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Suitaiology— A new water science to meet the challenges of climate change and agricultural sustainable development

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Abstract

Extreme climate change with increasing frequency and magnitude has globally caused great damage and loss through extreme droughts, floods and other secondary disasters during the past years. The most affected are agriculture and ecology. Floods and secondary disasters such as soil loss, mudslides, and landslides often cause losses to farmland, houses, and life. Extreme droughts cause water shortages for humans and livestock, crop failure, forests withered, and desertification. Facing disasters, traditional measures for flood or drought often fail. Traditional water science regards the surface and underground water produced by precipitation as the total amount of water resources. However, in the current situation, floods are actually just the source of disasters rather than water resources. In the extreme drought period, the so-called "water resources" has lost its meaning. Obviously, the traditional concept of water resources is very flawed and cannot effectively guide water management. In order to meet the challenges of climate change and sustainable agricultural development, we have proposed Suitaiology (from Chinese and Japanese: shuitai/suitai, "water dynamic status"; and from Greek: λόγος, logos, "study of") as a new branch of water science to redefine water resources and guide the optimization of water management accordingly. Suitaiology reveals that water resources are different from other resources from a dynamic point of view. Only the used part can become a resource, and the unused part will be lost and cannot become a resource. Therefore, water resources have the characteristics of being created. Suitaiology focuses on how to lead water as a resource and conform to the system situation of economic, social and ecological carrying capacity and sustainable development as the core, regards water management and its service objects, environment and conditions as a dynamic system that restricts and promotes each other, studies the natural situation of water, the impact of human intervention on the water situation, the negative and positive situation transformation relationship between the disasters nature and resources nature of water, and the relationship among water situation changes and economic, social and ecological systems, takes sustainable development as its basic ideological principles, and applies the concepts, knowledge and research methods from systems theory, cybernetics, information theory, operations research, and circular economy to research, and guides the integration and optimization of the existing flood control systems, drought control systems, and irrigation systems to a new type of low-cost, low-energy consumption, low-carbon footprint, easy-to-build and -handle water management system with significant comprehensive benefits. The study of Suitaiology will enhance the development and utilization of water resources, accelerate the progress of combating the disasters of drought and flood and desertification, and support sustainable ecological environment, economic growth, social development and poverty eradication.

Keywords: suitaiology; situation; water, water resource creation; flood; drought, definition