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SANITATION NECESSITY AND ENVIRONMENTAL EDUCATION

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Abstract: The paper focuses on the problem of sanitation in terms of three main aspects: the need, environmental culture and business. In today's world, the problem of sanitation is particularly relevant. As history shows, the problem of sanitation is important for people with a high standard of living. What is the main factor in improving sanitation? The systematic disposal of wastewater is an excellent example of a highly developed civilization. Is this solution available to all people in the world, or just for a small percentage of the population? The problem of environmental sustainability, global shortages of water and energy are closely linked to the problem of sanitation. The paper shows the need for the improvement in sanitation, standards of sanitary conditions in various countries of the world are compared. Also the computer system for the design of sewage in the Slovak conditions is briefly described.

Introduction. Access to the safe sanitary system is not a common rule throughout the world. Most developing countries have a problem as population of these countries is deprived of it. Because the cost of sanitation establishing is really high, the new affordable technologies should be a solution based on ecological sanitation, which saves water, recycles local nutrients and extracts energy. It is possible to implement both in rich and in poor countries. With the invention of the water toilet and subterranean gravity sewer systems the development of sanitation systems moved from decentralized to centralized wastewater disposal. The water toilet improved health, but severely polluted waterways. At the same time, the costs for sewage treatment started to exceed the range of affordability for most people in developed countries.

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Water consumption, water demand. The water toilets consume about 20 – 40 % of the all water consumed per capita. In Slovakia the water consumption has a decreasing trend, because the water price and water equipment technology save the water. The consequence is general decrease in water demand. Around 150 l/cap/day of water consumption in Slovakia we used for design the water supply system, including all water equipment, such as water treatment plant, pumping stations and after designing the sewer system with their equipment. Potable water is a limiting factor for development. It is misused to flush human waste where both water and the excreta should be considered as a resource.

Waste water reclamation. The waste water from population contains nutrients. These are almost sufficient to fertilize all the crops needed to feed the world population. The toilet waste water contains approx. 80–90 % of the major plant nutrients – nitrogen, phosphorus and potassium. If these nutrients are reclaimed using hygienically safe pathways, they can be used locally as a fertilizer in sustainable agriculture.

The sanitation necessity. The people in high develop countries consider sanitation as normal part for life. Only on their holidays, out of hotel resorts these people discover new habit of sanitation. The children who grow up in high level countries have no idea about the children in low level countries. Only the education could help to change the view of people in highly developed countries and should help to increase the sanitation in low developed countries.

Inequity in access to clean water and sanitation. The supply of safe drinking water and the provision of sanitation are management issues that raise concerns about inequitable service provision, particularly in developing countries. Although several successful initiatives have been launched to supply safe drinking water to urban populations, efforts still fall short of the required targets for sustainable development. In developing countries water delivery systems are plagued by leakages, illegal connections and vandalism, while precious water resources are squandered through greed and mismanagement. The World Bank recently estimated that US$600 billion is required to repair and improve the world's water delivery systems (UNCSD, 1999).

Two out of every five Africans lack access to an improved water supply. Throughout Africa, rural water services lag far behind urban services. In Africa, Asia, Latin America and the Caribbean, nearly 1 billion people in rural areas have no access to improved water supplies. To achieve the 2015 targets in Africa, Asia, Latin America and the Caribbean, water supplies will have to reach an additional 1.5 billion people.

Sanitation coverage in rural areas less than half that in urban locations, even though 80 % of those lacking adequate sanitation (2 billion people) live in rural areas – some 1.3 billion in China and India alone.

In Africa, Asia, Latin America and the Caribbean, nearly 2 billion people in rural areas have no access to improved sanitation facilities. To achieve 2015 sanitation targets in Africa, Asia, Latin America and the Caribbean, an additional 2.2 billion people will have to be provided with sanitation facilities.

The world organizations make a press to increase the sanitation over the world. In 2002 the World Summit on Sustainable Development in Johannesburg recognized the central role played by sanitation when it adopted a target to halve, by 2015, the percentage of people without access to basic

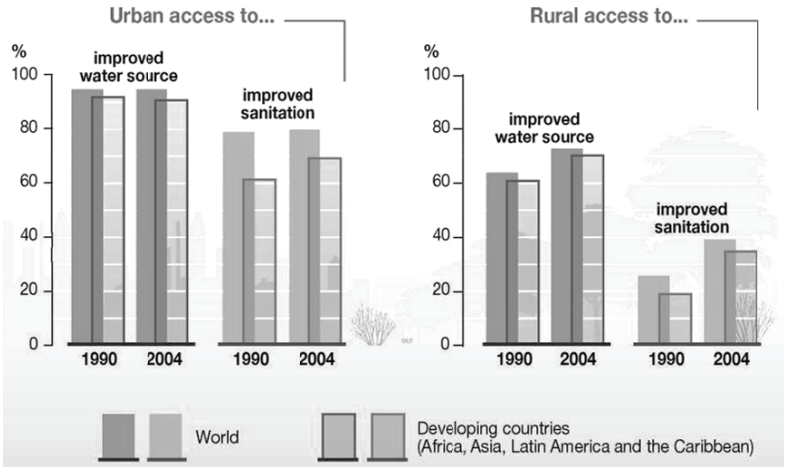

Fig. 1. Inequity in access to clean water and sanitation

sanitation. Sanitation and the means to practice hygienic behaviors yield direct benefits in terms of health, education and economic productivity. Lack of access to this most basic of needs is an assault against human dignity. This report, the synthesis of two previously released papers, lays out the economic case for investing in sanitation: 1.47 billion people (20 % of the world's population) stand to benefit if the target is met and the economic benefits could be as high as USD 65 billion annually. The greatest proportion of these benefits will accrue in the poorest regions of the world, particularly in Sub-Saharan Africa, but the benefit-cost ratio is consistently high across all regions [5].

The report goes on to explore ways and means to accelerate progress. Using a historic analysis of the public health movement in Europe in the late 19th century, it argues that institutions need to be reshaped to address the urgent need to increase access to basic services. An increased focus on the household and emphasis on creating and responding to demand for appropriate services are needed along with better and more efficient investments in public elements of sanitation, including sanitation in schools and health centers. The report, commissioned by the Government of Norway, was prepared by the Stockholm International Water Institute (**SIWI**) with input from the World Health Organization and the Norwegian Agency for Development Cooperation.

Some facts. Every 21 seconds, a child dies from a water-related illness, Women spend 200 million hours a day collecting water, more than people lack water who live in the United States, the majority of illness is caused by fecal matter, more people have a mobile than a toilet, lack of community involvement causes 50 % of other projects to fail, after only 1 min 3 children died from a water related disease. Thanks to the organizations such as WHO, UNICEF etc. the situation becomes better [8].

– At any given time, nearly half of the population of the developing world suffers from illness caused by lack of access to safe water and sanitation.

– Two in five people do not have the security and dignity of a hygienic latrine or toilet [4].

– If even just a small portion of a displacement community is practicing open defecation, the whole population is at greater risk of diarrheal diseases, worm infestations and hepatitis.

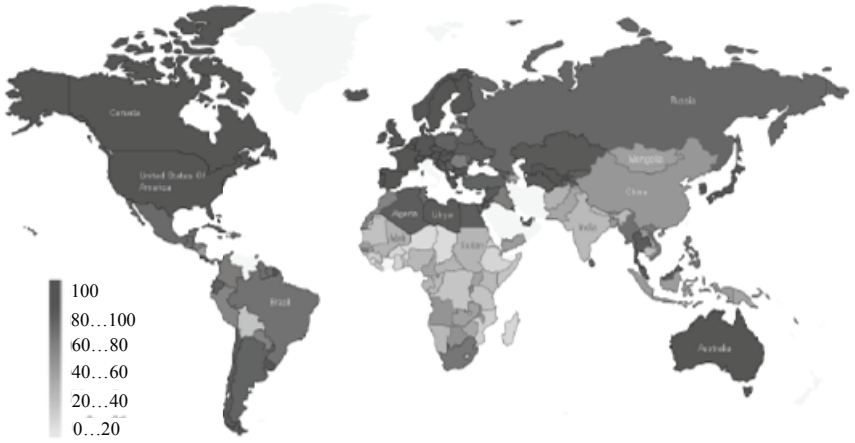

Fig. 2. Percentage of total population access to improved sanitation (2008)

– While access to safe water can decrease childhood water-related deaths by 15 to 20 percent, improved hygiene practices such as hand-washing reduces deaths caused from diarrhea by 35 percent, and access to adequate sanitation reduces rates by 40 percent.

Sanitation and business. Every $1 spent in the sector creates on average another $8 in costs averted and productivity gained [6]. A dollar invested in water and sanitation could give an economic gain of between $3 USD and $34 USD, depending on the nation [1]. A recent Water and Sanitation Program study showed that the lack of sanitation has cost countries anywhere from 1 percent to 7 percent of their GDP [10]. Sanitation as a Business tries to shift sanitation programming by changing the incentives and bringing the private sector into sanitation in new ways [7]. The key to Sanitation as a Business is to make ongoing sanitation services the goal, rather than the installation of the latrine. When sanitation services are profitable and businesses see everyone without a latrine as a potential customer, businesses – rather than development organizations – will expand latrine coverage to increase their profit margin. Thus many more people will have access to toilets than they would with typical programming.

In summer 2010, Water For People received a $5.6 million grant from the Bill & Melinda Gates Foundation representing a significant investment over four years in our Sanitation as a Business work, testing possible sustainable sanitation services in Africa, Asia, and Latin America. This groundbreaking program seeks to revolutionize the sanitation sector.

Starting the sanitation business doesn't require a lot of background or training. People with a kind demeanor and a strong work ethic can succeed in this industry. People and companies will call upon your sanitation company to rid their space of dirt, germs and waste. Sanitation is looked at as an unappealing job and many people and companies will be willing to pay for this service.

For starting the expert business, it is necessity to have the education in sanitary engineering or similar field. The computation of sanitation equipment necessity, the right determination of design, can start this business as a required.

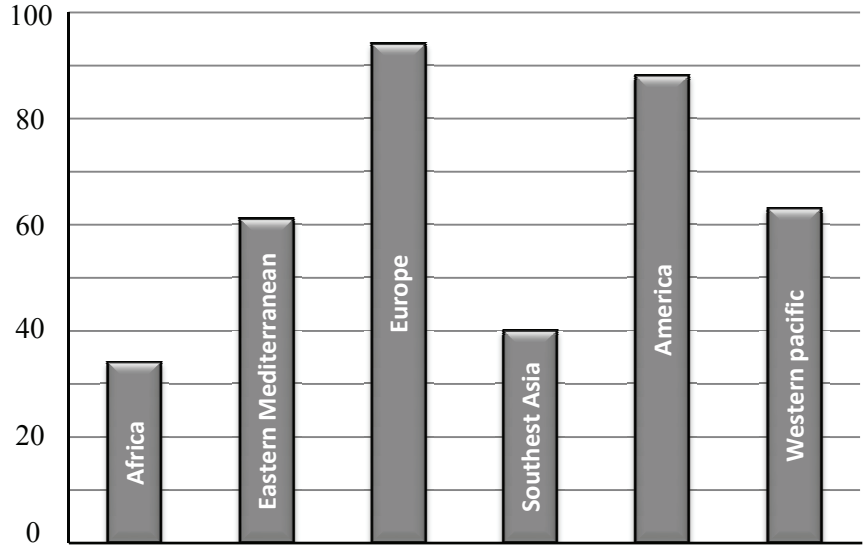

Fig. 3. Percentage of total population access to improved sanitation by Region (2008), %

The highly developed countries sanitation design, business and operation make a press for educated people in this field of business. Many computational procedures can help in proper design. The sanitation started in the history self-scientific discipline, such as water supply, water resource management, waste water management, sewer system design and operation, waste water treatment plant. Based on this information, the sanitation covers a wide scope of interest.

Sanitation and education. Education in sanitation can be divided in several branches: basic information about sanitation, high level education – covering design and operation for large groups of people – municipal sanitation.

Almost 2.5 billion people, two in every five people in the world, lack adequate sanitation, with children being one of the largest groups affected by this basic human need. Not only can the lack of adequate sanitation enable disease to impede a child's health and physical development, it can also prevent the child from attending school. Worldwide there are 120 million primary school-aged children not attending school. Many of them are unable to attend because their schools or homes lack basic sanitation facilities, and the majority of them are girls.

The sanitation crisis affects all children. Providing adequate sanitation and thereby reducing cases of diarrheal related diseases would add nearly 200 million days of school attendance annually.

Effective school sanitation and hygiene education. The provision of safe water and sanitation facilities in schools is a first step towards a healthy physical learning environment, benefiting both learning and health. However, the mere provision of facilities does not necessarily make them sustainable or produce the desired impact. It is the use of latrines and the related appropriate hygiene behavior of people that provides health benefits. In schools, hygiene education aims to promote those practices that will help to prevent water and sanitation-related diseases as well as encouraging healthy behavior in the future generation of adults [2].

A healthy physical environment:

– Keeping the compound and classrooms clean and free of waste and fecal matter;

– Providing toilets that are designed for children (boys and girls);

– Providing convenient hand-washing facilities;

– Providing not only sufficient safe drinking water, but also sufficient water for hand-washing;

– Providing classrooms which are well ventilated, providing enough light for studying and appropriate furniture (e.g. chairs and tables) for students.

Active and organized children:

– Clean and convenient use of facilities by all children and teachers;

– Consistent and organized cleaning and maintenance of toilets, hand washing and drinking water facilities by all children;

– Roles for older children to help and monitor younger children in using facilities and maintaining school cleanliness.

Sanitation and health. The main impact of sanitation is not a culture but human health. The sanitation became the necessity, and a part of culture. But in every case the human health protection has always been a top priority.

Access to adequate sanitation is extremely limited in many communities with a high prevalence of HIV/AIDS. Those with compromised immune systems, such as HIV/AIDS patients, are more prone to common illnesses and diseases, especially diarrhea [3].

If access to improved sanitation increased, diarrheal disease could subside, providing much need relief to those suffering from HIV/AIDS. In a study of HIV/AIDS individuals done in Uganda, the presence of a simple latrine reduced the risk of diarrheal disease by 31 percent [9].

Conclusion. Sanitation is the easy word with the principled impact of human health, of human well-being, of the culture, which defines the nations. Sanitation divides the world into many parts. Depending on the sanitation level we can define the level of the countries. The goal of the world organizations, which want to improve sanitation level, is to decrease the negative impact of lack of sanitation, needless deaths of children, and people in affected regions. In highly developed countries it is important to protect the public health against negative impact of insufficient sanitation. The rich counties offer high level education in the field of sanitation to help their countries and all people in the world through education as a strong weapon against insufficient sanitation.

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References

1. Hutton, Guy and Laurence Haller. Costs and Benefits of Water and Sanitation Improvements at the Global Level. World Health Organization, 2007.

2. Marielle Snel: School Sanitation and Hygiene Education, IRC International Water and Sanitation Centre, 2003.

3. C.L. Obi, B. Onabolu, M.N.B. Momba, J.O. Igumbor, J. Ramalivahna, P.O. Bessong, E.J. van Rensburg, M. Lukoto, E. Green, and T.B. Mulaudzi. The interesting cross-paths of HIV/AIDS and water in Southern Africa with special reference to South Africa. South African Water Research Commission, Vol. 32 No. 3, July 2006.

4. Programme for Water Supply and Sanitation. Progress on Drinking Water and Sanitation: Special Focus on Sanitation, New York: UNICEF; Geneva: WHO, 2008.

5. Securing Sanitation – The Completing Case to Address the Crisis, A Report Commissioned by the Government of Norway as Input to the Commission on Sustainable Development (CSD) and its Focus on Water, Sanitation and Related Issues. SIWI, 2005.

6. United Nations Development Program, Beyond Scarcity: Power, Poverty and the Global Water Crisis, Human Development Report (2006).

7. Water for People, Sanitation Inovation – Creating Long-Term Results by Incentivizing and Supporting Local Businesses.

8. Water.Org. – URL : http://water.org/. 2013.

9. Weinger, Maurice. Dignity for All: Sanitation, Hygiene and HIV/AIDS. USAID, 2008.

10. WHO and UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Progress on Drinking Water and Sanitation, New York: UNICEF; Geneva: WHO, 2008.

Необходимость санитарии и экологическое образование

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Ключевые слова и фразы: водоснабжение; здравоохранение; санитария; канализация; отведение сточных вод.

Аннотация: Рассматривается проблема улучшения санитарных условий с точки зрения трех основных критериев: необходимости, экологической культуры и бизнеса. Систематическое отведение сточных вод представляется отличным примером высокоразвитой цивилизации. Проблема устойчивого развития окружающей среды, глобальная нехватка воды и энергии тесно связана с проблемой улучшения санитарных условий. Показана необходимость улучшения санитарных условий, сравнивается уровень санитарных условий в разных странах мира. Также кратко представлена компьютерная схема для проектирования системы канализации в Словакии.
