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WATER RESOURCES MANAGEMENT — A CHALLENGE NOT FOR ECONOMISTS ONLY*

I. INTRODUCTION

The following approach to water resources management is based on the authors' conviction that there is a need to intensify the interdisciplinary debate on resolving the dilemmas of the allocation of these resources and, thereby, to improve the water supply and delivery system.

Although wherever natural resources are jointly used, there arises a risk that they will be exploited excessively or used up completely,¹ in the case of water resources, which have for quite a long time been considered free, inexhaustible goods functioning outside the economic account, their skilful management is today of particular importance. While global barriers limiting access to them are growing, and the consumers of these resources as well as the competitive consumption of the resources cannot be limited they are with reason defined as an endangered common good.² Although economic players (consumers, operators, municipalities, states) work for the common good, they have different objectives, sometimes contradictory ones, resulting from a range of motives, and therefore they act for the benefit of different communities, in different territorial systems and in different time scales.³

It is worth noting that the concept of the common good, one of the oldest categories of an interdisciplinary character, appears almost wherever there is a debate on the economic future of the world, on remedies for the growing problems of the economy, politics and morality, or on the systemic and insti-

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¹ M. Decko, P. Bielecka, Dynamika systemów jako narzędzie przeciwdziałania tragedii dóbr wspólnych, *Ekonomia i Środowisko* 2015, no. 2(53): 11.

² *Woda—zagrożone dobro wspólne*, interview with Satoko Kishimoto, co-ordinator of a project on fair access to water at the Transnational Institute (TNI), <https://kampanierzy.pl> [accessed 12 September 2016].

³ P. Gruszczynski, Etyczne dylematy gospodarki wodno-ściekowej w Polsce, *Annales. Etyka w Życiu Gospodarczym* 2007, no. 1: 369.

tutional conditions for harmonising development processes and overcoming disintegrating factors.⁴

In the Treaty establishing the European Economic Community, ensuring that every inhabitant has access to essential goods, including water, constitutes one of the objectives of public services.⁵ The need to protect water resources and use them in compliance with the principle of sustainable development has been highlighted in the preamble to the Directive establishing the framework for Community activities in water policy with regard to meeting the demand for water of the population and of the economy, improving water quality and reducing water pollution. It also established that water is not a commercial product, but a heritage which ought must be protected.⁶

These circumstances—in association with the development of earlier views and proposed compromise solutions reflected in the increasingly widespread economy of sustainable development, the economy of the common good, in anthropocentric and ecological ethics⁷—should be taken into account in the practice of water resource management, not just at the national, regional and local levels but also globally. Not only economists, but also researchers in other disciplines, politicians, business executives and managers as well as local communities, have to face challenges that go beyond previous patterns and require different thinking than before. They must resolve one of the most controversial issues of political economics raised by the question of how to organise the use of common resources so as to limit their excessive exploitation and excessive costs, arising, among other things, from the need to make large investments that will only be recouped in the long term.

The starting point of this paper, just one voice in this important discussion, is three interconnected assumptions largely derived from the achievements of Nobel Prize winner Elinor Ostrom, which have a strong empirical base and encompass successful as well as unsuccessful ways of disposing of common resources in many parts of the world:⁸

1) When choosing the way in which water resources are managed (alternatively referred to as a regulatory approach) it should be taken into account that despite the possibility of managing them in different systems and forms of ownership, purely market-based solutions, owing to a potential market failure, as well as statist solutions that do not comply with the applicable rules

⁴ M. Słodowa-Helpa, Odkrywanie na nowo dobra wspólnego, *Nierówności Społeczne a Wzrost Gospodarczy* 2015, no. 43(3): 8–20.

⁵ O.J. of the EU 2006 C 321E; M. Biernacki et al., Propozycje syntetycznego miernika oceniającego działalność instytucji użyteczności publicznej, *Zarządzanie Publiczne* 2013, no. 2(22).

⁶ Directive 2000/60/EC of the European Parliament and the Council of 23 October 2000 establishing a framework for Community action in the field of water management.

⁷ M. Słodowa-Helpa, Interdyscyplinarna natura paradygmatu rozwoju—uwarunkowania i propozycje usprawnienia dialogu, *Nierówności Społeczne a Wzrost Gospodarczy* 2015, no. 41(1): 67.

⁸ In 2013 as part of the Nobliści publication series, a Polish translation of her pioneering work of 1990 appeared, which perfectly fitted in the debate on the role of common resources and the mechanisms of their management. Compare E. Ostrom, *Dysponowanie wspólnymi zasobami* [Governing the Commons. The Evolution of Institutions for Collective Action], trans. Z. Wiankowska-Ładyka, Warsaw: Wolters Kluwer, 2013.

of the market economy, may lead to the destruction of some of these resources and a deterioration of social welfare.

2) The optimal management of water resources always requires regulation based on a set of conditions and principles for their effective use.⁹

3) Without them, the tragedy of common pastureland, described as early as the 1930s by the economist William Lloyd,¹⁰ and later analysed extensively by the biologist Garretto Hardin, is still a possibility. It depicts the mass consequences which the selfishness of rational individuals can bring about.¹¹

The thesis about the need to regulate and respect the principles of water resource management is confirmed by the significant evolution of Hardin's views, which—influenced to a large extent by discussions with Ostrom—concluded that his famous essay, quoted by many economists, ought instead to be entitled: 'The Tragedy of the Unregulated Commons.' It is also confirmed by the relatively optimistic message flowing from the research carried out by Ostrom, which undermines the imminence of the threat that this 'tragedy' will happen, provided, however, that efficient management has been ensured.¹²

Owing to the extent of the issues addressed in this paper, it is not possible to address all the challenges of the optimal management of water resources or dilemmas that emerge at different levels. Discussions will be limited to selected aspects, which are covered from the perspective of two disciplines in the field of economic sciences, focusing on the allocation of resources, namely economics¹³ and management.¹⁴ Issues of a general social dimension generating long-term external effects extending beyond enterprises and management dilemmas related to the day-to-day operation of water supply companies will be taken into account, albeit on a different scale. Although the latter are true of the Polish situation, they reveal more general problems which cannot be underestimated in the search for a formula to overcome barriers to the access to water resources related to the impairment of restoration capacity and depletion of these resources.

This does not mean, however, that an unequivocal position will be taken on the most justifiable forms and methods of regulation. Following Ostrom's

⁹ For more see: M. Słodowa-Helpa, *Odkrywanie na nowo*: 18–20.

¹⁰ W. Lloyd assumed that the pastureland on which a certain number of animals are grazing constitutes a common good accessible to all shepherds. Since each of them aims at maximising profits by increasing the flock, the resulting intensification of the use of the pastureland may lead to its hyper-exploitation and in an extreme form may undermine the basis of existence of its users, leading to the destruction of the common resources.

¹¹ G. Hardin, Extensions of "The Tragedy of the Commons", *Science* 280(5364), 1998: 682–683.

¹² J. Ganciarowska-Ziolecka, J. Średnicka, *Kapitał społeczny w ujęciu Elinor Ostrom: triumf interdyscyplinarności*, *Polityka Społeczna* 2011, no. 5–6: 7–12.

¹³ According to L. Robbins, 'Economics is a Science that studies human behavior as a relationship between limited resources and unlimited wants which have alternative uses' (L. Robbins (ed.), *The Common Sense of Political Economy, and Selected Papers on Economic Theory*, by Philip Wicksteed, London: G. Routledge and Sons, Ltd., 1933).

¹⁴ In R. Griffin's opinion, the essence of management defined most frequently from the perspective of resources boils down to such a selection and co-ordination of resources (human, financial, asset and information) as to make it possible to achieve the organisation's goals. Compare: R.W. Griffin, *Management*, *Houghton Mifflin Company*, 6th edn., New York: Houghton Mifflin College Div, 1999.

thoughts, to whose output we also refer in the main part of the paper, we fully share her view that scientists are too inclined to formulate ‘optimal’ solutions to problems associated with the use of common pool resources.¹⁵ Examples of successful as well as unsuccessful projects for the privatisation, nationalisation, ‘communalisation’ or the management of these resources in a different way, for instance as public-private partnerships are known. It is also known that privatisation, strongly promoted for some time after a period of unfulfilled promises regarding access to water and its quality and cost, is being rejected in some parts of the world while the trend for the renationalisation and regaining of public control over previously privatised water and sewerage services is accelerating.¹⁶ Although such solutions bring undeniable benefits to some communities by giving the lie to claims of some researchers and international institutions about the greater efficiency of the private sector, this is not the basis on which to generalise.

The principal aim of this paper is to identify and assess the conditions for managing water resources and the dilemmas involved in overcoming their excessive exploitation. The specific goals have been subordinated to this objective, in the form of the following questions:

—What are the circumstances determining the strategic nature of water resources?

—What regulatory solutions are considered in the process of their management?

—What conditions and principles should be respected in this process?

—What dilemmas do water distribution companies have to face?

—What considerations determine the multi-disciplinary and interdisciplinary nature of the problems analysed?

Against the background of the premises and assumptions outlined above, the next part of the paper will present various barriers to access to water resources that determine their strategic nature. The next part, which is a kind of bridge between the theoretical level and the practical aspects, deals with general regulatory solutions in the economy. Next, the conditions and principles of effective water resources management and some dilemmas related to the functioning of water supply companies in Poland will be presented. The conclusions and proposals stemming from the analyses carried out, referring to both the cognitive and practical spheres, will then follow.

¹⁵ E. Ostrom, *Instytucje i środowisko*, *Zarządzanie Publiczne* 2012, no. 2(20): 87.

¹⁶ In the last 15 years there have been more than 235 instances where the public sector has regained control of water supply and sewerage services, occurring in 37 countries. Only in the USA there have been 85 such cases since 2000. In Djakarta a privatisation process has been stopped following legal action taken by inhabitants. In Poland this trend has been observed among other things when in 2014 the local authority of Dąbrowa Górnicza re-purchased shares in a water company from a private shareholder Compare: S. Kishimoto, *Globalne zagrożenie dla zasobów wodnych*, <http://zielonewiadomosci.pl> [accessed 26 September 2016]; A. Kobyłka, *Malejące zasoby wody: globalny problem przyszłości*, <http://www.psz.pl/169-raporty> [accessed 14 September 2016]; *Wodociągi znów dąbrowskie*, <https://www.dabrowa-gornicza.pl/aktualnosc-1-28287.html> [accessed 8 September 2016].

II. THE STRATEGIC CHARACTER OF WATER RESOURCES AND THE BARRIERS HINDERING ACCESS TO THEM

The strategic character of water resources stems from their existential, economic and civilisational importance moderated by the scale of barriers to access to them. These barriers are of differing nature, depending to a large extent on the level of civilisational development and geographical location.¹⁷ They are connected with the uneven distribution of water resources internationally and nationally, their differing availability and flexibility of demand, as well as high susceptibility to the occurrence of external effects, and with the way in which changes are introduced, or corruption-based solutions which constitute one of the causes of conflicts of a social, economic, political and even military nature.¹⁸

Increasingly often, the procedure for resolving disputes between investors and public institutions implemented in response to the catastrophic consequences of certain privatisations and the use of the ISDS mechanism is considered to be a threat to the access to water resources.¹⁹

The scale of the problem of the ongoing difficulties or even the absence of access to water on a global scale is best demonstrated by the growing proportion of people confronted with these constraints. This is illustrated by the following facts:

1) Owing to the dynamic growth (rate) of the population and the consumption of water that is now much higher than in the past, the amount of water for every statistical person has been shrinking. While the world's population tripled in the twentieth century, the amount of fresh water consumed multiplied sixfold. The highest rate of natural growth occurs precisely where there is the greatest shortage of water.²⁰

2) In 1960 impaired access to water affected 19% of the world's population, in 1980 this problem was felt by 38%, while in 2005 it extended to as much as 50% of the global population.²¹

3) Pollution of sources of drinking water, visible especially in the poorest and conflict-affected countries, is just as dangerous as armed conflict. United Nations and WHO data both show that about four thousand children die every day as a result of waterborne diseases caused by the inadequate quality of water and poor sanitation infrastructure, more than those dying from AIDS, smallpox or malaria.²²

¹⁷ D.W. Bromley, *Property regimes and pricing regimes in water resources management*, in: *The Political Economy of Water Pricing Reforms*, New York: Oxford University Press, 2000: 29–48.

¹⁸ More on this: P. Gruszczyński, op. cit.; P. Kowalczak, *Konflikty o wodę*, Poznań: Kurpisz, 2007; A. Thier, *Korupcja w gospodarce wodnej*, *Aura. Ochrona Środowiska* 2015, no. 3.

¹⁹ A. Germanos, *Woda w publicznych rękach*, <http://zielonewiadomosci.pl> [accessed 20 September 2016].

²⁰ J. Cipiur, *Paradoks wartości czystej wody*, <https://www.obserwatorfinansowy.pl> [accessed 29 September 2016].

²¹ D. Owen, *The Sound of Thirst. Why Urban Water for all is Essential, Achievable and Affordable*, Cardigan: Parthian, 2012.

²² *Water—the common good. A debate in the European Parliament Human Rights Sub-committee*, 21 June 2016 [accessed 14 September 2016].

4) A lack of access to water is not only a problem for the poorest countries. As transpires from the World Water Assessment Programme) over a million EU citizens still have no access to drinking water and almost 2% of the population has no access to sanitary infrastructure. The poor condition of the pipelines causes leakage of between 10% and 40% of the water flowing through them.²³

5) Contrary to appearances, the problem of water shortage also concerns Poland, which has one of the lowest freshwater resources in Europe; 1.5 thousand cubic metres of water per inhabitant per year, which is three times less than the European average.²⁴

III. THE ESSENCE AND MANNER OF REGULATION IN ECONOMY

Depending on the type of resources we are dealing with, the usefulness of the possible forms of regulation may vary. However, the importance of the optimal allocation of resources is always due to their application(s)? and the fact that resources that are correctly allocated contribute to the highest possible increase in prosperity.²⁵

Generally speaking, economic literature usually distinguishes between two totally different ways of regulating the economy either by looking at it as a whole or at its individual components, which may either constitute the economies of particular regions, or elements distinguished according to other criteria. A criterion frequently used for dividing the economy into parts with a view to taking into account the regulation of specific features of a given area of management are industries or sectors.

At a high level of abstraction, the regulation of the system may be regarded as an orderly economic process related to development, which, by common consent, is based on an increase in the social division of labour, entailing two inter-related effects the continuous diversification and complication of economic structures, and the increasing specialisation of functions and simplification of individual actions, so

that the complexity of tasks does not exceed the intellectual capacities of the entities and groups that perform them.²⁶

In the short term, these phenomena tend to increase economic disintegration. Whether this will also be their long-term effect depends on whether the diversification and specialisation are accompanied by the development of mechanisms regulating economic processes. The result of regulation, under-

²³ Ibidem.

²⁴ Smaller resources are only in Malta, Cyprus and the Czech Republic. Cf. J. Cipiur, op. cit.

²⁵ In this part of the paper fragments of the work by M. Gorynia, *Teoria i polityka regulacji mezosystemów gospodarczych a transformacja post-socjalistycznej gospodarki polskiej*, Poznań: Wydawnictwo AE, 1995, have been used.

²⁶ S.N. Eisenstadt, Social change, differentiation and evolution, in: N.J. Demerath, R.E. Peterson (eds.), *System, Change and Conflict: A Reader in Contemporary Sociological Theory and the Debate over Functionalism*, New York: Free Press, 1967.

stood as an ordering process is a state of structural negentropy whose intensity is determined by the deviation from the most probable, chaotic distribution of elements contained in an organised whole. An important feature of an organised system, which an economic system is, is the degree of efficiency in the performance of its respective functions. Therefore, the assessment of the organisation of the system, in addition to the level to which it is organised, should also include the type of ordering into which it is organised, its appropriateness to perform its functions and, last but not least, the adaptability (functionality) effect achieved as a result of the organisation.²⁷

In contrast to the order introduced by regulation is chaos, a concept that is commonly perceived as pejorative, albeit used in many disciplines without negative overtones as a peculiar state in which one order disappears and another emerges.²⁸ In this sense, and in the long term chaos is creative, enabling a transfer to the new order.²⁹ From a short-term perspective, however, it means destruction, which is the price that nature and man pay for the evolution of systems and structures.

In the case of economic systems, which operate for a purpose, the process of organising is tantamount to ordering them on two levels: firstly, on the level of ordering, and secondly, on the level of the quality of this ordering. This is precisely the process when the term 'regulation' is used to describe it. If the system is not able to maintain a certain minimum level of regulation, it is at risk of gradual disintegration (entropy).

It could be assumed, having simplified things a little, that if the aim of regulation is to order the system (by achieving, maintaining or enhancing the state of structural negentropy) and if its efficiency in performing the relevant functions depends on the degree and form of ordering, then the method (or the mechanism) of regulation, understood here as widely as possible, affects the degree of efficiency of the economic system. The most frequently adopted criteria of this efficiency, include: maintaining economic equilibrium, the operating costs of the system, and the use of the production capacity and information flow in the hierarchy of the economic system.³⁰ An extensive 5-page list of such criteria has been quoted by János Kornai.³¹

To conclude, it should be noted that regulation, which is a term used in various scientific disciplines, does not have an unambiguous definition accepted by the representatives of the natural, technical or social sciences, including

²⁷ A.A. Malinowski, *Problemy ogólnej teorii systemów i ich znaczenie w biologii*, in: S. May (ed.), *Problemy metodologii badań systemowych*, Warsaw: Wydawnictwo Naukowo-Techniczne, 1973.

²⁸ Z. Hockuba, *Gospodarka chaosu. Transformacja a regulacja ekonomiczna*, *Ekonomista* 1993, no. 4.

²⁹ I. Prigogine, I. Stengers, *Z chaosu ku porządkowi [Order Out of Chaos: Man's New Dialogue with Nature]*, Warsaw: PWN, 1990.

³⁰ A.B. Bieć, *Organizacja i sprawność systemu gospodarczego. Elementy teorii*, Warsaw: PWN, 1988: 5.

³¹ J. Kornai, *Anti-Equilibrium. Teoria systemów gospodarczych. Kierunki badań [Anti-equilibrium: On economic systems theory and the tasks of research]*, Warsaw: PWN, 1973: 282–286.

economics. In the tradition of the economic sciences, as well as in some other disciplines, there are numerous meanings of the term, not necessarily coinciding with the broad, abstract understanding of the term presented here. In this sense, regulation should lead to agreement and to the coordination of a variety of different actions and interests, and its final effect ought to be the higher effectiveness (efficiency) of the system.

IV. PRINCIPLES OF WATER RESOURCE MANAGEMENT

Water management may be thought of as being carried out at several levels of abstraction, which can be reduced to two levels:

- the general, comprehensive and complex management of the economy on a national, international, or even global scale,
- specific instruments used in the regulation of the behaviour of the entities participating in the water management system.

At the level of the entire system, Marek Wąsowicz has formulated several general principles to which the management of water resources ought to be subordinated. They include:³²

- management of these resources in a system of separate hydrographic catchment areas;
- a comprehensive approach to and broad understanding of protection, including surface waters (internal and sea waters) and groundwater;
- at the same time taking into account the qualitative as well as quantitative aspects;
- achieving the pro-ecological objectives adopted;
- socialisation of the governance process, respecting participatory democracy;
- extensive use of market mechanisms.
- leaving some strategic decisions to the central government;
- maintenance of the necessary control and supervision of the enforcement of applicable law by national and supranational administrative authorities.

Wąsowicz divides the water management system into five sub-systems that carry out its five functions: organising, planning, empowering, motivating and controlling.³³

On a more detailed level, three types of institutions understood as formal and informal sets of rules governing the behaviours of common pool resource users can be distinguished.³⁴ They are:

³² M. Wąsowicz, *Podstawy ekonomiki gospodarki wodnej*, Warsaw: Oficyna Wydawnicza Politechniki Warszawskiej, 2000: 82–83.

³³ *Ibidem*: 83–97.

³⁴ K. Madani, A. Dinar, Exogenous regulatory institutions for sustainable common pool resource management: application to groundwater, *Water Resources and Economics* 2013, no. 2–3: 57–76.

—non-cooperative management institutions, the disadvantages of which are known as the tragedy of common pastureland and have been most broadly presented by Lloyd and Hardin, and which may, nevertheless, be eliminated by learning from experience (heuristic behaviour);

—cooperative management institutions analysed extensively by Ostrom, in which the rules of group rationality prevail and cooperation leads to the elimination or minimalisation of external effects and, in the long term, to enhanced advantages for all users;

—external regulatory institutions counteracting overexploitation and congestion, directed mainly at users inclined to observe the criterion of individual rationality only. Such situations, requiring the existence of external regulatory institutions, are relatively numerous.

Depending on the situation, these institutions may have different characteristics and take four forms determining their effectiveness in achieving the intended results. They are:

1) quota-based regulatory institutions where each user has been assigned certain quotas of the (obtained) resource;

2) status-based regulations where permissible quotas are defined with flexibility for individual periods and are contingent upon the respective condition of the system;

3) tax-based regulations introduced to limit exploitation (make it more expensive) which take different forms such as a tax included in the energy price or exploitation tax;

4) bankruptcy-based regulations that treat the resources as an entity falling into insolvency, where the exploitation quotas are reduced by certain values calculated using different insolvency methods.

On the basis of numerical simulations carried out, Kaveh Madani and Ariel Dinar have shown that, from the point of view of three criteria (social welfare, justice and regulatory resilience), the best solutions for rationalising the exploitation of common resources are the concepts of regulation based on the determination of the exploitation volume and maximum quotas.³⁵ Determining the quotas and other systems regulating access to resources have been the subject of numerous works tackling the issue of the regulation of access based tariff regulation.

A study by Dinar shows that there is a wide variety of systems of tariff regulation in the areas of agriculture, industry and domestic consumption, globally. Although he does not identify a single system of regulation that would be preferred, he points to the need for taking into account social and institutional factors, as well as external conditions such as restrictions on access to water resources, when reforming the tariff system.³⁶

The analysis of changes in the regulatory system in India carried out by Daniel W. Bromley, leads to three theses concerning the conditions of the effectiveness of changes in the system of water pricing regulation for agricul-

³⁵ Ibidem: 57–65.

³⁶ W.A. Dinar, *The Political Economy of Water Pricing Reform*, New York: Oxford University Press, 2000.

tural purposes, but which may also be applied in other, non-agricultural areas of regulation.³⁷ The first is the need to create an organisation that binds all entities within the framework of the management and maintenance of the water system. The second thesis refers to the tariff system and the water management system, understood as part of the ownership structure in which farmers are involved. The third thesis is related to the need to see the tariff system as part of the principles under which farmers are urged to contribute to the common good by improving water management to the benefit of each of them.

The extrapolation of these theses to the entire tariff system appears justified at this stage. At the same time, in parallel with the proposals for reforming the tariff systems, strong emphasis is placed on paying particular attention to the situation of people in financial difficulties.

A separate problem related to the access to water has been identified by Piotr Kowalczak who linked the process of urbanisation with the 'non-transferability' of water resources. This dependence changes dramatically the model of water management in respect of equitable charging for access to the same resource.³⁸

However, it is worthwhile to return to the still more general and even philosophical issues underlying such a solution for water resource management in order to avoid this tragedy, which is a metaphorical but very meaningful description of the dangers associated with the management of all scarce resources.³⁹

Firstly, one can doubt the appropriateness of a neoclassical economic analysis relating to the problems of the exploitation and exhaustion of natural resources, including water. Following the logic of this analysis, the increasing scarcity of a resource should lead to an increase in its prices, which may produce a substitution effect. As a result, the problem of the scarcity and exhaustion of resources will be reduced to technical and optimisation issues. Therefore, it is proposed that not only economic but also political assessments should be taken into account with regard to environmental issues.

Secondly, from the Keynesian point of view, 'politically determined assessments of the need to preserve the environment for future generations' are of decisive importance in the conservation of natural resources.⁴⁰ It is therefore about emphasising the role of the criterion of intergenerational ecological justice and not only microeconomic efficiency. As regards natural resources, the market is not a sufficient regulatory mechanism. Not all environmental effects (be it costs or benefits) can be expressed in purely monetary terms; on the contrary, there is wide scope for political assessments.

Thirdly, in the dispute about the supremacy of one of the two paradigms, it is necessary to seek a compromise⁴¹ that is an ecological paradigm of eco-

³⁷ D.W. Bromley, op. cit.

³⁸ P. Kowalczak, *Wodne dylematy urbanizacji*, Poznań: Wydawnictwo PTPN, 2011.

³⁹ B. Fiedor (ed.), *Podstawy ekonomii środowiska i zasobów naturalnych*, Warsaw: C.H. Beck, 2002: 121.

⁴⁰ *Ibidem*: 121.

⁴¹ K.E. Boulding, *Economics as a Science*, New York: McGraw-Hill, 1970.

nomics and the creation of an ecological meta-science emphasising the absolute primacy of the ecological aspects of economic development and calls for the ‘cowboy economy’ to be put aside in favour of the economy of the ‘Earth as a spaceship’ and the paradigm of the economisation of the environment. The other paradigm assumes a broad application of economic tools in the (optimisation analysis) analysis of best options and proposes the far-reaching economisation of the use of the environment. At the same time, it does not see the need to create an ecological meta-science, placing the emphasis on the autonomy and cooperation of particular disciplines dealing with the exploitation of natural resources.

Fourthly, the demand for a sustainable approach also refers to the dispute about the possibility of incorporating the relationship between humans and nature into modern science, especially in economics and ecology. On the one hand, the need to change the anthropocentric stance is raised, but without rejecting it radically. On the other hand, the need to reject anthropocentrism in favour of nature-centrism (biocentrism) is assumed. Different ways of solving ecological problems are proposed, such as eco-fascism, eco-anarchism, bio-regionism, eco-feminism or deep ecology. The third approach, referred to as exclusivity, takes the position that humans have absolute superiority over the natural environment, and simultaneous control of it. Contemporary philosophical and ethical trends propose compromise solutions, which are reflected in the concepts of new anthropocentric ethics and ecological ethics.

In numerous trends in economics (for example in the new institutional economics, industrial economics and evolutionary economics) the diversity of connections between economic entities, going far beyond the dependencies presented by pure price theory is shown. It is stressed that, in addition to the traditionally analysed competitive relations and the regulatory role of the State, cooperative links between economic entities as well as the transition from a competitive to a cooperative approach play an important role. Cooperation, previously perceived as a factor reducing competition, is increasingly frequently recognised in relation to competition. New, unconventional categories of the ‘marriage’, such as *coopetition*⁴², appear in connection with the evolution from simple forms of gaining a competitive edge to increasingly more complicated and difficult ones to follow or imitate, symbolising the symbiosis of competition and cooperation⁴³ and changing the win–lose situation into a win–win situation.⁴⁴ It is even proposed to replace the term *competition* with the term *coopetition*.

Cooperation, explained by the game theory and the company’s resource theory, occurs in all those places where competition and cooperation are realised simultaneously. It is therefore a strategy aimed at exploiting the syn-

⁴² J. Cygler, *Kooperencja przedsiębiorstw. Czynniki sektorowe i korporacyjne*, Warsaw: Wydawnictwo SGH, 2009.

⁴³ M. Aluchna et al., *Kooperencja przedsiębiorstw w dobie globalizacji. Wyzwania strategiczne, uwarunkowania prawne*, Warsaw: Wolters Kluwer, 2013.

⁴⁴ There is no need for a broad definition, particularly since the literature contains different interpretations of these both concepts, or even suggestions that they are synonymous and may be used interchangeably.

ergies that result from the operation of companies in the network and their appropriate configuration in relation to each other and other players in the sector, best reflected in the structures of supply chains. Within these meta-structures, companies cooperate in larger, more competitive and valuable markets, but also compete to obtain the greatest profits. Cooperation allows them to strengthen their bargaining power, make better use of resources and facilitate organisational learning. The dynamics of interaction are determined by the joint formulation of cooperation goals and independent competition targets.⁴⁵ A source of competitive advantage may be the possession of unique tangible and intangible resources, in particular in the form of capacity and competence.

In the conditions of globalisation and internationalisation which enforce the achievement of competitive advantages in international markets, clusters are a good example of companies cooperating and competing with one another, connected by a common goal and contributing to the implementation of the tasks for which they were established.⁴⁶

V. DILEMMAS ASSOCIATED WITH THE OPERATION OF WATER (SUPPLY) COMPANIES IN POLAND

Particularly important are the dilemmas related to the activity of water supply companies that operate in Poland pursuant to many legislative acts⁴⁷ and regulations arising from EU membership and the incorporation of Community law into Polish legislation. The nature of these dilemmas is largely determined by the fact that the vast majority of companies were created in the process of the transformation of the state sector or when they became the property of local authorities. Therefore they were endowed with assets that had been created by this sector or made available by municipalities when these 'municipalised' state assets of water supply companies were transferred to them. This issue is important inasmuch as it gives rise to the question whether the municipalities take over the rights to such companies free of charge. After all, before the period of the political change, investment had been financed by the State Treasury (and therefore by the general public as it is commonly understood) and doubts may arise with regard to the potential disposal of water supply companies, especially in the context of the Act on local government imposing this duty on municipalities. On the other hand,

⁴⁵ M. Słodowa-Helpa, *Rozwój zintegrowany—warunki, wymiary, wyzwania*, Warsaw: Wydawnictwo CeDeWu, 2013: 73; R. Strzelecka, *Perspektywa konkurencji, współpracy i kooperacji w sektorze firm deweloperskich w Polsce*, *Zarządzanie i Finanse* 2012, no. 1/3.

⁴⁶ M. Gorynia, B. Jankowska, *Koncepcja klastrów jako sposób regulacji zachowań podmiotów gospodarczych*, *Ekonomista* 2007, no. 3; M. Słodowa-Helpa, *Rozwój zintegrowany*: 73.

⁴⁷ Among other things, the following legislative acts: of 7 June 2001 on the Collective Supply of Water and Collection of Sewage; of 18 July 2001 on Water Law; of 17 September 2015 on Local Government and Entities Operating in the Form of Companies; of 15 September 2000—Code of Commercial Companies and Partnerships.

however, we may say that ownership of these companies does indeed belong to municipalities since the companies had been, before the time of the Polish People's Republic, owned by the municipalities, which were simply deprived of their ownership as a result of a political change. This is even more so considering the extent of the burden imposed on society and connected with the cost of water supply and sewerage services. And yet it must be assumed that thanks to the liquidation of its assets such as a water supply and sewerage company, a municipality may carry out other tasks ascribed to it, which it cannot otherwise carry out owing to expenditure constraints.

These considerations lie mainly in the area of legal and ethical dilemmas related not only to the limitations of natural resources, but also to other public goods, including among other things the income of a local community, for instance a municipality.

The ethical problems related to the operation of companies in a natural monopoly regulated locally have not yet been addressed in literature on the same scale as has been done with regard to other stakeholder groups. Three dilemmas have been formulated from this perspective, in the form of general questions followed by more specific ones as presented below:

—Does each owner have a full right to dispose of the usufruct resulting from his ownership of a water supply company?

—Should the guarantee of access to water supply and sewerage services be made at the cost of existing customers?

—Should it be the conservation of natural resources or the amount payable shown on the bill for water supply and sewerage that ought to be taken into account as of primary importance in the process of tariff determination?

Although the question of the use by the municipality of the usufruct arising from the ownership of a water supply and sewerage enterprise remains open, the ethical dimension of this question, incapable of being answered by management studies, is connected to three aspects of the shaping of ownership policy with regard to water supply and sewerage enterprises. They are:

1. Since a municipality is made up of its inhabitants, represented by the respective authorities, and the use of the usufruct of a water supply and sewerage enterprise means an increase in the tax obligation imposed on them, should these authorities follow the will of the inhabitants, or rather take a managerial decision regarding the use of this usufruct?

2. If the use of the usufruct in the form of dividend simultaneously entails outflows of funds from the municipality in CIT dues, is it ethical to create financial burdens and impose them on the local community if water supply is one of the municipality's tasks?

3. Should, and if so, how should municipalities shape the ownership structure and create the principles under which a water supply and sewerage company is to function?

These questions remain open, especially considering the difficulty of finding indicators for measuring the municipalities' right to dispose of assets. Moreover, although municipalities' responsibility for the functioning of water supply and sewage services is established by law, the legislative acts do not

specify what it means—or whether, regardless of the necessary costs, all residents of the municipality should have guaranteed access to these services

The second dilemma is related to the rules of financing inputs. Historically, all expenditure related to the construction and development of water supply and sewage infrastructure was borne by municipalities. However, as a result of the expansion of companies into areas other than that of the municipality in which the company originally operated, this situation has changed. This was also determined by the process undertaken by several municipalities of combining their respective duty to provide water supply services. In a great number of municipalities, the obligation to finance the maintenance and development of assets was then transferred to a water supply company. At present, owing to the budgetary problems of municipalities, the dilemma outlined above is becoming increasingly pronounced and questions arise about the sources of financing the expenditure necessary for maintenance, and in particular for the development of water supply and sewage networks. As experience shows, the expansion of the water supply and sewage network carried out separately from the possibility of financing its construction by entities equipped with such a network results in tariffs for water and sewage disposal increasing so much that potential customers find them unacceptable. As a result, an ethical problem arises with regard to charging the existing customers with the costs of building the network, and consequently with the cost of access to water as a basic resource. This situation is further complicated by the potential health problems of some residents, resulting from poor quality water coming from local sources located on property not covered by access to the water supply system. The principle of social solidarity or lack thereof is dominant here. At the same time, in contrast to the global scale, social solidarity at the local level is understood and associated with attempts to solve problems of civilisation in accordance with the principle of sustainable development.⁴⁸ It should be added that investments previously carried out directly by municipalities had their source of finance in the budget, which is connected to the actual financial commitment of all members of the local community. Regarding the issue discussed in this paper, if the answer to the question of the financing of network development by existing customers is in the affirmative, another question will then arise about the speed of the implementation of this process, while the adoption of such a solution may generate financial problems for the poorest of the existing customers. The following questions arise in relation to this problem:

1. Is it permissible to expect the existing customers to finance the development of access to the services of a water supply company?
2. Should differentiation of charges for water supply and sewage collection, when arising from the implementation of the investment in one municipality, be permitted and, if so, to what extent?
3. What dynamics should be expected in relation to the implementation of access to water supply and sewage services?

⁴⁸ T. Kosiek, Zrównoważony rozwój—rozwiązanie czy ideologia, *Zeszyty Naukowe. Organizacja i Zarządzanie* 2015, issue 85: 233–240.

4. Should decisions in this respect be taken by the municipality or directly by its inhabitants?

As can be seen, the responses of companies and local authorities, are implicit in the established facts. There are no answers to these questions available from management studies. It therefore seems to be universally justified to carry out more social research in this area. While the principles proposed by the economy of sustainable development may be applied here, they will not solve the problems expressed in the above questions.

In the area of sustainable development, at the level of the human and natural environment, a third dilemma also arises, connected to the policy of setting tariffs and the level of these tariffs, the determination of which depends on different factors in many spheres. One is the need to ensure special care for the natural resource which is water. According to the data of the Chamber of Commerce 'Wodociągi Polskie' (Polish Waterworks), in the last twenty years water consumption per inhabitant of Poland has been reduced by half approximately. However, what still remains an open question is the limit of water consumption per person, reflecting the minimum amount of water required for living purposes. While the volume of water consumption in European cities seems to have been stable in recent years, individual water consumption varies by almost 50%.⁴⁹ The high level of water consumption is not only associated with the potential waste of water, but also with the need to reconstruct the infrastructure to a greater extent than necessary. On the other hand, however, the rapid decrease in the volume of water and, consequently, waste water may cause problems of a technical nature and further may have an impact on the quality of water. There are no studies available in Poland on the influence of various factors on the consumption of water. The results of such surveys carried out in other countries, for example in Spain and some other regions of the world, are not transferable to the Polish situation because (i) water companies operate under different conditions, in a different environment, and (ii) these studies were carried out some time ago and may not be entirely adequate to the situation today.⁵⁰

Another problem that arises when an attempt is made to regulate the level of water consumption is related to the inconvenience of the average bill for water and sewage.⁵¹ In Poland, despite lower tariffs in absolute terms as compared to those applied by Western European companies, the burden of tariffs is much higher owing to lower income levels and further dynamic tariff increases may lead to an impoverishment of a significant part of the population, and adversely influence the collection of receivables, resulting in consequence

⁴⁹ P. Kowalczak, *Wodne dylematy*, passim.

⁵⁰ W.A. Dinar, *The Political Economy of Water Pricing Reform*, New York: Oxford University Press, 2000; E. Domene, D. Sauri, Urbanisation and water consumption: influencing factors in the metropolitan region of Barcelona, *Urban Studies* 2006, no. 43.

⁵¹ Recently the measure of such burden has been the percentage of the water consumption and sewerage bill in the disposable income. This percentage varies between: 2.5% in the USA and in EU member States, depending on the institution, they vary between 3 to 4%.

⁵² Najwyższa Izba Kontroli, *Kształtowanie cen usług za dostarczanie wody i odbiór ścieków* Warsaw, 2016.

in higher operating costs. Hence there will always be the need to choose the lesser of two evils. What is important, however, is the conscious creation of a long term individual water consumption plan, taking into account the local technical conditions of water acquisition. The technical conditions in this context are understood as the amount of water resources that a water company has at its disposal. In our opinion, there are three important elements which should be taken into account in the process of creating a long-term water consumption plan using economic methods. These are: customer income levels, the volume of water resources and the useful life of the existing technical infrastructure. The latter should define the timeframe in which the expected water consumption should be achieved. The following questions have been formulated to address the problem described in this way, although they only outline the area in which measures should be taken:

1. Is there a sufficient level of public awareness for accepting an increase in tariffs aimed at reducing the use of natural resources?
2. Is the customer's level of affluence high enough to create room for an increase in the burden of increased water tariffs and sewage collection?
3. How do we to create a tariff policy at a given time and how do we define this time?

Attempts to answer such questions may constitute the basis for a discussion which, while not solving this dilemma, will allow the reduction of social tensions connected with the implementation of the objectives. As in the case of other dilemmas, it is difficult to find measures that would allow transferring the answers to the questions raised from the ethical sphere to the area of management studies. However, it is clear from the above considerations that there are management factors in these areas, and even if they will not provide answers to these questions, may ensure greater rationality in decision-making.

The issue of the profits of water supply companies and their allocation has recently also been recognised by controlling bodies, including the Najwyższa Izba Kontroli (Supreme Audit Office).⁵² Although the Office did not take a negative view of the fact that municipalities draw profits in the form of dividends from water supply companies, the fact that this issue has been addressed and proposals regarding the creation of profits by these companies and the administrative reduction of profit margins have been formulated to show the importance of the problem. At the same time, it is worth noting that water supply companies operate partly in other municipalities as well and not only in those that own them. They often generate revenues outside the regulatory sphere as well. In such cases, the dilemma is distorted and loses its ethical dimension with regard to the municipality's authority, but only in relation to its inhabitants. The question that remains open is whether the municipalities benefit from being the owner of a water supply company. The ethical dimension of this question has three aspects. First of all, a question arises as to what makes the management of an organisation a success, followed by a question about the preconditions for the success of a public sector entity such as a water supply company, to end with one about what decisions taken by the managers affect the value of the company they manage in the most general sense of the word.

VI. CONCLUSION

The above considerations are grounds for formulating several conclusions and proposals. The occurrence of the tragedy of common pastureland is an objective and realistic threat to the increasing prosperity and ecological continuity of our civilisation. From the point of view of water resources, their rarity and especially non-renewable nature, they should be treated as a certain metaphor, a universal symbol of the problems which our civilisation is facing.

As it transpires, society has been able to develop mechanisms for regulating the behaviour of entities, which make it possible to limit or even eliminate the consequences of this threat.

Relying solely on the operation of market mechanism may be disastrous, but at the same time a far-reaching departure from it is not advisable, but rather its support, supplementation and correction with other instruments regulating the behaviour of economic operators and society.

The solutions adopted should be tailored to the conditions of place and time, and there are no best solutions, absolutely suitable for all conditions.

One of the increasingly recurring problems of market failure and highly simplified disputes that focus on the market-state mean that the concept of the common good is being rediscovered, extracted from *the black hole* of memory, to which a large number of economists have *consigned* it.

The euphoria associated with the growing attractiveness of the common good, not without reason defined by its second life, should not, however, obscure the risk it still carries. One should be aware of the dangers and pitfalls connected with misinterpretation of the essence of such a good, its too shallow interpretation, as well as with the dangers caused, among others, by the following factors with simultaneous activities in this field of researchers and social movements of different character and origins.⁵²

Although the common good may include various tangible and intangible assets, it cannot be identified only with resources, as unfortunately sometimes happens. The paradigm of the common good includes three elements forming an integrated, interdependent whole. They are resources, community and a set of principles, values and norms.⁵³

In the search for solutions to contemporary problems, it is necessary to ask questions, for example: to what extent a return to the concept of the common good, offering real forms of co-participation and responsibility, can help to overcome the painful effects of the threat of water shortage?

There is such an increasing number of opinions that in order to find answers to the questions formulated in this paper, it is necessary to cross the boundaries of disciplines, which may not just be invigorating, but in the twenty-first century even necessary to understand the world.

⁵² More on that in: M. Słodowa-Helpa, *Odkrywanie*, *passim*.

⁵³ D. Bollier, *The Commons. Dobro wspólne dla każdego*, Zielonka: Spółdzielnia Socjalna FAKTORIA, 2014; Ch. Felber, *Gospodarka dobra wspólnego. Model ekonomii przyszłości*, Rzeszów: Wydawnictwo Biały Wiatr, 2014.

Some economists emphasise that, paradoxically, the discipline of economics should be interdisciplinary, that it should take into account the achievements of other social sciences, while simultaneously affirming the pluralism of approaches within the discipline, that the world needs the economy of inclusion, especially when globalisation and technological change create great opportunities, but also enormous risks, and we are flooded by successive waves of the convergence revolution resulting from the growing synergy between its dynamically changing components, among others, the quantum, digital, and biomolecular revolutions.⁵⁴

What is a cause for optimism is that rebirth in the economy is becoming increasingly widespread, and that calls for its greater rooting in society and ethics are not without a response. A growing number of economists point to the need for economic links with politics, environment and culture. Instead of the economy of scarcity or overcapacity, a moderation economy and a new pragmatism are proposed.⁵⁵ The alternative are participatory economy, the economy of complexity, the economy of sustainable development, the economy of the common good, the economy of imperfect knowledge based on behavioural education (psycho-economics), which results in a far-reaching reconstruction of the homo *oeconomicus* concept. The concepts of homo *cooperativus*, homo sapiens *wikinomicus* and homo *sustinens*, based on Community and altruistic values, are becoming increasingly important, and the interdependence of the economy is being shaped by technological and social networking. It is accompanied by the development of bioeconomics and bioeconomy, covering practically all sectors and related services, which is a strategic cross-sectoral integrating form of activities, forming part of an interdisciplinary approach to the principles of planning and financing of research and business ventures.

Positive changes are also to be seen in other social sciences and in the practical sphere. The following should be noted, among others: the growing interest of researchers, public authorities and society in eco-innovation, confirming the growing awareness of environmental risks, as well as an increase in corporate social responsibility and the activity and effectiveness of many national and international organisations promoting sustainable production. It is also evident that the relationships between companies and their business and social environment are becoming more and more professional, increasing their credibility and reputation, which is becoming an important element in creating a competitive advantage.

In the context of the premises outlined above and questions that should be the subject of an intensified debate, the challenge that theorists and practitioners are facing is to find new legal structures, institutional forms and social

⁵⁴ G.W. Kołodko, Nowy Pragmatyzm, czyli ekonomia i polityka dla przyszłości, *Ekonomista* 2014, no. 2.

⁵⁵ M. Bałtowski, Ewolucja ekonomii a nowy pragmatyzm Grzegorza W. Kołodki, *Ekonomista* 2015, no. 5; M. Bałtowski (ed.), *Ekonomia przyszłości. Wokół nowego pragmatyzmu Grzegorza W. Kołodko*, Warsaw: PWN, 2016; J. Pach et al., *Ekonomia umiaru. Realna perspektywa? Nowy pragmatyzm Grzegorza W. Kołodko*, Warsaw: PWN, 2016.

practices that will allow different types of common resources to function on an increasingly large scale. What is needed are innovations in law, social policy, self-government, culture and social practice that build a world-view different from that prevailing in systems based on the state and the market.

Although we can observe the role of conscious and active consumers, for whom the ethical reputation of companies, high quality products and services is increasingly important as they have such a large influence on the new face of the markets of the future, with regard to water resources, the majority of society is unaware of the significance of the tragedy of common pastureland for water resources. This is why it is so important to educate and raise public awareness, which are two important instruments for averting this tragedy. It is also difficult to overestimate the role of all levels of the education system and the media. The issue of the rarity and scarcity of natural resources, including water, should be the subject of greater attention among responsible political groups, which should not evaluate their achievements solely in terms of the current political cycle, but should move forward in order to take into account the temporal dimension of the relationship between the state of the environment and the level of material consumption – in other words, to consider intergenerational or intertemporal differences in the level of social welfare.

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WATER RESOURCES MANAGEMENT —A CHALLENGE NOT FOR ECONOMISTS ONLY

Summary

The inspiration to focus on water resources management in the manner presented below originated in the authors' conviction of a need for an intensified debate on the ways of solving problems relating to the principles and rules governing the allocation of water resources and their varied uses in a situation of the growing risk of a complete use or serious abuse of water resources. These deliberations are expected to lead to an improved system of water supply and delivery and a better use of water in general. The aim of this paper was to identify and assess the dilemmas arising from solutions developed in two branches of science dealing with the allocation of resources: economy and management. However, it has not been possible to solve effectively and unambiguously all the problems. The analysis was conducted at different levels, starting from issues of a global character, through macroeconomic issues analysed at the national level, to the examination of companies operating as water suppliers, in an attempt to combine the cognitive aspects grounded in the existing theoretical conceptions with the more practical ones. Against such a background, the barriers hindering access to water resources have been presented. This was followed by some bridging as well as theoretical and practical aspects, and deliberations on

the general regulatory solutions adopted in the economy. After that the conditions and principles ensuring effective water resources management have been presented together with selected dilemmas pertaining to the functioning of water supply companies in Poland. A presentation of the results and proposals obtained in the course of the analysis, applicable to the cognitive sphere as well as the practical aspects, follows these deliberations.