UNITED NATIONS UNIVERSITY

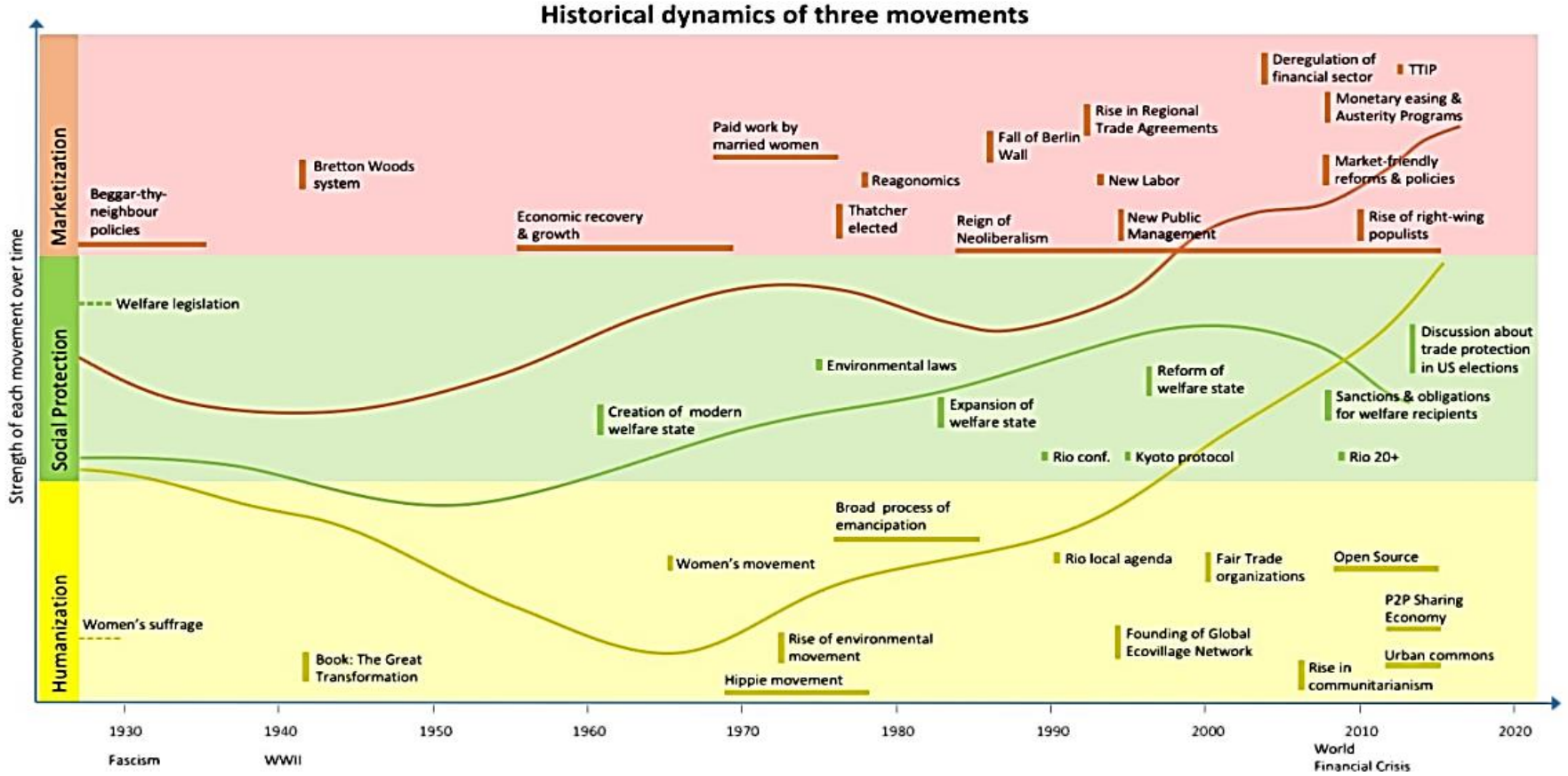
UNU-MERIT

Maastricht University

Socio-Technical Innovation for Sustainability: Digitalisation and Circular Economy

Dr. Serdar Türkeli , UNU-MERIT | UM
e-mail: turkeli@merit.unu.edu

Istanbul Chamber of Industry
Istanbul,
26 November 2020



Kemp et al. , 2019 Kemp, R., Strasser, T., Davidson, M., Avelino, F., Pel, B., Dumitru, A., ... & Weaver, P. (2016, September). The humanization of the economy through social innovation. In *SPRU 50th anniversary conference*.

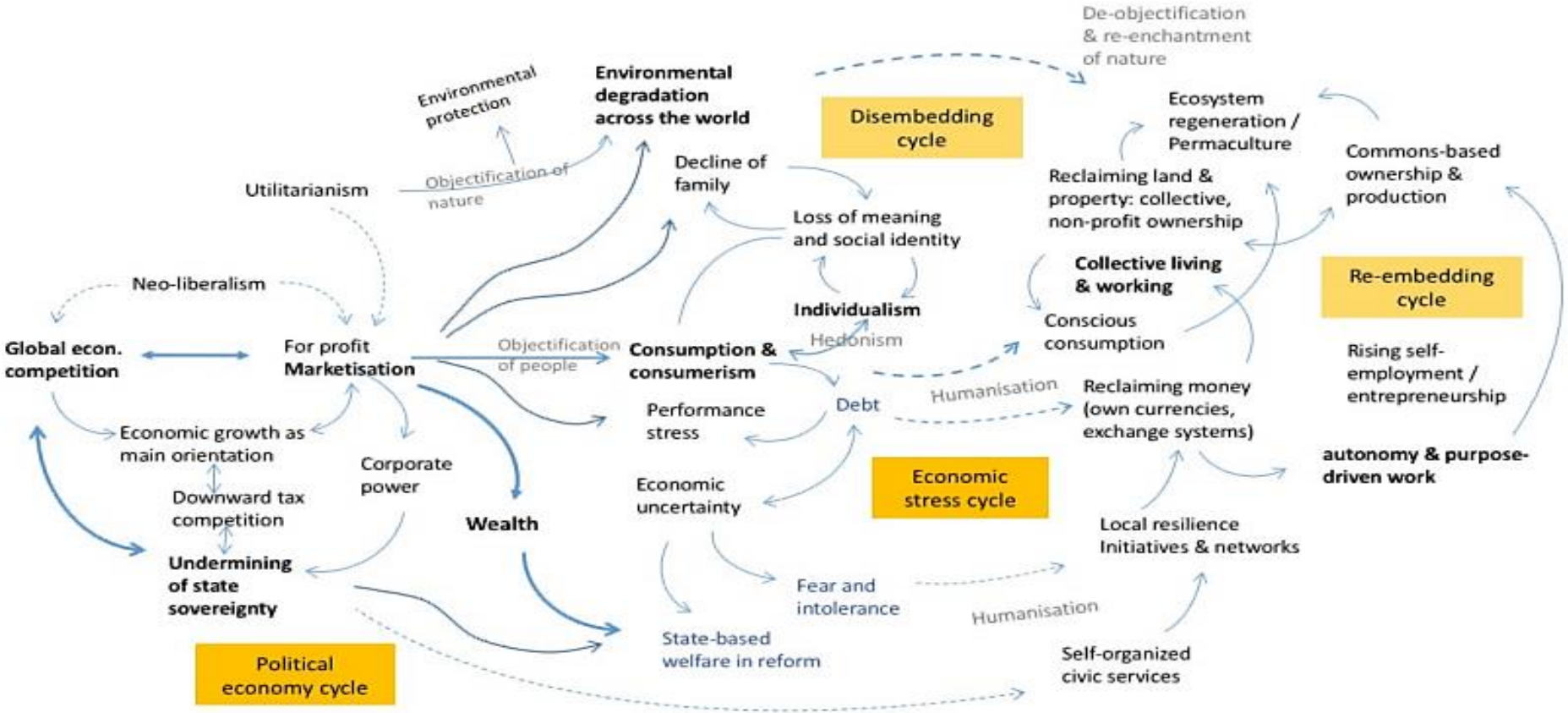
UNITED NATIONS UNIVERSITY
Maastricht University
UNU-MERIT

Layering and Transformation of Multiple Crises

…

11. **A Global and local structural healthcare crisis** *(e.g. high healthcare system costs (insurance, medicine, operations) plus high debt for education costs, leading to lack/low levels of personal savings and personal investments or if high, in general, feeds greed)* <->
12. **A Global and local contemporary housing crisis** *(e.g. low levels of personal savings leading to being increasingly dependent on lending for housing (mortgage), if not for housing, for other needs, not wants, due to lack/low levels of investment savings)* <->
13. **A Global and local financial crisis** (*e.g. Greenspan's team derivatives modelling flaw, and due to key performance criteria of financial providers private predatory lending practices, trade of non-real future options, swapping toxic credits overseas for needs and wants in developing countries*) <->
14. **A Global and local environmental crisis** (*e.g. carbon leakage, due to financial crisis, further exploitation of natural resources and outsourcing of production in order to close the gap of former financial loss, need)* <->
15. **A Global and local data privacy crisis** (*e.g. meanwhile manufacturing moving to/moved to overseas due to increases in digital services, servitization, and unregulated cybersecurity, legal gaps, alternative currencies, systemic hacks: Wikileaks, ransomware*) <->
16. **A Global and local trade crisis** (*e.g. anti-competitive state aid backed products and services leading to trade wars*)
17. **A Global and local humanitarian crisis** (*e.g. due to further exploitation of natural resources overseas and low level of livelihood quality of workers' overseas, refugee crisis etc.*) <->
18. **A Global and local political crisis** (*e.g. due to populism manipulating to a degree all of the ongoing crises and increasing nano and bio technological capacity of technonationalist implementation of big data and AI, flexible robotics, social scoring systems*) <->
19. **A Global and local Health crisis (COVID-19)** (*e.g. a zoonotic virus due to low level of nutritional capacity and states' intervention capacity in the livelihoods*) <->
20. **A Global and local crisis at individual and group level** (*e.g. racism, discrimination, social unrest*)

…



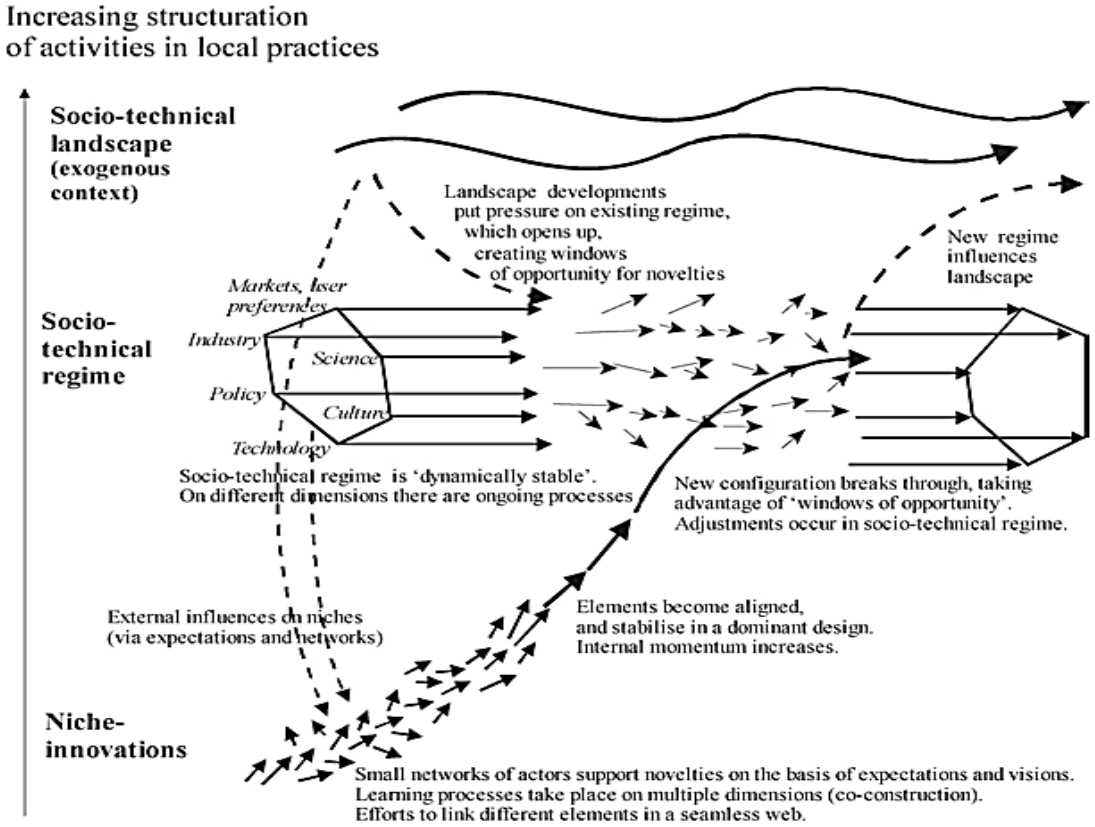
Ibid, Kemp et al. , 2019

UNITED NATIONS UNIVERSITY

UNU-MERIT

Maastricht University

Digital Economy and Circular Economy: Systemic Transitions & Change

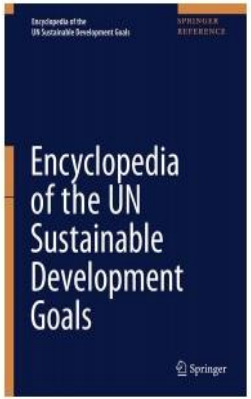


Source: Geels 2011

Türkeli and Kemp (2020) System Transition, Encyclopedia of UN SDGs, Innovation, Industry, Infrastructure, Springer (in Press)

Based on literature: Technological transitions, socio-technical transitions, sustainability transitions literature,

Sources: e.g. Kemp et al. , 2019; Geels 2004; Geels and Schot 2007, 2010; Loorbach 2007; Markard, 2012; Konnola, 2018, Turkeli 2020…



UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Socio-Technical System Actors and Domains

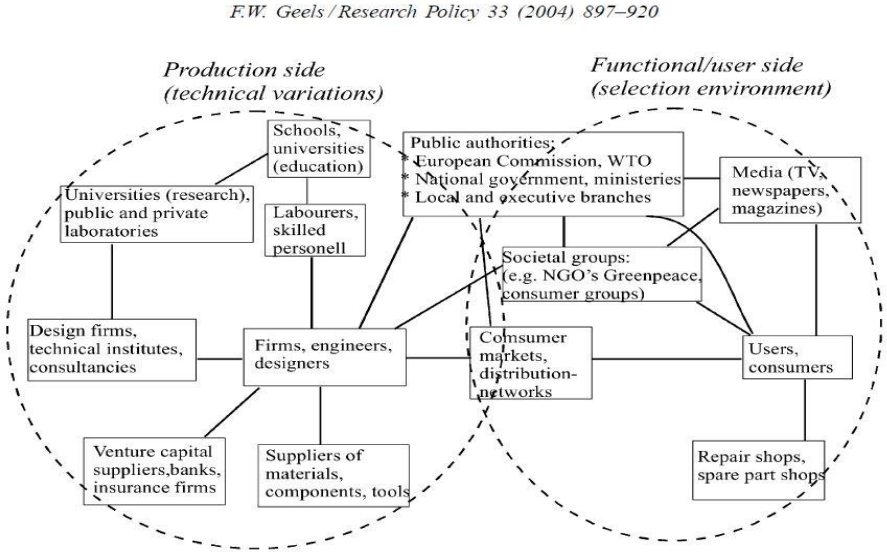


Fig. 2. Social groups which carry and reproduce ST-systems.

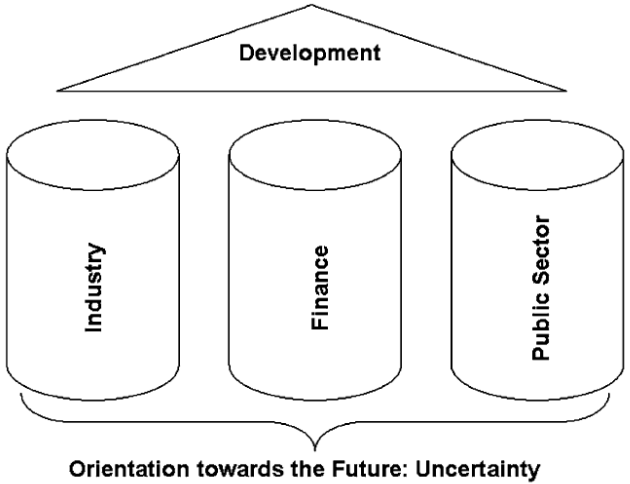
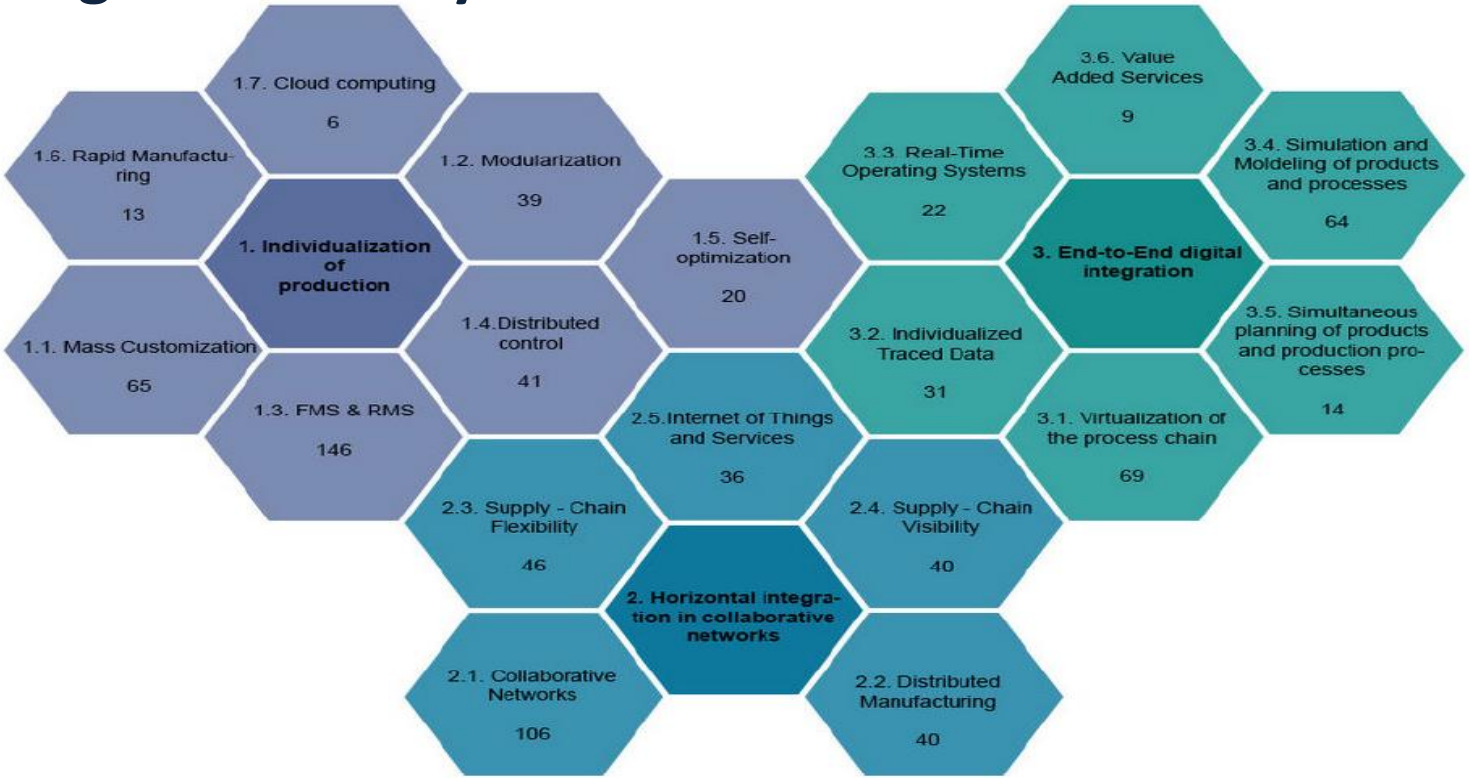


Fig. 1. *The three pillars of comprehensive Neo-Schumpeterian Economics.*

Hanusch, H., & Pyka, A. (2007). Principles of neo-Schumpeterian economics. *Cambridge Journal of Economics*, *31*(2), 275-289.

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Digital Economy and Transformation



Industry 4.0 related research streams; the numbers underneath the topics illustrate the assigned articles
Brettel, M., Friederichsen, N., Keller, M., & Rosenberg, M. (2014). How virtualization, decentralization and network building change the manufacturing landscape: An Industry 4.0 Perspective. *International journal of mechanical, industrial science and engineering*, *8*(1), 37-44.

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

The Latest Trends Digital Transformation

- Cyber security and privacy
- Personalization, Automation and Holistic view
- Rise of big data, AI, Blockchain, digital acryptocurrencies,
- Focus on home-office models, digital supply chains
- Data supply chains
- Collaborative digital channels
- Transparent and Advanced hybrid models
- Generational and Gender-based movements e.g. sustainable finance, development

Digital Economy and Transformation

Dijital Ekonomi 2 yatay-kesen (i, ii) ve 4 alan olarak toplamda 6 eksende çalışılmalıdır. Toplamda 41 ilk izleme ve değerlendirme konusu barındırmaktadır.

i. Dijital dönüşüm altyapısı: Bu noktada 13 izleme ve değerlendirme yapılmalıdır:
i.1) Teknoloji ve işletmecilikte devlet politikası
i.2) IT ürün tarifeleri
i.3) BİT harcamaları
i.4) Telekomünikasyon yatırımı
i.5) Denizaltı iletişim kablosu sayısı
i.6) 4G şebekelerinin kapsadığı yüzde veya nüfus
i.7) BİT erişimi ve kullanımı
i.8) Güvenli internet sunucuları
i.9) BİT yasaları
i.10) Genişbant hizmetlerinin maliyeti
i.11) Hız veya geniş bant hizmetleri
i.12) Fiber ağ
i.13) 5G geliştirme
ii. Siber Güvenlik: Bu noktada 5 izleme ve değerlendirme yapılmalıdır, ii.1) Yasal konular; ii.2) Teknik konular; ii.3) Organizayonel konular; ii.4) Kapasite Geliştirme; ii.5) Işbirlikleri

Digital Economy and Transformation

1. Kamu sektörünün dijital dönüşümü : Bu kontada 2 izleme ve değerlendirme yapilmalidir
1.1) G2G: Kamu kurum ve kuruluşları arasında e-devlet ara-çalışabilirlik (interoperability)
1.2) G2C: Vatandaşlar için e-devlet ve mobil devlet (m-devlet) uygulamaları

2. Özel sektörün dijital dönüşümü: Bu noktada 9 izleme ve değerlendirme yapılmalıdır:
2.1) BIT temelli Temelli Yenilikçi Çözümler üretim kapasitesi, marka ve patentleme
2.2) (Yerli , Yabancı) Teknoloji kullanımı
2.3) E-bankacılık (Finans)
2.4) Kredi kartı mülkiyeti (Finans)
2.5) E-ticaret pazarı
2.6) B2B dijital işlemler
2.7) B2C digital servisler
2.8) Açık veri kullanılabilirliği
2.9) AI geliştirme

Digital Economy and Transformation

3. Eğitimin dijital dönüşümü: : Bu noktada 7 izleme ve değerlendirme yapılmalıdır
3.1) Matematik ve fen eğitiminin kalitesi
3.2) Üçüncü derece eğitime (üniversite) kayıt
3.3) Telekomünikasyon uzmanları
3.4) Dijital yetenekler ve meslekler
3.5) Serbest meslek ve uzaktan çalışma
3.6) Dijital dönüşüm bilimsel yayınlar
3.7) Eğitim teknolojileri ve açık internet temelli eğitim

Digital Economy and Transformation

4. Sosyal sektörün dijital dönüşümü: Bu noktada 5 izleme ve değerlendirme yapılmalıdır

4.1) İnternet kullanıcıları

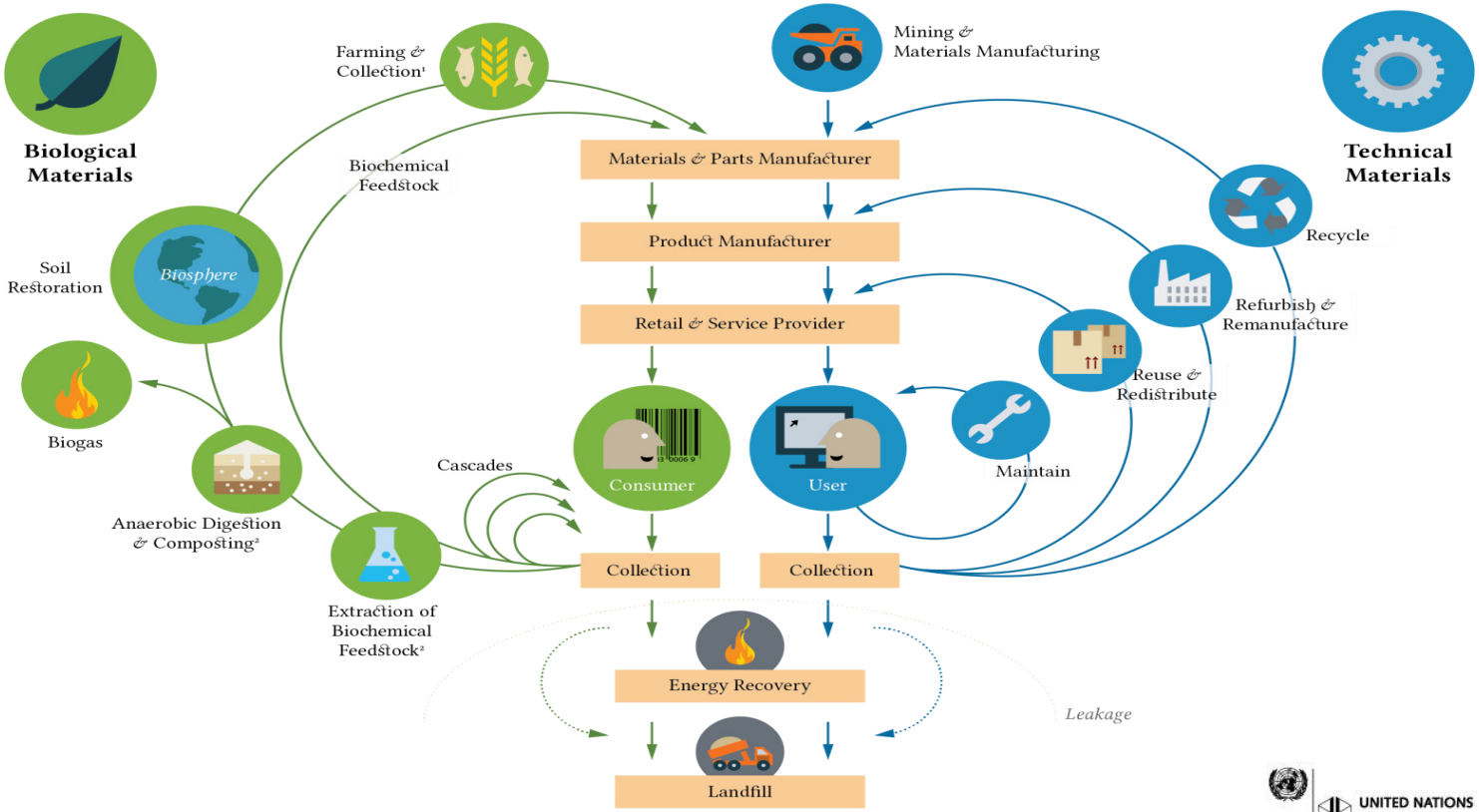
4.2) Vatandaş e-katılımı

4.3) Sosyal e-kampanyalar/bağışlar

4.4) Toplu farkındalık platformları

4.5) Birey ve Dijital Ekonomi

Circular Economy and Transformation



Source: Ellen MacArthur Foundation

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Circular Economy and Transformation

Technical Material Loops

- Repair (e.g. Electric Electronic Equipment, Textile)
- Reuse (e.g. Electric Electronic Equipment, Textile, Construction and Demolition)
- Refurbishing (e.g. Furniture)
- Remanufacturing (e.g. Electronic appliances)
- Recycling (e.g. recovery of materials)
- Waste-as-energy

Biological Material Loops

- Food Loss & Waste (e.g. Biogas)
- Composts & Fertilizers (e.g. Soil restoration)

Source: Ellen MacArthur Foundation

DUTCH AWEARNESS: IMPLEMENTING A COOPERATIVE ECONOMY THROUGH CHAIN INVESTMENT / A Digital Circular economy ?

In collaboration with Dutch aWEARness and PGGM, business models highlighting a cooperative economy and their financial effects on the value chain were explored.

Technology: Circular Track and Trace

CCMS is a **cloud data based platform software program**, where chain partners in the extended supply chain can share selected information related to the products they make. It includes a portal to the customers who buy the products and portals to supply chain partners and the government. Tracking and tracing of each step in the supply chain.

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

What can be done? Types of Eco-Innovation

A business model eco-innovation is a new business model that reshapes the way users receive value based on lower environmental impacts of products (goods and services) and the way these products are produced and delivered.

A business model eco-innovation is often an organisational eco-innovation, combined with process eco-technology and marketing eco-innovations, to produce and provide one or more product eco-innovations to consumers.

Business model eco-innovations usually put the superior environmental performance of a product eco-innovation at the centre of the customer value proposition.

Source: Kemp, René, Anthony Arundel, Christian Rammer, Michal Miedzinski, Carlos Tapia, Nicolò Barbieri, Serdar Turkeli, Andrea M. Bassi, Massimiliano Mazzanti, Donald Chapman, Fernando J. Díaz López & Will McDowall, 2019, Measuring Eco-Innovation for a Green Economy, *Wirtschaftspolitische Blätter, Special Issue on Nachhaltigkeit / Sustainability*, 66(4): 391-404,

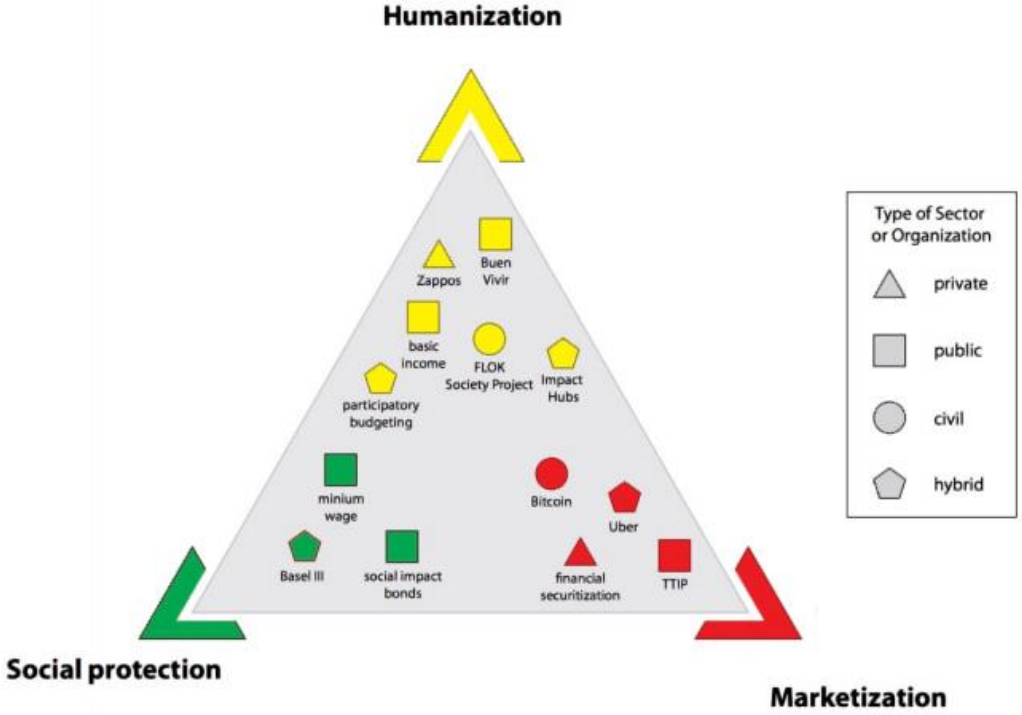
UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Types of Eco-Innovation

- A **product eco-innovation** is a new or improved good or service that generates lower environmental impacts compared to the products previously produced or used by the unit (see Section 2.2).
- A **process eco-innovation** is a new or improved process that generates lower environmental im- pacts compared to the process technology previously used by the unit (see Section 2.3).
- **An organisational eco-innovation** is a new or improved organisational method that contributes to lower environmental impacts compared to organisational methods previously used by the unit. (see Section 2.4). For practical purposes, it is useful to distinguish four additional types of eco-innovations:
- A **marketing eco-innovation** is a new or improved marketing method for commercialising new or improved products with lower environmental impacts, hence facilitating the adoption of these product eco-innovations by potential users (see Section 2.5).
- A **social eco-innovation** is a new social arrangement that is environmentally advantageous. Environmental advantages may result from a group of people using fewer natural resources, or from establishing principles of a circular economy among a group of people (see Section 2.8).

Source: Kemp, René, Anthony Arundel, Christian Rammer, Michal Miedzinski, Carlos Tapia, Nicolò Barbieri, Serdar Turkeli, Andrea M. Bassi, Massimiliano Mazzanti, Donald Chapman, Fernando J. Díaz López & Will McDowall, 2019, Measuring Eco-Innovation for a Green Economy, *Wirtschaftspolitische Blätter, Special Issue on Nachhaltigkeit / Sustainability*, 66(4): 391-404,

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University



Kemp et al. , 2019 Kemp, R., Strasser, T., Davidson, M., Avelino, F., Pel, B., Dumitru, A., ... & Weaver, P. (2016, September). The humanization of the economy through social innovation. In *SPRU 50th anniversary conference*.

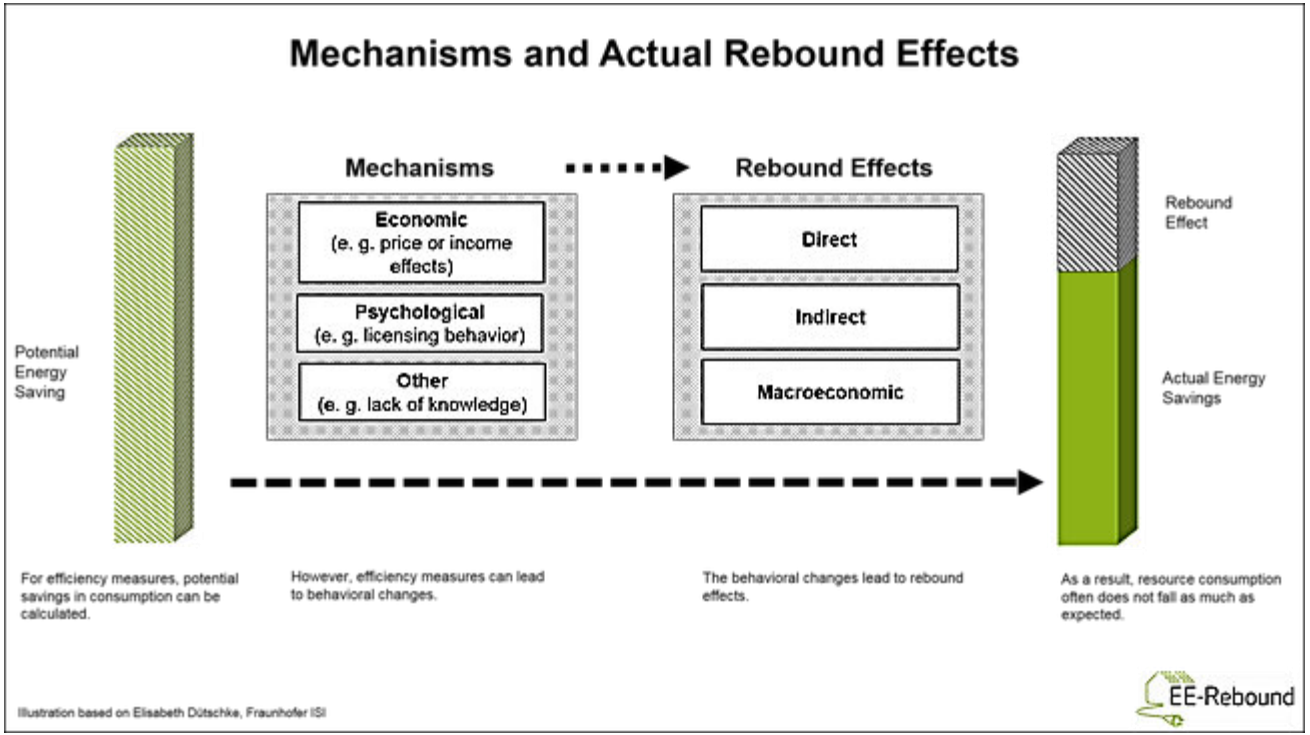
Keynesian Welfare - Schumpeterian Workfare
–> Neo-Schumpeterian Corridor

- Sustainable production
- Sustainable distribution
- Sustainable consumption

✓

- Sustainable finance?

Sustainable Consumption: Rebound effect for the case of consumers



Monetary reasons are often suggested:

When consumers save electricity, their expenses are reduced and money is saved. With this money they can consume more of the same or other products. In the case of direct rebound effects, this is called *the price effect*: more energy can be consumed for the same money. *Indirect rebound effects can occur from income effects* - incomes rise, more goods can be demanded.

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Possible Behavioral Changes and Effects of Efficiency Measures

A new, energy-efficient washing machine is purchased...

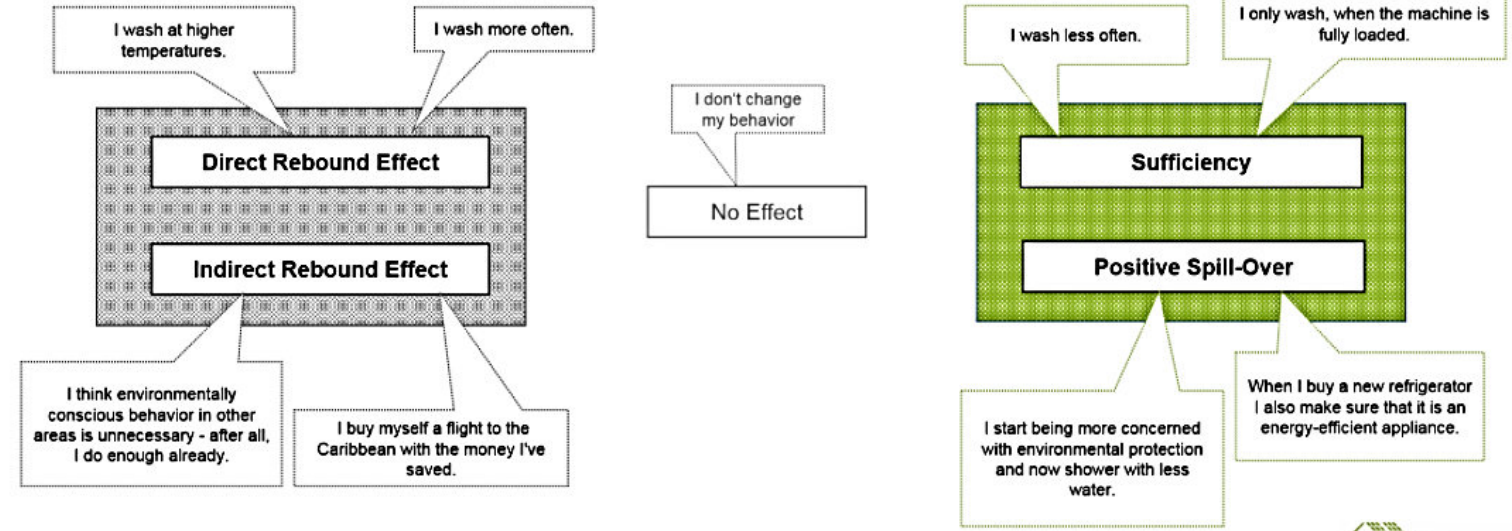
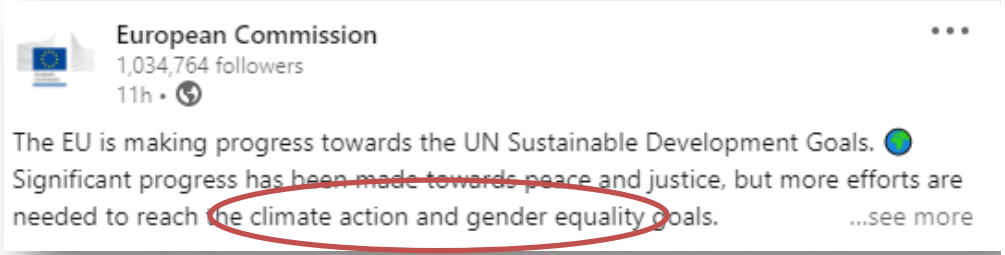


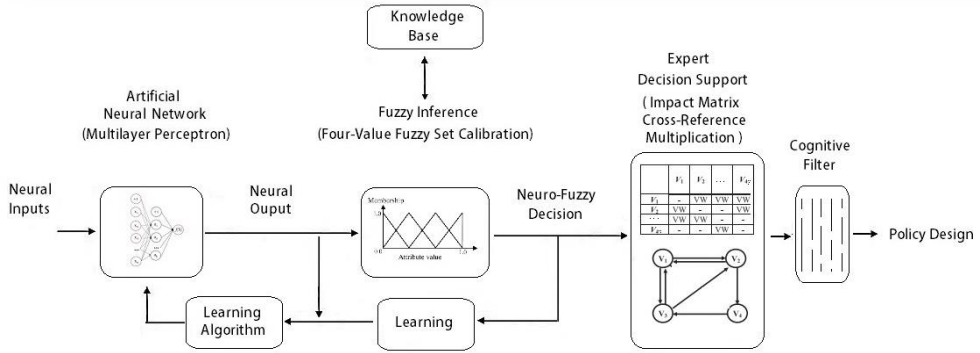
Illustration based on Elisabeth Dütschke, Fraunhofer ISI

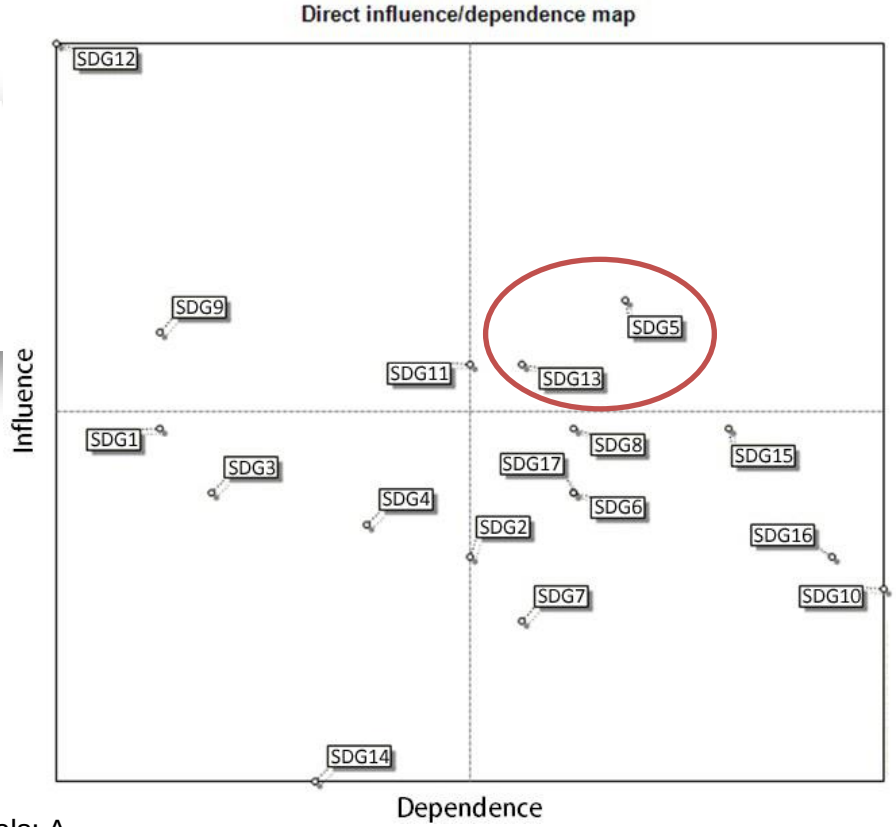
EE-Rebound

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Social Issues







Source: Türkeli S (2020). Complexity and the Sustainable Development Goals: A Computational Intelligence Approach to Support Policy Mix Designs. J Sustain Res. 020;2(1):e200006. https://doi.org/10.20900/jsr20200006

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Social Issues

Steve Glaveski , The Case for the 6-Hour Workday, December 11, **2018**
https://hbr.org/2018/12/the-case-for-the-6-hour-workday

Daniel Bernmar, Ignore the headlines: a six-hour working day is the way forward, **2017**
https://www.theguardian.com/commentisfree/2017/jan/06/ignore-headlines-six-hour-working-day-swedish

2020

The Commission's actions on social innovation stem from the Innovation Union initiative **(2010)** and of the Social Investment Package **(2013).**

Source: EC
https://ec.europa.eu/growth/industry/policy/innovation/social_en

Celbis, Mehmet Guney & Serdar Turkeli, 2015, Does Too Much Work Hamper Innovation? Evidence for Diminishing Returns of Work Hours for Patent Grants, *Journal Global Policy and Governance*, 4(1):
This study suggests that individual time is an important factor that needs to be considered in innovation research. We define two types of time: work time and free time. We find that work time has a positive but diminishing effect on innovative output such that after a certain point the innovation-enhancing role of work time is taken over by individual free time. Using a sample of OECD countries and Russia, we estimate a quadratic relationship between work time and per capita innovative output. ***For a hypothetical economy that has no other holidays but weekends, we estimate that individuals should not work more than about 6.6 hours a day for maximizing innovative output****. We also present a categorization of countries based on their innovative output and work hours that may kindle interest for certain case-specific future research.*

Key words: Innovation, Patents, Working Hours, Time, Neo-Capital Theories, Network Failures JEL Classification: O30, O31, J08, J22, M5

Wintjes, René, Serdar Turkeli & Florian Henning, **2013**, *Innovation Policy in Metropolitan Areas: Addressing Societal Challenges in Functional Regions*, Regional Innovation Monitor, Thematic Paper 6, European Commission.

Turkeli, Serdar & René Wintjes, **2014**, Towards the societal system of innovation: The case of metropolitan areas in Europe, UNU-MERIT Working Paper 2014-040

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Sustainable Finance

INDICES \ THEMATIC

ECPI Circular Economy Leaders Index

The Index selects the 50 top capitalized companies in the Global Market which are exposed to the opportunities offered by the Circular Economy.

EUR (Net Returns)

Last update: 13-Nov-2020

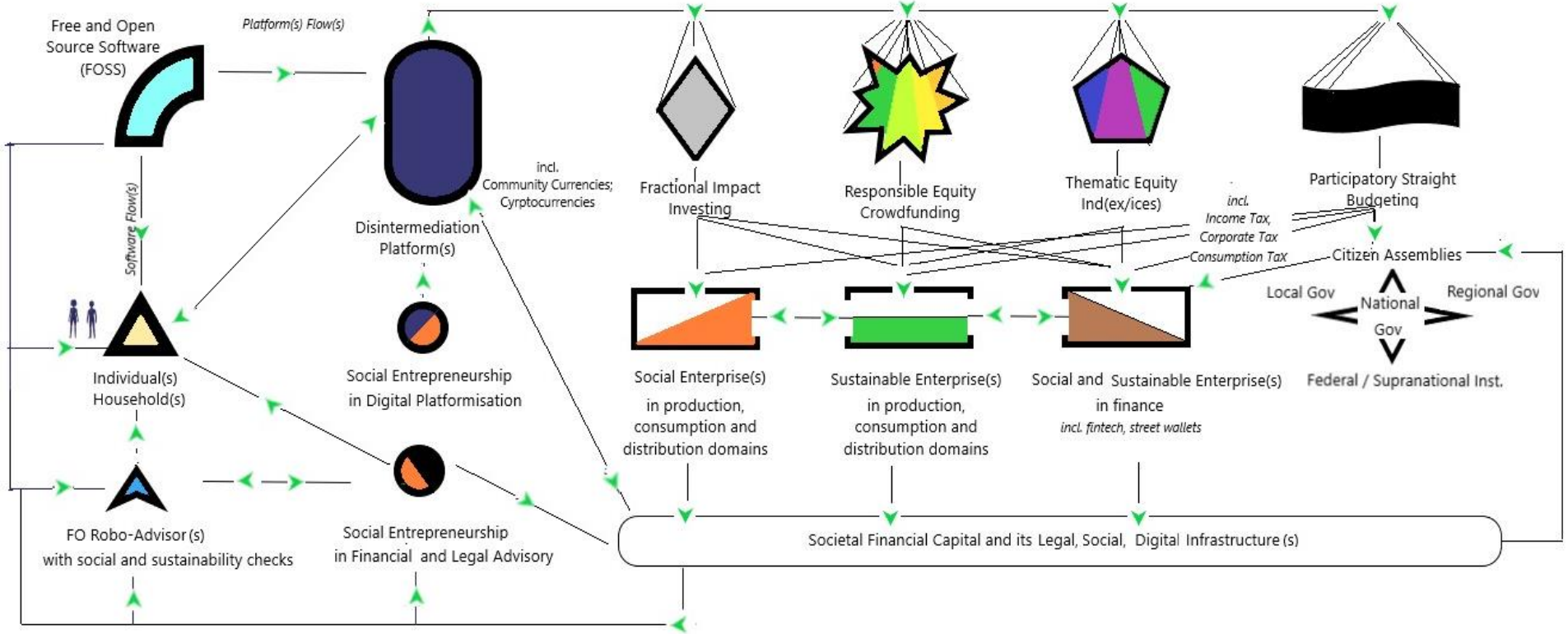
Ticker	GALPHCEN	YTD	7.18 %
Calculation	End-of-day	1Y	9.82 %
Components	50	3Y	38.96 %
Weighting	Equal Weighted	5Y	68.34 %
Excluded Sectors	YES	CAGR	16.6 %
Rebalancing Frequency	Semiannual	Annual Volatility	14.78 %
Last Value	2,952.70	Var 95%	-24.38 %
Daily Return	0.62 % (18.31)	Var 99%	-34.43 %
Weekly Return	4.03 %	Max Drawdown	-30.39 %

Resources

- PDF Index rules
- PDF Factsheet
- XLS Constituents
- XLS End of day level

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Niches and an Eco-system of New Finance

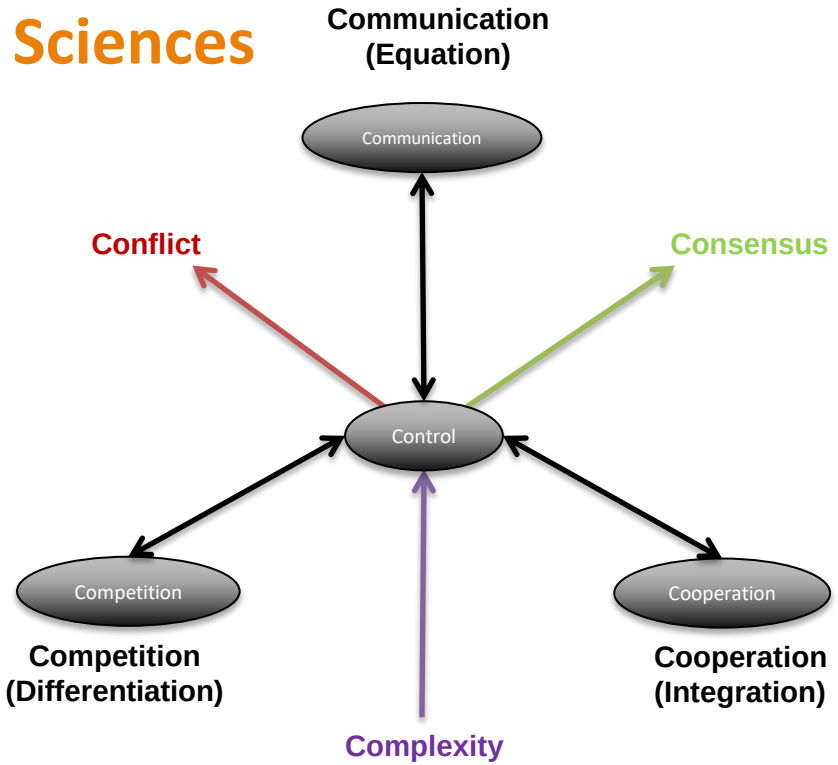


Source: Türkeli S (2020). Vrije Universiteit Brussel, Money and Law, Guest Lecture, Nov 16, 2020

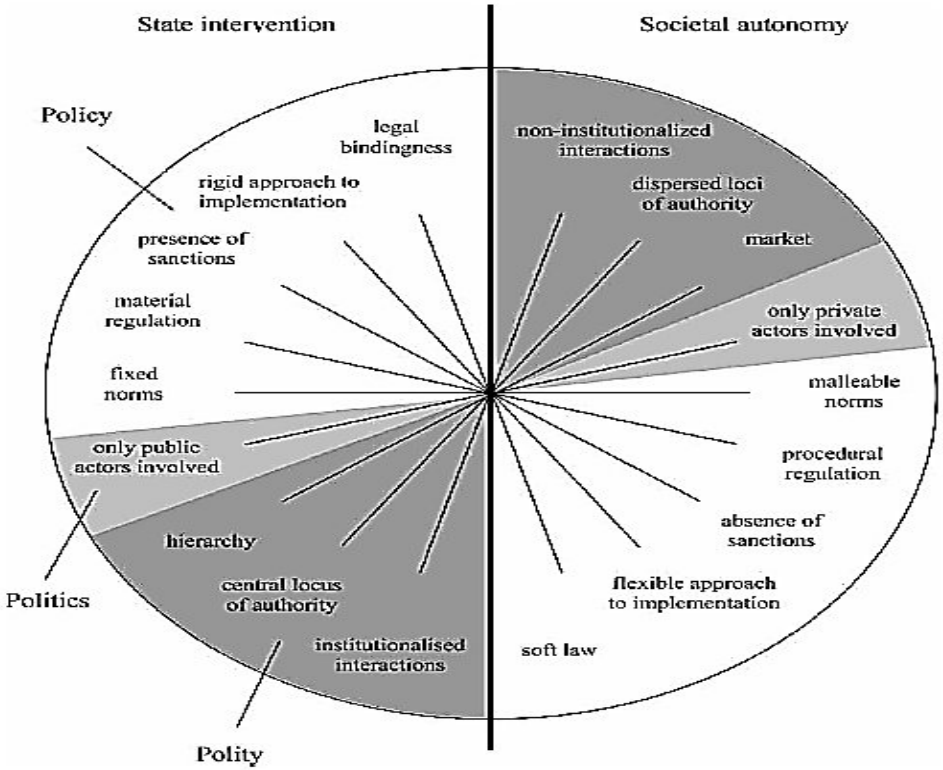
UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Niches	Cases	Regime Elements (incl. issues and frontiers)	Cases
Free and Open Source Disintermediation Software and Platforms	colu. ODYSSEY Data: Parse, Twilio, Bitcoinj, Github and Amazon	Private Software, Platforms, Banks, States	FINOS
Personalized Value|Purpose-based Robo-Advisors	wealthbot.io wealth management, set free	Personalized Risk based algorithmic Robo-Advisors	Too many (e.g. e.g. Betterment, Wealthfront, Scalable Capital)
Fractional Share | Impact Investing	symbid	Threshold Budgets	Too many
Responsible Equity Crowdfunding,	LITA.CO FundedByMe	Generic for Start-up Equity	Too many
Thematic Equity Index Funds (OTC)	symbid ECPI Sense in sustainability	Generic Index Funds Thematic Index Funds	ECPI Sense in sustainability
Participatory (Direct) Budgeting	>>> Conceptual…	Public sector budgeting, Participatory budgeting	citizenlab
(Lifeworld) Deal and (Post-) Taxonomy	>>> Conceptual…	Green Deal and Taxonomies	
Societal Financial Capital	>>> Conceptual…	Financialisation	**~ €260 billion** a year from 2020 to 2030 Green Deal; fine tuned **€547.2 billion** could be made available for investments over the next seven years to help achieve the EU's climate goals

4F in Social Sciences



Existing conceptions of modes of governance in politics, polity and policy dimensions



Source: Treib et al. (2007)

policy is "aiming *at planned formation of social domains through collectively binding decisions"* (Vowe, 2008), which is *embedded* into
polity *-communities, forms of politically organised societies-* and
politics *-the power struggle between the players inside the polity-* consisting of several *plans, programmes and projects* (Vowe, 2008).

Policy instruments

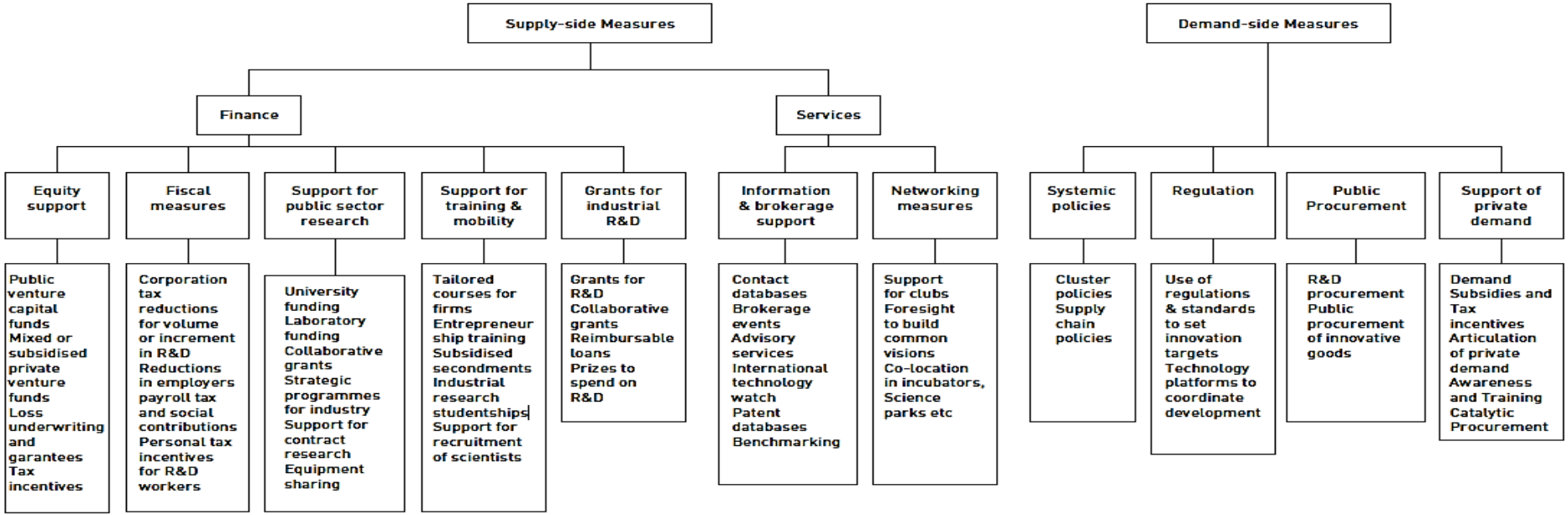
Three broad categories of policy instruments:

- a) economic and financial instruments (carrots),
- b) regulatory instruments (sticks)
- c) normative instruments (soft, sermons, voluntary)

(Borrás and Edquist, 2013).

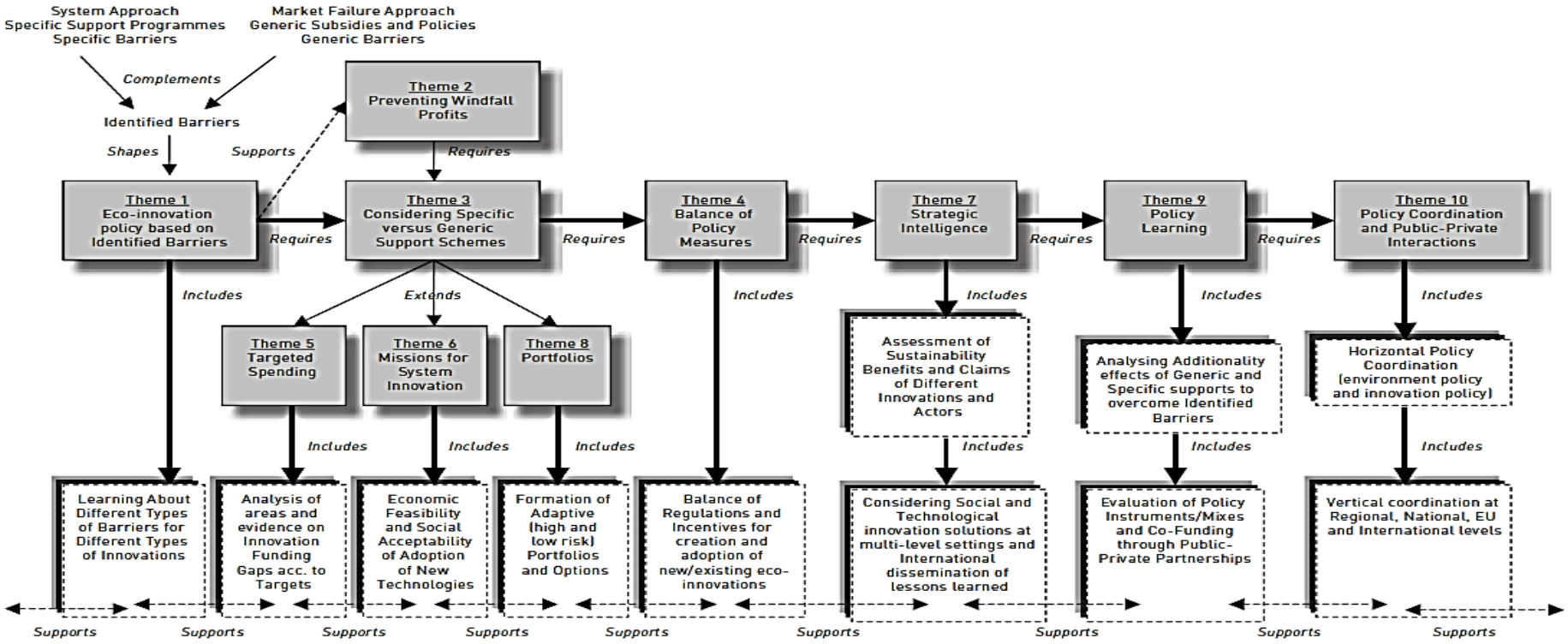
Policy Instruments

Table 4. A taxonomy of innovation policy



Source: Edler and Georghiou (2007, p. 953), based on authors' inventory of policy measures.

A Governance Framework



René Kemp, « Ten themes for eco-innovation policies in Europe », S.A.P.I.EN.S [Online], 4.2 | 2011, Online since 04 October 2011, connection on 16 March 2017. URL : http://sapiens.revues.org/1169

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

New roles for intermediaries: e.g. ShareNL *platformization and automation*

*"Welcome to a new world. A world where everyday, there is **more technology in our lives**, and **more life in our technologies**. A continuous **interflow of humanity and technology** is reshaping our society. Finding an equilibrium between 'man and machine' is of the essence. We invite you to join us today, in order to develop the opportunities and take on the challenges of tomorrow together."*

- *Our journey began during the emergence of the sharing economy. Over the years we developed a deep understanding **of how online platforms are reshaping the way people connect and how this affects industries and societies**. We **evolved into an agency with a unique global perspective and network**. **An ecosystem consisting of the world's largest online platforms, world leading companies, and some of the most advanced city-, state- and intergovernmental organizations. We have developed a strong track record on strategically consulting the leadership of governments and businesses.***
- *Today we are firmly rooted in the sharing & platform economy, but **as our ecosystem evolves we comprehend that digital platforms are only forming the foundations of where we are heading. New technologies like artificial intelligence, blockchain and internet of things will build and grow on these platforms and bring us new levels of platformization and automation.** Together with our ecosystem we embody this change, always with an eye for the 'people perspective.'*
- *Collaborating with us means you get access to **insights, inspiration, intelligence and interaction**. We are here to help you see, feel, think and create the change. From an inspiring keynote presentation to a highly effective one-on-one. From a creative concept to adapting your strategy. And from organizing an unforgettable experience or event to participating in a pilot project. We encourage you to explore what we have to offer you. Come on board, join our ecosystem and start 're:shaping the way we live, work & play.' "*

Source: ShareNL

New Scope for Finance

- Financing for sustainable and **digital** innovation, start-ups and non-listed companies;
- Making it easier for sustainable and **IT** companies to enter and raise capital on public markets;
- Responsible investing for long term, infrastructure and sustainable investment;
- Leveraging banking capacity to support the wider economy;
- Facilitating responsible investing; and
- Fostering retail and institutional responsible investment.

European Commission, 'Capital Markets Union'. Implementation table.
Available at: http://ec.europa.eu/finance/capital-markets-union/implementation-table_en.htm

Concluding Remarks

1. **Data-critical digitisation** (review of digital data needs in business processes, supply chains, human resources, production process, marketing & sales, maintenance & repair, take back and collection systems, track and trace systems)
2. **Open source transition** (phasing out licensed software costs, phasing in open source software and platforms)
3. **Bottom up accumulation of industrial needs and policy demand** (aggregation of operational needs)
4. **Addressing the Productivity Paradox** (Intangibles, Open innovation, Knowledge Spillovers and Servitization, Pre-competitive Collaborations)
5. **Increasing importance of Sustainable Cities and Chambers** (e.g. intermediary, industrial, supra-industrial issues, everyday issues of citizen)
6. **Knowledge bases on B2B & B2C for internal and export markets** (e.g. monitoring changing demographics and lifestyles in cities)

Concluding Remarks

7. **Industry-Higher Education interaction** for Labor Market (e.g. Labor Market demand; quotas, diploma/curriculum design in higher education based on industrial needs and targets, vision)
8. **Efficiency** in resource, energy and product (re)use.
9. **Multiple-value creation orientation** (e.g. public, private, social innovation, working hours)
10. **Financial market development** (e.g. equity indices, OTC)
11. **Technology and Policy Intelligence** (e.g. technology needs assessment, scanning, scouting, selection, vertical and horizontal coordination)
12. **Glocalisation** (Globalisation, Localisation of Sustainable Development Goals)

References

Turkeli, Serdar, 2020, Complexity and the Sustainable Development Goals: A Computational Intelligence Approach to Support Policy Mix Designs, Journal of Sustainability Research, 2(1): 1-22, DOI: https://doi.org/10.20900/jsr20200006, More information

Kemp, René, Anthony Arundel, Christian Rammer, Michal Miedzinski, Carlos Tapia, Nicolò Barbieri, Serdar Turkeli, Andrea M. Bassi, Massimiliano Mazzanti, Donald Chapman, Fernando J. Díaz López & Will McDowall, 2019, Measuring Eco-Innovation for a Green Economy, Wirtschaftspolitische Blätter, Special Issue on Nachhaltigkeit / Sustainability, 66(4): 391-404, More information

Turkeli, Serdar & Martine Schophuizen, 2019, Decomposing the Complexity of Value: Integration of Digital Transformation of Education with Circular Economy Transition, Social Sciences, 8(8): (243)-1-22, More information

Turkeli, Serdar, Beijia Huang, Agata Stasik & René Kemp, 2019, Circular Economy as a Glocal Business Activity: Mobile Phone Repair in the Netherlands, Poland and China, Energies, 12(3): 498-520, DOI: 10.3390/en12030498, More information

Huang, Beijia, Yanxi Chen, Will McDowall, Serdar Turkeli, Raimund Bleischwitz & Yong Geng, 2018, Embodied GHG emissions of building materials in Shanghai, Journal of Cleaner Production, 210: 777-785, DOI: 10.1016/j.jclepro.2018.11.030, More information

Turkeli, Serdar, René Kemp, Beijia Huang, Raimund Bleischwitz & Will McDowall, 2018, Circular economy scientific knowledge in the European Union and China: A bibliometric, network and survey analysis (2006–2016), Journal of Cleaner Production, 197(1): 1244-1261, DOI: 10.1016/j.jclepro.2018.06.118, More information

McDowall, Will, Yong Geng, Beijia Huang, Eva Bartekova, Raimund Bleischwitz, Serdar Turkeli, René Kemp & Teresa Domenech, 2017, Circular Economy Policies in China and Europe, Journal of Industrial Ecology, 21(3): 651-661, DOI: 10.1111/jiec.12597, More information

Kemp, René, Eva Bartekova & Serdar Turkeli, 2017, The innovation trajectory of eco-cement in the Netherlands: a co-evolution analysis, International Economics and Economic Policy, 14(3): 409-429, DOI: 10.1007/s10368-017-0384-4, More information

Blohmke, Julian, René Kemp & Serdar Turkeli, 2016, Disentangling the causal structure behind environmental regulation, Technological Forecasting and Social Change, 103: 174-190, DOI: 10.1016/j.techfore.2015.10.013, More information

Celbis, Mehmet Guney & Serdar Turkeli, 2015, Does Too Much Work Hamper Innovation? Evidence for Diminishing Returns of Work Hours for Patent Grants, Journal Global Policy and Governance, 4(1), More information

Bilman, Asli Seda & Serdar Turkeli, 2013, Interaction between international trade and economic growth: evidence from qualitative comparative analysis, International Economics Letters, 2(4): 5-18, More information

References

Kemp, René, B Never & Serdar Turkeli, 2020, Fostering Sustainable Development Goals Through an Integrated Approach, in: Ademola A. Adenle, Marian R. Chertow, Ellen H. M. Moors, and David J. Pannell, Science, Technology, and Innovation for Sustainable Development Goals: Insights from Agriculture, Health, Environment, and Energy, Oxford University Press, New York, More information

Turkeli, Serdar, Pui-hang Wong & Eleni Abraham Yitbarek, 2020, Multiplex Learning: An Evidence-Based Approach to Design Policy Learning Networks in Sub-Saharan Africa for the SDGs, in: In: Ramutsindela M., Mickler D. (eds), Africa and the Sustainable Development Goals, Springer, Cham, Springer Nature Switzerland AG 2020, Sustainable Development Goals Series, DOI: https://doi.org/10.1007/978-3-030-14857-7_26, More information

Turkeli, Serdar & René Kemp, 2018, Changing Patterns in Eco-Innovation Research: A Bibliometric Analysis, in: In: Horbach J., Reif C. (eds), New Developments in Eco-Innovation Research, Springer, Cham, DOI: 10.1007/978-3-319-93019-0_2, More information

Schubert, Torben, Angela Jäger, Serdar Turkeli & Fabiana Visentin, 2020, Addressing the productivity paradox with big data: A literature review and adaptation of the CDM econometric model, UNU-MERIT Working Paper

References (Other)

Arnaldi, S. (2018). Retooling Techno-Moral Scenarios. A Revisited Technique for Exploring Alternative Regimes of Responsibility for Human Enhancement. *NanoEthics*, *12*(3), 283-300.

Baudewyn, N., Draou, L., & Iania, L. Robo-advisors in asset management: towards a complete automation?.

Borrás, S. (2012). Three tensions in the governance of science and technology. The Oxford handbook of governance, 429-440.

Borrás, S., & Edquist, C. (2013). The choice of innovation policy instruments. Technological forecasting and social change, 80(8), 1513-1522.

Hoppe R. (1999) 'Policy analysis, science, and politics: from "speaking truth to power" to "making sense together"' Science and Public Policy

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Harvard university press.

Masini, Elenora. 1983. Visions of Desirable Societies. Oxford: Pergamon Press.

René Kemp, « Ten themes for eco-innovation policies in Europe », S.A.P.I.EN.S [Online], 4.2 | 2011, Online since 04 October 2011, connection on 16 March 2017. URL : http://sapiens.revues.org/1169

Ringe, W. G., & Christopher, R. U. O. F. (2020). Regulating Fintech in the EU: the Case for a Guided Sandbox. *European Journal of Risk Regulation*, *11*(3), 604-629.

Rip, A. and H. Kulve, 2008, Constructive Technology Assessment and Socio-Technical Scenarios, in Presenting Futures, E. Fisher, C. Selin, and J. Wetmore, Editors. Springer Netherlands. p. 49-70.

van Notten, P.W.F., et al., 2003, An updated scenario typology. Futures, 35(5): p. 423-443.

UNITED NATIONS UNIVERSITY
UNU-MERIT
Maastricht University

Q&A