WATER RESOURCE SECURITY IN THE CONTEXT OF CLIMATE CHANGE IN VIET NAM

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Abstract: *Nowadays, there is an alarming fact about the shortage of national water resource which is not known by the public. According to statistics, with the population of about 95 million, on average each Vietnamese can receive only 3,200 m^3/person/year from the internal water source. On the other hand, the assessment criteria of the International Association of Water Resource indicates that if a country cannot reach 4,000 m^3/person/year, it is regarded as a water shortage country.*

Both international and national studies have indicated that water resource security is a form of non-traditional security with a close connection with economic security, food security and poverty. If this is not properly solved, it will lead to social insecurity, poverty increase, and even conflicts that have a remarkable impact on national security.

Viet Nam is one of the countries that are most severely affected by climate change. With the global impact of climate change, many issues about water resources in Viet Nam, which used to be a potential threat, have now become a reality.

Keywords: *climate change, water resource security, national security.*

1. Water resource security and its connection with national security

National security is a political - legal concept that shows the social nature of a country. In spite of having different definitions among nations, the basic idea of national security is generally protecting national interests and eliminating threats to those benefits. National security consists of traditional and non-traditional items. Depending on the context and time, it is threatened by traditional and non-traditional challenges. In Viet Nam, the National Security Law 2004 [3] states that *"National security is the stability and sustainable development of Socialist Republic and the Socialist Republic of Viet Nam, the inviolability of independence, the affirmation of sovereignty and unity, territorial integrity in the country"; "Threats to national security are internal and external factors that can probably do harm to the national security of the Socialist Republic of Viet Nam".*

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From the cold war to the present, the reality is that the existence of institutions and national regimes is not only dependent on traditional military security elements. Non-traditional factors such as economic recession, public debt, terrorism, environmental pollution, poverty, etc. can cause a nation or a social system to collapse without any military acts.

In the context of drought, salinity intrusion, and floods becoming increasingly severe as a consequence of global climate, water security is now considered one of the issues that can seriously affect national security in the world as well as in Viet Nam.

As one of the leading environmental protection movement agencies in the world, since 1994, the US government has also acknowledged that *"water resources, once unchecked, can become the cause of any disasters that can be threatening to the stability of the regions and the world"* [6].

According to statistics, 70% of the Earth's surface is water, but only 2.5% is fresh water, 97.5% is sea water, which is not suitable for

human consumption and most fresh water, about 68.7%, is in the form of ice [6]. Water shortages currently affect more than 40% of the world's population, with 783 million of the planet's population having no access to clean water. A joint report by UNICEF and WHO also found that three out of every 10 people (2.1 billion people on Earth) lack access to safe water in their homes. At the same time, six out of 10 people (equivalent to 4.5 billion people in the world) lack safe sanitation services [10]. With increasing demand for water, by the middle of the twenty-first century, the number of people living with chronic water shortages will have increased steadily in excess of 4 billions [9].

In 2015 only, more than 3 million people worldwide died of diarrhea and water-related diseases. More than 800,000 of these were children. The major causes of death were lacks of clean water and proper sanitation. Most of the world's rivers are polluted and unsuitable for human use, hindering the lives of billions of dependent people as well as rivers and streams which are used for water supply and livelihoods, and these are also threats to plant and animal ecosystems. This is not just a matter of water, but a threat to human security. In most arid and semi-arid regions, the exploitation of water from groundwater and river systems is occurring at an unsustainable rate, affecting future food production and being an obstruction to socio-economic development [8].

Clean water is expected to soon become a valuable resource no less than oil. However, oil can be replaced with other fuels but water cannot. Many researchers have argued that water conflicts are likely to cause future wars, especially in Asia, North Africa and the Middle East.

In fact, the past period has shown that tension, political instability among countries in the world on water security is always present, and water conflict is always stressful. This can become a political problem that can escalate into a threat to the peace and stability of the world and its regions.

Typical examples are as followed: the conflict in the Middle East between Egypt and Ethiopia; Water Security Crisis in 1990 between Turkey, Iraq and Syria on the Euphrates River Benefit Sharing; tension between Israel and Palestine on the Jordan River Sharing; tension between Israel and Lebanon on the fresh water of the Litani River flow between the two countries' borders; conflict in sharing of water interests between India and Bangladesh on embankment projects on the Ganges; water on the border between the United States and Mexico; and the benefits of the Mekong River between China and downstream countries including Thailand, Laos, Cambodia and Viet Nam.

According to statistics, agricultural production is based primarily on water resources and is the largest source of water consumption in economic sectors. In most parts of the world, more than 70% of fresh water is used for agriculture. By the year 2050, an estimated population of 9 billion would require a 50% increase in agricultural production and a 15% increase in water availability [12]. This means that insecurity of water sources also means that economic security and food security will be affected [12].

The concept of "water war" is a new concept recently introduced by international scholars [10, 11]. Although it is merely a statement and a warning, it shows the concern of the international community on this issue is increasing. In the context of global climate change today, the issue of ensuring water security is more urgent than ever.

2. Viet Nam's current water resource security reality and challenges

According to a report by the Ministry of Natural Resources and Environment, Viet Nam has more than 2,360 rivers with a length of 10 kilometers or more, including 108 main rivers. The annual flow water in the territory of Viet Nam is about 830 billion m^3. However, most of Viet Nam's current water source comes from the upstream countries. The total area of river basins in the country is up to 1,167,000 km^2, of which the catchment area outside the territory accounts for 72%. Internal surface water volume is only 310 billion m^3 (37%), 520 billion m^3 (63%) comes from neighboring countries such as China, Thailand, Laos, Myanmar and Cambodia. Water that come from the upstream

countries in the Red River Basin accounts for 50%, while the Mekong River Basin accounts for 95% [5, 13].

Due to its geographic location and typical natural conditions, nearly 57% of the country's total water amount is in the Mekong River Basin, 16% in the Red - Thai Binh River Basin, about 4% in Dong Nai River Basin. For other large river basins, the total water only occupy the remaining part. In addition, Viet Nam's total rainfall is high but unevenly distributed both in time and space, affecting the reserves and distribution of water resources, causing frequent floods and droughts in a long time [5].

In the Mekong River Basin, hydropower dams, water transfer constructions which have been and will be constructed in the upstream countries will be a major threat to water resources, fisheries resources, silt and sediment, ecosystems,... of Viet Nam. The dams will prevent the transport of silt and sediment, altering the hydrological regime that damages agriculture and downstream fisheries, particularly in the Mekong Delta. In addition, water diversions during the dry season will cause serious shortage of water in the Delta. This is a worrying sign for the 20 million people here, especially affecting the livelihoods of riverine households, who get the main source of income from natural resources and agriculture. In the dry season of 2016, due to the impact of the El Nino, the Mekong River water level was at a recorded low rank in the last 100 years, causing severe droughts and saltwater intrusion in the Mekong Delta.

In addition, the Red River from the downstream has shown signs of pollution, while measures to tackle environmental pollution across borders are limited. The upstream area has operated dozens of hydroelectric power plants, 1,870 dams and canals, and 9 reservoirs with a total capacity of 200 million cubic meters, resulting in significant changes in flow regime, water quality, and sedimentation downstream. In particular, the northern mountainous provinces are vulnerable to floods by hydroelectric power plants water release and environmental pollution activities from the upstream.

Water security is highly dependent on the exploitation and use for socio-economic development. Although Viet Nam has joined bilateral and multilateral cooperation mechanisms for sustainable water resources development, it is a downstream country that has little advantage in international water use negotiations, the reality is still putting pressure on Viet Nam today to negotiate and share benefits with the upstream countries.

The conflicts are not only in water disputes with neighboring countries. The phenomenon of water disputes within the provinces and localities in Viet Nam is also increasing. To manage and use water for industrial production (factories, hydroelectric power plants, industrial parks,...) unreasonably, ineffectively has caused waste and conflicts of interests as well as environmental impacts. The development of hydropower projects in recent years has shown limited shortcomings in sharing water resources. Water resources on rivers have been largely used for hydropower, which has a major impact on downstream areas. In recent years there have been many water disputes between localities, between units in the same locality, between localities and hydropower plants,... For example, the water disputes between Da Nang and Quang Nam, the water release of Ho Ho hydropower plant (Quang Binh), Bac Ha hydropower plant (Lao Cai), Huong Dien hydropower plant (Thua Thien - Hue),... have negative impacts on the local lowland and adjacent areas.

Most people in Viet Nam nowadays think that Viet Nam's water resources are plentiful, but Figures have shown that with the current population, the average Vietnamese per capita receives only over 3,000 m^3 per person per year from the endogenous source of water, while according to the International Water Resources Association, a country is considered to be deprived of water if it does not reach 4,000 m^3/person/year. Viet Nam is one of the countries which is most severely affected by climate change, and these adverse impacts will increase to a higher level of alertness. Many of the problems of water resources are only present in the form of hazards, which are becoming more real.

Climate change is not only a warning but also an increasing presence of Viet Nam's water

resources. In fact, in the recent period, due to abnormal weather conditions, frequent water source droughts and droughts of saline water intrusion occurred in the 13 provinces of the Mekong Delta in 2016, which is considered the most severe drought in 100 years in Viet Nam. It is estimated that about 160,000 hectares of rice were damaged and approximately 800,000 tons of rice were lost during the drought and salt intrusion. In the Central Highlands, water in lakes, ponds, and many irrigation constructions were drying out, which cost hundreds of billions of VND for agriculture in this area. Meanwhile, two floods in late November and mid-December in 2016 in the central provinces and Central Highlands caused losses of about 2,600 billion VND. According to the General Statistics Office of Viet Nam, the total value of losses caused by natural disasters in 2016 is estimated at over 18 trillion VND [1].

Water is an indispensable demand for agricultural production. Viet Nam is an agricultural country with a population of 60.58 million people, accounting for 66.06% of the total population of the country, with 30.9% of agricultural land, and 17-19% of GDP of the country [1]. The issue of agriculture, rural areas and farmers is of special importance in building, developing and defending the country and ensuring national food security in Viet Nam. Viet Nam is always in the top group of rice exporters in the world, with a market share of nearly 20% globally. However, despite Viet Nam's surplus of rice for export, the food security index stands behind most importing countries such as Singapore, Malaysia and Brunei [8]. This shows that our food security is only at the national level (on a per capita basis) but not on household food security.

According to the General Statistics Office, by mid-century, Viet Nam's population was estimated at 108.7 million and 119.8 million (by high fertility and low fertility level), which is higher from 1.1 to 1.3% compared to today's demand of 95 million population [4]. Failure in water security also means not only affecting the production and livelihoods of tens of millions of farmers but also affecting the food security of the country. Having the advantage of being one of the leading rice exporters in the world, it is possible that in the future, Viet Nam's food security will be guaranteed. However, without proper policies and sanctions and sharing interests among nations, in the future when the upstream countries continue to build dams, hydropower projects, transfer water inside and outside the basin, not only water security, economic security, food security of Viet Nam will be affected.

In addition, in Viet Nam, the majority of the poor lives in mountainous and rural areas and their livelihoods largely depend on agricultural production. Unsecured water security means that agricultural production is suffering from high food prices. The poor will have more difficulty accessing food. According to a World Bank report, the rise in food prices is also directly related to the incidence of poverty, if food prices rise by 10% in Viet Nam, the corresponding poverty rate increases by 0.29% [2]. Hence, water security is one of the causes of poverty in Viet Nam.

It is recognized that water security, if not guaranteed, will have a significant impact on poverty reduction, socio-economic development, food security, economic security and national security of Viet Nam.

3. Some proposed solutions to protect water resource in Viet Nam

Water security is one of the non-traditional security issues that are pressing for urgent actions in Viet Nam. Water insecurity can undermine the economy, affect food security, increase poverty, and increase political instability.

From the viewpoint that water security is part of national security, we can see that ensuring the security of water resources must be parallel in many aspects: ensuring the reserve, quality and accessibility of water resources and respond effectively to climate change. Within the framework of this research, some solutions are proposed as follows:

Firstly, continuing implementing the contents of national strategies and programs on climate change, international conventions and agreements that Viet Nam has joined to mitigate climate change, one of the main causes

threatening water security in Viet Nam.

Secondly, developing a Set of Criteria and the Water Resources Security Indicators in line with the conditions in Viet Nam in order to assist the management and policy making. This tool provides information to managers and policymakers to assess and control the level of water security in our country and manage risk effectively. It is also encouraged to formulate and complete the system of policies, solutions and mechanisms for the prevention, response and assurance of water source security in Viet Nam; to develop and issue water resources planning in major national river basins soon. This is an urgent requirement for effective water resource management, which contributes significantly to sustainable development.

Thirdly, paying attention to the application of advanced science and technology to economical use of water resources in all fields, treatment of environmental pollution, disaster recovery and response to climate change. At the same time, it is necessary to research and develop alternative clean energy such as nuclear power, wind power, solar energy,... to ensure energy security, reduce energy pressure from hydropower.

Fourthly, enhancing the capacity of the economy to increase resilience to climate change and decrease water resources through the reform of growth models, the effective use of natural resources, towards green growth, green investment; restructuring the economy, selecting suitable industries to focus on development in the context of climate change.

Fifthly, stepping up the propagation, dissemination and education of the law on protection of water source security in order to raise the awareness of water source protection for organizations and individuals throughout the country.

Sixthly, building up and completing the system of information and databases on water resources, the environment and climate change; strengthening the monitoring, forecasting, warning practice of drought, salt water intrusion and cross-border water pollution, lowering the underground water level; actively researching and applying technical solutions to adapt to climate change and reduce water resources, including seasonal adjustment, adjustment of production sites, research and application of resistant rice varieties to apply appropriate farming systems (rotational cultivation, multi-cropping, intercropping) to reduce risks as well as exploit natural advantages.

Seventhly, implementing production planning and rearrangement of residential clusters under climate change scenarios; investing in the development of protection forest systems and infrastructure, especially irrigation and roads, in response to climate change; reviewing irrigation, agriculture, aquaculture, forestry and daily-life water supply planning,... in response to extreme weather and subsidence and erosion; collaborating with relevant sectors to develop a plan for water resources management; establishing areas for protection against floods, erosion and salinity intrusion in order to take initiative in transferring flood water into field improvement and aquaculture, creating safe lands for floods and erosion; and actively controlling water resources for agricultural production and rural industrialization.

Eighthly, planning, building and perfecting the system of fresh water reservoirs in the delta; building and strengthening the system of sea dykes and river dykes to combat erosion and salt intrusion; strengthening coastal wave breaking forests, building breakwaters, embankments,... to limit erosion, land subsidence; investing in infrastructure and environmental protection in the mountainous, rural and coastal areas where most poor people are concentrated, and are most vulnerable to the impacts of climate change and sea level rise; strengthening hygiene and epidemiological measures to protect the health of the people to ensure that the poor have access to clean water.

Ninthly, intensifying the inspection, examination and strict control of the activities of changing the flow, dredging the canals, exploiting sand and gravel to cause landslide, adversely affecting the basin environment, affecting to production and livelihood of the people; inspecting, examining and handling violations of water source-polluting activities; investigating, evaluating and classifying waste

sources nationwide; establishing a national database on waste sources.

Next, establishing a financial mechanism to support water security activities. On July 7, 1977, the world's leading experts on water resources led by Professor Quentin Grafton, Australian National University, initiated a charter proposing the establishment of a Global Human Water Security Fund (https://genevaactions.org). This fund is called upon to address three issues: (i) Ensure the provision of services for essential water needs, (ii) Ensure improved water quality in watersheds, rivers and streams and groundwater and (iii) Ensure enhanced management, management and planning of water. Given the challenges and experience in dealing with water security issues, Viet Nam should be a pioneer in the idea of setting up the Fund, along with other developing countries calling for the establishment of the Fund with the support from developed countries which are interested in suporting water resources such as the Netherlands, Australia, Japan, Korea and Germany. It is possible to select the Mekong Delta as the demonstration site for the Fund's support activities. In addition, Viet Nam should also preside over the establishment of the Fund in other multilateral cooperation frameworks such as the Australia-ASEAN Summit. This not only helps create resources for water resources security but also enhances Viet Nam's position in the world, contributing to strengthening national security.

Last but not least, promoting international cooperation on responding to climate change, continuing to strengthen international cooperation with countries in the Mekong River Commission and China to share the common interest in the development and common prosperity of the whole region under the 1995 Mekong Agreement and the newly established Mekong - Lan Tong cooperation channel; cooperating bilaterally and multilaterally to monitor and supervise upstream development activities.

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