

Three Platforms for Sustainable Environmental Sanitation

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ABSTRACT

This paper proposed three platforms for sustainable environmental sanitation to strengthen three pillars of sustainable development. Understanding of the sanitation scope was identified. Problem on polluted environment was added and accompanied by the products as environmental resources. Environmental resources, repression and remediation were proposed for the task of sustainable environmental sanitation in the future.

Key words: Resources, Repression, Remediation.

INTRODUCTION

Understanding of sanitation used by many references had been referring to the definition of sanitation by WHO^{1,2}. Next was the vision of ecological sanitation, shortly ECOSAN^{3,4} had extended the term sanitation with pollution prevention. In the context of pollution prevention, the important message was change the mindset of “throw away the waste as soon as possible” to “as much as possible utilizing the waste”. In line with ECOSAN was sustainable sanitation, shortly SUSAN⁵ with the addition of sustainability criteria, namely health and hygiene, environment and natural resources, technology and operations, financial and economic issues, socio-cultural and institutional aspects. It also included the provision of drinking water and sanitation, biodiversity and ecosystem management, energy, agricultural productivity and health⁶. Because sanitation was meant to sanitize the environment³, the environmental sanitation term used by some countries in all continents⁷⁻⁹, and also in this paper.

Most definitions of environmental sanitation were based on the measures or services and on its results. Little was known the definition of environmental sanitation in scientific perspective. However, the following definition could represent it:”

Environmental sanitation means the art and science of applying sanitary, biological and physical science principles and knowledge to improve and control the environment and factors therein for the protection of the health and welfare of the public.”⁷. Scientific definition was essential to identify the necessity of sciences and technologies, which supported the implementation of sanitation services and for scientific development as well as formal education curriculum.

Based on the definition provided for environmental sanitation, this paper proposed a concern regarding the environmental damage caused by natural events, and formulated environmental sanitation platforms to perform problem solving as well as scientific research in the future.

Special concern: impact of natural disaster

Environmental sanitation as services had been devoted to the health of all human and environmental health simultaneously. Services also included process, which involved other environmental components, i.e. biological components, which consisted of animals and plants; physico-chemical components that covered air, water and soil. In addition, the service also included the prevention of environmental damage.

It had been well known that environmental damage could occur due to the efficiency of the process never reaches 100%, resulted in the accumulation of persistent materials, which to some extent could be damaging to the environment. Moreover, it was important to note the environmental damage caused by natural processes, such as catastrophic hurricanes, which brought about physical damage in one place and accumulating contaminants on other places. Natural disasters certainly were difficult to be predicted and might be unavoidable, but the important thing was the

efforts to minimize the negative impact of disasters. Facing to the post disaster conditions, the impacted environment had to be rehabilitated.

However, in the best of my knowledge so far, concerning the remediation, restoration, or rehabilitation of the polluted environment had not explicitly expressed in the coverage of environmental sanitation. The addition of such service was to create an environmental sanitation capable of strengthening the three sustainable development pillars: social-economic-environment and goals.

Environmental resources	Environmental repression	Environmental remediation	Products as environmental resources
Physico-chemicals components			
<ul style="list-style-type: none"> • Air • Rain water, surface waters, groundwater as given naturally • Wastewater, solid wastes 	<ul style="list-style-type: none"> • Treatment • Treatment • Treatment 	<ul style="list-style-type: none"> - - - 	<ul style="list-style-type: none"> Clean air Clean water Treated wastewater for irrigation, compost for soil improvement etc.
<ul style="list-style-type: none"> • Damaged environments, such as • Polluted air, water, soil • Desertification^{10,11} • Solid waste post closure 	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> • Treatment 	<ul style="list-style-type: none"> The environmental media were safe to use for various purposes, and thus become environmental resources.
Biological components			
<ul style="list-style-type: none"> • Plant 	<ul style="list-style-type: none"> • Phytotechnological processes¹²⁻¹⁶ 	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> Materials for producing membrane¹⁷ Renewable energies such as bioethanol, biogas, etc. Coagulant, antimicrobial agent¹⁸ Greenspace Suitable plant for treatment
<ul style="list-style-type: none"> • Pathogenic organisms 	<ul style="list-style-type: none"> • Treatment 	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> Closing pathways of disease transmission to prevent resources loss.
<ul style="list-style-type: none"> • Animal manures • Deforestation intentionally such as for agriculture and unintentionally such as wildfires¹⁹ 	<ul style="list-style-type: none"> • Treatment - 	<ul style="list-style-type: none"> - • Forest management¹⁹, • Phytotechnological 	<ul style="list-style-type: none"> • Compost, fertilizer, biogas. • To be environmental resources.

Three platforms

In addition to SUSAN criteria, environmental sanitation provided the following three platforms for sustainability, i.e. Environmental Resources, Environmental Repression, Environmental Remediation, shortly 3ER.

Environmental Resources

In this platform, the environmental resources were air, water and land given naturally, with all the content of the physical materials, chemical substances and living beings. With the mindset that wastes were valuable, thus wastewater and solid waste were included in environmental resources. Also, with the obligation to restore the damaged environment, then the one was considered to be environmental resources.

Environmental Repression

What was meant by the environment repression was pollution prevention efforts. Pollution prevention was important for the purpose of safeguarding environmental resources so that it could continue to be used as a source of life. On this platform involved treatment or process for resources and all the waste materials for reuse.

Environmental Remediation

As described in the special concern, environmental remediation referred to the polluted/damaged environment. One should not let the damaged environment remained on the conditions. Therefore, restoration of the environment needed to be done by any one or a combination of recovery methods.

The following described each of the platforms in connection to sustainable environmental sanitation. The list was limited to technical aspect in general, because millions of detailed engineering had been available. Moreover, in implementation stage, all SUSAN criteria should be applied.

CONCLUSION

The damaged of environment required special attention, and thus should be included in environmental sanitation services. Both environmental repression and environmental remediation efforts were direct benefit for environmental resources to be sustainable. These were identified as sustainable environmental sanitation.

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