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**ECONOMICS OF SUSTAINABLE DEVELOPMENT  
IN THE THEORY OF SCIENTIFIC REVOLUTIONS  
BY THOMAS KUHN**

Key words: sustainable development, Thomas Khun's theory, paradigm, externalities, economy-environment-society macrosystem

**ABSTRACT.** The aim of this article is to analyze selected aspects of the theory of sustainable development as a potentially new paradigm in economic theory. The paper presents the concept of the economics of sustainable development in the context of the theory of scientific revolutions developed by Thomas Khun. The study focuses on such issues as externalities and the functioning of the economy in the macrosystem, including society and the environment. Their inclusion in the economics of sustainable development has allowed the assessment of such fundamental aspects as the voluntary nature of transactions or the social effects of running a business from a different perspective. Based on conducted analyses and the review of the literature, it has been noted that the main assumptions of the economics of sustainable development constitute some sort of anomaly, and perhaps even a revolution in relation to classical economics (understood, in this study, as a general theoretical concept that proclaims the reliability of the market mechanism, as well as the convergence of individual interests of producers and consumers with collective interests). In the context of Khun's concept, it has been pointed out that a possible future paradigm of economics will not constitute so much disapproval of the present one but will make it more comprehensive and will approach economic problems from a different perspective.

**INTRODUCTION**

The history of the concept of sustainable development is relatively short, however, it has had a significant impact on the understanding of the world and on the evolution of many scientific disciplines. The very essence of sustainable development, which considers, among other things, economic order combined with social and environmental order, must also have left its mark on the theory of economics. From the very beginning, in economic

research, understood as both empirical analyses and theoretical considerations, the quantity and quality of natural resources have been taken into consideration, and the social character of economic activity and its social effects are, in a way, the core of economic research. It is enough to mention here David Ricardo's steady-state theory, Adam Smith's concept of land rent or Thomas Malthus' population theory [Bartkowiak 2008, Burchard-Dziubińska 2011]. Regardless of whether a given issue is viewed through the prism of free market or interventionist concepts, the arguments presented ultimately refer to alternative ways of using natural resources and to the assessment of social effects of a specific approach to management.

The importance of the concept of sustainable development for economics is multi-pronged, although, in this paper, the attention is focused on two aspects that can be considered as specific anomalies (in the sense of Thomas Khun's concept) in relation to the assumptions of classical economics<sup>1</sup>. First of all, within the meaning of sustainable development, the economy is treated as part of a larger macrosystem, which also includes society and the environment [Michałowski 2012, Poskrobko 2013]. Second of all, the concept of sustainable development has adapted and creatively developed the notion of externalities, created by Alfred Marshal and developed by Arthur Pigou and other economists [Baum 2011, Graczyk, Kociszewski 2013, Małachowski 2016]. Originally, according to Marshal, externalities were understood as the non-market influence of third parties on an enterprise. Over time, it has been observed that a significant part of externalities is related to the influence of the environment and that the effects are visible not only in the case of enterprises but also in society [Bernaciak, Graczek 2002]. Recognition of externalities has shown that the economic effects of the operation of individual enterprises depend not only (not always) on voluntary agreements concluded between parties to a transaction, but also result from the activities of third parties.

## MAIN ASSUMPTIONS AND DILEMMAS OF THE ECONOMICS OF SUSTAINABLE DEVELOPMENT

Most importantly, it should be noted that the concept of sustainable development does not have a scientific origin. The concept has been developed in the world of international politics and was used in the Brundtland Commission report in 1987 for the first time [Kiełczewski 2010, Baum 2011]. According to the classical definition, sustainable development meets the needs of the present without compromising the

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<sup>1</sup> Being aware of the multiplicity of schools, concepts and ways to interpret the essence of economic processes, in this study, the concept of classical economics is understood as a general concept that proclaims the reliability of the market mechanism and the convergence of individual and collective interests.

ability of future generations to meet their own needs. The definition only refers to the temporal – horizontal dimension of sustainable development, without specifying in which areas of human activity it should take place. Other definitions, apart from the need for intergenerational solidarity, also identify three pillars of sustainability. One of the examples is the definition of the principles of sustainable development, created during the so-called Earth Summit in Rio de Janeiro, in which certain aspects were pointed out, such as: the need to preserve natural resources for future generations, the elimination of poverty in the world as well as the need for cooperation between countries to design new solutions to enable development while protecting the natural environment. There are many more definitions of the phenomenon of sustainable development, nevertheless, they share several common characteristics. Firstly, even definitions with a scientific provenance and of such a nature (developed by scientists) refer (intentionally or not) to the utilitarian character of sustainable development, indicating that it is a certain direction towards which humanity should move. Secondly, almost all definitions, explicitly or implicitly, tend to look at reality in a long – intergenerational perspective, rather more to the future which, in practice, means placing greater importance on forecasting within the field of different scientific disciplines or aspects of reality understood in a practical way. Thirdly, considering the three pillars of sustainability, they should be assessed as mutually dependent and, looking at the problem from a scientific point of view, an interdisciplinary approach to the issue should be considered. The above is not an easy task, especially if the relatively autonomous directions of development of individual scientific disciplines are taken into account, including different and often mutually incompatible research methodologies. Fourthly, the very idea of sustainable development provides for the necessity to find compromise solutions at the interface of social, environmental and economic issues. Finding the right optimum in this area is challenging, not only because of the methodological differences of certain sciences, but mainly because it goes beyond the competence of science. Although it should be agreed that, in its positive layer, economics should consider evaluative aspects due to, for example, the problem of distribution of produced goods [Kwarciański 2019, Kiryluk-Dryjska 2019]. It should be noted, however, that in practice the indication of a specific development path of individual societies depends more on individual and group decisions than on the results of certain studies.

## THE CONCEPT OF THE DEVELOPMENT OF SCIENCE BY THOMAS KHUN

Thomas Khun was one of the theorists of science, who assumed the revolutionary nature of its development and claimed that successive concepts contradict previous ones to a lesser or greater degree [Khun 2009]. According to Thomas Khun, science develops in cycles that consist of several fundamental stages. Initially, the discourse is of pre-scientific nature (pre-paradigmatic) and the most general and fundamental problems of a certain discipline are assessed. Moreover, individual schools of thought compete with each other [Flejterski, Urchs 2015]. Due to a lack of developed methodology, it is impossible to conduct detailed research. Then, the pre-scientific discourse is transformed into the phase of normal science, the essential feature of which is the formation of a paradigm. At some stage in the development of a particular discipline, a paradigm represents a general set of concepts and theories accepted by the scientific community. The stage of normal science is a period of „puzzle-solving”, the results of which are predictable. As detailed research is conducted, anomalies appear, i.e., outcomes that cannot be explained within the paradigm in operation at that time. Anomalies that hit the center of the paradigm are particularly significant. The paradigm is initially immune to anomalies, however, their accumulation leads to a crisis and then to a revolution and a new paradigm is developed which is, in whole or in part, incompatible with the old one. A new stage of normal science is initiated, and another cycle of development begins. There are several reasons for the emergence of new paradigms. Firstly, the former one may have described reality in an incorrect way. Secondly, the new paradigm may describe reality from a different point of view or in more detail. Thirdly, the old paradigm referred to the old reality. It is important to note that the latter case only applies to social sciences. By definition, the reality of formal and physical sciences is constant, while the reality of natural sciences is changeable on a geological scale and, from the perspective of human civilization - it is also almost unchangeable.

## ECONOMICS OF SUSTAINABLE DEVELOPMENT AS A REVOLUTION IN THE CONCEPT BY THOMAS KHUN

The economics of sustainable development is an example of a paradigm that describes a new reality in a more precise way and from a different perspective. That means that the majority of existing economic concepts are still valid, however, they explain economic reality in a different context or in a different way. There are two major dimensions with regards to the economics of sustainable development. The first one is the period of its creation. The economics of sustainable development was created in a different reality

than the classical concepts. The turn of the eighteenth and nineteenth centuries, when the classical theory of economics was being developed, was the period of the „empty world“. The number of people on Earth fluctuated around a billion, while today it is almost 8 billion. Moreover, as a result of industrial development, the level of consumption of goods by the vast majority of people living on Earth has increased. Such rapid changes had to affect social relations but also had to be the cause of the influence of the economy (or more broadly – civilization) on the environment which, in turn, required a different explanation of the new state of affairs by science. The second dimension of the economics of sustainable development is the previously mentioned interdisciplinary approach to socio-economic phenomena, illustrated by three pillars of sustainability.

The specifics of the economics of sustainable development, assessed from the point of view of the concept by Thomas Khun, will be illustrated in two areas in this study. The first one relates to the inclusion of external costs in the economic calculation. As a specific element of the theory of economics, the costs have existed much longer than the concept of sustainable development, however, they have been adopted by the theory in a creative way. Taking the costs into account has a significant impact on changing the view of socio-economic reality in relation to the classical paradigm. According to the concept of Adam Smith, the selfish aspirations of producers translate almost absolutely into a social good in the form of increased wealth. It should be mentioned that the observations of the founder of the classical theory were correct to a large extent in this respect. Indeed, the pursuit to maximize the economic effect of the producer and the usefulness of the consumer coincide with each other and contribute to the development of society as a whole. An example here is the aforementioned history of the last two centuries, when the essentially free economy, cooperating with science and being protected by law [Acemoglu, Robinson 2014], has contributed not only to an increase in the number of people in the world but also to the rise of life expectancy and the improvement of standards of living. Convergence of interests occurs when there is a market interaction between a producer and a consumer and usually relates to the satisfaction of material needs. That is probably one of the reasons why the phenomena related to the above were recognized as one of the first principles of economics. The point is, that the concept of external costs has proved that economic rationality and selfishness do not necessarily translate into social welfare and based on a growing number of examples, can even reduce it. According to the concept developed by Thomas Khun, there are growing anomalies that challenge the classical paradigm. Despite the increase in the production of material goods, the living conditions of a significant number of social groups did not improve and often deteriorated. It was only in the middle of the 20<sup>th</sup> century, along with an increase in the number of environmental problems, was it noticed that a significant portion of external costs was of environmental nature which, in turn, was a direct reference to the ecological order.

The second area of the economics of sustainable development, of a *quasi-revolutionary* character in relation to the classical model, is the location of the economy in the macrosystem, along with the environment and society. From the very beginning of scientific discourse on the principles of management, attention has been paid to its social nature and the need (even necessity) to explore natural resources. The economic goal, however, was of paramount importance, since wealth, even understood in a social rather than individual context, mainly meant the satisfaction of material needs. According to the economics of sustainable development, on the other hand, the three elements of the macrosystem (identical to the three orders) are equal, environmental and social goals are considered independent, and, at the same time, they are correlated with economic goals [Rogall 2010]. This is to be understood as that both the goods provided by the economy and a clean environment are necessary for welfare. With regards to the environment, however, it should be mentioned that it is not about the full recognition of its intrinsic value, because when considering the numerous definitions of sustainable development, it can be noticed that there is a mention of the creation of opportunities to develop for present and future generations. It can be concluded, by implication, that according to the principles of sustainable development, the natural environment is, first and foremost, the habitat of the species *Homo sapiens*, and that particular operations should be directed towards establishing parameters most suitable for human beings. The above is the right approach, even despite the recognition of the rights of non-human beings in the economics of sustainable development [Jeżowski 2009].

## THE ROLE OF THE STATE IN THE ECONOMY OF SUSTAINABLE DEVELOPMENT

Drawing attention to the existence of the phenomenon of external costs, for which, by definition, there is no market, has shed new light on the role of the state in the economy [Fiedor, Graczyk 2006]. The same applies to the context of location of the economy in a macrosystem, the elements of which are society and the environment. Małgorzata Burchard-Dzubińska [2017] notes that the inability to establish property rights for the global environment generates externalities, and thus creates the need for legal and administrative regulations of their internalization, which, however, should not restrict economic freedom in an excessive way. In principle, the paradigm of classical economics recognized the need to limit the interference of authorities in the economic process as much as possible, arguing that it was necessary to liberate entrepreneurship and resourcefulness from the supervision of the state. Mutual interactions between a producer and a consumer were supposed to optimize the profit of the former entity and the usefulness of the latter one. Despite the fact that the interactions were based on mutually selfish premises, they

were essentially ethical, as the producer, to satisfy the needs of the consumer, in the long run, had to be honest [Smith 2007]. The above-mentioned fact is often referred to by the representatives of economic schools who support free-market solutions. Significant improvement in the quality of life of the residents of highly developed countries (although not only those) is a result of unleashing human creativity in the first place. Generally speaking, the above is manifested by the ability to create new solutions that meet the needs of consumers and keep internal costs of production to a minimum. Thus, the market is full of relatively cheap and useful products. If the essence of the problem was the direct relations of a producer and a consumer then, indeed, the role of the state in sustainable development would mainly involve financing research and development. The point is, however, that there are more issues than producer-consumer relations. The phenomenon of external costs, which have existed since the beginning of the market economy but have only recently been recognized and defined, raises the question of who should bear them, on what terms and in what amount. First of all, it should be noted that the absence of a price, by definition, makes it impossible for the market to determine the value of those costs. Therefore, the only institution that seems to be able to handle the task is the state. The theoretical problem, which can be considered a manifestation of revolution in the sense of the concept by Thomas Khun, also has an important impact on economic practices and politics. Nevertheless, the need for the internalization of external costs (inclusion of the entity that generates the costs in the economic account) is one of the most important aspects in this regard. However, the very recognition of such a necessity not only does not solve the problem but generates several questions, of theoretical and empirical nature, which is significantly influenced by the environmental, social and intergenerational nature of many external costs. It is important to note that any production of material goods involves the generation of a certain amount of waste, and even the use of the most advanced technology does not eliminate it completely. From an economic point of view, the reduction of pollution is not the microeconomic interest of the producer, which is directly related to the essence of external costs. The scale and manner of the reduction of costs, imposed by law, may vary depending on the adopted solutions, which makes the process of internalization arbitrary, to some extent. Obviously, the above-mentioned phenomenon does not apply to internal costs of an enterprise since it is the company's microeconomic interest to reduce them. However, the common background of reducing both types of costs is the need to use innovative and energy-saving technical solutions. The assessment of the impact of pollution on the environment is even more arbitrary. All actions and interactions within the market mechanism relate to human beings, mainly to two aspects that are measurable in terms of value - profit of an entrepreneur and usefulness of a consumer. Two complementary goals and one financial measure allow to develop compromise solutions, materialized in the form of a price. The situation is different when it comes to the environment. First of all, its users are non-human entities that do not participate in the market process and do



not have the possibility to express their preferences by means of money. The above also applies to the intergenerational nature of external costs, which (referring to the classical definition of sustainable development) by causing changes in the environment make it more difficult or impossible to implement the aspiration of future generations with regards to development. While agreeing on the essence of the matter, it should be noted that the scale of changes in civilization in recent years (and presumably also in the future) makes it very difficult to predict future directions of development and possible costs necessary to reduce current pollution. Indeed, the changes in the environment (including climate change) may make the costs much higher, however, future technological development may contribute to their significant reduction. Similarly, it is also difficult to predict what the aspirations and needs of future generations might be. Due to the unforeseen development of telecommunications techniques, mainly the Internet, the present shape of civilization, human behavior and aspirations is far from what was predicted in the past. The role of the state with regards to the internalization of external costs is indisputable in the context of a lack of microeconomic justification for the reduction of pollution by economic entities, although the matter is not fully explained. Apart from the aforementioned arbitrariness of solutions and the unpredictability of future consequences of current actions (which is a challenge for science, especially economics), it is also important that, as Francis Fukuyama [2017] notes, governments, which are entities responsible for the development of countries, act in a similar way to enterprises, focus on current economic growth and avoid paying external costs. The situation described above results not only from the conflict of social, economic and environmental goals but mainly from a conflict between urgent and current, important and long-term needs.

The issues that concern the quality of the environment and assessment of measures to improve its parameters are not only related to external cost but also (perhaps most importantly) to the location of the economy as an element of the environment-society-economy macrosystem, which is an important dimension of the economics of sustainable development. The multi-dimensional nature of the issue presented above and the problems with the financial assessment of the influence of economic activities on the environment, make the proposed solutions seem arbitrary. Social dialogue and consultations with experts are only a partial solution to the problem, because first of all, it does not clearly explain the essence of the phenomenon from a theoretical point of view and it is not objective. Second of all, in principle, potential solutions are always debatable and, third of all, they may cause the dissatisfaction of society. The last aspect does not refer to the conceptualization of the phenomenon of the location of the economy in a larger macrosystem but to the operationalization of the results, and it is due to the fact that the activities related to the discussed issue involve making the costs of production of individual goods «realistic», taking into account social and environmental consequences. In practice, it means an increase in total costs and, therefore, ultimately also in prices.

## SUMMARY

In the study, there are differences presented between the perception of reality by economics, generally referred to classical, and economics of sustainable development. Considerations that refer to the theory of the development of science by Thomas Khun indicate that the recognition of such phenomena as externalities and the location of the economy in a larger environmental and social spectrum significantly broadened the understanding of such concepts as the efficiency of production and economic calculations. The consequences of management for the third parties that are involved in market transactions, including the possible long-term impact, are a challenge not only to the theory of economics but also to economic practice and politics. It has been mentioned that due to the multi-dimensional nature of the issue and the multitude of measures that are used to assess individual phenomena (and thus the impossibility of applying a uniform financial measure), possible solutions are quite arbitrary, from an economic point of view and, in any case, they are far from the price compromise obtained under market conditions. A lack of microeconomic justification for reducing external costs also sheds a different light on the role of the state as an institution established to ensure broadly understood justice and long-term development. All the above constitute a sort of anomaly taking into account the concept of Thomas Khun, which could eventually lead to the emergence of a new paradigm in economics.

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Sowa kluczowe: zrównoważony rozwój, koncepcja Thomasa Khuna, paradygmat, efekty zewnętrzne, makrosystem gospodarka-środowisko-społeczeństwo

### ABSTRAKT

Celem opracowania jest spojrzenie na wybrane aspekty teorii zrównoważonego rozwoju, jako potencjalnie nowego paradygmatu w teorii ekonomii. Przedstawiono koncepcję ekonomii zrównoważonego rozwoju w kontekście teorii rozwoju nauki opracowanej przez Thomasa Khuna. W rozważaniach skupiono się na takich zagadnieniach, jak efekty zewnętrzne i funkcjonowanie gospodarki w makrosystemie, łącznie ze społeczeństwem i środowiskiem. Ich uwzględnienie w ekonomii zrównoważonego rozwoju pozwoliło na inne spojrzenie na tak fundamentalne aspekty jak dobrowolność transakcji lub społeczne skutki prowadzenia działalności gospodarczej. Na podstawie przeprowadzonych rozważań oraz przeglądu literatury, zauważono, że główne założenia ekonomii zrównoważonego rozwoju stanowią swoistą anomalię, a być może wręcz rewolucję w stosunku do ekonomii klasycznej (rozumianej w niniejszym opracowaniu jako ogólną koncepcję teoretyczną, głoszącą niezawodność mechanizmu rynkowego oraz zbieżność interesu indywidualnego producentów i konsumentów oraz zbiorowego). W kontekście koncepcji Khuna wskazano, że możliwy przyszły paradygmat ekonomii stanowić będzie nie tyle obalenie obecnego, co jego uszczegółowienie i spojrzenie na problemy gospodarcze z innej perspektywy.

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