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**SUSTAINABLE WATER AND SANITATION SERVICES
FOR ALL IN A FAST CHANGING WORLD**

**DEWATS dissemination in Vietnam:
achievements and lesson learnt**

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The speedy economic development and rapid growth of population and urbanization in Vietnam have created great pressure on the environment by its manufacturing process and human activities. Thus, it is necessary to protect the environment through policies and appropriate technology for the sustainable development of the country. The DEcentralized WAstewater Treatment Solutions (DEWATS) dissemination in Vietnam is one of the measures contributing to address this issue.

Background

In recent years, Vietnam has made outstanding progress in economic development and stepped out of the poor countries list (2010) with the GDP per capita increased by 3.4 times compared between 2000 and 2011 (In 2000: 402USD and in 2011: 1.375USD¹). The economic development has contributed from industry, commercial, tourism, services and even handicraft villages, etc. The economic sectors have been developed so speedily that has led to increasing environmental pollution which caused by untreated wastewater and solid waste produced during manufacturing activities². Furthermore, the rapid growth of population³ and urbanization increase the demand for education, healthcare, transportation, etc. and increase the pressure on using water and discharging wastewater to the environment.

For sustainable development, the factors such as economic, society and environmental protection should be balanced. However, in addition to the economic development indicator, many environmental indicators that are not achieved put pressure on the environment and degrade the natural ecosystem.

Government's policies and strategies/programs

International issue: Along with the world efforts, Vietnam has signed a number of international conventions on environment and environmental protection such as: United Nation Framework Convention on Climate Change (UNFCCC) 1992; Stockholm convention signed on May 22nd, 2001 in Stockholm and validated from May 17th 2004. Vietnam ratified the Stockholm Convention on Persistent Organic Pollutants on July 22nd 2002 and becomes the 14th member of this Convention. Other Conventions include the Convention on Biological Diversity (CBD, 1992), Convention on Ozone Protection (1985) and Montreal Protocol on Substances that Deplete the Ozone Layer (1987).

Laws and byelaw documents on the Environment: Nowadays, Vietnam has established a sufficient legal system on the environmental protection including: Law on Environment Protection 1993 (No: 29-L/CTN) amended in 2005 (No: 52/2005/QH11); Law on Water Resources 1998 (No: 08/1998/QH10) amended in 2012 (No: 17/2012/QH13); Decree No. 67/2003/ND-CP dated 13/6/2003 on environmental protection fees for wastewater to cope with contaminated environment; Decree 179/2013/NĐ-CP issued by the Government on November 14th 2013 defines the penalties on environmental protection. Based on this Decree, Provincial People's Councils (PPC) issue detailed penalty guideline adapted to each province. For example, the Decision No 57/2013/QĐ-UBND issued by Gia Lai PPC on December 31st 2013, Resolution No 17/2013/NQ-HĐNQ issued by Hung Yen People's Council. Also, Vietnam issued National technical regulations on the Environment such as QCVN 40:2011/BTNMT⁴; QCVN 14:2008/BTNMT⁵, etc.

National Programs on Environmental Protection: In addition to introducing laws and byelaws, Vietnam has taken various actions on environmental protection with National target programs and strategies such as: National strategy on Environment Protection to 2020, vision to 2030; National Strategy on Clean Water Supply and Rural Environmental Sanitation. National target program on water supply and sanitation in rural areas 1999-2005, 2006-2010 and 2012-2015 focusing on increasing the numbers of people using clean water, improving the sanitation, drafting and gradually applying socialization mechanism and policy on water supply and sanitation with priority to rural; National target program on new rural development 2010-2020, etc.

International programs: Research organizations and international donors are interested in environmental protection through funding and technical assistant projects such as: (i) Industrial Wastewater Management project in Nhue – Day and Dong Nai river basin (VIPM) funded by the WB; (ii) PCB Management and Disposal project funded by Global Environment Fund through the WB; (iii) Vietnam Provincial Environmental Governance project funded by the Canadian International Development Association (CIDA), Canada, the project purpose is to strengthen capacity of Ministry of Natural Resources and Environment.

In addition, Non-Governmental Organisations (NGOs) and international organizations also have implemented many activities to improve the sanitation conditions and sustainable development in Vietnam such as: Bremen Overseas Research and Development Association (BORDA) – from Germany with dissemination of the DEWATS, East Meets West on water supply and sanitation, CityBlue ++ sanitation program in Hoi An city, etc.

Dissemination of DEWATS in Vietnam

Demand on wastewater treatment

Vietnam has a population of around 87.8⁶ million, with 31% of its population living in urban areas and 69% living in rural areas. Every day, millions of cubic meters of domestic wastewater are discharged to the environment, and most of it is not treated properly. Taking the tourism city of Hoi An city for example, the population is 90,000 and daily domestic wastewater produced is around 8,300 m³ which is discharged to the environment. With 1.4 million visitors annually, the wastewater from tourism activities is about 8,600 m³ per day⁷. Thousands of traditional craft villages with approximately 10 million⁸ workers participating in product manufacture, and thousands of large and small industrial zones, contribute substantially to the development of national economy as well as increasing living standard of people. Nevertheless, these activities also produce and discharge to the environment a huge amount of wastewater.

The above data shows that the need for treatment of wastewater produced by human activities and manufacturing in Vietnam at present is urgent. This has motivated implementation of programs and projects on environmental protection, as well as stimulating research and development into appropriate technologies to improve sanitation conditions in Vietnam.

General of current situation of wastewater treatment

In the big cities with dense populations such as Hanoi, Ho Chi Minh City, etc, there has been investment in construction of centralised collection and treatment facilities to solve the problem of environment pollution caused by the wastewater, mainly domestic wastewater⁹. However, in peri-urban areas, the countryside and manufacturing facilities, etc. that are impossible to connect to sewerage systems, wastewater from industrial zones, hospitals, schools, etc. should be treated on-site before being discharged to the environment¹⁰.

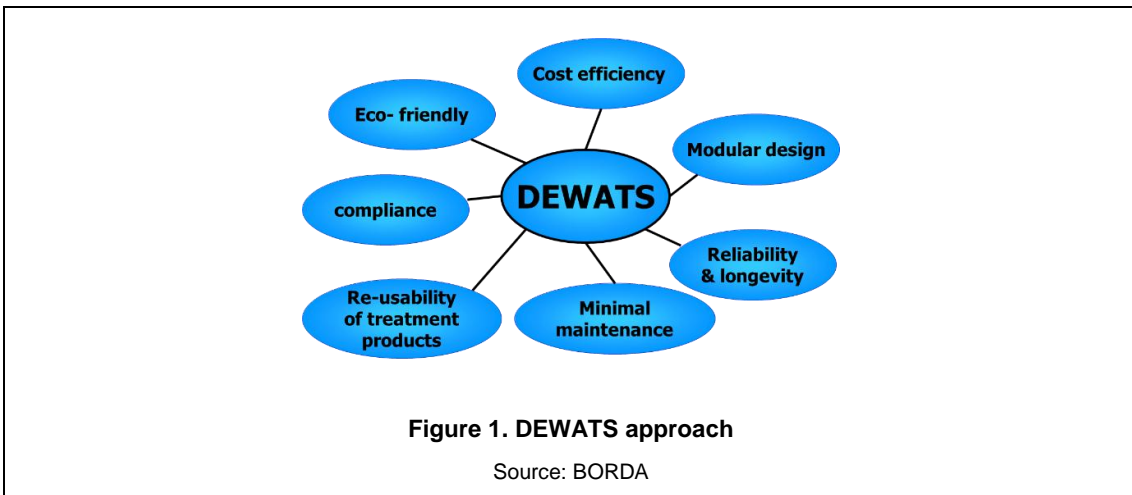
For on-site wastewater treatment the septic tank is the main solution specified in the national construction design standards. However, this provides only preliminary treatment before discharge into the sewage system of a municipality or to the environment because the treatment efficiency is less than 50% of that required for effluent discharge (for COD). To deal with this problem, at the moment the BAffled Septic Tank with Anaerobic Filter (BASTAF) is being researched and introduced instead of conventional septic tanks in order to treat the wastewater on-site with higher efficiency. In addition, at manufacturing facilities, hospitals, etc. the technologies such as biogas, Upflow Anaerobic Sludge Blanket (UASB), Aerotank, Membrane Bio Reactor (MBR), etc. are being introduced for wastewater treatment.

The above technologies with different advantages and disadvantages are applied to treat wastewater to meet the National Technical Standards, however, they focus on the treatment techniques without supportive components such as encouraging the participation of the community, roles of local authorities/ Community based organizations or clients themselves in on-site wastewater management. So, BORDA, a non-profit organization from Germany, has cooperated with the Vietnam Academy for Water Resources (VAWR)

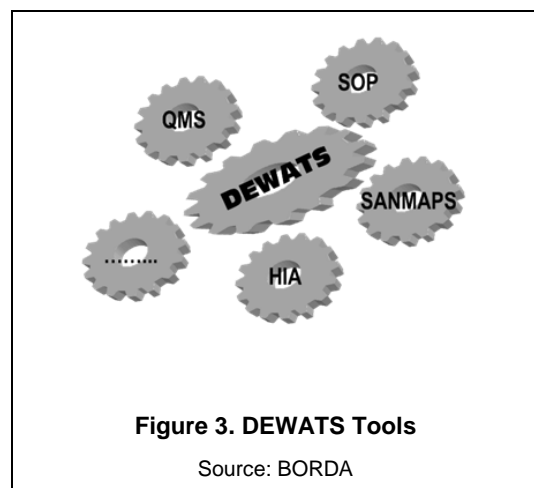
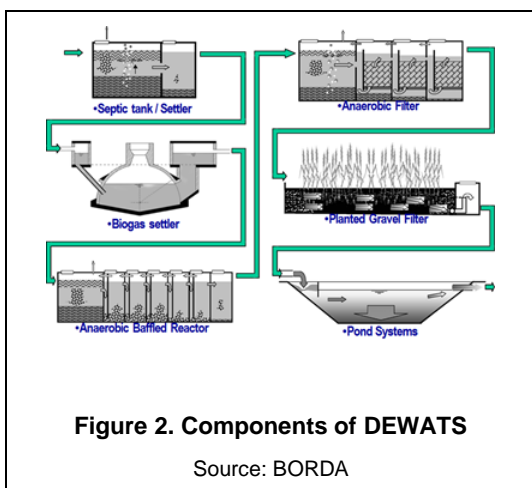
under the Ministry of Agriculture and Rural Development (MARD) to disseminate DEWATS in Vietnam. With a comprehensive technical solution and institutional emphasis on sustainable development, DEWATS is now a highly potential solution for improving the environmental sanitation conditions in Vietnam.

Brief introduction of DEWATS

DEWATS has been researched and developed by BORDA to approach the low - income people in the developing countries. DEWATS uses mechanical treatment technology combining with biological (aerobic and anaerobic) for organic wastewater treatment (especially wastewater with high level of organic pollutants). Wastewater is treated in a natural way without chemicals or energy in the process, so the cost for wastewater treatment is very low compared with other solutions (the DEWATS approach was shown in Figure 1). Wastewater treatment facilities are built primarily from simple local materials without machinery which are easy to build (DEWATS facility components are illustrated in figure 2). Manual on operation and maintenance of wastewater treatment is simple and clear, so it is suitable for local people in the community who are not highly trained, leading to stability and sustainability. At present, DEWATS has been researched and developed as basic need service packages such as CBS - community based sanitation, SME - small and medium enterprises, SBS - school based sanitation, etc.



In order to promote the efficiency in DEWATS implementation, BORDA has been using a supportive system such as: QMS - quality management system, HIE - Health Impact Evaluation, IHWM – In-House Wastewater Management, SANMAP - sanitation mapping, SOP - standard operation process, etc, (some of these are shown in Figure 3) which support DEWATS by being implementing quickly and easily, and meeting technical standards. Hence, DEWATS is considered as the appropriate, effective and sustainable solution as being encouraged for implementation by the International Water Association (IWA). At the IWA conference in May, 2011 in Manila Philippine, DEWATS received an award for offering a sustainable solution for wastewater treatment practice.



Dissemination of DEWATS in Vietnam

Contents and approaches

Foreseeing the high demand on organic wastewater treatment in different sectors of Vietnam, since 2008 BORDA had proposed the program on "Southeast Asia natural resources management" with the aim to disseminate DEWATS as basic need service packages. So far, the program has already been implemented with two phases 2008 - 2010 and 2011 - 2013 and with a current ongoing phase for 2014 - 2016.

The approach of providing the sanitation service packages with low-cost operation and maintenance, environmental friendly and sustainable operation for treating organic wastewater, DEWATS is expected to be an appropriate solution in the process of implementing the goals on improving the environment set by the Vietnamese government.

Achievements and lesson learnt

In a two phase program for disseminating DEWATS in Vietnam, implementing organizations (VAWR and BORDA Vietnam) have applied DEWATS to different wastewater sources such as domestic wastewater from residential areas and hospitals, wastewater from livestock farms / slaughterhouses, etc. and these plants have proved efficient in operation and effective in achieving effluent quality. Table 1 shows a list of typical implemented DEWATS projects in Vietnam.

No.	Location	Construction time	Treatment capacity (m3/day)
1	Kim Bang Hospital, Ha Nam province	2006	125
2	Bear Rescue Centre in Tam Dao, Vinh Phuc province	2007	22
3	Ninh Khanh Prison in Ninh Binh province	2008	40
4	Cau 1 hamlet, Kieu Ky commune, Gia Lam district, Hanoi	2008	40
5	Paediatrics hospital in Thanh Hoa city, Thanh Hoa province	2008	300
6	Ha Phong Slaughterhouse, Ha Long city, Quang Ninh province	2009	40
7	Noodle processing village, Khac Niem commune, Bac Ninh city, Bac Ninh province	2009	400
8	Nursing centre for wounded soldiers in Kim Bang district, Ha Nam province	2011	40
9	Primary school in Cam Thanh commune, Hoi An city, Quang Nam province	2013-2014	10

Source: Technical Data sheet (TDS) – BORDA Vietnam Office

From the pilot DEWATS projects mentioned above, about 370,000 m³ of waste water¹¹ is treated every year in compliance with National Technical Regulation with COD reduction of about 620 tons¹², which contributes to improve sanitary conditions for thousands of people, students, patients etc. in the project area. Additionally typical DEWATS projects to treat various emission sources should provide extremely valuable experience for the implementation of similar projects in the DEWATS dissemination program in Vietnam.

In addition to the above achievements, the lessons learned during the implementation of DEWATS projects aim to help the dissemination of DEWATS in this phase more efficiently:

- Implementing sample DEWATS projects for different sources of waste is very necessary. Government agencies and clients will have a chance to experience the actual DEWATS project in which they are interested, and the belief in DEWATS is strengthened.

- The approach to the individual clients in different sectors is good for practical research; however, it is not really effective to disseminate DEWATS in long term. The national and provincial programs (especially sanitation programs) funded by the international donors are good places to perform this task.
- Community participation in the environmental management is very important for DEWATS plants to be operated effectively and sustainably.
- Support from the local authorities and participation of the environmental organizations is necessary because the community itself experiences difficulties in securing funds, obtaining technical assistance, etc.
- The numbers of engineers who really understand about DEWATS are limited so that providing technical assistance at large scale is a challenge. The lack of regular communication between those involved in technical assistance and construction can cause mistakes during project implementation. Any changes (even small ones) made without the knowledge of the design engineer will affect the operation of a wastewater treatment plant. Therefore, it is necessary to develop a training program for stakeholders in DEWATS projects for the projects to be implemented quickly and sustainably.
- The operation and maintenance (O&M) of DEWATS plant is very simple. However, unless the simple O&M instructions are followed strictly, problems will occur during operation and maintenance. Therefore, it is necessary for operators to comply with guidelines presented in the DEWATS handbook about O&M and instructions of engineers.

Orientation and plan for future

In the light of the stable and effective operation of the DEWATS plants that have been built, the high demand for wastewater treatment, the strategy on environmental protection of the Vietnam government and the interest of international donors, VAWR and BORDA Vietnam have developed an operational plan in this phase as follows:

- Program approaching: propose DEWATS for the national programs, Official Development Assistant (ODA) programs on environmental protection funded by WB, ADB, JICA, etc. In addition, individual clients are still valued and respected.
- DEWATS dissemination: training, techniques exchanging of DEWATS implementation to sanitation programs applying DEWATS.
- Standardizing the training materials: the instructions, especially for community use will be adapted taking account of the skills and qualifications of licensees.
- Strengthening marketing activities: the information about solutions, applicable capacity and evidence of DEWATS operations will continue to be disseminated at all authority levels, the state environmental management offices, donors and international programs relevant to DEWATS in order that knowledge of DEWATS will be spread more widely.
- Strengthening research activities: DEWATS for treating different wastewater sources should be researched further for more appropriate proposals. Furthermore, supportive components should be integrated as much as possible with DEWATS plants for greater efficiency and sustainability.

Conclusion

DEWATS is the appropriate solution to treat organic wastewater (especially for highly contaminated organic wastewater) with low- cost of construction and operation & maintenance in comparison with other solutions. DEWATS operation without reliance on chemical or energy makes the techniques environmental friendly and sustainable. The operation and maintenance techniques necessary are simple, so it is easy for communities to be trained for participation in environmental protection.

DEWATS is a promising trend in improving the sanitation conditions in different sectors that are very pressing in Vietnam, such as agricultural and food processing villages, animal husbandry, livestock slaughtering, domestic wastewaters from schools, hospitals, hotels, restaurants, etc. Practically, DEWATS has been disseminated in India, Indonesia, etc. and is currently being implemented in Vietnam with positive outcomes.

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Notes

- ¹ General Statistical Office of Vietnam: gso.gov.vn
- ² National Environment Report 2010
- ³ Vietnam population raised 13.15% from 2000 – 2011, General Statistical Office of Vietnam: gso.gov.vn
- ⁴ National Technical Regulation on Industrial Wastewater
- ⁵ National Technical Regulation on Domestic Wastewater
- ⁶ Statistical Yearbook 2011
- ⁷ Report of Natural Resources and Environment Office in Hoi An – Blue City ++ Workshop 17/02/2014
- ⁸ Project “Integrated water management concept for craft villages – INHAND”, TU Dresden, Germany, 2009
- ⁹ In Hanoi, there are about 500,000 m³ of wastewater discharged into environment, of which 400,000 m³ are domestic wastewater <http://ashui.com/mag/chuyenmuc/nng-lng-moi-trng/1409-ha-noi-chua-the-xu-ly-nuoc-thai-hieu-qua.html>
- ¹⁰ Nguyen Van Bao Tam – Deputy Head of International Cooperation, Ministry of Natural Resources and Environment, Vietnam Architecture Magazine No.07/08.
- ¹¹ Technical Data Sheets from BORDA Vietnam and VAWR office
- ¹² Technical Data Sheets from BORDA Vietnam and VAWR office
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