

Pollution is the largest environmental cause of disease and premature death in the world today. Diseases caused by pollution were responsible for an estimated 9 million premature deaths in 2015—16% of all deaths worldwide—three times more deaths than from AIDS, tuberculosis, and malaria combined and 15 times more than from all wars and other forms of violence. (Lancet Commission, 2017, p. 1)

In the report “State of the Climate in 2017,” published by the American Meteorological Society in August 2018, it is being stated:

In 2017, the dominant greenhouse gases released into Earth’s atmosphere—carbon dioxide, methane, and nitrous oxide—reached new record highs. The annual global average carbon dioxide concentration at Earth’s surface for 2017 was  $405.0 \pm 0.1$  ppm, 2.2 ppm greater than for 2016 and the highest in the modern atmospheric measurement record and in ice core records dating back as far as 800,000 years. The global growth rate of CO<sub>2</sub> has nearly quadrupled since the early 1960s.... In the Arctic, the 2017 land surface temperature was 1.6 °C above the 1981–2010 average, the second highest since the record began in 1900, behind only 2016. The five highest annual Arctic temperatures have all occurred since 2007. (Blunden, Arndt, & Hartfield, 2018, p. Sxvi)

The ecological indicators show that there is more of a global warming, where the released greenhouse gases are increasing and where also the temperatures are continuously rising further. This is even feeding speculations, whether the world may be entering a so-called “Hothouse Earth” scenario:

We explore the risk that self-reinforcing feedbacks could push the Earth System toward a planetary threshold that, if crossed, could prevent stabilization of the climate at intermediate temperature rises and cause continued warming on a ‘Hothouse Earth’ pathway even as human emissions are reduced. Crossing the threshold would lead to a much higher global average temperature than any interglacial in the past 1.2 million years and to sea levels significantly higher than at any time in the Holocene.... Collective human action is required to steer the Earth System away from a potential threshold and stabilize it in a habitable interglacial-like state. Such action entails stewardship of the entire Earth System—biosphere, climate, and societies—and could include decarbonization of the global economy,

enhancement of biosphere carbon sinks, behavioral changes, technological innovations, new governance arrangements, and transformed social values. (Steffen et al., 2018, p. 1)

In summary, it should be clear that all systems (subsystems, sectors, and subsectors) in a Quintuple Helix and a Smart Quintuple Helix Innovation System are performing a pivotal function, influencing each other. If more sustainable development is being considered (and demanded) on a national level, as a result of “global warming” (Carayannis, 2011), and if, for instance, more targeted investments in a specific Helix of the Quintuple Helix start flowing, then there will be a positive impact on all other subsystems and on the society as a whole. The Quintuple Helix model demonstrates that an investment in knowledge and a promotion of knowledge production bring into play new and crucial impulses for innovation, know-how, and the advancement of society. By initiating small steps toward sustainability, long-term and leading knowledge societies can emerge, which will live in balance with nature, and ultimately, perhaps, lead to a “green economic wonder.”

To conclude, the Quintuple Helix model makes it clear that the implementation of thought and action in sustainability will have a positive impact on society as a whole. The new quality management for more sustainability lies therefore in the creation of new knowledge, know-how, and innovation in balance with nature (see Carayannis & Campbell, 2010, pp. 58–62). One chief objective of the Quintuple Helix is to enhance “value in society” through the resource of knowledge. The discussion about the Quintuple Helix model indicates that striving for the promotion of knowledge as a “knowledge nugget” should be regarded as being essential (see Carayannis & Formica, 2006, p. 152): This means that knowledge is the key to and fore more sustainability and to a new quality of life. Today, knowledge is the “most fundamental resource” (Lundvall, 1992, p. 1). Nevertheless, whether a state (nation-state, beyond nation-state) is leading in different fields in the future will be primarily, if not even solely, decided by its potential to develop new knowledge, know-how, and innovation in balance with nature. However, the improved exchange of knowledge and the striving for knowledge, new know-how, and innovations through the Quintuple Helix model can be or at least offer a solution for the challenges of sustainable development under the aspect of global warming in the twenty-first century.

Mastering and balancing ecological issues and challenges (such as global warming) often are being depicted and presented as a theme of survival for humanity in a global format (e.g., see Steffen et al., 2018). Consequently, the European Commission (2009) can assert the major need for a greater “socio-ecological transition.” Social ecology makes the context of the natural environments for society and economy more visible and emphasizes an understanding of interaction and co-development of society and environment (nature). The Quintuple Helix Innovation Model (Carayannis & Campbell, 2010) bridges social ecology with knowledge production and innovation. *Here, the natural environments of society and economy challenge but also encourage and inspire knowledge production and innovation. In the approach of the Quintuple Helix Innovation Model, the natural environments of society are being identified as opportunities for driving further and excelling the sustainable development and coevolution of knowledge economy, knowledge society,*

*and knowledge democracy.* This also has a potential of influencing the way how we perceive and organize entrepreneurship.

Recent empirical evidence suggests further that there is by tendency a decoupling of economic growth from a further increase of energy sector emissions: “Private-sector incentives help drive decoupling of emissions and economic growth. The importance of this trend cannot be understated. This ‘decoupling’ of energy sector emissions and economic growth should put to rest the argument that combatting climate change requires accepting lower growth or a lower standard of living” (Obama, 2017, p. 1). *There is evidence that there can be and that there actually is economic growth and economic development that is environmentally and ecologically sensitive and that supports (and encourages) environmental protection* (see again the summary and presented overview in Obama, 2017). *This certainly indicates a road further into a promising and progressive future of human civilization (on this planet and beyond), where economic growth, sustainable development, and quality of democracy are coming together, where there is a coevolution of knowledge economy, knowledge society, and knowledge democracy* (Campbell, 2018). Eco-innovation and eco-entrepreneurship within diverse innovation ecosystems serve here as interesting and innovative examples (Carayannis, Barth, & Campbell, 2012).

The Quadruple Helix and Quintuple Helix regard themselves to be “human-centered” oriented. While for the Triple Helix model the existence of a democracy is not (per se) necessary for knowledge production and innovation, the Quadruple Helix is here more explicit. With the way how the Quadruple Helix is being engineered, designed, and “architected,” from that it is clear that there cannot be a Quadruple Helix Innovation System without democracy or a democratic context. The following attributes and components define the fourth helix in the Quadruple Helix: “media-based and culture-based public,” “civil society,” and “arts, artistic research, and arts-based innovation.” By this the fourth helix in the Quadruple Helix represents the perspective of the “dimension of democracy” or the “context of democracy” for knowledge, knowledge production, and innovation. This is particularly true when democracy is being understood to transcend the narrow understanding of being primarily based *on* or being primarily rooted *in* government institutions (within Triple Helix). Civil society, culture-based public, quality of democracy, and sustainable development convincingly demonstrate what the rationales and requirements are for conceptualizing democracy broader (Campbell & Carayannis, 2013a).<sup>1</sup> *Political pluralism in a democracy coevolves with the pluralism, diversity, and heterogeneity of knowledge, knowledge production, and innovation* (“Democracy of Knowledge,” see Carayannis & Campbell, 2009, 2012, p. 55). *We postulate here a congruence of structures and processes in democracy and in innovation systems.* The Quintuple Helix extends the Quadruple Helix by aspects of the “natural environments of society and economy,” “social ecology,” and the “socio-ecological transition.” Also this environmental context of society can be better addressed in a

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<sup>1</sup>To turn this line of thinking, autocracies are not interested to allow the development of a free and mature civil society. On the contrary, autocracies want to control and suppress the rise of an independent civil society.

democracy than in a nondemocracy. *The current world appears to be challenged by a race between developing democracies versus emerging autocracies over knowledge production and innovation* (Carayannis & Campbell, 2014, p 19).

At the beginning of our analysis, we have listed two research questions. The first research question was carrying the core of our whole analysis: *How do knowledge, innovation, and the environment (natural environment) relate to each other?* The second research question we have posed is: *What are key features of Smart Quintuple Helix Innovation Systems?* We will address now this second research question in terms of a draft and in the design making of a short “manifesto,” where we are putting forward several propositions to be further discussed.

*The theory, concept, and program of the Smart Quintuple Helix Innovation Systems refer to the following features, which can be regarded as hypotheses for strategy, policy-making, and decision-making.*

1. Environmental and ecological sensitivity should be regarded as key drivers for knowledge, knowledge creation, and knowledge production and innovation. So how can knowledge and innovation, which are environmentally and ecologically sensitive, be translated into economic success, economic growth, and economic development?
2. Long-term economic development and sustainable development are furthermore based on ecological and environmental sensitivity and finally have the potential to provide for higher or for more stable economic growth rates. This also refers to social ecology.
3. In the long run, there is more (and not less) economic growth in combination with environmentally (ecologically) friendly economic development and sustainable development. This represents a core assumption.
4. Environmental protection must be regarded also as an input and an investment in economic growth and for economic growth.
5. There is no alternative to democracy, not now and not in the future. Democracy is the future. Democracy encourages knowledge and innovation for quality of democracy within the framework of a knowledge democracy.
6. Knowledge economy, knowledge society, and knowledge democracy are based on knowledge and innovation, and (a) they understand knowledge and innovation as key drivers for economic growth and economic development, and (b) they understand environmental and ecological sensitivity as key drivers for knowledge and innovation.
7. *Smart (SmART, smart art) Quintuple Helix Innovation Systems see and appreciate “art” also as a manifestation of knowledge and innovation (in addition to art as a manifestation of aesthetics).*