


Chapter 10

Water and Energy Nexus in the Circular Economy Context

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ABSTRACT

The relationship between water and energy is strong enough to create a nexus. It is clear that water and most of the resources we obtain energy from today are finite. Although it is possible to benefit from infinite energy sources, the water side of the nexus is dependent on finite resources. Therefore, it is important to make the nexus a circular structure for sustainability. In this study, the water side of the nexus seems prone to circular sustainability. The perspective from the energy side is more pessimistic. However, the available data mainly covers developed economies. Therefore, it has become clear that all stakeholders must take responsibility in order to create a global circular economy. It was concluded that more funds are needed from developed economies to strengthen the water-energy nexus in developing economies, and developing economies need to reduce their own population pressures.

INTRODUCTION

The beginning of life on Earth took place in water. Since this beginning, water has been the basic component of life on Earth. All life forms have continued their existence in places where water was available according to their needs. Humans are also one of the creatures that continue their lives dependent on water. For this reason, people continued their lives in places where there was access to water. When

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they transitioned to an agricultural society, they chose regions where access to water was easy, as in the hunter-gatherer period. Since agricultural societies were more dependent on water, they clustered on the coasts and started civilization in these regions. In essence, it would not be wrong to associate the entire history of humanity with the economy. Because people have had to use relatively scarce resources efficiently during every period of their lives. While hunter-gatherers needed water for their most basic needs, farmers also needed it to continue their production. The situation has not changed since the industrial revolution. Water has remained a natural part of human life and a basic input in the economy. As humanity and civilization have flourished, economic relations have become more complex. Accordingly, the relationship between water and economy has become increasingly stronger. Today, water is a basic production input in every field, from the manufacturing industry to agriculture, from the energy sector to urban use. Without water, it is not possible to continue production activities in any sector.

In today's world, the inputs of life and production activities have changed compared to the past. This change will continue to change as civilization progresses. For example, the food items that humans need to sustain life have become more diverse and complex compared to the past. Similarly, production has become more complex and diverse with increasing and changing human needs and technology. In direct proportion to this increase, the demand for water, which continues to be an input for every production, has also increased. At this point, another input that is as necessary for production as water comes to mind. This input is energy. As the production process, which used to be based on muscle power, began to be replaced by machines over time, the demand for energy has also increased. While the energy required at the beginning of the mechanization process was provided by coal, this was eventually replaced by oil and then by fossil-based fuels such as natural gas. Although electricity was later included, the partial dependence on fossil fuels for electricity production could not be eliminated.

However, there is a dependency on water for all the processes that are in effect to obtain energy. This can be seen in all sectors where the necessary inputs are provided to produce energy. From mining to the metalworking industry, from oil refining to distribution, water is a production input that cannot be ignored in every field. For example, it is a requirement for water cooling systems in facilities that operate with nuclear and thermal power to generate electricity. It is used for washing in solar systems. Hydroelectric systems are already directly dependent on water. Even wind energy is not free from a water footprint. While water is used in processes such as waste storage and cooling in mining, it is used for process and cooling purposes in oil refineries. In the simplest terms, all the equipment required to produce energy has a certain water footprint. This shows that the nature of energy production is directly and/or indirectly dependent on water.

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