Refurbishing "Circular Economy" concept in Russia: from industrial policy towards innovation by co-creation

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Abstract

Circular economy (CE) as a solution approach to global challenges is gaining momentum around the world. We aim to contribute to its origins in a historical perspective. Russia has a long history of industrial development: from being mainly agrarian in 1920s to winning WWII and even succeeding in the space exploration. Our findings demonstrate that CE concept was an integral part of the soviet industrial policies and most likely contributed to its "industrial miracle". Among the key instruments were standardization and unification, territorial-production complexes, secondary resources and recycling, and zero-waste technologies. We review the soviet policies according to the modern 10R CE framework and highlight that successful innovation requires not only technological, but also social innovation, lacking in the USSR. The collapse of the USSR led to a 30-years gap in Russia's CE development until the recent changes in governmental priorities that are eventually refurbishing CE concept from 2017 onwards.

Key words

Circular economy, industrial policy, social innovation, Soviet Union, Russia, co-creation, awareness

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1. Introduction

The concept of the Circular Economy (CE) is closely related to the 12th Sustainable Development Goal (SDG) on resource and energy efficiency (UN, 2019). By covering the whole lifecycle from responsible production and consumption, waste management, through the market for secondary resources to recycling, the key ambition is to "close the loop" and bring benefits for both economy and environment (EC, 2015). In particular, CE practices have strong connection to SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 15 (Life on Land) and others (Schroeder et. al., 2018). Therefore, the implementation of such complex agenda (as CE) requires interdisciplinary actions, which are continuously evolving in the domains of industrial policy (circular economy policies), business practices (circular business models), eco-technologies, circular lifestyles (zero waste living, sharing economy) and social innovation in the area of cooperation and co-creation among producers, consumers and other societal actors in sustainable development work (Korhonen et. al., 2018, p. 547).

In this review, we find that the concept of the CE is not entirely new for Russia and its modern economy may learn from the past experience of the industrial policies. In particular, Russia's experience with the CE concept started with the creation of the Soviet Union (hereafter, USSR) and a necessity for its rapid industrialization. The USSR existed from 1922 to 1991 and included 15 republics across entire Northern Asia and much of Eastern Europe. After the WWI and the October Revolution of 1917, the USSR was formed under tough economic and social conditions. In order to get the country out of crises, new government built a highly centralized economy with a clear set of goals that were reassessed every 5 years to facilitate rapid development.

Going beyond the historical review of the USSR policies, in this study we intend to focus on policy instruments and explore the relationship between the USSR practices and modern R´s topology (e.g., Reduce, Reuse, Recycle, etc.) that supports CE practices around the world. Our intention was not necessarily to cover all practices of USSR with respect to modern CE concept, but rather to find examples of such practices in order to open up new research track for further investigation. Therefore, we searched through soviet books and documents that cover industrial policies in the period between 1926 (the beginning of rationalization of production in the USSR) and the end of the Soviet Union in 1991 in order to find relevant cases with regard to the latest 10R classification (Reike et al., 2017). The list of 10R value retention options with clarifications on the related activities according to Reike et al. (2017) is presented in Table 1.

Overall, this study provides a summary of USSR practices that now appear to be fundamental for modern CE concept (in our opinion) in introducing resource efficiency, recycling, modularity for remanufacturing, zero-waste technologies and eco-industrial parks in modern strategies around the

world. Interestingly, despite rapid industrialization being the main goal of the USSR, the shortage of many goods and resources led to the creation of CE elements and therefore had positive environmental externalities that had neither been planned nor anticipated beforehand. Further systematic investigation is required to study multiple Soviet documents describing those ideas and practices in order to support CE development in Russia and worldwide. This chapter concludes with the revival of the CE concept in modern Russia from 2017 onwards by emphasizing the importance of the social innovation dimension in the CE transformation supported by recent examples.

Table 1. Classification of 10R (value retention options) according to Reike et al. (2018) under the terms of the Creative Commons Attribution License (CC BY). For a complete table description, please see the original source.

R №	CE Concept	Key activity of customer	Key activity of market actor	Type of circularity
R9	**Re-mine**	Buy and use secondary materials	Grubbing, selling/ high-tech extracting, reprocessing	Downcycling
R8	**Recover**	Buy and use energy (and/or distilled water)	Energy production as by-product of waste treatment	
R7	**Re-cycle**	Dispose separately; buy and use secondary materials	Acquire, check, separate, shred, distribute, sell	
R6	**Re-purpose**	Buy new product with new function	Design, develop, reproduce, sell	
R5	**Re-manufacture**	Return for service under contract or dispose	Replacement of key modules or components if necessary, decompose, recompose	Product upgrade

R4	**Re-furbish**	Return for service under contract or dispose	Replacement of key modules or components if necessary	
R3	**Repair**	Making the product work again by repairing or replacing deteriorated parts	Making the product work again by repairing or replacing deteriorated parts	
R2	**Re-use**	Buy second-hand or sell second-hand, imply minor repairs if needed	Buy, collect, inspect, clean, sell	Client/user choices
R1	**Reduce**	Use less, use longer; recently: share the use of products	Life cycle: concept and design phase	
R0	**Refuse**	Refrain from buying	Life cycle: concept and design phase	

2. The Soviet Union´s "Circular Economy" experience

2.1. The overview of the USSR's industrial development

The industrial strategy of the USSR demonstrated an incredible capacity to shift within 20 years from mainly agricultural economy towards an industrialized country (Kim, 1969). Such rapid development was achieved by the combination of industrial policies and the variety of political instruments to facilitate the transition. Regrettably, many of those instruments were based on extreme form of authoritarianism with a high degree of control over public, propaganda broadcast by state-controlled mass media and the widespread use of state terrorism. Therefore, we suggest splitting those two dimensions: the USSR ideas related to the CE and the Soviet governance of those ideas, which was not always best.

In the USSR, the successful development of the industrial and economic systems was largely driven by the fundamentally new system of standards. The process of *standardization* started in 1926 with the establishment of the state agency Gosstandart and was finalized by the Resolution of the Council of Ministers of Soviet Union (hereafter, Resolution) from 11.12.1965 (Tkachenko,

1986, p. 28). Standardization was a very proactive process as it aimed to be ahead of the industrial race and to produce national standards (GOST and OST standards) with long-term vision. It became more than just the regulation of quality – it also brought significant opportunities to foster scientific and industrial progress by increased production efficiency, time-saving for engineering, the development of new technologies, as well as the cost reduction, resource and energy efficiency (Tkachenko, 1986, p. 6).

Resource efficiency was mainly driven by economic savings rather than by nature preservation initiatives. In particular, the waste was considered to have economic value as a secondary resource; however, its environmental impact as of contaminant was largely overlooked (Palgunov & Sumarokov, 1990, p. 9). In contrast to the industrial sector, Soviet eco-culture in a society was a significant part of the USSR education system with the key incentives to nurture social and environmental responsibilities. Moral norms were powered by the Constitution of the USSR with the key goal to protect nature and improve environmental conditions, while making scientific and rational use of land with its biological (plants and animals) and technological (minerals, water) resources (Constitution of the USSR, 1977).

Overall, we have identified the following instruments practiced at various stages of the Soviet industrial development: rationalization ("racionalizacija") of the production processes including standardization and unification ("unifikacija"); territorial-production complexes; secondary resources concept and recycling; inventory of material flow systems; and zero-waste technologies.

2.2 Principles of Refuse (R0) and Reduce (R1)

When applied to producers, principles of Refuse (R0) and Reduce (R1) refer to the design production processes avoiding waste generation via the use of fewer resources or sharing economy leading to resource efficiency (Reike et al., 2017). In the USSR, great savings of natural resources, energy and raw materials were achieved by four key principles of *Cooperation*, *Concentration*, *Combination* and *Specialization* (Varlamov, 1979, pp. 15, 21, 55). These principles fostered industrial synergy, as an ecosystem principle, and resulted in an optimized cooperation between highly specialized experts and technologies, so-called *territorial-production complexes* (Varlamov, 1979, p. 24). In 1916, Vladimir Lenin wrote in his essay that the concentration of various production facilities between one and even several industries into a complex ("kombinat") increases each other's efficiency, for example, by using waste and by-products of one plant in the production processes of another one (Lenin, 1927, p. 312).

The cooperation strategies were highly valued and by 1978, the USSR had 8000 agro-industrial complexes made of 115 000 agricultural associations ("sovhoz" and "kolkhoz") and 3700 energo-industrial complexes, which encompassed 100 percent of coal-fired plants, 94 percent of automotive industry, 80 percent of combine harvesters and 66 percent of weaving machines (Varlamov, 1979, p. 28, 31). Overall, resources and energy were extensively shared and recycled

in forest, chemical and energy industries, agriculture, metallurgy, machinery, construction, transport (Varlamov, 1979, p. 34) with many examples in Western, Southern and Eastern Siberia, in Kursk area, Far-east of the USSR and other areas. For example, in 1978-1980, Sayan-Sushenskoe complex extended across Krasnoyarsk krai and city Minusinsk by encompassing a hydroelectric power plant, two metallurgic plants, 12 enterprises of electrical manufacture, agricultural associations, food and construction industries as well as social infrastructure. There were at least nine more industrial complexes of such scale across the USSR, which intended to maximize the efficiency by closing the loop of material and energy flows (Varlamov, 1979, pp. 54-63; Palgunov & Sumarokov, 1990, p. 14).

The resource efficiency of the USSR was also facilitated via a thorough inventory of material flow system at all life cycle stages that was controlled by the state operator on material supply Gossnab and regulated by the Resolution from 30.06.1981 № 612 (Resolution, 1981a). Moreover, Gossnab regulated sharing economy at the industrial level by identifying tools and equipment that were not often used at one plant to be redistributed to other plants according to demand. Meanwhile, people were motivated by the system of extra payments in addition to the regular salaries. Thus, the resource efficiency and cost reduction was achieved by employees who used raw materials, fuel or energy rationally (Recommendations, 1987). Even in everyday life, people were oriented to avoid waste generation by shopping with multiuse (instead of single-use) fabric bags. Everyone carried a string bag called “avoska” (meaning a “maybe bag”) that was compact, easy to wash and lasted for years. By using fabric bags, people were supporting the All Russian Association of the Blind People that was producing those “avoska” bags (Goldman, 2018).

2.2 Principles of Reuse/Resell (R2), Repair (R3), Refurbish (R4), Remanufacture (R5)

Circular Economy principles of reuse (R2), repair (R3), refurbish (R4) and remanufacture (R5) can be related to the *unification* strategy of the USSR. In 1980, the unification was regulated by GOST 23945.0-80 and defined as a design process aiming to create uniform details, which could be interchangeable between a variety of products and across different industrial sectors (Tkachenko, 1986, pp. 187-189). The goal was to completely refurbish and remanufacture existing design in order to substitute individual manufacture by common assembles capable to create any machinery and equipment out of unified modules via an *aggregation approach* (Tkachenko, 1986, p. 206). In modern CE practices, we recognize this approach as a modular design. Meanwhile, forty years ago, unification was already one of the key strategic concepts of the USSR economy acknowledged by the industrial policy 1981 - 1985 (USSR Economic Strategy 1981-1985).

For example, unification strategy was applied to various automobile parts (e.g., engine, transmission, electronics, optics) to become more durable and substitutional between various Soviet car brands. Such strategy greatly facilitated the aggregation approach, so that, up to 70 percent of machinery in agriculture, construction, logistics and transportation was assembled from 10-15 bases with different modules added to each other (Tkachenko, 1986, pp. 203-204). In the

food industry, glass bottles were uniformed to create a single design and allow continuous reuse of the glassware for milk, beer and beverages across the entire USSR (Oleynik, 2016).

In Soviet times, most of the products and equipment were repaired and reused as many times as possible. Thus, after buildings' demolishing, the remaining equipment (e.g., water meters, fire hydrants) was repaired, cleaned and returned to the public services according to the instructions and regulations by the Decree of Gosgrazhdanstroy from 26.12.1983 № 414. Meanwhile, people were buying and selling their used goods (e.g., shoes, knitwear, furs, furniture, appliances) in second-hand shops that were regulated by a Decree of SNK RSFSR from 01.01.1923. By 1939, there were 205 second-hand shops and this number was rapidly increasing during the following years (Tverdykova, 2013, pp. 80-89).

2.3 Principles of Repurpose (R6), Recycle (R7), Recover (R8) and Re-mine (R9)

The principles of repurpose (R6), recycle (R7), recover (R8) and re-mine (R9) can be grouped as strategies providing a second life to materials and products. The USSR was famous for not wasting anything that had direct or indirect potential for material and energy savings. Thus, at the end-of-life, the majority of industrial and household waste was carefully collected, inspected and deemed as *secondary material resources* according to a variety of standards (e.g., GOST 25916-83 from 14.09.1983) (Alekhin & Lyusov, 1988, p. 3).

Out of many examples, secondary resources for recycling included used paper and cardboard from packaging materials, printing, sanitary and hygienic products called "*makulatura*" (GOST 10700-75), used glass from food and glass industries (OST 21-7-74), used plastic and polymeric waste from construction materials, film tape materials and artificial leather (OST 63.8-81), metallic scrap and slag from smelting and chemical plants, cinema and jewelry industries, as well as pieces of non-historical art (GOST 1639-78) (Zalkind et al., 1985). Moreover, energy was also a significant part of the secondary resources system of the USSR by incorporating gases captured from the refinery, blast-furnace, oil mining processes, waste steam and heat (Sidelkovsky, 1989).

The collection and sorting of secondary resources was regulated by law according to the standardization system. At the same time, people received free tickets for special book series when collecting used paper and cardboard. Thus, during the year of 1974, people collected 2.6 M tons of paper and cardboard, which is equivalent to 50 books per 1 tonne of waste (Zalkind et al., 1985, p. 4, 29-30). Moreover, every school and university held competitions for the biggest amount of collected paper. In the case of used glassware, people were carefully washing and removing all labels from the bottles to sell them at the nearest grocery stores for an attractive price. Such public motivation was one of the tools for a substantial increase in the collection of secondary resources. By the Resolution from 1980, it was planned to collect 3.3 M tons of used paper and cardboard by 1985 and 4.6 M tons by 1990.

Upon the collection of secondary resources, Gossnab was responsible for final sorting and recycling. In case of glass bottle fabrication, it was virtually infinitely recyclable process. Every tonne of glass that was recycled into new items was saving about 250 kg of carbonate soda, 250 kg of limestone, 50 kg of dolomite, 700 kg of quartz from being mined from the nature. Moreover, the system of secondary resources resulted in great economic benefits by reducing electricity consumption by 6 percent, water usage by two times and fuel combustion by four times all over the USSR (Zalkind et al., 1985, p. 3, 19-20). Another example is the recycling of paper and cardboard that was producing 0.7 tonnes of new materials out of 1 tonne of waste, saving 0.85 tonnes of cellulose and 4.4 m^3 of trees (Palgunov & Sumarokov, 1990, pp. 171-174). Additionally, the recycling of plastic also contributed to the great cost savings (53 M rubles) and resources preservation (1.5 M tones) in 1975 - 1980 (Palgunov & Sumarokov, 1990, pp. 156-157). As an example, plastic waste was added to other materials to improve their qualities, such as sound insulation or sealant impermeability.

Recycling of the metallic waste was either direct by using the waste to produce construction materials or indirect via preliminary metals recovery. In the latter case, secondary resources of precious metals (gold, silver, platinum, palladium) were a subject of daily and weekly inventories according to the Resolution from 07.01.1981 № 10 and from 16.02.1990 № 179 (Palgunov & Sumarokov, 1990, pp. 42-44). Based on the content of precious metals, the waste was sold to Gossnab and sent to The Moscow Reprocessing Plant № 1 to recover pure metals according to the code of the USSR laws 1930 № 25. Recovered precious metals were becoming the property of the People's Commissariat of Finance of the USSR and were distributed for further recycling.

Non-ferrous metals (copper, nickel, lead, zinc, titanium, magnesium, aluminum, tin, mercury, antimony) were also recovered and used as secondary resources in metallurgy regulated by GOST 1639-78 (Palgunov & Sumarokov, 1990, p. 189). For example, in 1937, the Ufaleysky Nickel Smelting Plant was re-mining molten slag to recover the impurities of nickel and cobalt by reductive-sulfurizing smelting method with 20-30 percent efficiency (Smirnov et al., 1970, pp. 149-151). Otherwise, metallic slag from smelting plants was directly recycled in the production process of cement and other construction materials. Up to 75 percent of the total amount of the USSR´s metallic slag was recycled with the rate of 23 M tonnes per year (Palgunov & Sumarokov, 1990, pp. 175-176.). Construction materials were also made of recycled coal ash from coal-fired power plants (Varlamov, 1979, p. 23), which in 1979 reduced the cost of concrete production by 15 percent (Alekhin & Lyusov, 1988, pp. 15-16).

Secondary use of water and the recovery of energy in the USSR had positive externalities in natural resource preservation. For example, energy recovery from the secondary sources during 1981-1987 resulted in 21.5 M tonnes of saved coal (Goskomstat, 1988, pp. 3, 17), thus, avoided coal mining along with its environmental implications (Varlamov, 1979, p. 21). In the case of water, up to 99.7 percent of wastewater was yearly recycled in Moscow, which was preventing about 4200 M m^3 per year water withdrawal from natural aquifers (Palgunov & Sumarokov, 1990, p.

12). One of the examples is when wastewater from the household use of city Moscow was purified at the Novo-Kuryanovskoy treatment plant and recycled for technical use at the Lenin´s Komsomol automobile plant (Palgunov & Sumarokov, 1990, p. 12). Moreover, water reservoirs that were created to provide water for technical use at the Ekibastuz coal-fired thermal power station later were repurposed for the recreation and sport activities of city Ekibastusz (Kazakhstan) (Varlamov, 1979, p.23).

Zero-waste technological systems were one of the key economic strategies acknowledged by the industrial policy 1981-1985 (USSR Economic Strategy 1981-1985). Zero-waste technologies were developed in many industrial sectors, such as metallurgy, milk and coking coal industries (e.g., Hramcov & Nesterenko, 1989; Laskorin et al., 1986). Closed circular systems of wastewater, energy and materials were created within the industrial (territorial-production) complexes and individual plants (Palgunov & Sumarokov, 1990, p. 14). For example, water purification system "Crystal" was developed by the Mosvodokanal Project and installed at many industrial plants to reduce water consumption by circular drainless technologies (Palgunov & Sumarokov, 1990, p. 13).

In 1984, a zero-waste seminar was held in Soviet Tashkent (Uzbekistan) organized by the United Nations Economic Commission for Europe where zero-waste technologies were defined as "application of knowledge and resources for reasonable use of raw materials and energy for nature preservation" (Alekhin & Lyusov, 1988, p. 11). Since then, environmental aspects of primary and secondary resources became distinct chapters of the books on the economic strategies of the USSR merging economic and environmental dimensions (e.g., Alekhin & Lyusov, 1988; Palgunov & Sumarokov, 1990). Thus, already thirty-five years ago, the USSR launched the first prototype of the modern CE concepts merging the development of economy along with environmental awareness (even if it was not perfect), but still lacking social framework.

Despite promising economic and environmental development, often, quality was less important than the results and the risks of not achieving production goals. To some extent, the technological progress was suppressed by the lack of incentives to innovate given the symbiosis of authoritarian political setting and 'collective nature' of the Soviet economic/industrial system (Ermolaev, 2017). In 1990, it was estimated that annually about 20 tonnes of raw materials per person were extracted in the USSR with secondary material recycling achieving only 10 percent (Palgunov & Sumarokov, 1990, p. 12). From this review, it appears that the USSR was rich of highly qualified human resources capable for technological innovation, however, lacking appropriate governance instruments for its effective implementation. By the end of the USSR's existence, one of the most vibrant economies in the world significantly slowed down and became unable to follow up with Sustainable Development and Circular Economy worldwide.

3. Circular Economy development in post-Soviet Russia

After the USSR collapse, Russia had gone through a systemic crisis that imposed a negative impact in all areas of life including economic, environment, social issues etc. (UN, 2012, p. 6). Since then, most of the USSR achievements in various sectors including resource efficiency, closed loop/interconnected production, education, science, medical care quality etc. have been challenged. The old institutions were destroyed, the new ones were not yet properly established. Regrettably, the Soviet CE principles were replaced by the highly criminalized waste sector that had been preventing any further steps in the waste management development in Russia for many years (NTV, 2012). Therefore, that period of 30 years (1989-2018) had become a long path to learn again how to respect and (re)value natural resources and environment in modern Russia.

3.1 Circular Economy revival in modern Russia

The year 2017 was announced by the President to be the year of Ecology and this government's attention has brought the first results. The intention was to draw public attention towards environmental issues, support the protection of ecological and biological diversity and reinforce ecological security of the country. Within the year, environmental conditions have been reassessed with regard to the quality of air, soil and water concluding *critical ecological situation,* that became acknowledged as a real threat to the national security of the country. Moreover, a detailed inventory was performed to assess the amount of waste in modern Russia, which led to the development of "The Strategy of Ecologic Security of the Russian Federation up to 2025" (Decree № 176, 2017). This strategy emphasizes that the decrease of 4-6 percent of annual GDP is caused by economic losses from the worsening environment (and related economic matters), yet not taking people's health into account (para. 18). Among other national threats, this strategy highlights the scarcity of clean technologies, high corruption level within environmental projects as well as low level of environmental education and eco-culture of Russians (para. 21).

By the end of 2017, not everything planned was achieved; however, this year became a turning point in Russian transition to CE principles (Nodelman, 2017). Based on the work done during that year, President issued a List of Instructions (Decree № Пр-2319, 2017) aiming to improve waste management system by implementing additional 11 assignments in the coming years. Among them is to create a universal state electronic system of waste flows accounting (а, б); to increase environmental knowledge and ecological awareness of people, and to implement stimulation mechanisms for waste separation (в).

The coming year 2018 has truly revitalized the discourse on the CE in Russia with several important events stimulating innovations in various domains: government, academia, business and civil society. Already at the beginning of the year, the adoption of "The Strategy for Development of Industry for Sorting, Recycling and Treatment of Waste" up to 2030 (hereafter, 'Waste Strategy') (Decree № 84-р, 2018) has opened new opportunities for the refurbishment of the CE concept in Russia. This Waste Strategy defines goals, objectives and stages of fundamentally new priorities in the waste management policy. In particular, it provides a plan for the development of

new industry clearly moving away from the landfill principle towards "close the loop" of product life cycle via the 3R (Reduce, Reuse, Recycle) concept (Decree № 84-p, 2018, p.33).

The Waste Strategy is indeed a new approach to the way the waste is understood and treated in modern Russia. It gives an extensive analysis of the waste volume and waste/resources structure that demonstrates great commercial opportunities within this new industry with export potential (Decree № 84-p, 2018, pp 6-.33). The existing problems concerning the lack of equipment and clean technologies for 3R-waste management are highlighted as a priority direction for research and development (Decree № 84-p, 2018, pp.19-24). In overall, this strategy follows the elaboration of new industrial policy approach to build various domestic industries with the focus on import substitution that started in Russia in 2008 (Gerasimenko, 2012, 2015).

Moreover, the Waste Strategy provides a set of new definitions. Thus, the Industry for Sorting, Recycling and Treatment of Waste is defined as "a complex of economic entities connected financially, technically and organizationally in one or several sectors of economy that support engagement of waste into further economic activity, create and develop innovative technologies for resource efficiency, treatment and utilization of waste, as well as implement special industrial equipment for ecological safety in waste management practice" (p.3). And the concept of eco-industrial parks is introduced via the term "Ecotechnopark", which is defined as "a complex of objects united by energy links, including buildings and facilities, technological and laboratory equipment used for sorting, recycling and treatment of waste, ensuring continuous waste conversion into industrial products, and the implementation of scientific and (or) educational activities" (p.3).

In the middle of 2018, the Annual St. Petersburg International Economic Forum became another event that boosted CE development in Russia. There were several sessions dealing with the issues of CE development with one session entirely dedicated to "Circular economy: Russian model and international experience" (Economic Forum, 2018). Right after the Forum, a transition to the CE principles spread out to Russian regions (Decree № 57, 2018) and within a month the first "Ministry of Ecology and Circular Economy" was created in Ulyanovskaya Oblast (Decree № 16/299-П, 2018). The objectives and responsibility areas of this Ministry clearly demonstrate a significant shift towards a new type of economy with waste as a new source. Thereafter, the resource framework of the Oblast combines the management of both natural (air, forest, water etc.) and industrial resources (para. 2.9-2.11) potentially fostering local business. The St. Petersburg Economic Forum in June 2019 reinforced the focus on CE and sustainability and added new dimensions such as sustainable urban development, green finance as well as strong partnership dimension for CE implementation (Economic Forum, 2019).

3.2 Social innovation for Circular Economy development

The Waste Strategy of Russia embraces the importance of cooperation as "effective inter-industry, inter-department, inter-subject *interaction* for achievements of these goals and objectives by federal, regional, and municipal governments, private sector, academic and science institutions, civil movements, non-governmental partnerships, media and citizens" (p.33). However, it appears that only vertical hierarchy top-down is foreseen as the implementation plan for Russia. Specifically, it states that the realization of the Waste Strategy is in "learning effective interdepartmental, inter-industry and *vertical* interaction of the executive power at federal, regional and municipal levels" (p.42). Whereas, the horizontal cooperation and co-creation among government, academia, business and civil society appear to be overlooked by the strong role of the government in industrial policy development.

Meanwhile, the dimension of cooperative partnership within the horizontal social interactions lies through all CE principles and, perhaps, is an essential element of such economy to actually move from a theory to its successful implementation. One of the latest CE definitions highlights that "CE promotes high value material cycles alongside more traditional recycling and develops systems approaches to the *cooperation of producers, consumers and other societal actors* in sustainable development work" (Korhonen et. al., 2018, p. 547). The importance of mutual cooperation for CE is now acknowledged worldwide and widely discussed across international workshops and conferences.

Although cross-sector co-creation partnerships are still rather new to Russia, in the fall of 2018, the Round Table on CE was held at the Moscow State University that brought together various key stakeholders from government, academia, business and civil society in the area of waste management and industrial development (MSU, 2018). This meeting provided a good start and hopefully will draw interest and attention to the necessity of social innovation tools for the CE implementation in Russia. As highlighted at the Annual St. Petersburg International Economic Forum 2018, Russians are encouraged to adopt international experience for effective problem solving and innovation. For example, international experience in the Quadruple Helix Model of Open Innovation 2.0 "where government, industry, academia and civil participants work together to co-create the future and drive structural changes far beyond the scope of what any one organization or person could do alone" (Salmelin & Curly, 2018, p.69) could be one of the potential directions for Russian CE development.

This Quadruple Helix Model has been proven as innovative approach, which could be applied within living/social innovation labs. In turn, a Living Lab (a term originated at the Massachusetts Institute of Technology, MIT) is a platform that brings together government, industry, academia and civil participants to co-create the future by co-developing prototypes. In particular, living labs place the *citizen* at the center of technological innovation to co-create solutions for specific needs and aspirations of local contexts, cultures, and potentials (EC, 2018). European Network of Living Labs (ENoLL) constitutes more than 400 living labs around the world that are maintained by

universities, governments & municipalities, companies and local communities, with some of them already working in the area of CE (ENoLL, 2018).

Social (innovation) Labs also provide new solutions that move away from rigid "strategic planning" towards safe experimentation and co-creation space to address complex social challenges. The innovations generated by social labs flow from at least four sets of outputs: physical capital (new services or infrastructure), human capital (new capacities and skills), social capital (increased trust and collaboration), and intellectual capital (new knowledge and learning) (Hassan, 2014, p.3). As a result, by focusing on practical actions towards innovation, social labs help to address complex social challenges of modern society.

The first known to us such prototype project in the CE is the awareness based Social (innovation) Lab "Beyond Waste: Circular Resources Lab", that took place in September-December 2018 under the cooperation of École Polytechnique Fédérale de Lausanne, Impact Hub Lausanne/Geneva, Collaboratio Helvetica and the United Nations Sustainable Development Solutions Network of Switzerland.[1] This project was inspired by a wide range of participatory leadership methodologies and tools among which are the "Theory U", developed by Dr. Scharmer (MIT) and strong mindfulness approaches applied to co-create prototype solutions for CE development in canton Vaud (Switzerland).

As indicated previously, a Social Lab provides safe experimentation and co-creation spaces for innovative solutions for the CE. This approach may help Russia to foster the development of innovative environment and, eventually, to implement co-creation partnerships. As of today, the level of cooperation and trust in Russia is known to be rather low due to historical and institutional reasons (Gerasimenko, 2012). Meanwhile, classical industrial policy approach from 2008 onwards does not bring expected results from the most ambitious projects at the Skolkovo Innovation Center and other initiatives (Kalinina, 2016). Therefore, a new type of co-creation methodologies may facilitate Russian transition from just a good invention capacity towards an innovation implementation capacity, which has to be improved significantly.

In April 2019, Samara National Research University (SSAU) held a conference on "Innovative Approaches to Circular Economy Development in Samara Region". The conference gathered the representatives of government, academia, business and civil society that participated in a one-day awareness-based mini social lab organized within the conference (Grekov, 2019b). This mini lab has become the first of its kind (known to us) experiment with multi-actor social lab approach in Russia utilizing awareness-based practices for the SDGs solutions (Grekov, 2019a). Following this experience, more activities along these lines are in preparation in Samara region.

[1] One of the co-authors of this chapter (Prof. Gerasimenko) has been a co-host and co-facilitator of this social lab. More information about the project is available at https://www.circularresourceslab.ch/.

Modern Russian education around CE issues is rather rare; however, the year of Ecology 2017 definitely has brought more interest in this area. A notable example of higher education in this topic is the Master level courses on Circular Economy Development encompassing both socio-economic and environmental technology dimensions at the Samara National Research University. These (two master) courses were introduced in the curriculum since 2016 and from thereon they are dedicated to preparing a new generation of experts for effective CE implementation (Gerasimenko, 2018). This is the beginning and much more still needs to be done for public education following the President's Instructions described above. We are looking forward to collaboration and co-creation on this topic within and outside Russia.

4. Conclusion

The scope of modern challenges requires Russia to become more open to new ideas, approaches and experiments. However, before "re-inventing the wheel", it is worth to review the historical experience, specifically the tools that were already implemented to foster economic/industrial development with a focus on CE practices. From the review presented in this chapter, it appears that modern Russia may get insights and inspiration from the USSR experience via its key principles, economic instruments and tools. There are several examples that stand out at various stages of the Soviet industrial development that brought economic recovery from two world wars and the Revolution.

Among the key instruments are rationalization ("racionalizacija") of the production processes including standardization and unification ("unifikacija"); territorial-production complexes; secondary resources and recycling; inventory of material flow systems; zero-waste technologies. Furthermore, by exploring the relationship between the USSR practices and the latest 10Rs classification, we attempted to identify the fundamental basis for modern CE principles. The combination of reviewed examples provides some support for the conceptual premise that CE initiatives of the USSR started already 93 years ago (in 1926) from a new course of industrial and economic development, which were supplemented by environmental dimension 35 years ago (in 1984). Although many ideas related to the CE development in the USSR did not come into the full practice for various reasons, we find that the lack of social innovation framework, which is now addressed in modern CE principles worldwide, is crucial for a systemic change.

Although after the USSR's collapse, modern Russia lost the CE direction for the last 30 years, the Year of Ecology in 2017 and the introduction of a set of governmental strategies in 2018 became a turning point in the Russian transition to the CE principles on various levels. From this review, it appears that the good governance of innovative ideas is crucial for their successful implementation. Therefore, we suggest that social innovation tools should be introduced and practiced for the refurbishment of CE ideas through the new lenses of cooperation and co-creation among various actors, such as government, academia, business and civil society. This could be facilitated through, for example, social/living lab forms of governance learning from international

experience, such as the Social Lab "Beyond Waste: Circular Resources Lab" (2018) in Switzerland. It is worth mentioning that in Russia, Samara National Research University and the Samara region in general have already undertaken steps in that direction.

This review does not claim to be a complete study of the USSR's practices with regard to the CE concept and should be treated as an informative basis for further thorough investigation of its actual application to modern Russian setting. Taken together, the USSR's and modern Russia's experiences suggest that focusing solely on technological innovation without social innovation backup does not bring desirable results. Hence, by strengthening the role of social innovation and co-creation, Russia may finally close its (in)famous gap (between being great inventors with interesting ideas and at the same time being rather poor innovators) in order to successfully implement CE strategies in modern Russia.

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