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Restructuring the economy, associated with green development, circular economy

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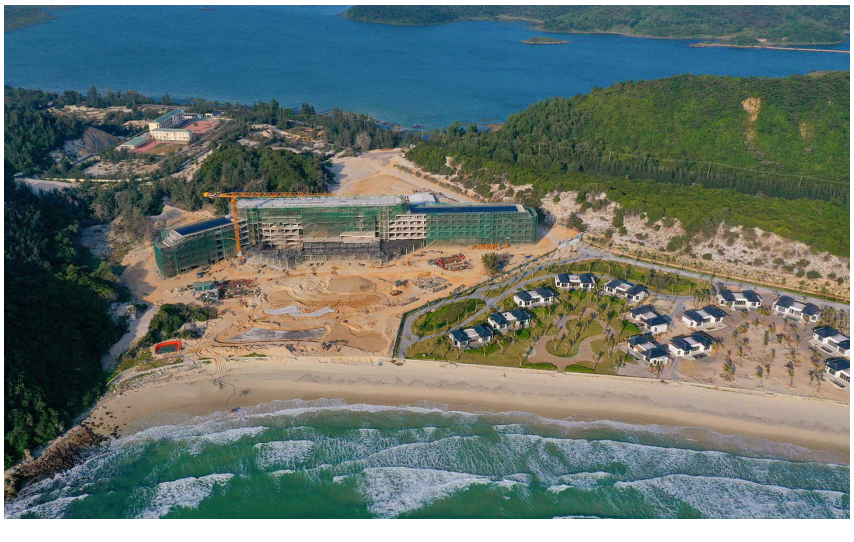


VIEW EXCHANGE

GREEN SOLUTION & TECHNOLOGY

GREEN COOPERATION

GREEN GROWTH & DEVELOPMENT

NATURE & ENVIRONMENT OF VIETNAM

The 5th National Environmental Conference:

Restructuring the economy, associated with green development, circular economy

On August 4th, 2022, in Hà Nội, the Ministry of Natural Resources and Environment (MONRE) held the 5th National Environment Conference (NEC). The very important Conference is held every 5 years with the goal of assessing the status of environmental protection work, discussing and agreeing on tasks and solutions for the next years. The Conference took place in the context that green recovery is a common global trend, and the development of green economy and circular economy are being strongly promoted in Việt Nam.

Attending the Conference were Deputy Prime Minister Lê Văn Thành, Ms. Caitlin Wiesen, Chief Resident Representative of the United Nations Development Program - UNDP in Việt Nam... and about 600 representatives from leaders of Ministries, departments, branches, mass organizations at the Central level, representatives of leaders of the people's committees of provinces and centrally run cities, representatives of units in the natural resources and environment sector at Central and local levels, universities, institutes, research centers and experts in the field of environment and representatives of a number of international organizations and experts which are now operating in Việt Nam.

▲ *Deputy Prime Minister Lê Văn Thành delivered directive speech at the Conference*

STRONG TRANSFORMATION FROM POLICY TO AWARENESS AND THINKING TO ACTION

Speaking at the Conference, the Minister of Natural Resources and Environment emphasized, the strong statement on reaching net - zero emissions by 2050 by Prime Minister Phạm Minh Chính at the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change demonstrates Vietnam's political determination and commitment in addressing serious global challenges in terms of climate change, the environment, the decline of ecosystems, toward a healthy planet; and at the same time take advantage of the opportunity to put our country on the "green" path, realizing the goal of becoming a high-income developed country by 2045. This is a development trend in line with the "development agenda" on sustainable development of the United Nations for the next 15 years. With that in mind, the MONRE chose the theme of this year's Conference as "Harmonizing economic development and environmental protection towards a circular economy and sustainable development" as a strong call for gathering together and unification to protect the environment, prevent the degradation of biodiversity for a life in harmony with nature and for a more sustainable future.

Looking back at the environmental protection work from 2015 to now, it shows a strong transformation from policies and solutions to awareness and thinking and action. Environmental issues are always at the center of the agenda; development programs, strategies, master plans and plans of the country with the highest goal of protecting the people's health, ensuring the quality of the living environment and protecting biodiversity and ecosystems. Building a green, circular and environmentally friendly economy has been incorporated into the Party's guidelines and policies, and the State's laws and policies. The Resolution of the 13th Party Congress affirms the policy of "building a green economy, a circular economy, friendly with the environment", "develop roadmaps, mechanisms, policies and laws to form and operate the circular economy model".

▲ *Minister of Natural Resoures and Environment Trần Hồng Hà giving a speech at the Conference*

With the efforts of the whole political system and the hands of the whole people, environmental protection has changed from passive to response, to active prevention, protection and recovery. The system of policies and legislation on environmental protection has been completed, in which the Law on Environment Protection (LEP) 2020 with many breakthrough policies and solutions, marks a period of strong transformation in environmental protection work, towards the highest goal of improvement of environmental quality and protect people's health. The quality of the living environment continues to improve. Modern models and technologies are deployed in recycling and waste treatment. Monitoring, warning and forecasting activities on environmental quality have been improved, providing information on the environment, serving well for socio-economic development and community health protection. Many movements and typical models of environmental protection have come into life, becoming the actions and lifestyles of everyone, every home and social community, such as the problem of plastic waste, environmental protection in living places… make practical contributions to environmental protection.

In addition to the successes achieved, the work of environmental protection in our country still has shortcomings and limitations, stemming from many different subjective and objective reasons. The quality of the environment has improved but is still slow; the environment in some places continues to be polluted, especially in river basins and craft villages; some environmental incidents still occur; the unreasonable and unsustainable exploitation of natural resources continues to lead to loss of resources and bad impacts on the environment; The situation of deforestation, illegal hunting, trading of wild animals and plants and invasive alien species are complicated.

DEVELOP GREEN ECONOMY, CIRCULAR ECONOMY TO CONSERVE AND EFFICIENTLY USE NATURAL RESOURCES

Speaking at the Conference, Deputy Prime Minister Lê Văn Thành affirmed that, in recent years, Việt Nam has paid great attention to environmental protection. Accordingly, the economy is being strongly restructured, associated with the development of the digital economy, green economy and circular economy in order to conserve and effectively use resources for development, protection of living environment and people's health. The Deputy Prime Minister highly appreciated the results achieved by the natural resources and environment sector over the past time with the investment in projects of waste treatment, pollution remediation and environmental improvement; the conservation of nature and biodiversity is focused; International cooperation is promoted to attract advanced technologies and techniques, important resources for environmental protection.

However, the Deputy Prime Minister pointed out that climate change and environmental pollution are becoming more and more serious, threatening the development of humanity in general and Việt Nam in particular. Faced with these challenges, the Party's stance on environmental

▲ *Conference scene*

protection in the coming period is to effectively implement the Government's commitment at COP26 with achieving net emissions of "zero" by 2050 as one of the important tasks. To achieve that goal, it is necessary to establish a National Steering Committee to implement the implementation of Vietnam's commitments at COP26, led by the Prime Minister as Chairman, Deputy Prime Minister as Vice Chairman, member of the Steering Committee are Ministers and members of the Government, leaders of many Ministries, branches and agencies; applying high technology to develop circular economy; developing the public transport system, limiting private vehicles; review the planning of coal power plants, develop renewable energy sources. Besides, the Deputy Prime Minister asked the natural resources and environment sector and localities to focus on planning, especially in urban planning, to keep the green land fund and develop green trees in urban areas; Reviewing projects and factories in industrial zones; focus on training human resources for environmental protection management, especially high-quality human resources; Strengthen and diversify investment capital sources for environmental protection; Prioritize budget sources as capital to attract, develop and solve environmental problems.

At the Conference, the delegates also listened to presentations on identifying challenges, opportunities and orientations for environmental protection work in the coming period presented by Deputy Minister of Natural Resources and Environment Võ Tuấn Nhân; Promoting the strength of the entire people to participate in environmental protection presented by Vice Chairman of the Central Committee of the Vietnam Fatherland Front Phùng Khánh Tài; Vietnam's efforts in addressing global environmental issues presented by the Chief Resident Representative of the United Nations Development Program in Việt Nam, Ms. Caitlin Wiesen. Besides, there are comments from representatives of the Ministry of Public Security; Vietnam Chamber of Commerce and Industry (VCCI) and some localities such as Sóc Trăng, Tiền Giang, Tuyên Quang... Accordingly, the presentations and opinions presented at the Conference were exchanged, discussed, specifically and objectively evaluate the advantages and disadvantages of environmental protection work in the past time, point out the causes and share lessons learned from that to unify the tasks and solutions that are to raise awareness and responsibility of each citizen and enterprise for environmental protection; Successfully transforming the economic structure, renewing the growth model from "brown" to "green", from intensive exploitation of natural resources to development based on the ecosystem, knowledge economy, digital economy, circular economy, low carbon; investment in natural capital; Solve environmental pollution problems in craft villages and main river basins; promote the classification of domestic solid waste at source; applying advanced technologies in recycling and solid waste treatment, gradually reducing the direct burial of waste; Effectively implement the Government's commitment at COP26 on energy transition; reduce greenhouse gas emissions; sustainable use of natural resources…; Strengthening international cooperation, uniting the whole people, promoting the role of international cooperation, applying science and technology, digital platforms in solving environmental problems, climate change, biodiversity.

Within the framework of activities towards the 20th anniversary of the establishment of MONRE, MONRE organized a symposium on state management of environmental protection; Scientific Conference on summarizing scientific and technological activities in the period 2011 - 2020 and orientation to 2030; The Exhibition of Achievements of the Natural Resources and Environment Sector and the 5th NEC are among the activities towards the 20th anniversary of the establishment of the Ministry.

COMMENTS AT THE 5th NEC

● ***MAJOR GENERAL TRẦN MINH LỆ - DIRECTOR OF THE ENVIRONMENTAL CRIME PREVENTION AND CONTROL DEPARTMENT, MINISTRY OF PUBLIC SECURITY (MPS)***

In order to strengthen crime prevention, ensure security, order and social safety in the environment, in association with the implementation of the LEP 2020, in the coming time, the People's Public Security force will focus on a nu mber of tasks and solutions: Thoroughly grasping the guiding viewpoints of the Party, State and leaders of the MPS on environmental protection, sustainable development and crime prevention on environment and natural resources, food safety; Continue to coordinate with relevant Ministries, departments and branches to promptly advise the Party, State, the Central Public Security Party Committee and the leadership of the MPS to perfect the legal basis for the operation of the People's Public Security force in general and the Environmental Crime Prevention Police force in particular, especially in the application of Criminal Law and sanctioning of administrative violations in the fields of environment, natural resources and food safety; Consolidate and strengthen inter-sectoral coordination and international cooperation in environmental crime prevention…

● ***PROF. DR. ĐẶNG HUY HUỲNH - ASEAN BIODIVERSITY HERO, VICE PRESIDENT OF VIETNAM ASSOCIATION FOR CONSERVATION OF NATURE AND ENVIRONMENT (VACNE)***

Although, the natural resources and environment sector has made great efforts to solve environmental problems, air pollution, climate change... are still occur in reality. In the past time, VACNE has accompanied the MONRE in the protection of nature, environment, conservation of biodiversity, response to climate change, serving the career of sustainable development of the country. Through this Conference, I hope that Ministries, sectors and leaders of 63 provinces/cities will accompany MONRE to solve current environmental problems for our future generations. After the Conference, all cities from the Central to local levels should take action so that our society will no longer have waste, water is no longer polluted and people and living world develop comprehensively towards sustainable development and prosperity.

● ***MR. VƯƠNG QUỐC NAM - VICE CHAIRMAN OF SÓC TRĂNG PROVINCIAL PEOPLE'S COMMITTEE***

The 5th NEC is an opportunity for the entire political system and social community to pay attention and acknowledge environmental issues in recent years. From the reality and inadequacies of the locality in waste treatment, Sóc Trăng Province proposes the natural resources and environment sector to promote the development of biomass electricity to solve the current waste problem radically and thoroughly. Although, the Government has policies to encourage the promotion of renewable energy; including the development of biomass power, but so far, the ratio of quantity as well as output from biomass power plants is still modest. This type of energy is facing many barriers, from the lack of stability and sustainability in fuel supply, the price of raw materials... to the incentive mechanisms for bioelectricity that are not attractive enough. The development of biomass electricity aims to optimize the use of agricultural and forestry by-products, contributing to meeting energy sources and for socio-economic development in Việt Nam ■

VŨ NHUNG - NGUYỄN HẰNG

New points of Decree No. 45/2022/ND-CP on administrative penalties in the field of environmental protection

NGUYỄN AN THỦY
Department of Politics, Enforcement and Inspection General Department of Environment

On July 7th, 2022, the Government issued Decree No. 45/2022/ND-CP regulating on administrative penalties in the field of environmental protection, effective from August 25th, 2022. The Government's promulgation of Decree No. 45/2021/ND-CP is very timely, to ensure that there is adequate regulation for administrative penalties on environmental protection in accordance with the Law on Environmental Protection (LEP) in 2020 and the Law on Amending and Supplementing a number of articles of the Law on Handling of Administrative Violations 2020. This is the basis for competent agencies to consider handling administrative violations, raise awareness of organizations and individuals and enhance efficiency and effectiveness of state management in the field of environmental protection.

The Decree has 4 chapters, 78 articles and 1 appendix, which adds regulations, including some new points such as:

Firstly, Decree No. 45/2022/ND-CP has fully supplemented sanctions for new regulations in the LEP in 2020 on violations of regulations on environmental permits and environmental registration; violating regulations on trial operation of waste treatment works after being granted environmental permits; violating regulations on environmental protection in the management of persistent pollutants and raw materials, fuels, materials, products and goods containing persistent pollutants; violation of labeling and disclosure of information containing persistent pollutants; violating the disclosure of environmental quality monitoring information, publicizing environmental information, providing and updating information and data for the environmental database; violating regulations on the responsibility of producing and/or importing organizations and individuals on recycling, collection and treatment of waste; violation of regulations on mitigation of greenhouse gas emissions and protection of the ozone layer; violations against regulations on environmental protection of natural heritage; violation on using of natural ecosystem services…

Secondly, the sanction level in Decree No. 45/2022/ND-CP has been adjusted to suit management requirements and practical application. Specifically, increase the level of punishment for the group of acts of intentionally stealthily and sneaky discharging untreated waste into the environment, causing environmental pollution such as: Construction, installation, equipment installation, pipelines or other discharge routes to discharge untreated waste into the environment, without constructing environmental protection works... to the maximum extent (1 billion VND for individuals; 2 billion VND for organizations) to ensure deterrence. At the same time, for groups of acts occurring in public places, the fine levels have also been adjusted to bring the fine levels for acts in consistent with the sanctioning competence of many local forces such as: police officer (has the right of maximum fine for an individual is VND 500,000) or the head of the commune-level police station or the head of a police station (has the right of maximum fine for an individual is VND 2,500,000). With the reduction of fines for several acts such as dumping, disposing, discarding cigarette's butts and heads at the wrong places (fines from 100,000 VND to 150,000 VND) and personal hygiene acts (urination and defecation) at the wrong place in the apartment, commerce, service or public place (the fine level is from 150,000 VND to 250,000 VND) will facilitate to be fined on the spot without needing to make a record. The reduction of this fine level is to ensure feasibility for the majority of people and at the same time to simplify the sanctioning procedure with the form of on-the-spot fines. From there, the sanctions for handling environmental violations in public places will be effectively applied in practice.

Thirdly, the Decree stipulates the application of additional sanctioning measures depriving the right to use environmental permits for a number of serious violations with high risk of causing environmental pollution such as: constructing, installing equipment, pipelines or other waste lines to discharge untreated waste into the environment; failing to build and install environmental protection works according to regulations; acts of discharging wastewater and emissions in excess of technical regulations many times, so serious that they are suspended; acts of violating regulations of hazardous waste treatment facilities to the point of being suspended... According to current regulations, environmental permits are documents issued by competent state management agencies to organizations and individuals engaged in production, business and ser-

vice activities are allowed to discharge waste into the environment, manage waste and import scrap from abroad as raw production materials, together with requirements and conditions on environment protection. The deprivation of the right to use an environmental license means that such organization or individual is not eligible for production, business or service activities.

Fourthly, the Decree also adds a number of regulations to ensure the effective enforcement of penalties for violations of environmental protection in practice, such as:

- Adding 1 article on the statute of limitations for sanctioning administrative violations for each violation act, in which specifying the group of finished acts and the acts in progress. This provision is consistent with the provisions of the Law on Handling of Administrative Violations Amended and Supplemented in 2020 and is also an important basis for determining the statute of limitations for sanctioning of each act, avoiding arbitrary application;

- Adding specific regulations on measures to force organizations and individuals to return illegal profits, this will effectively prevent intentional violations to evade investment or operating costs for environmental protection works;

- Adding the authority to sanction administrative violations for a number of new forces such as: Fisheries control; airport authorities; Health Environment Management Department; specialized inspectors of industry and trade, specialized inspectors of culture, sports and tourism... to maximize the force involved in timely detecting and handling administrative violations in the field of environmental protection;

- In addition, the Decree adds responsibilities of the Management Boards of economic zones, industrial parks, export processing zones and high-tech zones for procedures for deprived of the right to use a license for a definite time, suspended from operation for a definite time, or forced to take remedial measures for the violation and responsibility for organizing the implementation of the decision on enforcement of the additional sanction of suspension of operations, coercive application of remedial measures and forced relocation of the project or facility as prescribed, for cases where violating organizations or individuals are located in the area of the management board of economic zones, industrial parks, export processing zones, high-tech zones.

Fifthly, some acts have not yet been immediately sanctioned, depending on the roadmap specified in the LEP in 2020, specifically:

- In Clause 1, Article 26 of the Decree, a fine ranging from VND 500,000 to VND 1 million shall be imposed on households and individuals for failing to classify domestic solid wastes as prescribed; do not use the packaging containing the waste according to regulations. However, according to the provisions of Clause 6, Article 75 of the LEP in 2020, the provincial people's committees are responsible for detailing the management of solid waste of households and individuals in the area, the deadline before December 31st, 2024, at the latest. Therefore, these acts have not been applied right at the time when Decree No. 45/2022/ND-CP takes into effect. The time to apply this sanction is December 31st, 2024, at the latest and depends on the progress of promulgating regulations on domestic waste management of households and individuals in the province. Thus, it can be understood that from the time after August 25th, 2022 (the effective date of Decree No. 45/2022/ND-CP), in case any province or city has issued regulations on domestic

▲ *An environmental police officer is taking samples of wastewater discharged from the enterprise's sewage pipeline into the environment*

solid waste management then households and individuals in that province or city are responsible for organizing the implementation and will be administratively sanctioned according to regulations if they fail to comply. In case before or after the deadline of December 31st, 2024, in the province or city, there are no regulations on household and individual solid waste management, the sanction prescribed in Clause 1, Article 26 of the Decree shall not be applied in that respective province.

- Similar to an act of administrative violation that, according to regulations, has a roadmap for implementation such as: installing automatic and continuous monitoring equipment; extended liability of the manufacturer; regulations on mitigation of greenhouse gas emissions and protection of the ozone layer… The Decree also stipulates adequate sanctions to ensure synchronization with current legal regulations. However, the application of sanctions for these acts must be based on the time when the organization or individual is required to perform that responsibility in accordance with the Law.

Sixthly, some other content:

- Regarding regulations on sanctioning of administrative violations on ordinary industrial solid waste; violating regulations on environmental protection for hazardous waste generators; hazardous waste transportation and treatment activities... have been fully updated and supplemented in accordance with current legal regulations, including the act of purchasing and receiving ordinary industrial waste and hazardous waste without any handling measures or no handling function as prescribed… to handle cases arising in reality without sanctions. As for public hygiene, the Decree adds regulations on disposing of plastic waste directly into ponds, lakes, canals, rivers, seas and oceans; acts of outdoor burning by-products from plants near residential areas, airports, main traffic routes, supplementing acts of bringing waste into the territory into Việt Nam below the level specified in Article 239 of the Penal Code.

- The issue of information disclosure has been regulated throughout and uniformly in the LEP in 2020 according to specific contents, the Decree also stipulates penalties for violations related to publicity: Environmental impact assessment report which was approved appraisal results, environmental permits, plans to prevent and respond to environmental incidents, waste monitoring results of project owners, production and business establishments enterprises, concentrated production and business zones, industrial clusters in the provision and publication of information on the environment.

- Regarding regulations on sanctioning administrative violations on environmental monitoring, new regulations have been added under the LEP in 2020 such as: not installing monitoring cameras or automatic sampling devices for wastewater; failing to keep monitoring data of wastewater and emissions as prescribed or failing to connect and transmit monitoring data to competent authorities as prescribed; the installation lacks one of the automatic and continuous monitoring parameters; fail to ensure the confidentiality and integrity of automatic and continuous monitoring data; intervene and adjust monitoring results automatically and continuously before transmitting data to the receiving agency as prescribed.

- Regarding regulations on sanctioning of administrative violations on environmental protection in the import and demolition of used ships; import machinery, equipment, vehicles, raw materials, fuel and materials; environmental protection in scrap import, it has supplemented and clarified the act of transferring imported scrap as raw production materials, in which fines have been divided according to the volume and type of infringing scrap (iron, steel, paper, plastic) to ensure fairness and apply effective treatment in practice; regulations on penalties for violations against imported scrap quality assessment organizations have been added in accordance with the Decree on sanctioning of administrative violations in the fields of standards, measurement and quality of products and goods. In which the Decree shall be applied for handling of violations against the results of inspection and analysis of quality of imported scrap shipments.

- For the green area, the LEP 2020 has provided regulations on criteria for establishing natural heritage based on international criteria and Vietnamese current conditions, at the same time, the Decree also stipulates the investigation, evaluation, management and protection of environment at natural heritage in order to protect and promote the sustainable value of natural heritage in our country. Therefore, the Administrative Penalties Decree also stipulates the responsibilities of organizations and individuals in the restoration and protection of natural heritage and payment for natural ecosystem services. For conservation of nature and biodiversity, the Decree has arranged and integrated the contents of sanctioning provisions on nature conservation and biodiversity from Article 47 to Article 54 and reviewed the sanction in accordance with several other specialized administrative penalties decrees and in line with reality; focus on sanctioning for acts of illegal destruction and encroachment on natural heritage in Article 47 to be consistent with Clause 12, Article 6 of the LEP in 2020 ■

Strengthening efficiency of environmental impact assessment on development investment activities

NGUYỄN XUÂN HẢI - ***Director***
Department of Environmental Impact Assessment,
Vietnam Environment Administration (VEA)

The process of industrialization and modernization of our country has been taking place at a rapid pace and has achieved great achievements in many fields. The problem is how to continue socio-economic development without harming the living environment of people, how to achieve a harmonious, long-term and sustainable development between development and protection of the natural environment. To meet that urgent requirement, Việt Nam has been approaching many harmonized development policies, using integrated environmental management tools such as laws, decrees, circulars; environmental standards; environmental protection planning; strategic environmental assessment; environmental impact assessment (EIA); environmental permit; taxes, fees, deposit, reimbursement; communication and public awareness raising.

For EIA work, legal regulations have been formed since promulgated the Law on Environmental Protection (LEP) in 1993, continuously improved, adjusted, supplemented through the promulgation of the LEP in 2005, 2014, 2020 to match the actual development situation in Việt Nam in the past decades, especially in the context that the whole country has promoted the open-door policy to encourage development investment to realize the goal of industrialization and modernization of the country.

The process of completing the EIA object

The object of making EIA reports has been gradually improved according to the development stages, specifically: the LEP in 1993 and Decree No. 175/CP dated October 18th, 1994 on guiding the implementation of the LEP had been stipulated on the subject of EIA for existing facilities as well as for new projects; The legal regulations after the 2005 LEP no longer stipulates EIA for operating establishments. Meanwhile, the legal regulations from 1993 to 2020 all stipulate that the list of projects subject to EIA but those subject to EIA is reviewed, updated and gradually reduced, specifically: Reduced from 146 items in Decree 29/2011/ND-CP down to 113 items in Decree No. 18/2015/ND-CP and 107 items in Decree No. 40/2019/ND-CP and in the direction of stronger decentralization for localities. From Decree No. 40/2019/ND-CP, there is a list of production types that are at risk of causing environmental pollution. On this basis to have stricter requirements on EIA and environmental management.

Subjects to perform EIA are specified in the LEP in 1993, 2005, 2014 and are specifically listed type, scale, capacity, type from international experience without considering the location of the project to be located. deployed to surrounding sensitive objects that may be affected by the project. In particular, the LEP in 2020 has been introduced, which no longer has a fixed list of projects subject to EIA, but rather categorizes investment projects according to environmental criteria. Group I project and a part of Group II projects must carry out EIA. Some new regulations on EIA in the LEP in 2020, Decree No. 08/2022/ND-CP, Circular No. 02/2022/TT-BTNMT include:

Investment projects are classified into four groups: High risk of adverse impacts on the environment, risk of adverse impacts on the environment, low risk of adverse impacts on the environment and no risk of adverse impacts on the environment. Corresponding to each specific project object, the state management agency in charge of environment will apply appropriate management mechanisms.

Regulations that only subjects with high risk of adverse environmental impacts (Group I) are required to make preliminary EIA. This regulation aims to overcome the limitations and inadequacies of the current Law, including Reducing administrative procedures for many investors, whereby projects that are not in Group I will not have to be preliminarily assessed of environmental impact to save time and costs.

Fully apply environmental tools to manage and screen investment projects with considerable risk of adverse environmental impacts such as: Preliminary assessment of environmental impacts, EIA, issuance of environmental permits if waste is generated.

For projects applying advanced and environmentally friendly technologies, environmental permits shall be granted right from the feasibility study stage and post-inspection (through inspection and examination) when the project is put into operation or only after the project is put into operation or they only must register the

environment (not an administrative procedure, done in a simple and online form) at the Commune People's Committee. The LEP in 2020 has properly redefined the role of EIA in the preparation and construction phase of the project; The project and facility management when put into operation is replaced by environmental registration and environmental registration tools.

Completing the process of making, evaluating and approving

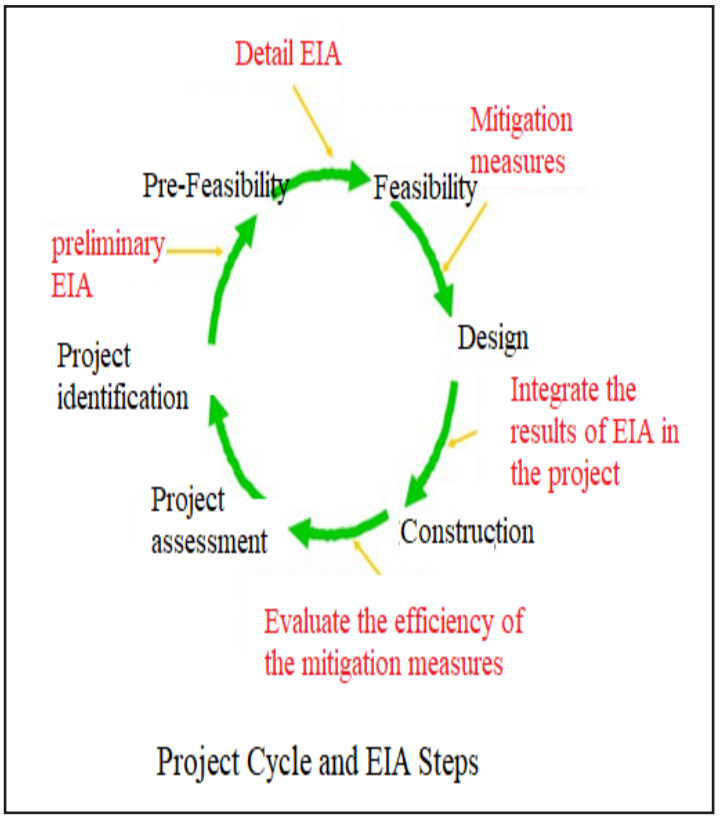
Compared with the LEP in 2014 and earlier, the LEP in 2020 has stipulates a preliminary assessment of environmental impacts for projects with high level of adverse environmental impacts in the pre-feasibility study stage. At the same time, these projects must carry out EIA in the feasibility study phase. In addition, the EIA is carried out concurrently with the preparation of the feasibility study report. The content of the EIA report is specified in the guiding circulars in the direction of becoming more detailed, specific, substantive and feasible. In addition, the legal regulations before 2021 assign specialized Ministries and provincial people's committees to appraise the EIA report. The LEP in 2020 only assigns the Ministry of Natural Resources and Environment (MONRE), the Ministry of National Defense (MND), the Ministry of Public Security (MPS) and the provincial people's committee to appraise the EIA report.

Regarding approval: The LEP of 1993 is to approve the EIA report; changed from 2005 to approval of EIA report and from LEP in 2020 to approval of appraisal results of EIA report. Before the promulgation of the LEP in 2020, EIA appraisal and approval agencies include the MONRE, Ministries and agencies directly under the Government (for projects under their decision and approval competence), MND, MPS (appraisal and approval of EIA reports for projects with elements of national secret); provincial people's committee; district people's committee (appraisal and approval of environmental assessment reports for projects with small environmental impacts in the form of environmental protection commitments, environmental protection plans). However, the LEP in 2020, which requires unified management of EIA appraisal, the agency that appraises and approves the EIA appraisal results only has the MONRE, the MND and the MPS (organizing the appraisal of EIA reports for investment projects classified as State secrets on national defense and security) and provincial people's committees. According to the LEP in 2020, the composition of the appraisal council is publicly regulated and creates conditions for many components to participate. The experts participating in the Appraisal Council at all levels are selected and most of them are experts with appropriate qualifications; The quality of experts participating in the activities of the EIA Appraisal Council varies between localities for many different reasons (geographical factors, funding...). According to the LEP in 2020, the decision approving the EIA report is replaced by the decision approving the appraisal result of the EIA report.

Complete community consultation

The participation of stakeholders in the EIA process is very important to complete the EIA report and get the community's consensus for the Project. The consultation has also made remarkable progress over the years: The 1993 LEP does not stipulate public consultation; Since the 2005 LEP, consultation during EIA implementation has become a mandatory requirement and is gradually improved, specifically: Consultation of communities directly affected by the project through community meetings organized by the commune people's committee (CPC) and the project owner co-chaired and provided for the consultation minutes; Consult the CPC and relevant organizations in writing and the CPC is responsible for replying within 15 days; There are provisions for cases where public consultation is not required. From Decree No. 40/2019/ND-CP stipulating that project owners are required to consult experts and scientists for a number of projects of the type of projects that are likely to cause environmental pollution and consult with professional organization in model accuracy for some types of projects.

Meanwhile, the LEP in 2020 has made great strides in public consultation. Regulations on consultation in the process of making and appraising EIA are increasingly stricter and more substantive, showing democracy, humanity and sound science. For the first time, the responsibility of the project owner in consultation with the residential community is prescribed right from the time of making the EIA report. The results of consultation with the local community, relevant agencies and organizations are important information for the project owner to research and come up with solutions to minimize the project's impact on the environment and complete the project's EIA report. In particular, to make the consultation more substantive, the EIA report must be posted online before the appraisal at the website of the appraisal agency, approved the EIA report and publicly announced the decision approving the appraisal result of the EIA report; Specific content of consultation during EIA implementation; Specific



▲ *EIA Cycle*

regulations on consultation subjects (Clause 1, Article 26 of Decree No. 08/2022/ND-CP). Residential communities and individuals directly affected by environmental impacts caused by project activities, including: Residential communities and individuals living, producing and doing business in the land area, water surface, land with water surface, sea area occupied by project investment; residential communities and individuals within the direct impact of wastewater, emissions, dust, noise, solid waste and hazardous waste caused by the project; communities and individuals affected by subsidence, landslides, riverbank and coastal sedimentation caused by the project; communities and other affected individuals, identified through the EIA process; Agencies and organizations directly related to the investment project, including: CPC, Vietnam Fatherland Front Committee at commune where the project is implemented; Management board, investor in construction and infrastructure business of production, business and service zones, industrial clusters where the project is located within the management boundaries; State agencies managing irrigation works, for projects that discharge wastewater into irrigation works or occupy irrigation works; State management agencies assigned to manage environmentally sensitive areas (if any); The MND, the MPS or the provincial-level military command, the provincial-level public security, for projects related to security - defense factors (if any).

Some difficulties, shortcoming and inadequacies

In addition to the achieved results, in the process of implementing EIA work, there are still some shortcomings such as: The coordination between levels and sectors in environmental protection work is not regular and continuous, so there are many limitations to monitoring and urging establishments to comply with regulations on environmental protection. The coordination in inspection, supervision and guidance activities of specialized agencies under MONRE with localities is not really close. There is a lack of resources to carry out EIA work. There has not been a close coordination between the project owner and the consultant in the process of EIA implementation, in many cases the project owner has contracted and left the environmental consultant to carry out the EIA, while the legal responsibility has not been met. The responsibility for the content of the EIA report belongs to the project owner. Due to this lack of close coordination, the content of environmental advice provided in the EIA report is sometimes inconsistent or even inconsistent with the content of the investment project; The environmental impact mitigation measures stated in the EIA report were not implemented because the project owner did not understand the contents of the EIA report…

Currently, a number of new investment projects in Việt Nam have been and will be applying best available techniques (BAT) to efficiently use resources and reduce pollution emissions. However, the BAT that project owners commit to apply in Việt Nam comes from abroad, Việt Nam has not yet developed and issued guidelines on requirements for applying BAT in accordance with actual conditions, leading to difficulties in screening, selecting and appraising new investment projects and projects on upgrading, expanding and transforming technology.

In addition, Article 52 of Decree No. 08/2022/ND-CP of the Government specifically stipulates a number of contents related to environmental safety distances from residential areas and safe environmental distances from production, business, service and warehouse facilities to residential areas. In particular, the Government has assigned the MONRE to assume the prime responsibility for developing and promulgating environmental technical regulations on envi-

ronmental safety distances from residential areas of production, business, service establishments and regulated warehouses defined at Point d, Clause 2, Article 53 of the LEP, specifically, establishments and warehouses that generate dust, odors and noise.

In fact, the implementation of regulations on safe distances has been generally applied for many years during the construction planning stage with the basis of application being QCVN 01:2021/BXD - National technical regulation on planning construction, or specialized regulations such as safe distances in livestock farming according to the provisions of the Law on Livestock, specialized in oil and gas, chemicals... However, the implementation encountered many difficulties and obstacles, and in fact, complaints of people arose when the facilities and warehouses did not ensure a safe distance from residential areas.

Some proposals to enhance the effectiveness of EIA for development investment activities

Currently, EIA is evaluating and forecasting mainly waste and waste stream management, but it is not possible to thoroughly assess biodiversity, natural resources, and other impacts unrelated to waste, natural landscape, climate change, ecological balance. Therefore, in the near future it is necessary to focus on:

Firstly, continue to complete research to have a set of criteria to be able to quantify the damage to forest resources and biodiversity when implementing the investment project, thereby serving as a basis for requesting the project owner to have specific and feasible plans for reforestation and biodiversity compensation.

Secondly, research is needed to assess the project's impact on climate change and vice versa; measures to ensure ecological balance and preserve the natural landscape when implementing the project.

Thirdly, promote training and propaganda activities on new regulations related to EIA in the LEP in 2020, Decree No. 08/2022/ND-CP, Circular No. 02/2022/TT-BTNMT. Communicating to raise awareness on EIA for policy-making agencies, strategic decision-makers, planning agencies, environmental management agencies and the community; strengthen the cooperation of relevant agencies for EIA work and promote the participation of the community in the EIA process.

Fourthly, continue to develop specialized technical guidelines on EIA; perfecting the system of national standards and technical regulations on environment and environmental database to create favorable conditions for the preparation, appraisal and management of EIA reports. Improve the quality of EIA reports.

Fifthly, strengthen the inspection of the performance of the state management function on EIA work in the localities. Strengthen cooperation with international organizations and non-governmental organizations in capacity building training on EIA.

Sixthly, coordinate with the Ministry of Science and Technology, relevant Ministries and ministerial-level agencies to develop and issue technical guidelines on BAT for application in Việt Nam; periodically review, update and supplement the list of BATs to ensure conformity with reality and development level of science and technology; guiding the application of the BATs to each type of production, business or service that are likely to cause environmental pollution.

Seventhly, to build a scientific and practical basis for stipulating safe environmental distances from residential areas of production, business and service establishments and warehouses that are at risk of causing environmental pollution, contributing to the development of environmental pollution and well implement the LEP, focusing on facilities and warehouses that are at risk of spreading dust, unpleasant odors and noise as prescribed at Point d, Clause 2, Article 53 of the LEP.

Eighthly, carry out investigation and assessment of types of production, business, service establishments and warehouses that are at risk of spreading dust, unpleasant odors, and noise. Synthesize and evaluate regulations related to safe distances applicable to each type of production, business, service and warehouse. Synthesize and evaluate international experience on methods of determining the safe distance from the environment according to each type of production, business and service.

On that basis, the MONRE promulgates national technical regulations on environment related to environmental safety distances from residential areas of production, business and service establishments and warehouses that are at risk of spreading dust, unpleasant odors and noise as prescribed at Point d, Clause 2, Article 53 of the LEP ■

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Strengthening the efficiency of solid waste management in Việt Nam

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In recent years, towards the goal of sustainable development of the country, the Party, National Assembly and Government have always paid attention to directing socio-economic development in association with attaching importance to environmental protection and that has achieved many positive results, creating a good premise to strengthen environmental protection work in the future. However, along with the socio-economic development, the strong population growth has rapidly increased the amount of solid waste generated with increasingly complex composition, which has been causing difficulties for the management of waste treatment, especially for domestic solid waste (DSW).

The Law on Environmental Protection (LEP) in 2020 has introduced separate regulations on the circular economy (CE), which defines the CE is an economic model in which design, production, consumption and service activities aim to reduce the exploitation of raw materials and materials, prolong the product life cycle, limit waste generated and minimize the adverse impact on the environment; stipulates that production, business and service establishments are responsible for establishing a management system and taking measures to reduce resource exploitation, reduce waste and raise the level of waste reuse and recycling right from the project construction stage, product and goods design to the production and distribution stage... This is a new approach in management that the Ministry of Natural Resources and Environment (MONRE) is and will be implementing in the near future, contributing to the achievement of the goals of the Project on Development of a CE in Việt Nam, which has just been approved by the Prime Minister in Decision No. 687/QD-TTg dated June 7th, 2022 .

1. Situation of generation, classification, collection and transportation of DSW in the period 2016 - 2021

DSW in urban and rural areas

In the period 2016 - 2021, the amount of DSW generated will continue to increase nationwide. It is estimated that the amount of DSW generated in urban areas nationwide increases by an average of 10% - 16% per year. In 2019, the total amount of DSW generated nationwide was about 64,018 tons/day, of which the amount of DSW generated in urban areas was 35,624 tons/day, the amount of DSW generated in rural areas was 28,394 tons/day. In which, Hồ Chí Minh City and Hà Nội have the largest amount of urban solid waste generated. In these two cities alone, the total amount of DSW generated from urban areas is up to 12,000 tons/day, accounting for 33.6% of the total amount of urban solid waste generated in the whole country. Basically, the amount of DSW generation in rural areas depends on population density and people's consumption demand. In general, the delta area has a higher amount of DSW generation than the mountainous area; the area with a higher consumption level will also have a higher amount of DSW generated. In 2020, the amount of DSW generated is increasing, with complex properties and components. The total volume of DSW generated in the provinces/cities is about 81,121 tons/day. The localities with the volume of DSW generated over 1,000 tons/day account for 25%.

Sorting, collecting, storing, gathering, transshipping, transporting DSW

In recent years, waste separation at source has been directed and organized by all levels and sectors, contributing to reducing the amount of waste to be treated and increasing recycling and utilization of resources. Many localities have actively developed programs and projects for implementation. However, the general assessment shows that the classification at source has not achieved high results because the regulation is not yet highly coercive, mainly encouraging. On the other hand, many localities currently do not have separate collection equipment and means for each type of classified waste. Therefore, in many cases where the classified waste is transported together in the same equipment and vehicles, in some cases the treatment facility only applies a common treatment method for the classified waste. Therefore, the efficiency of classification at source is not high.

The collection and transportation is done differently between urban and rural areas, between localities and even between regions within the same locality. In general, localities still lack specialized equipment for solid waste collection and transportation. In fact, only new urban areas have specialized vehicles such as solid waste containers, specialized vehicles for transporting solid waste while in rural areas, there are often no specialized means of transport, but using manual vehicles to transport the DSW to the collection point.

The rate of solid waste collection in urban areas of localities nationwide in 2020 will reach 94.71% of generated waste, achieving the target set out in accordance with the National Strategy on Integrated Solid Waste Management (SWM) by 2025, vision to 2050 has been approved by the Prime Minister in Decision No. 491/QD-TTg dated 7/5/2018.

In rural areas, many localities have formed self-managing groups and women's unions to collect waste at a certain frequency and transfer it to a collection point for urban environmental companies to transport to treatment facilities. However, in the process of implementation, there were some places where waste was collected to the collection point but not transported to the treatment place, leading to the formation of temporary landfills causing environmental pollution.

Some provinces/cities use waste transfer stations in the process of collection and transportation. The selection of collection areas and transfer stations is often difficult, often encountering objections from people because the gathering and transshipment generates odors, leachate and attracts insects, affecting the environment. Many collection points do not have roofs, so when the rain causes wetting, leachate is generated, affecting the environment.

In addition, transportation is still facing many difficulties because most of the waste landfills are located far from residential areas, which has increased transportation costs. In addition, the transportation capacity of some localities is still limited and the means of transport are still rudimentary and unsafe, causing leakage and spillage of waste during transportation.

Handling DSW

Currently, a part of recyclable waste arising from daily life has been voluntarily classified, collected and sold to scrap collectors by people and finally transferred to recycling facilities. This, on the one hand, contributes to reducing the amount of waste to be treated, making full use of the resources contained in the waste. However, many of the above-mentioned recycling facilities are establishments in craft villages or small-scale establishments, using outdated recycling technology and do not meet the requirements of environmental protection. In addition, these facilities often demolish and utilize recyclable and non-recyclable parts that are disposed of together with the DSW. The above activities have the potential to cause environmental pollution if not managed appropriately.

There are about 400 solid waste incinerators nationwide, 37 concentrated composting production lines, over 900 landfills, many of which are unsanitary. Some facilities apply the method of burning solid waste with energy recovery to generate electricity or a combination of different treatment methods.

Regarding the rate of waste treatment according to the treatment methods, currently about 71% of the total waste is treated by landfill method (excluding waste from composting facilities and ash generated from incinerators), about 16% of total waste is treated at composting plants and about 13% of total waste is treated by incineration and other methods.

2 . DSW management

About the organization and state management apparatus on solid waste

At the Central

Before the Government's Resolution No. 09/NQ-CP dated February 3rd, 2019, the state management of DSW was assigned to many Ministries to jointly manage, including the MONRRE, Ministry of Construction, Ministry of Science and Technology. The interference and overlapping of state management functions in the field of DSW include the development and promulgation of legal documents; formulating and directing the implementation of strategies, policies, schemes, programs, master plans and plans; organize periodical assessment of current status and forecast of SWM; directing, guiding and organizing the implementation of management.

Immediately, after the Resolution No. 09/NQ-CP, which assigned the MONRE to be the focal point for unified state management of solid waste, the MONRE quickly issued a plan to implement the unified state management plan on solid waste and implemented activities such as reviewing and evaluating current legal documents; examine and evaluate SWM nationwide; organize seminars and conferences on treatment technology, management model for DSW with the participation of Ministries, branches, localities and experts and scientists; closely coordinate with media agencies to propagate and raise awareness of the people and the whole society about waste management.

According to the provisions of the LEP in 2020 and guiding documents, the MONRE is currently assigned to be the focal point for unified state management of DSW.

Locally

Previously, there was no consensus in the localities in the assignment of specialized agencies to advise and assist the provincial people's committees in DSW nmanagement; some provinces/cities assigned to the Department of Construction while some other provinces/cities assigned the Department of Natural Resources and Environment (DONRE), some assigned to both units in advising and assisting the provincial people's committee on management DSW.

After the Resolution No. 09/NQ-CP, some localities have started to assign the DONRE as a specialized agency to assist in the management of DSW. However, up to now, the transfer to the DONRE as a specialized agency to assist in the management of solid waste across the country has not yet been implemented in all localities.

Regarding implementation of urban and rural SWM contents

On the implementation of DSW management objectives and tasks

According to the National Strategy on Integrated SWM to 2025, with a vision to 2050, approved in Decision No. 491/QD-TTg dated May 7th, 2018 of the Prime Minister, targets by 2025, 90% of the total amount of DSW generated in urban areas will be collected and treated to meet the requirements of environmental protection; strive for the rate of DSW to be treated by direct burial to be less than 30% of the collected waste; 80% of the DSW generated in concentrated rural residential areas is collected, stored, transported, self-treated and centrally treated to meet the requirements of environmental protection.

▲ *The Vĩnh Tân Waste-To-Energy Plant in Đồng Nai Province*

On the other hand, according to Resolution No. 06/NQ-CP dated January 21st, 2021 of the Government promulgating the Action Plan to continue implementing Resolution No. 24-NQ/TW of the 11th Party Central Committee on Active response to climate change, improvement of natural resource management and environmental protection according to Conclusion No. 56-KL/TW dated August 23rd, 2019 of the Politburo, the target by 2025 is 90% of urban solid waste to be collected, treated and strived that the proportion of urban solid waste treated by direct burial is less than 30% of the total amount of collected waste.

According to the results of reports of provinces and centrally-run cities on environmental protection in 2020, the rate of solid waste collected in urban areas in 2020 will reach about 94.71%. Thus, it is possible to assess the current collection and treatment of solid waste in urban areas that have met the objectives of the National Strategy on Integrated SWM and the Action Program to continue the implementation of the Resolution No. 24-NQ/TW of the Government. However, with the current high burial rate, the goal of striving for the rate of DSW to be treated by direct burial at less than 30% of the collected waste is very difficult to achieve if the local authorities do not quickly convert existing landfill technologies to more advanced, environmentally friendly solid waste treatment technologies.

Results of the implementation of programs, schemes, projects, national and regional master plans on the contents of SWM

Construction Law, guiding documents and Decree No. 81/2017/ND-CP stipulate that the Ministry of Construction has the following tasks: (i) To elaborate and promulgate according to its competence or submit to competent authorities for approval and guiding the inspection of the implementation of regulations on the formulation, appraisal and approval of SWM planning; (ii) Organize the elaboration, appraisal, collection of written opinions of the MONRE, submission to the Prime Minister for approval or approval under the Prime Minister's authorization of the inter-provincial SWM planning; guide and inspect the implementation of the planning after it is approved; (iii) Appraisal of SWM plannings of centrally run cities which are special grade urban centers for submission to the Prime Minister for approval; obtain written consent for the people's committees of centrally run cities that are grade I cities to approve the city's SWM planning; (iv) Guide and inspect the elaboration and management of construction plannings of solid waste treatment facilities. In addition, Decree No. 59/2007/ND-CP stipulates the responsibilities of the Ministry of Construction as follows: (i) To guide the planning of construction of solid waste treatment facilities and ground reuse of solid waste treatment facilities and ancillary works after termination of operation (Clause 2, Article 9); (ii) Regional, inter-provincial, inter-urban and key economic zone SWM planning approved by the Prime Minister or authorized by the Prime Minister to the Minister of Construction for approval (Clause 1, Article 10).

Implementing the above regulations, the Ministry of Construction has presided over the development and submitted to the Prime Minister for promulgation many plans on SWM, such as: Master Plan on Hazard-

ous Medical Solid Waste Treatment System to 2025 in Decision No. 170/QD-TTg dated February 8th, 2012; SWM planning in the Northern key economic region to 2030 in Decision No. 1979/QD-TTg dated October 14th, 2016; SWM planning in Nhuệ - Đáy River Basin to 2030 in Decision No. 223/QD-TTg dated February 12th, 2015; Planning on SWM in Đồng Nai River Basin up to 2030 in Decision No. 07/QD-TTg dated January 6th, 2015; Planning on SWM in Cầu River Basin up to 2020 in Decision No. 2211/QD-TTg dated November 14th, 2013; The Project "Mobilizing investment resources to build a water supply, drainage and solid waste treatment system" in Decision No. 1196/QD-TTg dated July 23rd, 2014...

On the other hand, Decree No. 38/2015/ND-CP regulates the responsibilities of the Minister of Natural Resources and Environment in organizing the implementation of waste management contents for the formulation and implementation of environmental protection planning. This is amended in the Law amending and supplementing 37 laws related to planning, in which waste management is a content of the environmental protection planning and comply with the provisions of the Law on Planning and Environmental Protection and relevant international treaties to which Việt Nam is a member. Law amending and supplementing 37 laws related to planning also stipulates the responsibility of the MONRE to be the organization for the formulation of national environmental protection planning; develop environmental protection content in regional planning; guide provinces and centrally-run cities to develop environmental protection content in the provincial planning which includes content on waste management planning. Currently, the MONRE is developing a national plan for environmental protection, including content on waste management planning.

General assessment of SWM

In general, the system of legal documents is becoming more and more complete, creating an important legal basis for unified waste management in a new direction; is an important step to promote reuse and recycling of waste; contribute to prevent outdated waste treatment technologies, landfill technology and improving the efficiency of environmental protection. The rate of solid waste collection in urban areas is increasing, meeting the target under the National Strategy on Integrated SWM by 2025, with a vision to 2050 and Resolution No. 06/NQ- CP of the Government on January 21st, 2021 issued an Action Plan to continue implementing Resolution No. 24-NQ/TW of the 11th Party Central Committee on proactively responding to climate change, strengthening resource management and environmental protection according to Conclusion No. 56-KL/TW dated August 23rd, 2019 of the Politburo. At the local level, regional SWMplans and local plans have been developed, serving as a basis for building solid waste treatment facilities. Some localities, especially cities directly under the Central Government, have begun to apply new and advanced technologies such as burning with energy recovery as a basis for consideration and replication. The interest of all levels, sectors, people's awareness and society's increasing attention to the management of DSW.

In addition, the management of DSW still has many shortcomings and limitations. Most of the DSW has not been classified at the source, although the local solid waste classification programs have been implemented in recent years, they are model-building and not synchronous; The rate of landfilled solid waste is still high; Waste treatment technology of many establishments is still out of date; The existing DSW treatment capacity cannot meet the generated solid waste volume, while the investment in new construction or project expansion does not meet the requirements; Advanced and modern DSW treatment technologies have high investment and treatment costs while local budgets for DSW treatment are limited.

▲ *Waste sorting line at the South Bình Dương Waste Treatment Complex (Bình Dương Provnce)*

The reason is that the collection of sanitation fee (service price) of DSW for households and individuals is collected by household or by demographic, which discourages people to reduce the amount of waste generated and classification at source. The construction of modern waste treatment facili-

ties requires large investment capital, many localities do not have enough resources or investment is not adequate; meanwhile, the promotion of socialization of investment in solid waste treatment facilities is still slow. Many localities have not been active in the construction of waste treatment facilities; The investment in the construction of waste treatment facilities is still scattered and small... The planning and determination of the location for construction of waste treatment facilities faced difficulties due to people's objections; the organization of planning implementation in the localities is still slow, lack of resources to implement; The awareness of a part of people in the classification, storage, collection and transportation of solid waste is still limited. In many places, people have not actively participated in sorting activities at source and have not paid the full environmental sanitation fee.

3. Solutions to improve the efficiency of DSW management towards a CE

Immediately after the Resolution No. 09/NQ-CP was issued, the MONRE submitted to the Prime Minister to issue Directive No. 41/CT-TTg dated December 1st, 2020 on urgent solutions to strengthen SWM; formulate and submit to the National Assembly for promulgation the LEP in 2020, submit to the Government for promulgation Decree No. 08/2022/ND-CP dated January 10th, 2022 and promulgate according to its competence Circular No. 02/2022/TT-BTNMT dated January 10th, 2022, in which there are many new and specific regulations compared to the previous one on DSW management, including regulations on waste classification at source, roadmap to limit direct burying of waste; criteria for selection of solid waste treatment technology; collect prices and service charges for collection, transportation and treatment of solid waste from households and individuals by weight or volume of waste; guidance on methods of pricing solid waste treatment services…

In addition, in order to early put the LEP in 2020 and its guiding documents into practice, in the past time, the MONRE has organized conferences and training seminars for the local authorities in organizing the implementation of new provisions of the Law, at the same time also promoting propaganda and awareness raising about environmental protection, especially in the field of SWM and classification of solid waste at source.

In 2022 , the MONRE is urgently implementing a number of contents:

- Issue and publicize the list of DSW treatment technologies recommended for application in Việt Nam, as a basis for localities to organize the implementation;
- Formulate and promulgate national technical regulations on solid waste landfills and waste incinerators;
- Issue technical guidelines on waste classification at source for localities to use as a basis for implementation; pilot implementation of DSW classification activities at households and individuals in some localities;
- Issue technical guidelines for the renovation, upgrading and treatment of environmental pollution at unsanitary waste landfills and areas contaminated by waste, ensuring the requirements for environmental protection;
- Propagating and disseminating the Law; communication and raising public awareness on DSW management according to the new provisions of the LEP in 2020 and guiding documents.
- Agree with the Ministry of Construction on the agency that promulgates a circular detailing the contents of investment activities under the mode of public-private partnership (PPP).

Activities continue to be carried out

- Well organize the implementation of new policies in the LEP 2020, in which the roles and responsibilities of local authorities, people and businesses are emphasized. Pilot implementation, earlier than the roadmap prescribed by the LEP 2020 in implementing waste classification at source; collect prices and service charges for collection, transportation and treatment of solid waste by volume and packaging in a number of major provinces and cities. Effectively implement regulations on expanded responsibilities of manufacturers and importers, giving priority to encourage enterprises to proactively build their own systems of collection, recycling, product treatment and packaging.
- Review, develop, complete and organize the effective implementation of mechanisms, policies and laws related to DSW management; mechanisms and policies to encourage, support and encourage socialization in the management of solid waste, especially in encouraging investment in construction and operation of solid waste treatment facilities and implementation of the collection model, transport and treat DSW according to the provisions of the LEP and the Law on Investment in the form of PPP to ensure the effectiveness, stability and sustainability of the project, promote and diversify resources for waste treatment.
- Develop, finalize and promulgate economic - technical norms on collection, transportation and treatment of solid waste.
- Increase investment in infrastructure and develop human resources: localities need to arrange land fund for DSW treatment zones according to planning, allocate enough funds for investment in construction and operation of collect, store, transfer, transport and treat solid waste in the locality ■

Some suggestions on solutions to improve the efficiency of environmental impact assessment report in Việt Nam

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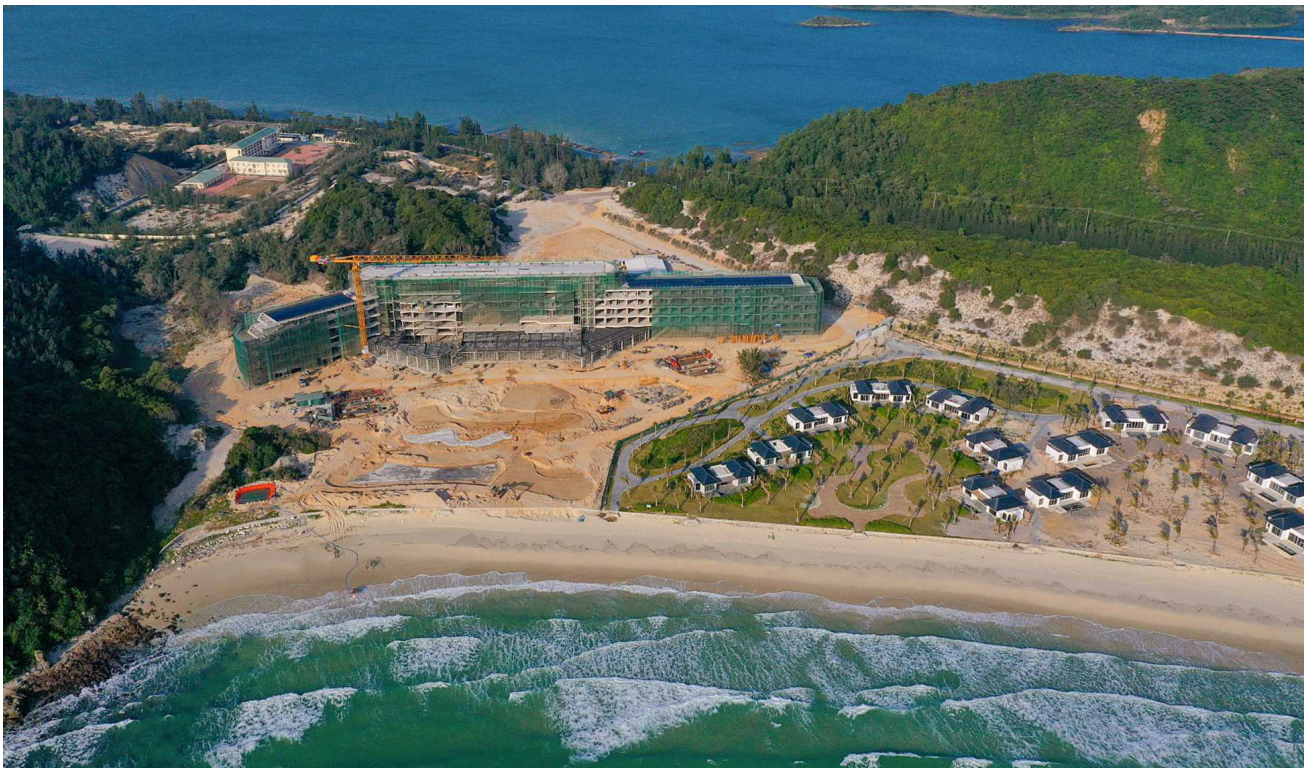
In the world, the implementation of environmental impact assessment (EIA) for investment projects is considered one of the effective management instruments to contribute to ensuring sustainable development goals. In Việt Nam, EIA has been codified in the Law on Environmental Protection (LEP) in 1993, 2005, 2014 and 2020. The implementation of EIA in Việt Nam in recent years has brought many encouraging results.

The LEP 2020 has a new breakthrough provision for EIA in general, appraisal of EIA report in particular, that is, instead of issuing a decision approving the EIA report as stipulated in previous LEPs, the LEP 2020 stipulates the issuance of a decision approving the results of appraisal of the EIA report. The content of this Decision is specified in the Circular No. 02/2022/TT-BTNMT dated 10th January 2022 of the Ministry of Natural Resources and Environment (MONRE). Accordingly, the "Contents and requirements on environmental protection of the project" attached to the Decision approving the results of appraisal of the EIA report are very comprehensive and detailed, specifically, it is necessary to clearly show the sources of waste generation, the nature and flow rate of wastewater, exhaust gas, the nature and volume of solid waste, hazardous waste and unrelated impacts to other wastes. Environmental protection works and measures of the project are also required to clearly show the corresponding treatment works, treatment and storage technologies. In order to be able to make a decision to approve the appraisal results with the above content requirements, it is necessary to be based on a good quality EIA report.

Obviously, the quality of the EIA report over time has been continuously improved mainly by the legal provisions on EIA, the activities of the EIA report appraisal council are increasingly comprehensive, close and MONRE has organized many training sessions and issued technical guidelines for preparing EIA reports for various types of projects. However, the current reality shows that up to 90% of EIA reports submitted for initial appraisal are not approved or approved with the condition that they have to



▲ *Consultants must be qualified to implement EIA*

be revised and supplemented, including many EIA reports that must be revised and supplemented significantly. Meanwhile, the review of EIA reports revised and supplemented at the request of the Appraisal Council to ensure quality and meet the approval decision in a relatively short time, as stipulated by the LEP 2020, has been a great pressure on the Council's Standing Agency. Therefore, one of the important and urgent tasks in the coming time is to have more effective solutions to improve the quality of the EIA report.

There are many factors influencing the quality of the EIA report, however, within the framework of the article, I would like to mention 3 factors:

About the costs for preparing EIA report

According to the provisions of Article 31: of the LEP 2020, EIA is implemented by the project owner or through a consulting unit. In practice, however, most if not all of EIA reports are prepared by the consultants. According to legal provisions, the selection of EIA consultants is done in the form of bidding and the funding factor is often decisive, leading to a situation that is the level of funding for the preparation of the EIA report tends to get lower and lower and this is one of the important reasons leading to the unsatisfactory quality of the EIA report.

This problem has been noticed by the MONRE as well as the Vietnam Environment Administration (VEA) and in the period 2017 - 2018, it has carried out a very elaborate survey and research to develop 2 schemes including: "Fees for appraisal of EIA report" and "Floor cost level for preparing EIA report" (understood as the minimum budget) for each different type of project. These schemes have been submitted to the Ministry of Finance for consideration and promulgation according to their competence, however, only the scheme for fees for appraisal of EIA report is accepted. The provision of the "floor cost level for preparing EIA report" not only contributes to ensuring sufficient minimum budget for the preparation of quality EIA report, but also serves as a basis for the project owner in making economic contracts for the preparation of the EIA report. This is a completely correct and necessary approach to contribute to improving the quality of the EIA report, which needs to be further considered for solutions in the coming time.

Consulting on preparing EIA report

Article 31 of the LEP 2020 stipulates that "Consultants must be qualified to implement EIA". However, in the past time and up to now, "qualified to implement EIA" has only been specified in general, without specific criteria leading to the situation of hundreds of flowers in bloom, as an environmental consultant, it is possible to participate in the bidding for the preparation of EIA report for any type of project, leading to the situation that many consulting units do not have appropriate professional capacity and experience to also provide EIA report preparation services.

Recognizing this situation, in 2015, MONRE planned to issue a Circular that specifically stipulates the requirements and criteria for an organization that provides environmental consulting services in general and prepares an EIA report in particular and only consulting units with Certificates issued by MONRE can provide EIA report preparation services. However, due to some legal problems, this Circular has not been issued yet. The granting of an EIA report preparation certificate is similar to that of a practicing certificate or a driver's license, which is a good orientation to contribute to improving the quality of the EIA report preparation consultant, which needs to be further considered for an appropriate solution in the near future.

EIA techniques

Currently, many EIA methods including qualitative, semi-quantitative and quantitative methods are used, including the rapid assessment method based on pollution factors issued by the World Health Organization (WHO) or the US Environmental Protection Agency for a long time in the 70s and 90s of the 20th Century or of a few research works published in Việt Nam, but without official approval of the competent state agencies.

It is even more remarkable that the rapid assessment method right from its name shows that the goal is to determine the potential impacts of the project on the environment in a preliminary way, so the accuracy is not high and it is only suitable for the pre-feasibility study phase of the project. However, in current practice, most of the EIA reports made in Việt Nam use the rapid assessment method as the main method. Therefore, there is a fact that the quantitative calculation results of the pollutant load and concentration are low and not consistent with reality.

It is therefore recommended to MONRE to consider having a solution in the direction of promulgating pollution factors suitable for Việt Nam's conditions and step by step limiting, moving towards not allowing the use of rapid assessment method in the EIA at the feasibility study stage of the project.

Obviously, EIA is a legal instrument that plays an important role in environmental management and protection. This instrument is not only effective in terms of environmental protection but also economically effective for investors in particular and the community in general. However, the Law enforcement on EIA in Việt Nam currently still has some shortcomings, which need to be improved in the coming time so that EIA can play its right role in social life ■

Proposed criteria, process for developing and applying the best available techniques suitable for conditions in Việt Nam

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Vietnam Association for Conservation of Nature and Environment

1. INTRODUCTION

In the face of environmental quality problems in our country, there are complicated happenings due to the development of industries, including environmental pollution and resource degradation, which are taking place sharply with increasing complexity, causing great damage to the environment and economy, causing many different serious consequences, requiring technological innovations and improvements in production to both ensure product quality and reduce damage to the environment. Best Available Techniques (BAT) is an integrated management approach of applying available, safe and practicable techniques to reduce or prevent the emissions of one or more pollutants, or efficiently use resources (energy, raw materials or water) or reduce incident risks (such as chemicals), thereby increasing economic efficiency for businesses applying BAT.

In the past time in Việt Nam, there have been a number of domestic manufacturing sectors that have known and used BAT since the 90s of the last Century. The textile and footwear sectors are the two earliest and deepest integration sectors, also the first two sectors to approach BAT. BAT supports businesses to access the market and meet the strict requirements of customers. Currently, many businesses are adopting sectoral best techniques for resource efficiency and emission reduction but do not call BAT. However, the BAT in use in Việt Nam mostly comes from abroad, Việt Nam does not have its own list of BATs.

In Việt Nam for the first time, the concept of BAT was included in the Law on Environmental Protection (LEP) 2020: "The BAT are effective, advanced management techniques and methods that are suitable to reality in order to prevent and control pollution in each stage of the production process, minimizing the impact on the environment" (Clause 36, Article 3). This Article proposes criteria, process to develop and roadmap to apply BAT suitable for conditions in Việt Nam under the provisions of the LEP 2020.

2. BAT DETERMINATION CRITERIA

Based on the definition of BAT under Clause 36, Article 3 of the LEP 2020, the criteria for determining BAT include:

a) Group of technical criteria, including the following parameters:

- Norms of consumption of raw materials for each type of raw materials for production (in kg/ton of product).
- Norms of consumption of chemicals for each type of chemicals for production (in kg/ton of product).
- Norms of consumption of heat or energy from burning coal, oil, firewood, liquefied petroleum gas (LPG), natural gas (NG), biomass (in GJ/ton of product).
- Norms of consumption of electricity (in MWh/ton of product).
- Norms of consumption of water (in m^3/ton of product).

The criteria in the technical group are denoted by $Y_{kt\text{-}i}$, where i is the number of technical criteria from 1 to 5.

b) Group of criteria for prevention and control of pollution, reduction of adverse impacts on the environment (referred to as group of environmental criteria), including parameters:

- Emission factor for each pollutant present in exhaust gas (in kg/ton of product) (referred to as gas emission factor).
- Emission factor for each pollutant present in wastewater (in kg/ton of product) (referred to as wastewater emission factor).
- Emission factor for conventional solid waste (in kg/ton of product) (referred to as conventional solid waste emission factor).
- Emission factor for hazardous waste (in kg/ton of product) (referred to as hazardous waste emission factor).

Parameters belonging to environmental criteria are denoted by $Y_{mt\text{-}j}$, where j is the number of environmental parameters from 1 to 4. These parameters can be simply called Y_{ti}, where i is from 1 to 9.

Because each group of parameters is used to evaluate the available techniques of a particular technological line. If in a production establishment there are many technological lines, each of which produces many different products, it is necessary to define each group of parameters for each technological line and for each type of product.

The group of parameters for evaluation of available techniques can be summarized in Table 1.

The parameters for evaluation of BAT will change over time for the better depending on the level of production technology, waste treatment technology and production management, environmental management. Therefore, the BAT will only be suitable for a certain period of time and only suitable for a certain country or territory. Thus, it is not possible to take the BAT parameters of the years 2015 - 2020 to apply for the period 2021 - 2025; It is also not possible to take BAT (set in 2020) of developed countries such as the US, European countries, Japan, Korea... to apply at developing countries like Việt Nam. Each country, within a certain period of time, needs to establish a set of BAT parameters in accordance with its own country's actual conditions.

3. BAT DEVELOPMENT PROCESS

The process of developing BAT for a specific sector includes the following steps:

- *Step 1:* Determine the number of production establishments in a sector with similar technology, make a list of establishments that need to be surveyed (Example: Producing bleached paper from scrap paper) (The number of factories denoted from 1 to n).

- *Step 2:* Make a survey form including general information; information on production technology; product capacity; technical parameters: consumption of raw materials, chemicals, heat, electricity, water; environmental parameters: characteristics of gas emission, wastewater (flow rate, concentration), solid waste, hazardous waste; waste treatment technology; measures to prevent, reduce and treat environmental pollution.

- *Step 3:* Carry out field survey, measurement, sampling and analysis according to the survey form made in Step 2 at the production establishments mentioned in Step 1.

- *Step 4:* Calculate technical and environmental parameters (Y_{ti}) for each factory (denoted $Y_{n\text{-}ti}$).

- *Step 5:* Make a comparison table to determine the parameters corresponding to the BAT of the production sector (denoted Y_{ci}) (see Table 2).

4. BAT APPLICATION ROADMAP

According to Clause 3, Article 105 of the LEP 2020 on the BAT application, the Ministry of Natural Resources and Environment (MONRE) shall assume the prime responsibility for and coordinate with the Ministry of Science and Technology (MOST) and relevant Ministries, ministerial-level agencies in formulating and issuing technical guidance on the BAT application in Việt Nam. Periodically, the MONRE shall assume the prime responsibility for and coordinate with the MOST and relevant Ministries, ministerial-level agencies in reviewing, updating and supplementing the list of BATs to ensure conformity with reality and level of science and technology development; technical guidance on the BAT application to each type of production, business and services with risks of causing environmental pollution, to consider recognizing that BAT has been applied in the group of industrialized countries to apply to new investment projects in Việt Nam. Only BAT of developed countries such as the US, European countries, Japan, Korea can be applied to new investment projects (especially foreign investment projects) in Việt Nam.

Table 1. Criteria for evaluation of available techniques

No.	Criteria	Units in ton of product	Denoted by group	Denoted in general
I	***Group of technical parameters***		$Y_{kt\text{-}i}$	Y_{ti}
1	Norms of consumption of raw materials	kg/ton	$Y_{kt\text{-}1}$	Y_{t1}
2	Norms of consumption of chemicals	kg/ton	$Y_{kt\text{-}2}$	Y_{t2}
3	Norms of consumption of heat	GJ/ton	$Y_{kt\text{-}3}$	Y_{t3}
4	Norms of consumption of electricity	MWh/ton	$Y_{kt\text{-}4}$	Y_{t4}
5	Norms of consumption of water	m^3/ton	$Y_{kt\text{-}5}$	Y_{t5}
II	***Group of environmental parameters***		$Y_{mt\text{-}j}$	
6	Gas emission factor	kg/ton	$Y_{mt\text{-}1}$	Y_{t6}
7	Wastewater emission factor	kg/ton	$Y_{mt\text{-}2}$	Y_{t7}
8	Conventional solid waste emission factor	kg/ton	$Y_{mt\text{-}3}$	Y_{t8}
9	Hazardous waste emission factor	kg/ton	$Y_{mt\text{-}4}$	Y_{t9}

Table 2. Determination of the BAT based on field survey data

No.	Criteria	$Y_{1\text{-}ti}$	$Y_{2\text{-}ti}$	$Y_{3\text{-}ti}$	....	$Y_{n\text{-}ti}$	Y_{ci}	Y_{ci}	BAT
I	*Group of technical parameters*								
1	Norms of consumption of raw materials	$Y_{1\text{-}t1}$	$Y_{2\text{-}t1}$	$Y_{3\text{-}t1}$	…	$Y_{n\text{-}t1}$	Min $\{Y_{1\text{-}t1\ldots} Y_{n\text{-}t1}\}$	Y_{c1}	Y_{c1}
2	Norms of consumption of chemicals	$Y_{1\text{-}t2}$	$Y_{2\text{-}t2}$	$Y_{3\text{-}t2}$	…	$Y_{n\text{-}t2}$	Min $\{Y_{1\text{-}t2\ldots} Y_{n\text{-}t2}\}$	Y_{c2}	Y_{c2}
3	Norms of consumption of heat	$Y_{1\text{-}t3}$	$Y_{2\text{-}t3}$	$Y_{3\text{-}t3}$	…	$Y_{n\text{-}t3}$	Min $\{Y_{1\text{-}t3\ldots} Y_{n\text{-}t3}\}$	Y_{c3}	Y_{c3}
4	Norms of consumption of electricity	$Y_{1\text{-}t4}$	$Y_{2\text{-}t4}$	$Y_{3\text{-}t4}$	…	$Y_{n\text{-}t4}$	Min $\{Y_{1\text{-}t4\ldots} Y_{n\text{-}t4}\}$	Y_{c4}	Y_{c4}
5	Norms of consumption of water	$Y_{1\text{-}t5}$	$Y_{2\text{-}t5}$	$Y_{3\text{-}t5}$	…	$Y_{n\text{-}t5}$	Min $\{Y_{1\text{-}t5\ldots} Y_{n\text{-}t5}\}$	Y_{c5}	Y_{c5}
II	*Group of environmental parameters*								
6	Gas emission factor	$Y_{1\text{-}t6}$	$Y_{2\text{-}t6}$	$Y_{3\text{-}t6}$	…	$Y_{n\text{-}t6}$	Min $\{Y_{1\text{-}t6\ldots} Y_{n\text{-}t6}\}$	Y_{c6}	Y_{c6}
7	Wastewater emission factor	$Y_{1\text{-}t7}$	$Y_{2\text{-}t7}$	$Y_{3\text{-}t7}$	…	$Y_{n\text{-}t7}$	Min $\{Y_{1\text{-}t7\ldots} Y_{n\text{-}t7}\}$	Y_{c7}	Y_{c7}
8	Conventional solid waste emission factor	$Y_{1\text{-}t8}$	$Y_{2\text{-}t8}$	$Y_{3\text{-}t8}$	…	$Y_{n\text{-}t8}$	Min $\{Y_{1\text{-}t8\ldots} Y_{n\text{-}t8}\}$	Y_{c8}	Y_{c8}
9	Hazardous waste emission factor	$Y_{1\text{-}t9}$	$Y_{2\text{-}t9}$	$Y_{3\text{-}t9}$	…	$Y_{n\text{-}t9}$	Min $\{Y_{1\text{-}t9\ldots} Y_{n\text{-}t9}\}$	Y_{c9}	Y_{c9}

Technical guidance on the BAT application to a sector includes general information, sectoral environmental issues, production steps and applied techniques, emission and resource consumption levels, techniques reviewed to determine BAT, conclusions about BAT, new techniques, conclusions - recommendations. Based on the technical guidance, MONRE shall assume the prime responsibility for and coordinate with the MOST in promulgating technical regulations on compulsory application.

Article 53, Decree No. 08/2022/NĐ-CP stipulated the roadmap for BAT application to investment project owners of the type of production, business and services with risks of causing environmental pollution in Appendix II to this Decree as follows: For investment projects at Level I before 1st January, 2027, Level II before 1st January, 2028, Level III before 1st January 2029 (Clause 1). For operating establishments, the application schedule is delayed 1 year compared to the investment projects: Establishments at Level I before 1st January 2028, Level II before 1st January, 2029, Level III before 1st January 2030 (Clause 2).

To meet the above roadmap for BAT application, MONRE needs to coordinate with the MOST and relevant Ministries, ministerial-level agencies to issue technical guidance, followed by technical regulations on compulsory BAT application to 17 types of production, business and services causing environmental pollution mentioned in Appendix II, Decree No. 08/2022/NĐ-CP.

Clause 3, Article 53, Decree No. 08/2022/NĐ-CP also encourages project owners and establishments of the type of production, business or services with risks of causing environmental pollution to apply BAT to at least one production activity or stage earlier than the schedule specified in Clauses 1 and 2, Article 53 to enjoy incentives and support as prescribed in this Decree.

5. CONCLUSIONS - RECOMMENDATIONS

Currently, in Việt Nam, there are several businesses using BAT, but most of the references come from abroad. Việt Nam does not have its own list of BATs. To be able to apply BAT according to the provisions of the LEP 2020, it is necessary to develop a system of criteria, process for determining and conditions for applying BAT. The MONRE shall assume the prime responsibility for, and coordinate with relevant Ministries and sectors in, soon developing technical guidance on the BAT application, thereby promulgating technical regulations on compulsory BAT application for 17 types of production, business and services causing environmental pollution ■

REFERENCES

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Assoc. Prof. Dr. Hồ Thị Thanh Vân: I hope that research on green energy will be widely applied to contribute to solving global problems

On 22nd June 2022, at the headquarter of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Paris, France, the UNESCO Jury and the L'Oréal Foundation presented the International Rising Talent Award in 2022 to Assoc. Prof. Dr. Hồ Thị Thanh Vân - Hồ Chí Minh City University of Natural Resources and Environment. She was honoured that demonstrated the key role and contribution of female scientists in our country in the field of natural science and applied science.

To learn more about her contributions in the field of environment, the Environmen Magazine had an interview with Assoc. Prof. Dr. Hồ Thị Thanh Vân.

▲ *Assoc. Prof. Dr. Hồ Thị Thanh Vân*

• ***Congratulations to Assoc. Prof. Dr. Hồ Thị Thanh Vân, you have been selected as one of the fifteen talented young female scientists in the world in 2022. What does this Award mean for scientific research and teaching activities you are pursuing?***

Assoc. Prof. Dr. Hồ Thị Thanh Vân: To achieve this success, I have received a lot of support and companionship from my colleagues in the research group, my family, agencies and even UNESCO, the L'Oreal Foundation, the people who created opportunities, encouraged female scientists like me to devote themselves to science. I think, this award is a great honour, a pride not only for me personally but also for the team of young female intellectuals doing scientific research in Việt Nam. I am very happy when the name of Việt Nam was called up on the awards night and I hope that the country's scientists will continue to make more contributions to training and scientific research.

▲ *Assoc. Prof. Dr. Hồ Thị Thanh Vân received the International Rising Talent Award in 2022 in Paris, France*

• ***Can you share about the research that you have done that has been voted and awarded by the Jury, as well as the application of the research in current practice?***

Assoc. Prof. Dr. Hồ Thị Thanh Vân: My work "Research the development of fuel cells and green hydrogen energy - establish a green, renewable and sustainable energy cycle" was appreciated by the Jury of the International Rising Talent Award. The work aims to approach and solve urgent problems and global challenges of energy security, environmental protection towards sustainable development by establishing a clean energy cycle, which focuses on the research and production of green hydrogen energy, fuel cells, creating a green, clean, sustainable energy cycle that is renewable and environmentally friendly to replace other types of fossil fuel.

Currently, fuel cells, green hydrogen energy have been widely applied in the world, evaluated and predicted to be one of the main energy sources in the future. However, these are renewable energy sources, so their prices are still quite high. My research and other scientists' research around the world are aim-

ing to reduce the cost of these forms of energy so that they can be used and applied widely in life, ensuring energy security, contributing to reduce global warming due to the use of fossil fuels.

At the COP26 held in Glasgow (Scotland, UK) in November 2021, Việt Nam and nearly 150 countries committed to bringing net emissions to "zero" by mid-century; together with more than 100 countries pledged to cut methane emissions by 2030; joined 140 countries in the Glasgow Leaders' Declaration on Forests and Land Use; together with 48 countries participated in the Global Coal to Clean Power Transition Statement; together with 150 countries participated in the Adaptation Action Coalition… This work has an important meaning in joining hands to contribute to the commitment to reduce greenhouse gas emissions of Việt Nam in particular and countries around the world in general at the COP26.

▲ *Assoc. Prof. Dr. Hồ Thị Thanh Vân (far left) guides the fuel cell research process to students at the laboratory of the Hồ Chí Minh City University of Natural Resources and Environment*

• ***In the process of researching this topic, what difficulties and challenges did you face and how did you overcome it?***

Assoc. Prof. Dr. Hồ Thị Thanh Vân: If the research environment in developed countries is likened to a fertile soil where the seeds are put in to germinate, then in Việt Nam, the seeds that want to germinate must be resilient and make efforts to find moisture, nutrition, light to grow, blossom, bear fruit. When I returned from studying and working abroad, especially with the approach to research on renewable energy - a new research direction in Việt Nam 10 years ago, I faced many difficulties, sometimes it seems impossible to continue. However, in those times, I always told myself and believed that any problem has its solution, the important thing is to continue to persevere and think to find a way to solve the existing science problems. Trying to find and think about these and other ways to approach problem solving is a good condition and opportunity for me to promote more creative ideas in scientific research and technology development. Returning to the country in 2013, I engaged in my passion with a meager salary of about 6.5 million VNĐ, while to buy two grams of white salt (in the form of platinum salt) as nanomaterials as research materials for the application of fuel cell costing nearly 5 million VNĐ. Then many more things such as measurement and analysis need modern machines that cannot be found in Việt Nam, I have to bring them to foreign labs or send samples to measure in countries with modern technology like Korea, Canada… at a rather high cost.

In recent years, Việt Nam's research environment has prospered, facilities and equipment for research are more and more modern. The concept of "clean energy" that I pursue has also become popular, attracting a lot of people's attention. Many foreign investors have expressed their desire to cooperate and expand my research work on a large scale. What I have cultivated and worked hard for over the past 10 years has begun to sprout…

• ***What suggestions and recommendations do you have for this research to be widely applied in Việt Nam?***

Assoc. Prof. Dr. Hồ Thị Thanh Vân: The trend of shifting from fossil energy to renewable energy sources is a fierce race among countries towards sustainable development in the future. On this "racetrack", in order not to fall behind, Việt Nam needs to accelerate faster.

I hope that research directions on high technology with wide application to contribute to solving global challenges in general and research directions on green energy in particular will receive more attention and investment, especially pilot production projects with a simplified mechanism of administrative procedures and focus on contracting all output products. This will create conditions for scientists to best promote their capacity and creative thinking in research projects. In addition, I think that international cooperation should also be promoted. On the other hand, universities and research institutes are places

The "International Rising Talent Award" is a prestigious award within the framework of the Program "For the development of women in science" by the L'Oréal Foundation and the UNESCO. The Award was first launched in 2000 to support and encourage female scientists to pursue scientific careers. Over the past 20 years, the Program has honoured 122 outstanding female scientists and supported more than 3,800 talented young female scientists from 110 countries. In 2022, the Award honoured fifteen promising female scientists selected from among 250 young talent profiles from national and regional programs. Up to now, Việt Nam has had 3 female scientists awarded this prize by UNESCO, including: Dr. Trần Hà Liên Phương, International University - Vietnam National University, Hồ Chí Minh City (in 2015); Dr. Nguyễn Thị Hiệp, International University - Vietnam National University, Hồ Chí Minh City (in 2017) and Assoc. Prof. Dr. Hồ Thị Thanh Vân, Hồ Chí Minh City University of Natural Resources and Environment (in 2022).

where research and technology development activities are concentrated, most research and invention results are kept. Although many institutes and universities have achieved many successes in technology transfer and commercialization of inventions this number is not commensurate with the potential. Therefore, in the future it is necessary to shorten the gap between universities and enterprises to promote the transfer and commercialization of research results, and to promote the application of these results to improve productivity, increase product value; promote the economic development of the country.

• ***Scincerely, thank you!***

MAI HƯƠNG

THE PROJECT TO COLLECT AND RECYCLE USED BEVERAGE CARTONS

A program to collect and recycle used beverage cartons (UBC) will be piloted in Hồ Chí Minh (HCM) City from August 2022 to March 2023. The Program aims to collect and completely recycle 3,000 tons of beverage cartons, turning them into useful products such as paperboard materials and bio-roof panels.

Evolving from the model of collecting cartons through informal waste collectors, initiated in 2010 by Swedish food processing and packaging solutions company Tetra Pak, the pilot Program will be implemented under a partnership between the Packaging Recycling Organization Vietnam (PRO), Tetra Pak and Circular Action.

According to Mr. Eliseo Barcas - Managing Director of Tetra Pak Vietnam, driving the collection of UBC for recycling has always been at the core of Tetra Pak's sustainability agenda. It is a crucial part of Tetra Pak's long-standing efforts in realizing its promise to protect what's good, including protecting food, people and the planet. "This Program reflects Tetra Pak's commitment to supporting its customers in fulfilling their producer's responsibility to collect product packaging after the sale", he said.

The difference between this pilot program and previous activities is the sponsorship of PRO Vietnam and the application of digital solutions from Circular Action to manage carton collection. "We appreciate the initiative, the model and the effectiveness of the collection and recycling of UBC by Tetra Pak - one of our core members. We want to collaborate to execute this pilot project with the common goal of establishing a new model in UBC collection for recycling. This initiative faces challenges in practice, supporting the informal sector in this value chain and building the circular economy in Việt Nam", said Chairman of PRO Vietnam Phạm Phú Ngọc Trai.

The pilot Program is remarkable because it helps build awareness and encourages collectors actively participating in the community to collect cartons at the source. Selling used cartons to recyclers will also improve the commercial value of this kind of waste. Meanwhile, collectors will also receive a financial incentive based on the volume of cartons they collect. Through this model, the Program hopes to build an ecosystem of collecting and recycling cartons from the beginning of the collection chain to include those who gather the waste.

This will help improve the collection and recycling rate and reduce the number of cartons discharged into the environment, moving towards a circular economy. In addition, it also improves the livelihoods of collectors participating in the Program. Three aggregators, including Lagom Vietnam, Tiến Thành Paper and VECA, have confirmed their participation in the program. These aggregators will purchase UBC from the informal sector and sell them to Đồng Tiến Paper Factory in Bình Dương Province. Here, UBC will be recycled into valuable products such as industrial wrapping paper, eco-roofing and eco-flat sheets. The project aims to approach and engage more aggregators, thereby increasing the Program coverage and collection volume. Consultant and project manager Thierry Sanders, President of Circular Action said: "This pilot project brings a triple dividend to Việt Nam. Firstly, it reduces waste disposed of in the environment or landfills. Secondly, it increases the income of the informal collectors and, thirdly, it is efficient since we pay on delivery. Later in the Program, we will reintroduce our mobile technology to pay the poorest collectors involved in the supply chain directly" ■

HOÀNG ĐÀN

Landfills releasing more planet - warming methane than previously thought

With about 570 million tons of the greenhouse gas emitted every year from both industrial and natural processes, the concentration of methane in the atmosphere has been increasing at a record pace, according to the US National Oceanic and Atmospheric Administration.

In some countries, the biggest source is agricultural fields and farm animals- particularly cows but also livestock and chickens. Yet there is another major global source - garbage. With data from a satellite-mounted detector showing high methane levels over cities in India, Pakistan and Argentina. High-resolution satellite images snapped in 2020 revealed the methane was coming from upwind landfills in the Argentine capital of Buenos Aires, the Indian cities of New Delhi and Mumbai and Pakistan's second-largest city of Lahore, according to the study published in the Journal Science Advances.

A landfill in Mumbai, for example, was putting out about 9.8 tons of methane per hour, or 85,000 tons per year, according to the study's findings. The Buenos Aires landfill emitted some 250,000 annual tons - or half of the City's total methane emissions.

These observations can tell us where the large methane emissions are and where mitigation action can be taken. Mitigation steps might include food composting or capturing the methane for biogas. Landfills are places where a large amount of waste and other refuse is buried in the ground. When natural waste like food, wood or paper decomposes, it releases methane into the air. Landfills are the third-largest source of methane emissions worldwide, after oil and gas systems and agriculture.

According to the World Bank, landfill waste-responsible for about 11% of global methane emissions - is expected to increase about 70% by 2050 as the global population continues to climb. Because methane is 80 times more powerful than CO_2 over a 20-year period, reducing methane emissions now can have a quick impact on climate change.

"This new work shows just how important it is to manage landfills better, especially in countries like India where landfills are often on fire, emitting a wide range of damaging pollutants", said Mr. Euan Nesbit, an Earth scientist at Royal Holloway, University of London, who wasn't part of the study. Nesbit added that the newer satellite technology, combined with on-the-ground measurements, makes it easier for researchers to identify "who is polluting the world".

Earlier this year, smoke hung over New Delhi for days after a massive landfill caught fire as the country was sweltering in an extreme heat wave with temperatures surpassing 50 degrees Celsius (122 Fahrenheit). At least two other landfill fires have been reported in India this year.

China, India and Russia are the world's biggest methane polluters, a recent analysis by the International Energy Agency found. At last year's United Nations climate conference, 104 countries signed a pledge to reduce methane emissions by 30% by 2030 compared with 2020 levels. Both India and China are not signatories ■

NGUYÊN HẰNG

▲ *A person picks through trash for reusable items as a fire rage at the Bhalswa landfill in New Delhi, Indias*

Correlation between antibiotics in water of the Saigon River Basin

NGUYỄN PHÚ BẢO[1, 2*], PHẠM HỒNG NHẬT[2], ĐINH QUỐC TÚC[1], NGUYỄN THỊ MINH HIỀN[3]
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In this study, 12 antibiotics were detected in the water of the Saigon River Basin with increasing concentrations from not detected in the upstream to 869.3 ng/L (Sulfamethoxazole) in the downstream source (downstream, aquaculture area). The correlations between 12 antibiotics ranged from low intimate level (average correlation coefficient about 0.27 for Vancomycin), to moderate (approximately 0.54 for Ofloxacin) and fairly tight (about 0.73 for Norfloxacin). When taking into account the various correlations, the correlation coefficient between antibiotics grew dramatically; the 2-variable correlation (r: - 0.12 between Ciprofloxacin and Vancomycin) had the lowest correlation, followed by the 3-variable correlation. However, the connection of 11 additional medications and more than 3 factors (r: 0.46 - 0.78) was the strongest (r: 0.94 - 0.99). Therefore, when assessing correclation of antibiotics in water, it is essential to evaluate in relation to co-occurring antibiotics that can be extended to more than three variables.

1. Introduction

Water is a unique solvent that makes up a significant amount of the Earth's surface (about ¾ of it) and has impurities in fresh water that range from 0.01 to 0.1% by mass [1]. The antibiotic (a compound that is soluble in many other solutes) is regarded as a solute in the water solvent of a river basin.

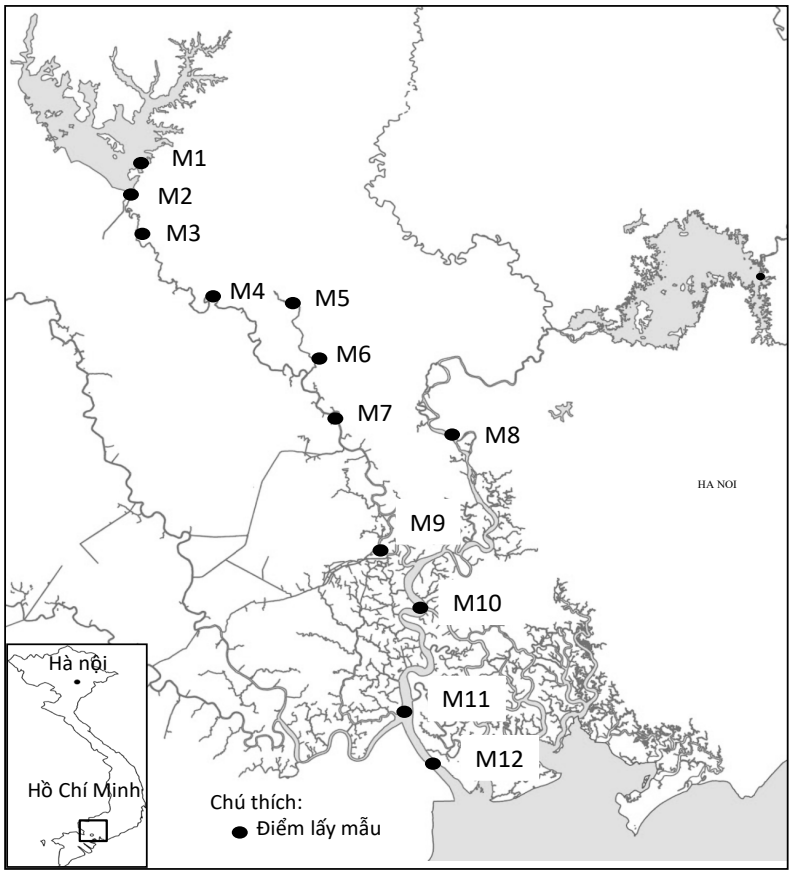
Antibiotic usage is widespread at the moment and the Minnesota Department of Health Organization listed antibiotics as one of the 20 global pollutants of concern [2]. Antibiotics have been examined and categorized based on their characteristics, properties, and evaluation (chemical/class group, number of compounds tested), as well as their hazards and potential effects on human health and the environment [3]. Several studies have revealed that due to the characteristics of the antibiotic, their presence will bring certain effects on environmental components [4, 5].

The Saigon River plays a crucial role in supplying water for domestic use, production, Receiving and cleaning wastewater for the provinces of Tây Ninh, Bình Dương, Bình Phước, especially Hồ Chí Minh City (HCMC). Its water source has a massive industrial potential, particularly for a number of significant economic sectors and industries, such as water supply for HCMC's agricultural production (roughly 12,000 ha), water supply for daily life, industry, and services (roughly 930,000 m^3/day) [6] and exploitation of the water's surface for transportation, aquaculture, and fishing [7].

Due to the influence of wastewater from manufacturing and habitation activities along the River, the likelihood of water contamination in the Saigon River is relatively significant. A considerable amount of antibiotics has been utilized for human and veterinary usage due to the region's socioeconomic growth, which includes cattle raising, raft farming in the upstream area, and living in the downstream area. Only a portion of these antibiotics are absorbed and metabolized in the body of humans and animals, the rest (largely) is indeed eliminated and released into the environment. According to certain research, antibiotic residues are primarily found in domestic wastewater, waste from hospitals and livestock farms. The amount of medicine excreted might reach 70%.

The results of the survey on the use of antibiotics in 55 pig farms in the provinces of Đồng Nai and Bình Dương [8] revealed that up to 13 types of antibiotics were most commonly used, with Tyrosine (16.39%), Amoxicillin (11.89%), Gentamicin (8.61%), Enrofloxacin (6.56%), Penicillin (6.15%), Lincomycin (5.74%), Tiamulin (5.74%), Colistin (5.33%), Streptomycin (4.51%), Norfloxacin (4.51%), Tetracycline (4.1%), Ampicillin (4.1%) and Flo phenicol (3.28%). The classification of antibiotic residues as novel contaminants (Emerging Contaminants) refers to pollutants that are present in environmental components but have not yet undergone enough research and monitoring. Even at very low amounts, antibiotic residues in watersheds can have detrimental effects on individuals and ecosystems.

Studies have indicated that the Saigon - Đồng Nai Basin's wastewater contains endocrine disruptors and antibiotic residues. The frequency of detection of Fluoroquinolone antibiotic residues was 41% in water samples and 58% in sludge/sediment samples [7]. When in single form or in combination with other antibiotics (mixed), antibiotics have diverse effects on the environment and human health [9, 10]. As a result, in this study, the presence of antibiotics and the relationships among them will be examined in the water of Saigon River.



Symbol	Coordinates
M1	11°20'16.8"N 106°21'05.0"E
M2	11°18'29.3"N 106°20'23.9"E
M3	11°16'45.4"N 106°21'17.8"E
M4	11°09'22.3"N 106°27'05.6"E
M5	11°09'04.1"N 106°35'16.4"E
M6	11°02'55.2"N 106°36'41.2"E
M7	10°58'51.7"N 106°38'33.4"E
M8	10°56'50.1"N 106°48'21.5"E
M9	10°46'33.2"N 106°42'26.2"E
M10	10°40'46.9"N 106°46'09.5"E
M11	10°31'48.6"N 106°45'18.9"E
M12	10°26'32.7"N 106°46'52.8"E

▲ *Figure 1. Map showing of sampling sites (M1- M12) in the Saigon River*

2. Materials and methods

2.1. Field sites and sampling

Antibiotics in water samples were collected from 12 sampling sites (M1 - M12) as shown in Figure 1 based on Vietnamese Standards [11]. Surface water samples were collected by a barometer (Wilco Company, US) from 0 to 50 cm depth, 2 L, then immediately loaded into a brown glass bottle and labeled. The water samples were stored in a 4^0C refrigerator and pre-treated within 48 h.

2.2. Preparation and detection of antibiotic samples

Sample extraction: Antibiotics in water were extracted using Solid Phase Extraction (SPE) technique [12, 13, 14].

Detection of antibiotics: Concentration of antibiotics were analyzed by high-performance liquid chromatography with mass spectrometer double quadrupole detection (HPLC/MS/MS, 6410 B, Agilent) which were referenced in the literature [5, 12, 13, 14].

2.3. Methods for cconstructing correlations between two random variables

Pearson correlation coefficient is a statistical index which measures the degree of association between two variables [15].

$$\rho_{xy} = \frac{Cov(x,y)}{\sigma_x \sigma_y} \qquad (1)$$

In there:

ρ_{xy}: Pearson correlation coefficient

Cov(x,y): Covariance of variables x and y

σ_x: Standard deviation of the series of variables x

σ_y: Standard deviation of the series of variables y

The standard deviation represents the dispersion of the data in comparison to average level.

The covariance represents a linear relationship between two variables and is calculated by the following formula:

$$Cov(x,y) = \frac{\sum_1^n (x_i - \bar{x})(y_i - \bar{y})}{n} \qquad (2)$$

$\bar{x}$ và $\bar{y}$$\bar{x}$ và $\bar{y}$: Sample mean values of independent variable (x) and dependent variable (y).

x_i và y_i: Sample mean values i of the independent variable (x) and of the dependent variable (y).

n: Sample size.

2.4. Methods for constructing correlation betweenn three random variables

In cases where there is a correlation between antibiotics with various water quality parameters, it is essential to determine multivariate correlation. The correlation coefficient of three random variables is calculated according to the following formula [16]:

$$R_{z,xy} = \sqrt{\frac{r_{xz}^2 + r_{yz}^2 - 2 r_{xz} r_{yz} r_{xy}}{1 - r_{xy}^2}} \qquad (3)$$

In there:

z: Dependent variable, antibiotic concentration of Chlotetracycline or Ofloxacin.

x, y: Independent variable, concentration of Sulfamethazine, Vancomycin.

r: Pearson correlation coefficient between variables.

2.5. Methods for constructing multiple correlation (more than 3 variables)

Multiple correlation coefficient can be calculated by the following formula:

$$R^2 = R^2_{y,x_1,\ldots,x_k} = \frac{SS_{Reg}}{SS_T} \quad (4)$$

On Excel software, using the formula R^2 = SQRT (R Square (R_1, R_2)) [16] to calculate the correlation coefficient.

In there:

R_1: An n × k array containing sample data X, concentration of 11 antibiotics.

R_2: An n × 1 array containing sample data Y, concentrations of Chlotetracycline or Ofloxacin.

SS_{Reg}: Sum of squares due to regression.

SST: Sum of squares of errors in regression analysis.

The partial correlation coefficient between the variables xi and xj where i ≠ j controls all other variables is calculated by the formula:

p_{ij} is the inverse of the correlation matrix R of X.

$$r_{x_i x_j,z} = -\frac{p_{ij}}{\sqrt{p_{ii}p_{jj}}} \quad (5)$$

2.6. Data analysis

Statistical analyses are means, standard deviation (SD), one-way ANOVA and correlation analysis were performed using 2016 Excel software [16]. All the analysis results of antibiotics and calculation of correlation were considered to be statistically significant for pair comparisons with p-level ≤ 0.05.

3. Results and Discussion

3.1. Antibiotics in water of the Saigon River

In this study, 12 antibiotics were identified in the Saigon River Basin. Highest mean concentration of antibiotics was Sulfamethoxazole antibiotics. Its level ranged altered from not determined to 697.3 ng/L in the rainy season and to 786.2 ng/L in the dry season (both at M6). At the M1 site, lowest concentration of all antibiotics was not detected.

For 12 antibiotics were detected in water samples of the Saigon River (Table 1), five antibiotics (ciprofloxacin, norfloxacin, ofloxacin, sulfamethoxazole, trimethoprim) were frequently detected with compounds greater than 83.3%. The total concentrations of antibiotics in water samples ranged from 12,9 ng/L located in the upstream of the Saigon River (M1 in rainy season) to 3,238.8 ng/L which located in animal farms area near the river (M6 in dry season). These results suggest that the quality of water source has been severely disrupted by productivity and activities.

For fluoroquinolones, the maximum concentration was found at site M6, M11 (dry season) with the value of 598.3 ng/L (Ciprofloxacin, M11) and 604.3 ng/L (Norfloxacin, M6). The two sites of M6 and M11 are located in the rivers receiving directly integrated wastewater from animals farm (M6) and agriculture (M11) (Figure 1).

Table 1. Concentrations of antibiotics in water of the Saigon River Basin (ng/L)

Antibiotics	*Range*	*Mean*	*Median*	*Detection Rate (% of 24 samples)*	*LODs (ng/L)*
Chlortetracycline	< LODs - 86.5	22.3	12.7	75.0	1.00
Ciprofloxacin	< LODs -598.3	207.2	150.1	83.3	0.90
Enrofloxacin	< LODs -192.3	57.0	19.4	50.0-75.0	1.40
Erythromycin	< LODs -148.4	54.3	52.7	75.0	1.30
Norfloxacin	< LODs -604.3	218.9	174.3	83.3	0.60
Ofloxacin	< LODs -386.2	206.3	231.7	83.3	1.30
Sulfamethazine	< LODs -85.6	17.9	8.9	50.0-58.3	2.10
Sulfamethoxazole	< LODs -869.3	338.9	258.3	91.7	2.20
Tetracycline	< LODs -142.8	42.3	34.3	75.0	0.60
Trimethoprim	< LODs -270.4	104.4	88.2	91.7	1.20
Tylosin	< LODs -179.2	57.8	49.0	75.0	0.40
Vancomycin	< LODs -311.6	46.4	2.8	50.0	1.20

Average concentrations of antibiotics were ranged from 17.9 ± 10.4 ng/l (Sulfamethazine) to 338.9±104.4 ng/L (Sulfamethoxazole). Compared with the concentration of antibiotics in some worldwide rivers, the concentration of the antibiotics in water of the Saigon River was in the same range with some other studies [5, 14, 17].

3.2. Correlation between two variables of antibiotics in water of the Saigon River Basin

Using the data analysis tool Correlation on Excel software, the pairwise correlation coefficients for different variables are shown in Table 2.

- The correlations between antibiotics in water was moderate. The average correlation coefficient (r) is approximately 0.57, fluctuating from 0.27 (correlation of Tylosin and other antibiotics) to 0.73 (correlation of Norfloxacin and other antibiotics).
- The most intimate correlation is between Norfloxacin and Trimethoprim (correlation coefficient-r was 0.97); Sulfamethoxazole and Ciprofloxacin (correlation coefficient was 0.95).
- The correlation between several antibiotics with others is reported to be low level, the correlation coefficient is minor, average correlation coefficient is approximately 0.27 (Tylosin), 0.36 (Vancomycin) or 0.40 (Sulfamethazine).
- No study on the correlation between antibiotics has not yet been reported globally.

Comment: In conclusion, the covariance between two antibiotic substances in water could produce results that do not accurately reflect the relationship between the two variables. As a result, the multivariate correlation evaluation approach must be considered to determine the relationships between antibiotics.

3.3. Multiple correlation of antibiotics in water of the Saigon River Basin

Correlation of 3 random variables

The majority of studies has been based on multiple correlation of antibiotics so far. The calculation of multiple correlation coefficients is depending on equation (3), in which Chlortetracycline (or Ofloxacin) is the dependent variable and Sulfamethazine, Vancomycin groups are independent variables. The data in Table 2 are used to calculate the correlation coefficient. As a result, consider antibiotics with correlation coefficients was low (Table 3).

Correlation coefficients between Chlortetracycline (CTC) with Sulfamethazine (SMZ), Vancomycin (VAN) groups:

$$R_{ctc,smz.van} = \sqrt{\frac{r_{xz}^2+r_{yz}^2-2r_{xz}r_{yz}r_{xy}}{1-r_{xy}^2}} = \sqrt{\frac{0,593+0,015-2(0,770)(-0,124)(-0,189)}{1-0,036}} = 0,771$$

Correlation coefficients between Ofloxacin (OFL) with Sulfamethazine (SMZ), Vancomycin (VAN) groups:

$$R_{ofl,smz.van} = \sqrt{\frac{r_{xz}^2+r_{yz}^2-2r_{xz}r_{yz}r_{xy}}{1-r_{xy}^2}} = \sqrt{\frac{0,0142+0,032-2(0,377)(0,179)(-0,189)}{1-0,036}} = 0,455$$

Table 2. Statistics of correlation coefficient of antibiotics in water of the Saigon River Basin

Antibiotics	Mean	Median	Standard Deviation	Sample Variance	Range	Confidence Level (95.0%)
Chlortetracycline	0.52	0.62	0.28	0.08	0.90	0.189
Ciprofloxacin	0.70	0.78	0.25	0.06	0.80	0.170
Enrofloxacin	0.67	0.75	0.21	0.04	0.57	0.141
Erythromycin	0.60	0.62	0.18	0.03	0.66	0.118
Norfloxacin	0.73	0.72	0.22	0.05	0.65	0.145
Ofloxacin	0.54	0.59	0.14	0.02	0.49	0.096
Sulfamethazine	0.40	0.48	0.39	0.15	1.28	0.262
Sulfamethoxazole	0.70	0.71	0.24	0.06	0.79	0.163
Tetracycline	0.70	0.80	0.22	0.05	0.62	0.147
Trimethoprim	0.72	0.75	0.21	0.04	0.59	0.142
Tylosin	0.27	0.32	0.24	0.06	0.86	0.162
Vancomycin	0.36	0.38	0.29	0.09	0.85	0.196

Table 3. Correlation coefficients between Chlortetracycline, Ofloxacin and Sulfamethazine, Vancomycin (VAN)

Signed	Antibiotics	Chlortetracycline	Ofloxacin	Sulfamethazine	Vancomycin
z	Chlortetracycline (CTC)	1.000			
z	Ofloxacin (OFL)	0.632	1.000		
x	Sulfamethazine (SMZ)	0.770	0.377	1.000	
y	Vancomycin (VAN)	-0.124	0.179	-0.189	1.000

**Notes: Here x and y are viewed as the independent variables and z is the dependent variable.*

The correlation coefficient between Chlortetracycline, Ofloxacin and the Sulfamethazine (SMZ), Vancomycin (VAN) groups was calculated, and the findings are shown in Table 2. The correlation coefficient between Cchlortetracycline, Ofloxacin with Sulfamethazine (SMZ), Vancomycin (VAN) groups is significantly increased.

Therefore, it means that Chlortetracycline and Ofloxacin are dependent on a number of antibiotics and thus the use of multiple correlation calculation method for building correlation between an antibiotic with antibiotics is appropriate.

Multiple correlation for more than 3 variables

Consider the partial correlation matrix between antibiotics as shown in Table 2.

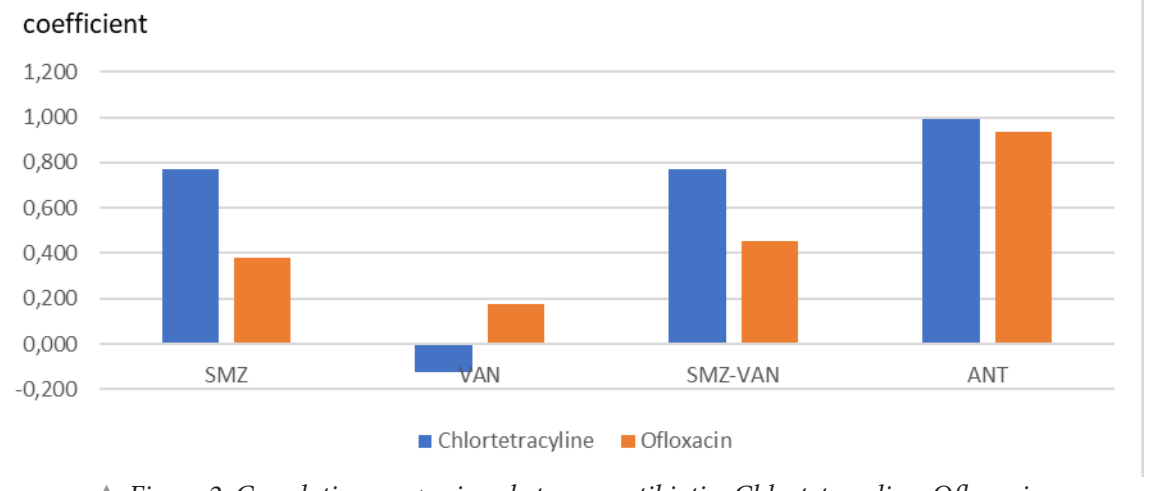
The partial correlation coefficient of antibiotic concentration can be calculated by equation (5) and Excel software (using minimum squares regression [16].

The correlation coefficient between chlotetracycline, ofloxacin, and the antibiotics VAN rises up to 2.5 - 6.2 times when compared to the correlation coefficient between Chlotetracycline, Ofloxacin and the antibiotic SMZ, which increased by just about 20.6%.

Table 4. Summary of results by calculating multiple correlation coefficient, between Chlortetracycline, Ofloxacin and 11 antibiotics in the Saigon River Basin

Regression statistics	Chlortetracycline with 11 antibiotics (ANT)	Ofloxacin with 11 antibiotics (ANT)
Multiple R	0,99	0,94
R Square	0,98	0,87
Adjusted R Square	0,96	0,76
Standard Error	5,01	57,53
Observations	24	24

The correlation coefficient between Chlotetracycline, Ofloxacin and 11 antibiotics is much higher in cases where there is a correlation of more than three variables, specifically when upgrading the 11 antibiotics correlation coefficient by 5.2 - 8.0 times for SMZ or VAN, 1,3 - 2,1 for SMZ - VAN category.



▲ *Figure 2. Correlative comparison between antibiotics Chlortetracyline, Ofloxacin and antibiotics in 3 correclation cases*

Overall, the correlation coefficient of antibiotics in water of Saigon River will be improved when considering the correlations of antibiotics.

Conclusion

In this study, 12 antibiotics were detected in the Saigon River Basin with concentration of antibiotics fluctuating from LOD to 869.3 ng/L (Norfloxacin).

Correlations coefficient from each pair antibiotics in the Saigon River Basin were mmoderate (0.57).

There is a gradual increase in the correlation between antibiotics and other antibiotics according to the correlation relationship: correlation of more than 3 variables > correlation of 3 random variables > correlation of 2 variables.

The occurrence and correlation of antibioticsration of antibiotics in water Saigon River require concern and long-term monitoring of antibiotic residues. Because of the presence of these antibiotic are confirmed for the occorrence of other antibiotics, with a strong correlation coefficient ■

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7 groundbreaking initiatives to reduce plastic waste

Since the 1950s, researchers estimate that more than 8.3 billion metric tons of plastic has been produced. And 60% of that waste has ended up in landfills or the environment. That number has increased rapidly over the years. For example, Statista recorded that global plastic production doubled from 1976 (50 million metric tons) to 1989 (100 million metric tons). Since then, that annual number has skyrocketed: It peaked at 368 million in 2019 before decreasing to 367 million in 2020.

A million metric tons decrease of plastic production is not enough to address the mounting pressures plastic puts on the environment. We still do not know how long it takes for plastic to decompose. That means that the estimated 12 million metric tons of plastic waste that entered the ocean in 2010 is still breaking into microplastics and filling up the stomachs of birds and sea creatures. The plastic we've released into our environment is not going away. While recent studies of plastic-eating enzymes and bacteria offer some hope for the future of plastic waste management, the best way to address our environmental stressors is through reduction.

Plastic waste is on its way out, thanks to these Governmental measures from around the world. From India to Maine, governing bodies at all levels are imposing bans and implementing recycling innovations. Consumers are shopping smarter and companies are building better to ensure the protection of our environment. Slowly but surely, the world is adapting to a brighter future as more and more countries follow the lead. But there's still a lot of work to be done - or undone.

Here are 7 times cities and countries made monumental firsts in the global charge toward plastic waste reduction.

1. PLASTIC BAG BANS

In 2020, New York City made headlines across the US as the cultural capital of the world moved to ban plastic bags. But did you know that this wasn't the first plastic bag ban to be seen in a US state? In fact, the US wasn't even the first country to introduce this idea. Back in 2002, Bangladesh became the first country to implement a plastic bag ban. Since then, other countries have followed suit, introducing their own measures to combat the persistent and pervasive nature of plastic bags.

▲ *An egret walks among heaps of garbage on the shores of Puri Beach in India*

While plastic bag bans have led to other questions, such as the environmental impacts of their reusable or compostable replacements, they have also led to further advancements in overall plastic bans. In 2020, Bangladesh's High Court ordered a ban against all single-use plastics in coastal hotels and restaurants.

▲ *The tiny plastic particles called microbeads added scrubbing power to facial cleansers*

2. NO MORE MICROBEADS

The tiny plastic particles called microbeads added scrubbing power to facial cleansers, toothpastes and household cleaners - and plastic into our natural waters. Back in 2014, the Netherlands became the first country to outlaw the use of microbeads in personal care products. Since then countries like Australia and South Korea have joined the cause, with the UK boasting some of the strictest regulations.

The UK Ban of 2018 outshines other bans by outlawing the manufacturing of products containing microbeads and also prohibiting the use of "biodegradable" microbeads. But there is still a long way to go as only a handful of countries have enacted legislation addressing the plastic bead problem and countries like the US have loopholes in the rules set by their 2015 Microbeads Ban.

3. RECYCLED PLASTIC ROADS

In India, about 26,000 metric tons of plastic waste is generated each day. But instead of just tossing it, they're innovating new methods of recycling. India has been experimenting with plastic roads since the early 2000s, converting the pesky waste problem into a smooth, long-lasting highway to the future. Scientist and Chemistry Professor Rajagopalan Vasudevan first used plastic as a binder in gravel in 2002. According to Mr. Rajagopalan Vasudevan, three metric tons of carbon dioxide is saved for every kilometer of road that reuses plastic instead of incinerating it. Over 6,000 miles of roads in India have used this plastic-recycling innovation since that first trial.

Since then, other countries have begun to follow India's example. From Ghana to the UK and the US, this new, eco-friendly road technology is paving the way towards a brighter future.

4. MAKING COMPANIES PAY

In 2021, Maine became the first US state to introduce a revolutionary law to put the responsibility of packaging waste on companies. The Extended Producer Responsibility (EPR) program will shift cardboard, plastic containers and nonrecyclable packaging recycling and disposal costs to the manufacturers. Less than a month later, Oregon became the second US state to approve a packaging law.

But the concept of EPR is not new. In France, their own set of producer policies have been in place for 20 years. The New York Times reported that close to all European Union states, Japan, South Korea and five Canadian provinces have similar packaging laws. While Maine has set the precedent in the US, 10 other US States may soon follow in their footsteps.

5. THE LONG BATTLE AGAINST STYROFOAM

Unlike other forms of plastic, polystyrene, commonly known as Styrofoam, is not biodegradable and is difficult to recycle. When a cup of coffee is finished, the cup itself isn't. It will be around for decades, until it breaks down into particles and contaminates local ecosystems and bodies of water. Styrofoam doesn't just last in our environment - the debate surrounding it is long-lasting, too. In 1988, New York was the first US state to enact a Styrofoam ban, but it was overturned two years later.

But now the world may be ready to take on Styrofoam. In 2021, Costa Rica banned the importation and distribution of polystyrene and implemented fines for violators. Maine became the first US state to ban food containers made of polystyrene from businesses, though many cities and counties across the country already had such bans in place. And in 2019, New York State once again moved to ban polystyrene. With more US states and countries enforcing the elimination of Styrofoam, the world is ready to see big steps in not just waste management but reduction.

▲ *Styrofoam is not biodegradable and is difficult to recycle*

6. THE WORLD'S FIRST CIRCULAR PLASTICS ECONOMY

The EU announced its first-ever European wide strategy to curtail plastics consumption and pollution in 2018. With a ban on single-use plastics, the creation of a comprehensive reuse system and the establishment of a market for recycled plastics, the EU aims to create the world's first "circular" plastics economy. The plan hopes to combat marine litter by addressing the disposable items most found on their beaches, such as cigarette butts, wrappers, cotton bud sticks, food and beverage containers and plastic bags. The EU's efforts to change the life cycle of plastic while reducing its use is part of an overall effort to shift into a low-carbon economy. The 27 EU member countries-where plastic recycling rates are already three times that of the rate of the US are adopting the overall scheme.

7. WHOSE TRASH IT IS ANYWAY?

The importing and exporting of plastic waste are not a new concept. But some countries are finally putting their foot down and saying "no". For years, richer countries have relied on poorer countries to manage their waste, exporting trash to countries like Việt Nam or Ethiopia to be recycled or incinerated. It's estimated that 68,000 shipping containers-worth of plastic were exported from the US in 2018. This enormous amount of waste ends up in overseas landfills, contributing to a host of problems with overwhelmed facilities and waste-management systems.

In 2017, in a surprising turn of events for the world's largest plastic importer, China announced a ban on imported plastic waste. And other countries followed suit. In 2020, 180 nations adopted new international rules that limited the trade of plastic waste. But the practice of richer countries shipping their problems off to developing countries didn't disappear. The US never joined the agreement and continues to ship their plastics to other countries.

China's Ban was a step in the right direction for the economy of waste. But countries like the US continue to ignore their plastic production problem and rely on other countries to be their dumping grounds. This mismanagement leads to the disruption of other countries› environments. It also places the problem on those who should not be responsible for the consequences of plastic. It is unsustainable for the US to ship plastic recycling to other countries where they're more likely to become further pollutants. The only solution to stop the exportation of plastic is major reductions in production and use. It's time for the US to change their relationship with plastic because in this case, their system of "recycling" may not be enough ■

NAM VIỆT

India bans single-use plastic to combat pollution

Plastic pollution has become ubiquitous in India, the world's second most populous country. The country is the world's third-largest producer of plastic waste, trailing only the United States and China, according to a recent report from Australia's Minderoo Foundation.

But India, which uses about 14 million tons of plastic annually, according to reports by Reuters, "Lacks an organized system for managing plastic waste, leading to widespread littering". Streets across towns are littered with used plastic goods that eventually choke drains, rivers and oceans and also kill animals.

▲ *Towns in India are littered with used plastic goods that eventually choke drains, rivers and oceans*

Rapid economic growth has fueled demand for goods that come with single-use plastic products. Single - use plastic refers to the plastic items that are once used and discarded. Single use plastic has also among the highest shares of plastic manufactured and used - from the packaging of items to bottles, face masks, polythene bags, cling film, coffee cups, food packaging and trash bags…

As per the UNEP's report published in 2021, the single use plastics account for a third of all plastic produced globally, with 98% manufactured from fossil fuels. Single - use plastic also accounts for the majority of plastic discarded - 130 million metric tons globally in 2019.

India bans the manufacture, import, stocking, distribution, sale and use of identified single-use plastic items, which have low utility and high littering potential, all across the country, Ministry of Environment, Forest and Climate Change informed on June 28th, 2022. Post this, the Ministry defined a list of items that will be banned from next month.

The manufacture, import, stocking, distribution, sale and use of following single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from the 1st July 2022.

Items To Be Banned from July 1st: Balloon sticks; Cigarette packs; Cutlery items including plates, cups, glasses, forks, spoons, knives, trays; Earbuds; Sweet boxes; Invitation cards; Cigarette packs; PVC banners measuring under 100 microns.

Plastic bags, another major pollutant, are not on the list for now, but the Government has mandated an increase in thickness to make them easier to reuse. Some plastic packaging used for consumer food products will be excluded from the ban, but manufacturers are tasked with ensuring that it is recycled.

The single-use plastic ban will be monitored by the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs), who will report to the Centre on a regular basis. Reports suggest that the CPCB has issued directions at the national, state, and local levels to not supply raw materials to industries that engage in banned items. The CPCB has also ordered local authorities to issue fresh commercial licenses with the condition that single use plastic items will not be sold on their premises. More importantly, existing commercial licenses will be cancelled if they are found to be selling the banned items ■

PHƯƠNG LINH

MAC Logistics Corporation: Meeting the requirements to collect, transport, recycle and treat hazardous waste nationwide

▲ *mAc's HWTF illustration*

After three years of development, Mộc An Châu's (mAc's) Hazardous Waste Treatment Facility (HWTF) is fully operational. Located at Đa Phước Solid Waste Treatment Complex in Bình Chánh District (Hồ Chí Minh City), the Facility is the result of mAc's capital investment and arduous development process. On the occasion of the Facility becoming fully operational, Environment Magazine had a chance to sit down with Mr. Trương Kiên Dũng - Chief Operating Officer of mAC to discuss what's next for the Facility and mAC.

• ***Could you tell us about the development of the HWTF, as well as the development of mAc?***

Mr. Trương Kiên Dũng: mAc was founded back in 2007. Throughout the development of the Company and the Facility, we have always followed these three principles: Financial transparency, community benefits and preserving the living environment.

With these principles in mind, we have spent more than ten years planning and developing the Facility, starting in 2011, in hope to provide additional solutions to the Hồ Chí Minh City's ever-growing issue of preserving the living environment and promoting sustainable economic growth. These principles follow the mission to protect and manage the City living environment and waste treatment that the Government has stated through Decision No. 491/QĐ-TTg dated May 7th, 2018 on approving adjustments to National Strategy for General Management of Solid Waste to 2025, with vision towards 2050 and Resolution No. 3/NQ-HĐND dated June 11th, 2017 of the Hồ Chí Minh City (HCMC) People's Council on urban environmental protection, residential areas and waste management in the City.

December 20th 2019 marks a shift for both mAc and HCMC, as constructions for the HWTF began at Đa Phước Waste Treatment Complex and Cemetery. The Facility is one of the few that specializes in treating solid industrial waste and hazardous waste. After construction began, mAc has dedicated all its resources into promptly developing and providing the Facility with the necessary equipment, hoping to make the Facility operational as soon as possible.

On July 6th, 2021, the Facility acquired the license for trial operation from the Ministry of Natural Resources and Environment (MONRE), meeting the requirements to collect, transport, recycle and treat hazardous waste. Acquiring the License at the time was an opportunity for mAc to support the City in a state of emergency, as hazardous medical waste increased exponentially due to the COVID-19 pandemic.

After a year of trial operation, on July 7th, 2022, the Facility acquired the License to be fully operational for phase 1, with a capacity of treating 313 tons of waste per day, through Environment License No. 140/GP-MT-TCMT.

• ***Could you tell us about the advantages and difficulties you faced during the development of the Facility? Also, could you tell us what prominent features of the Facility will aid in meeting the requirements to preserve the living environment of the City?***

Mr. Trương Kiên Dũng: Firstly, mAc would like to thank you HCMC's officials for supporting the development of the Facility. In 2012, during the conception of the Facility, unofficial reports recorded that HCMC emitted around 1,500 - 2,000 tons of industrial waste a day, with hazardous industrial waste comprising 20% of the total, averaging around 250 - 350 tons a day. As economic and industrial growth accelerated in the following years, industrial waste also increased drastically. In 2020, it is reported that HCMC emits more than 4,000 tons of solid industrial waste and 400 tons of hazardous industrial waste, with 45 tons of hazardous medical waste comprising the total. At the time, the City had companies that were licensed to treat this waste, but due to the small scale and low capacity of their facilities, they could only meet 30% of the treatment requirements for this waste. Thus, mAc's Facility was developed in hope to aid the City's current and future waste treatment issue.

For the development of the Facility, mAc has employed industry experts as consultants, as well as utilizing our experienced and passionate engineers to ensure that the Facility meets all Government standards and requirements

Along with the advantages above, we have also faced some difficulties for the development of the Facility, mostly due to the extensive scale of the project. Acquiring the approval of policies, technology, finance; license for constructions and operate; as well as other relevant paperwork were a bit of a challenge, as they all need to be thoroughly reviewed by the City. As necessary as they were, it still cause a delay towards the development of the Facility.

In addition, during the construction of the Facility, mAc and the rest of the country were also heavily affected by the consequences that the COVID-19 pandemic caused. As a result, planning for construction and facility equipment were challenging. However, with our unrelenting efforts, mAc was able to complete and put the Facility under trial operation to aid the HCMC's effort in combating the largest wave of the pandemic that was about to happen and mAc's Facility has a few key features and benefits, which includes its location, scale and technology.

The Facility is located at HCMC's Solid Waste Treatment Complex, which is far from any residential area. The location provides a lasting and stable environment for the Facility to operate. With its scale being one of the largest in the nation, the Facility provides uniform infrastructure and modern equipment, including two industrial and hazardous waste incinerators and corresponding

▲ *The Plastic Recycling System is one of the key waste treatment systems of the Facility*

emission monitoring systems for both of their chimneys. The Facility's liquid waste treatment system is also equipped with automatic monitoring systems. All our environmental monitoring systems record data and send them back to Ministry of Natural Resources and Environment (MONRE) for further monitoring and compliance purposes. As a result, the Facility meets all requirements to treat most of common industrial waste, as well as hazardous industrial waste, providing an efficient waste treatment solution for HCMC's industrial waste issue.

Currently, mAc also looks forward to expanding the Facility's provided services, which includes treatment and recycling of the City's commercial waste, treatment and recycling of oversized vehicles, recycling of solar panels and many more.

• ***As one of the most advanced waste treatment facilities with the highest capacity in the South, how do you find the necessary inputs for the Facility? How has mAc cooperated and expanded its network to find customers?***

Mr. Trương Kiên Dũng: As one a newcomer to the industry, our Facility is still foreign to a number of the customer base. We are in the process of approaching potential customers and building our brand to find stable inputs for the Facility. Besides from traditional business approaches, we have also deployed an extensive online marketing plan to find potential customers that aligns with our approach.

At the moment, one of the waste treatments services that we are pushing towards is recycling of solar panels. The solar industry in Việt Nam has seen incredible growth in recent

▲ *The Incinerators of the Facility, two of the largest in HCMC with a capacity of 48 tons a day*

years, with many projects large and small being developed throughout the nation. Solar panel producers are always in the process of research and development to develop ever advancing technology for solar panels, improving their efficiency and production cost. Thus, in the near future, there will be a significant number of outdated panels to be replaced and discarded of. As one of the first Facility licensed for treatment of solar panels waste by MONRE according to the Law on Environmental Protection (LEP) in 2020 (solar photovoltaic panels waste with hazardous waste code 19 02 08), mAc looks forward to capitalize on this advantage for the near future.

▲ *The Facility's specialized collection and transport vehicles fully meet current regulations*

• ***Speaking about the LEP in 2020, there are specifics about extended producer responsibility (EPR) as well as a push for circular economy for sustainable growth. How will these policies help waste treatment facilities operates more efficiently in the near future?***

Mr. Trương Kiên Dũng: A long with traditional methods for environmental protection by ensuring waste treatment during production, EPR requires producers to also take responsibilities for managing the life cycle of their products after they have become waste. This includes collection, pre-treatment sorting, deconstruction, odor elimination, preparation for recycling, recollection or discard of production waste.

To managing authorities, EPR is effective in balancing the financial load and responsibilities from local authorities and taxpayers to producers. Reducing waste emission can help preserve resources and increase recycling, which can help promoting circular economy and sustainable growth.

To producers and importers, being assigned specific responsibilities like waste treatment and recycling will push enterprises towards developing more environmentally friendly product, with features like biodegradable packaging, environmentally friendly raw materials, high recycling capability, and reducing unnecessary packaging in general, to meet EPR requirements. In addition, with costs of raw materials escalating due to the pandemic, collection and recycling of waste can help enterprises lessen their dependence on imported raw materials, while decreasing the cost of waste treatment and increasing brand value and sustainable growth at the same time.

To waste treatment facilities, EPR requires producers and importers to collect, treat and recycle waste; or cooperate with another relevant facility to manage this process. Thus, EPR provides an opportunity for the environmental industry and services in managing and treatment of waste, especially for HWTFs. Furthermore, EPR also provides policies that aids in recollection of discarded goods and highly recyclable waste, which can lighten the cost of treatment and recycling hazardous waste for corresponding facilities.

• ***For the Facility to operate efficiently to aid in combating the pressing issue of treatment and recycling of hazardous waste for HCMC, do you have any suggestions or recommendations to the relevant authorities?***

Mr. Trương Kiên Dũng: For the near future, we expect the City's waste emission to continuously increase, following the growth of many industries. Thus, increasing the Facility's capacity in treatment and recycling of waste is necessary and critical to meeting the demands of the market. At the same time, mAc plans to expanse and increase the Facility's capacity from 500 tons per day to 3,500 tons per day, with 1,000 tons of capacity dedicated to thermoelectric power generation from commercial waste treatment and 2,500 tons of capacity dedicated to treatment of hazardous industrial waste. We look forward to working with relevant agencies and potential customers to plan and develop this next phase for the Facility.

In addition, mAc hope that the EPR policies will be even further discussed and enforced, as it can ensure the integrity of the process of recollection, treatment, as well as recycling of waste, which will lead to significant decrease in the cost this process and promoting circular economy.

• ***Scincerely, thank you!***

PHẠM ĐÌNH

The Basel Convention tightens controls on global e-waste trade

With 189 parties, the Basel Convention (BC) is an international treaty designed to reduce the movements of hazardous waste and specifically to prevent the transfer of hazardous waste from developed to less developed countries. At the 15th meeting of the Conference of the Parties to BC (BC COP15), the BC have adopted amendments to ensure all transboundary movements of waste electrical and electronic equipment (WEEE) are subject to prior informed consent.

New amendments will establish new definitions of hazardous and non-hazardous electronic waste, ensuring that these two categories of e-waste will either be banned from trade, or at a minimum, require notification by the exporting country and consent by the importing country prior to export.

Prior to this change, only hazardous WEEE required prior informed consent. In amending Annexes II, VIII and IX, the parties aim to protect "vulnerable countries from unwanted imports" as well as adopting "environmentally sound management of e-wastes" with new technology, contributing to a circular economy.

The amendments were first tabled by Ghana and Switzerland in 2020 and exempt WEEE pre-processed in the exporting country to a "safe" concentration of metals or plastics already listed on the Convention's non-hazardous list, Annex IX. The amendments to Annexes II, VIII and IX of the Convention will mean all shipments of WEEE, hazardous or not, will require prior informed consent from 1st January 2025. The new rules will be followed, after a few years, by a similar agreement for mixed and contaminated plastics.

The Basel Action Network (BAN), an non - governmental organization (NGO) working to combat hazardous e-waste exports to developing countries, initially discovered the issues generated through global e-waste dumping in China and Africa in 2001 and 2005. The NGO's work was instrumental in exempting e-waste that is "pre-processed in the exporting to a safe, non-hazardous concentrate of metals and plastics" from the amendments, which it says will protect legitimate recycling. This exemption will enable a greater number of electronics to be recycled into "commodity-grade secondary resources" rather than thrown into landfills or incinerators.

▲ *New amendments of the BC will establish new definitions of hazardous and non-hazardous electronic waste*

▲ *Workers with WEEE in Agbogbloshie, an area of Accra, Ghana, famous for being "the largest e-waste dumpsite in the world"*

Executive Director of BAN Jim Puckett said: "E-waste exports, particularly to developing countries, typically result in environmental harm even when the material is deemed non-hazardous. Due to the deadly emissions created when e-waste is processed thermally or in primitive acid stripping operations, the new agreement will go a long way towards protecting the environment and human health worldwide".

However, the BAN says there remains "one major loophole promoted heavily by electronics manufacturers". Exporters can avoid the Conventions' rules on the transboundary movement of waste if they claim their exports are to be repaired. This loophole is the product of an interim Basel guideline that allows exporters to avoid the Convention's rules altogether if they claim that the exports are to be repaired and sign a contract to that effect.

While everyone realizes that repair plays an important role, it cannot be used as a free ticket to export all manner of wastes which might never be repaired or might leave hazardous discarded parts. This would leave open the barn door to exploitive waste traders with no possibility for enforcement. The BAN, along with developing countries, aim to close that final loophole to prevent this kind of abuse in the name of reuse.

At COP15, 22 developing countries urged that more work should be done on this section of the guidelines, to better define when e-waste is explicitly waste material and when it is not. Many parties wished to base the definition on functionality and not repairability. This will now be included in continued negotiations, starting next year.

Alongside environmental and health benefits, the amendments are also expected to simplify the global e-waste trade due to customs and environmental border officials not having to undertake, in most cases, expensive testing to determine the status of e-waste imports.

In a statement, the United Nations Environment Program welcomed the amendments, saying: "This bold decision not only protects vulnerable countries from unwanted imports, but also fosters the environmentally sound management of e-wastes with state-of-the-art technology and thus contributes to a circular economy" ■

CHÂU LONG

Committing to end plastic pollution, US and European Commission join the Clean Seas Campaign

The United States of America (US) and the European Commission (EC) have officially joined the Clean Seas Campaign (CSC), demonstrating their commitment to ending plastic pollution. In doing so, they acknowledge the need to curb the flow of marine litter and plastic pollution entering lakes, rivers and the ocean and in effect, are providing greater engagement to the biggest Campaign devoted to "turn the tide" against plastic in the world.

The CCSC, launched by the UN Environment Program (UNEP) in 2017, has been a catalyst for change, transforming habits, practices, standards and policies around the globe. With the US and the EC joining newcomers Cabo Verde, Portugal, Rwanda, Tanzania and Uganda, 69 member states have now joined the global movement devoted to ending marine litter and plastic pollution, along the life cycle and from source to sea.

▲ *The CSC launched by the UNEP in 2017*

Commitments made by the 69 signatory countries now cover more than 76 per cent of the world's coastlines. More voluntary commitments are expected to be made at this year's United Nations Ocean Conference to address ocean-related issues that affect communities and countries. To date, individual pledges of action originating from the CSC have reached more than one million.

Director of UNEP's Ecosystems Division Susan Gardner said: "We are pleased to welcome the US and the EC as new Clean Seas members. Their leadership and commitment to the values and mission of Clean Seas will be paramount in accompanying the Intergovernmental Negotiating Committee (INC) process and developing a globally binding treaty to end plastic pollution. Our success is part and parcel to the ongoing work of our Clean Seas members and partners".

The CSC is broadening its scope and entering a new strategic phase that will see it accompany the political process for the implementation of UNEA Resolution 5.14 and its focus on ending plastic pollution. The campaign seeks to support the INC process initiated to form a legally binding agreement and engage with Governments and the private sector to undertake concerted action to end plastic pollution ahead of the Sixth United Nations Environment Assembly (UNEA-6).

In the lead up to joining the CSC, the US has made significant strides in its actions to reduce plastic pollution. In 2021, the US Environmental Protection Agency (EPA) published the National Recycling Strategy, reaffirming the goal to increase the US recycling rate to 50 percent by 2030. Through pursuing a Sustainable Materials Management (SMM) approach, the EPA aims to reduce the environmental impacts of materials across their lifecycle. The National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program forms partnerships across the US and internationally to support local and national efforts to drive more sustainable behaviors and reduce the generation of waste and marine debris. NOAA funds locally driven, community-based marine debris removal projects around the US and supports the monitoring of debris amounts and types in shoreline environments. NOAA also funds research and advances science to help understand debris baselines, chemicals in plastics, debris detection, plastic ingestion by wildlife, economic implications, and how to minimize the impacts of derelict fishing gear.

The EPA also initiated the Waste Wise Program which works with businesses, Governments, and nonprofit organizations to promote the use and reuse of materials more productively over their entire life cycles, while the US Department of Energy (DOE) developed a Strategy for Plastics Innovation which coordinates various initiatives on plastic recycling, degradation, upcycling and design for circularity.

"I'm thrilled that the US is now a member of the CSC and I affirm our commitment to the Campaign's objective of 'turn the tide' on marine litter and plastic pollution, including through upstream actions. I am pleased to celebrate the achievements of the CSC and to highlight the critical role partnerships play in addressing this global challenge. We welcome the opportunity the Campaign offers to promote innovation and cooperation among all stakeholders", said Assistant Administrator for the NOAA Nicole LeBoeuf.

The EC has also become a leader in the fight to "turn the tide" against plastic pollution in the past years, having recently supported a broader EU-wide ban on some single-use plastics products for which easily available and affordable alternatives exist. The Directive on single-use plastics aims to prevent and reduce the impact on the environment of certain plastic products and promote a transition to a circular economy through a variety of new measures, requiring a sustained quantitative reduction in consumption of certain single-use plastics for which there are no alternatives. Furthermore, a collection target of 90% for single-use plastic beverage bottles has been set by 2029, while incorporating 25% of recycled plastic in PET beverage bottles from 2025 and 30% in all plastic beverage bottles from 2030.

European Commissioner for the Environment Virginijus Sinkevičius said: "The EU and its member states take an active role in the work for a successful outcome of the Global Agreement on Plastics. We must tackle plastic pollution with measures for the entire plastic life cycle, from design to production, use, recycling and disposal and by addressing the sources on land and in the sea. We need a strong commitment to link the work on sustainable development goals on clean water and sanitation and those on marine life".

The ocean makes life on earth possible, helping to regulate our climate, providing the main source of protein for more than a billion people and generating much of the oxygen we breathe. Marine litter and plastic pollution pose an existential threat to ocean health. There is a need to rebuild humanity's relationship with the ocean and place it firmly at the center of future sustainable development solutions ■

NAM HƯNG

COCA-COLA VIETNAM COOPERATES WITH ĐÀ NẴNG CITY TO LAUNCH "FOR A VIỆT NAM WITHOUT WASTE" PROGRAM

Coca-Cola Vietnam, in partnership with Đà Nẵng City, has launched a "For a Việt Nam without waste" event with joining by representatives from agencies and the local community. With many activities over a half-day, the "For a Vietnam Without Waste" event aims to raise public awareness of waste sorting, encourage people to use reusable bags and promote a green lifestyle and sustainable production and consumption. Coca-Cola Vietnam handed Đà Nẵng Department of Natural Resources and Environment, Department of Industry and Trade 90 segregation trash bins and 4,000 reusable bags, worth VNĐ700 million. The in-kind sponsorship will help the local authority propagate the Law on Environmental Protection in 2020.

To attract families and young people to join hands to collect plastic waste for recycling purposes, the event encourages attendees to bring used plastic bottles to exchange for their favorite Coca-Cola products. These bottles and cans collected at the event will then be hand-made into lanterns for local underprivileged children, thanks to the Women Union and the Youth Union of Hòa Minh Ward. Attendees can also enjoy an exhibition of winning projects in "A New Life of Waste" contest finale, where the most outstanding and practical recycling ideas are demonstrated.

To "refresh the world", Coca-Cola Vietnam has pursued sustainable development and comprehensive growth for almost 30 years. "We hope that the 'For a Vietnam Without Waste' event can contribute to the joint effort of Đà Nẵng and Hồ Chí Minh City authorities to raise more awareness and build sustainable consumption habits for the community. We will continue to accompany these cities' Governments to promote collection and recycling activities locally and nationwide", said Chief Executive Officer of Coca-Cola Beverages Vietnam Limited Peeyush Sharma. Mr. Lê Thế Nhân, Vice Chairman of the People's Committee Liên Chiểu District said: "Plastic waste is a collective issue to be solved collectively by the community. Therefore, we acknowledge and welcome Coca-Cola Vietnam's efforts to protect the Đà Nẵng living environment through practical initiatives like today's event. This is an excellent example of how public and private sectors together can raise public awareness and call for good action to make Đà Nẵng the most worth-living place in the country and a city without waste".

The event "For a Vietnam without waste" is the latest initiative toward a World Without Waste vision of the Coca-Cola Company. From the vision announced in 2018, Coca-Cola set ambitious goals to make its packaging 100 percent recyclable globally by 2025, use at least 50 per cent recycled material in its packaging by 2030 and collect and recycle the equivalent of every bottle it sells globally by 2030 ■

TRẦN HƯƠNG

The Ocean Cleanup and KIA sign partnership to turn pollution into a solution

For seven years, Kia will support The Ocean Cleanup (OC) as an official "Global Partner" via financial contributions and in-kind supplies to support ocean operations and the construction of the various river cleaning devices - The OC's Interceptor Solutions. The OC, a Netherlands based non-profit organization, is developing and scaling technologies to rid the world's oceans of plastic. They aim to achieve this goal by taking a two-sided approach: Stemming the inflow via rivers with Interceptor Solutions and cleaning up what has already accumulated in the ocean.

For the latter, the OC is developing large-scale systems to efficiently concentrate the plastic for periodic removal. To curb the tide via rivers, it has developed Interceptor Solutions to halt and extract riverine plastic before it reaches the ocean.

▲ *Mr. Ho Sung Song (left), President and CEO of Kia Corporation and Mr. Boyan Slat (right), Founder and CEO of the Ocean Cleanup signed an agreement to officially confirm their global partnership*

In January 2022, the OC signed a partnership agreement with Coca-Cola Vietnam to stem the tide of plastic pollution in the Mekong Delta region. In 2021, The Coca-Cola Company became a global implementation partner for the OC's river project.

Sustainable use of plastics

"Plastic is not inherently a bad material, but we must use it responsibly. We demonstrate how we can turn pollution into a solution by launching applications that help clean the oceans and simultaneously - together with our partner Kia - provide proof that recycled plastic can be used sustainably. I hope that we can inspire others to do the same said Mr. Boyan Slat, Founder and CEO of the OC. "This cooperation is the next step in our efforts to prevent that our catch does not end up back in the environment while using its value to support our cleanup efforts further".

In addition, Kia will also supply the OC with four electric vehicles, including one EV6 and three Niro EVs, to the organization's headquarters in the Netherlands. In return, the OC will supply usable fractions of the collected plastic and share the organization's research results and relevant data on reducing plastic pollution with Kia.

Virtuous Recycling Loop

This partnership is one of the key strategies in Kia's corporate vision to build a sustainable future for mobility. Kia plans to increase its percentage of plastic re-use to 20 percent by 2030 and expects to further contribute to environmental protection by establishing and activating a "Virtuous Recycling Loop" to minimize climate impact when disposing of vehicles.

Mr. Ho Sung Song, President and CEO of Kia Corporation commented, the key to Kia's vision for a sustainable future is not just to change the product and service areas, but to make positive changes for the planet and added, "Kia will continue to make inspirational movements through open partnerships with various partners with innovative technologies and ideas like the OC".

Kia joins companies including the Body Shop, Kevin Murphy, PUMA and SC Johnson that have formed strategic partnerships to ensure a steady supply of ocean plastic feedstock for recycling into their products and packaging. Combined with the UN's recent global plastics treaty and the work of collaboratives such as Next Wave Plastics; marketplaces such as Ocean works and organizations such as the Ocean Plastic Leadership Network, we hope to soon see signs of the tide turning on global plastic pollution ■

PHẠM ĐÌNH

Opportunities and challenges of Việt Nam in developing a circular economy

▲ *Mr. Murooka Naomichi - Senior Representative of JICA Vietnam Office*

Japan is considered as a leading country in handling environmental issues, since 1999, the Government of Japan has developed a policy on circular economy (CE) vision, updated for the 2nd time in 2020. In 2000, the Government of Japan continued to promulgate the Fundamental Law on Establishing a Sound Material-Cycle Society and develop fundamental plans for establishing a sound material-cycle society. Therefore, the experience of Japan, especially the 3R model (reduce, reuse, recycle) is very valuable for Việt Nam in developing a roadmap for implementing the CE. On 6th July 2022, MONRE in collaboration with the Japan International Cooperation Agency (JICA) held a workshop on "Japan's experience and policy suggestions for Việt Nam in developing a roadmap to implement CE". On this occasion, the Environment Magazine had an exchange with Mr. Murooka Naomichi, Senior Representative of JICA Vietnam Office about this issue.

• ***Can you share some highlights about Japan's outstanding results and lessons learned in developing the CE?***

Mr. Murooka Naomichi: In Japan, the idea of a CE system has been around since 1999 to solve challenging problems of environment and resources for the sustainable development of Japan in the 21st Century such as limiting landfills, reducing the possibility of mineral resource depletion in the future, global environmental problems, toxic chemicals... Japan has maximized resources, energy efficiency (minimizing resource inputs and waste emissions), strengthened partnerships between businesses, consumers and the Government (maximizing benefits for the whole society), established new industrial technology systems (recycling-oriented technology system), promoted industries related to the environment (developing new types of industries and improving the competitiveness of enterprises).

Right from the early days of implementation, Japan has determined that, in order to develop a CE, what needs to be done is to reduce the amount of waste released into the environment, which is done through waste treatment. Therefore, Japan has made efforts to implement measures to improve production efficiency, product use efficiency and appropriate treatment of used - recycled products.

The first point is the solution for inputs into the production process, including three main solutions: Increase the proportion of recycled products used in products; Increase the energy efficiency of the products themselves; Mechanism, extended responsibilities of the mmanufacturerss. In Japan, all three solutions are institutionalized. The second point is the result achieved in appropriate treatment - recycling, Japan has clarified the fundamental policy to develop a material-cycle society based on the Fundamental Law on Establishing a Sound Material-Cycle Society. Currently, the Law clearly stipulates that for each list of goods that must be recycled appropriately, including six categories: packaging, household electrical appliances, food, construction waste, auto parts and small household appliances.

In addition, Japan not only attaches significant importance to "material-cycle" as mentioned above, but also attaches significant importance to administrative measures to treat waste appropriately, which we clearly stipulate in the Law on "The Declaration System" to monitor the waste treatment process, and we also have regulations on preventing littering and improper disposal of waste. In addition, a major problem that is currently being particularly concerned by countries around the world is plastic waste. To solve this problem, Japan has set out policies to raise people's awareness in reducing using plastic items, one of which is the policy of charging for using plastic bags at stores and supermarkets. If buyers are charged directly for this cost, they will be more interested and conscious in reducing the use of plastic products. Thus, a prominent feature in the development of a material-cycle society in Japan's chain of "production, use and disposal processes" is the institutionalization of what can be done and put into Law, clear regulations to put into practice.

▲ *Workshop on Japan's experience and policy suggestions for Việt Nam in developing a roadmap to implement CE held on 6th July 2022 in Hà Nội*

However, behind the achievements, the process of developing the CE in Japan also leaves practical lessons. In Japan there are also a lot of problems that arise and from there it is imperative to have solutions to solve each problem. Japan's recycling promotion policies stem from the fact that there is a serious lack of landfills. Since the Rio Earth Summit 1992, environmental issues have received more attention. I think it is very important to widely share nationwide the problems and difficulties that lead to the need for policy formulation.

• ***So, in your opinion, to develop the CE, which factors should be focused on?***

Mr. Murooka Naomichi: When implementing the CE policy, it is necessary to switch to a highly circular business model with appropriate assessment from the market and society.

First, businesses that use and produce recycled materials need to implement interlinking forms in the process from product specification design → production → use → disposal → recycling → utilization of recycled materials. Therefore, the manufacturing industry is considered as the main industry that needs to be transformed into a circular product manufacturing industry from design to recycling and also the recycling industry is considered as a complementary industry that will progress purchasing various used products on a large scale, in order to promote the utilization and production of high-quality recycled materials from purchased recycled products.

In addition, investors need to appropriately assess the value of short-term unprofitable businesses that play a role in promoting healthy recycling development for the CE through investment responsible for the environment and society. In addition, consumers, as a part of the CE system, need to take specific actions, change lifestyles as well as consumption behaviours such as actively buying products that have less impact on the environment, reducing waste... Therefore, businesses and consumers need dialogue with each other to enforce the laws and policies necessary for the development of the CE.

• ***For Việt Nam, what is the driving force for the development of a CE, and what are the opportunities, challenges and solutions proposed to transform a linear economy into a CE and establish a sustainable society?***

Mr. Murooka Naomichi: It is known that the issue of the CE in Việt Nam has been included in the Resolution of the 13th National Party Congress. The LEP has also institutionalized, introduced a separate article on the CE and the Government's Decree No. 08/2022/NĐ-CP also specifically stipulates the implementation of the CE and the development of a national action plan on the CE. Developing a CE will help Việt Nam's economy develop in a sustainable way, avoid wasting resources, maximize the value provided to product users, and increase the utilization rate (increasing sales revenue), while efficiently recycling used products (reducing costs), Việt Nam can build a society in which inputs are reduced and gross profits are increased.

However, the challenge facing Việt Nam today is to build a social system that can effectively reuse and recycle used products that are being discarded. We cannot transition to the CE model if the Government, businesses, investors and consumers act separately. Therefore, it is time for Việt Nam to strengthen cooperation to establish a legal foundation so that all parties can meet, cooperate and exchange information, thereby developing a reasonable implementation mechanism in the process chain from product specification design → production → use → disposal → recycling → utilization of recycled materials. The development of this mechanism is not easy, so Việt Nam needs to take it step by step to be able to develop a CE. Also, it is necessary to have a firm policy orientation to effectively deploy the CE models. In this context, the results of JICA's survey on the CE in Việt Nam conducted since January 2022, not only supported the Institute of Strategy and Policy on Natural Resources and Environment (MONRE) to develop a framework for the National Action Plan on CE, but also provided an overview of the legislative system as well as the activities of the CE taking place in Việt Nam; helping identify the outstanding shortcomings, thereby developing future technical cooperation projects between JICA and MONRE.

• ***Thank you very much!***

BÙI HẰNG

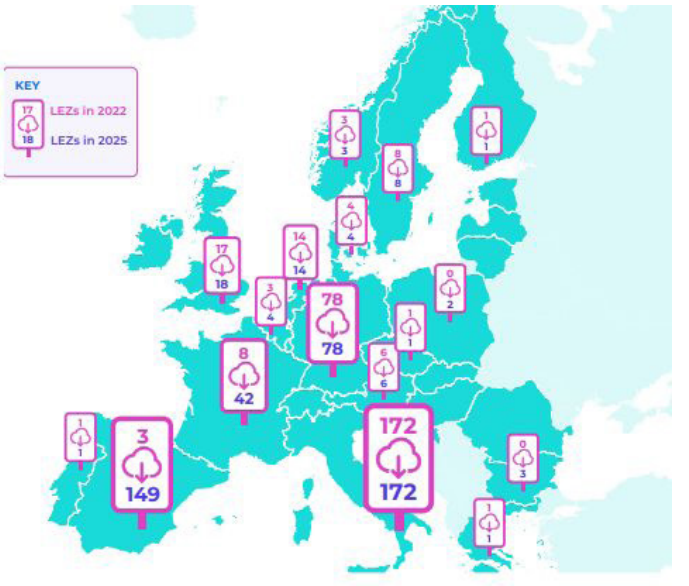
Clean air zones in Europe nearly doubled in the past years

Air pollution is a "public health emergency" responsible for more than 300,000 premature deaths a year in the EU, according to the World Health Organization. Dirty air is thought to cut global life expectancy by an average of almost two years, making it the single greatest environmental threat to human health.

Cities are at the forefront of the clean air struggle as many are pollution hotspots, with EU air quality limits being breached in more than 100 of them across the continent. The number of citizens at risk is also particularly high in urban areas, with cities accounting for only 4 percent of the EU's land area but 75 percent of its population. Given almost a quarter of Europe's greenhouse gas emissions from transport come from cities, it is imperative that urgent action is taken in cities.

Road transport continues to be one of the main sources of toxic air pollution, especially nitrogen oxides. Research by health experts showed that transport-related air pollution cost the average European city resident 1,276 Euros per year, with lower-income citizens and regions being disproportionately affected.

In Central and Eastern Europe, the burning of solid fuels for domestic heating and industry results in high concentrations of both fine and coarse particulate matter, which causes cardiovascular disease, lung cancer and other diseases that lead to premature deaths. Therefore, we need to treat air quality as a priority issue.



▲ *Trends and projections of low-emission zones in Europe*

Low-emission zones (LEZs) that regulate access to urban areas based on the emissions of vehicles are one of the primary clean air measures in European cities. They have proven effective in curbing toxic air pollution and can also reduce road traffic overall and boost the local economy.

In Madrid City (Spain), a 32% fall in NO_2 concentrations was observed after an LEZ was introduced in 2018. There has been a 20% drop in NO_2 since the low-emission zones was expanded in London City (United Kingdom). The United Kingdom Head of the Clean Cities Campaign Oliver Lord said: "The new analysis showed that cities embracing LEZs such as Bristol, Birmingham and London were on the right side of history. Clean air zones are one of the most effective ways to tackle toxic air in our cities. We should applaud city leaders who are taking tough decisions to deliver clean air zones so that we can transform the air we breathe and phase out polluting cars".

All of Europe's top 10 most popular tourist cities now restrict petrol and diesel clunkers, with stricter rules expected in existing LEZs including London,

▲ *Road transport is the main sources of toxic air pollution in cities*

Paris, Brussels and Berlin within three years. Italy tops Europe's clean air table, with 172 declared clean air zones compared with 78 in Germany, 17 in the UK, 14 in the Netherlands and 8 in France.

LEZs were first introduced two decades ago and they saw a particularly strong uptake after the adoption of the EU's air quality directive in 2008. The report (carried out by Clean Cities Campaign) found that between 2019 and 2022, the total number of LEZs has increased by 40 percent, now present in 320 cities across Europe. By 2025, the researchers expect that this number will grow by almost 60 percent to a total of 507 LEZs. This is largely due to new national laws coming into force in France, Spain, Poland and Bulgaria that mandate or support the adoption of such schemes.

In Poland, the new Act on Electromobility and Alternative Fuels is giving competence to cities to set up LEZs. Krakow and Warsaw will launch a low emission respectively by the end of 2022 and in 2023 and several other cities have expressed interest in setting up LEZs, such as Lodz, Wroclaw, Zabrze, Gliwice, Rzeszow, Bydgoszc and Gdansk among others. The Bulgarian capital of Sofia also has plans to adopt a LEZ, which is supposed to launch in November 2022 pending the result of ongoing public consultation and an upcoming City Council vote.

However, the report warns that LEZs alone will not be enough to fulfil the EU's zero pollution ambition, nor will they allow cities to attain their climate objectives. Only zero-emission transport will allow them to attain this goal and therefore, zero-emission zones (ZEZs) are needed. The first wave of ZEZs is already underway, with three (partial) LEZs currently in force in European cities. Current confirmed, published plans foresee the creation of a total of 35 ZEZs by 2030, nine of which will apply to all vehicles.

Given the urgency of the climate crisis and the public health emergency, it is very likely that a much larger number of LEZs will soon be prepared in cities across Europe, the report underlines ■

AN VI

On 1st August 2022, the United Nations Environment Program (UNEP) released its Foresight Brief report detailing the increasing problem of plastics in agriculture practices. The report "Plastics in agriculture - an environmental challenge" is designed to introduce specific issues concerning climate change to a general public audience. The document explores the ongoing problem of soil pollution - caused by plastics use agricultural practices - and the impact this has on the environment and food security.

The millions of tons of plastic swirling around the world's oceans have garnered a lot of media attention recently. But plastic pollution arguably poses a bigger threat to the plants and animals - including humans - who are based on land.

Very little of the plastic we discard every day is recycled or incinerated in waste-to-energy facilities. Much of it ends up in landfills, where it may take up to 1,000 years to decompose, leaching potentially toxic substances into the soil and water.

According to the report, such contamination seriously impacts the health and productivity of soil, thus impacting the quality and quantity of food grown. Research is referred to demonstrating the impact on soil health, biodiversity and productivity a presence of plastics in soil has. Plastics entering agricultural fields often end up entering nearby ecosystems, UNEP notes. Caused by surface run-off, erosion, or by natural vegetation moving plastics further into the soil through tunnels created by earthworms, these plastics begin to contaminate areas external soil sites and waterways, threatening the environment overall.

Contributors of plastic pollution in soil

The report estimates that one third of all plastic waste ends up in soils or freshwater. Most of this plastic disintegrates into particles smaller than five millimeters, known as microplastics, and these break down further into nanoparticles (less than 0.1 micrometer in size). The problem is that these particles are entering the food chain.

In particular, microbial communities, soil invertebrates, and soil physio-chemical properties are at risk from microplastics in soil. Microplastics can also decrease the number, diversity, movement and rate of reproduction of biota; decrease biomass of soil fauna; increase the biomass of microbes; and increase microbial activity, according to research from the Bulletin of Environmental Contamination and Toxicology.

Nevertheless, wider research suggests that as the color, texture, chemical composition, surface characteristics and sorption capacities of microplastics change over time, they may become more efficient in absorbing other soil contaminants such as heavy metals and organic pollutants, exposing less contaminants to soil biota and plants. The report further underscores the use of biosolids, derived from sewage sludge from wastewater treatment plants (WWTPs), as a big contributor of microplastics into soil. With high usage in Australia, North America, the EU and the UK - each using 40 - 75 percent of biosolids as fertilizer - it is estimated that the annual input of microplastics to agricultural land in Europe and North America could exceed the amount of microplastics estimated to be in surface waters in the global ocean.

UNEP calls for "targeted solutions" to reduce microplastics in soils

Looking at other causes of soil pollution, the report shifts focus to biodegradable plastics. Despite their ability to decompose in the environment, they often are not able to in soil because the lack of required conditions, including light, oxygen, moisture and microorganisms, are not present in the soil. Beyond this, the report adds that biodegradable surface plastics like mulch films are frequently swept off of soil by wind or surface run-off to more atmospheric or aquatic landscapes where they do not have the conditions to decompose, becoming as polluting as non-biodegradable plastics.

Researchers in Germany are warning that the impact of microplastics in soils, sediments and freshwater could have a long-term negative effect on such ecosystems. They say terrestrial microplastic pollution is much higher than marine microplastic pollution - estimated at four to 23 times higher, depending on the environment.

Recommendations moving forward

Reflecting on its findings, UNEP details forward solutions to reducing the amount of plastic entering the environment through these practices.

First, while highlighting difficulties caused by the variety of composition and size of polluting plastics, it points to efforts to reduce plastic content in sewage sludge coming from WWTPs. For example, the introduction of filters into washing machines to prevent the leakage of microplastics from textiles entering municipal water streams. However, this is not a standard yet adopted by washing machine manufacturers, and there is little targeted research investigating the removal of microplastics from sewage sludge. Despite this, new research into ultrasound in moving microplastics from sludge before it is used in agriculture gives more promise, resulting in a removal of nearly 40 percent of polyethylene microspheres

Second, the report divulges into the work being done to improve the biodegradability of polymers used in agricultural products. An example of this research is a sprayable biodegradable polymer membrane to be used as mulch film, formulated from seaweed, sugar cane, or leather. The report also considers the use of waste products from timber and agricultural industries to produce bio-based polymers for seed coatings. This would reduce the amount of food resources, such as corn or sugar cane, used to create more expensive biodegradable alternatives. Controlled release fertilizers (CRFs), formed from polylactic acid (PLA), okara (soy pulp), linseed, polyurea and corn starch hydrogel, is another alternative for plastic seed coatings.

▲ *Growing vegetables with cover crops mulch to reduce plastic contamination in soil*

Third, the brief explores nature-positive approaches, like natural mulch cover crops, to reduce plastic contamination in soils. Looking at this solution, it is emphasized that specific information and training would be needed for a widespread introduction of this. This option could also lead to a reduction in yields and increased cost for the producer.

Overall, alternative solutions to the use of plastics in food production is a hard sell, due to the cost effectiveness and ease-of-use plastics provide. UNEP suggests Government incentives and levies on un-sustainable practices as two optional ways interdisciplinary organizations can create positive change in agriculture practices. Specifically, the body recommends introducing standards for the use of sewage sludge-derived biosolids, manufacturing changes to reduce the use of plastic in agricultural products, and the education of consumers on textile choices to prevent plastic leakage from municipal water.

The foresight brief echoes a report previously shared by the UN Food and Agriculture Organization (FAO), published in December 2021, detailing the implication of agricultural plastics on food security, human health, and the environment. Sharing concerns explored in the brief, the FAO report exposes many problems linked to the presence of plastics in agriculture, causing reduced yields, harming wildlife through indigestion and the dispersal of pathogens and toxic chemicals in oceans ■

NHẬT MINH

10 facts about biodiversity, nature protection and Indigenous Peoples' rights

From unimaginable habitat loss to heartbreaking species extinctions, it shouldn't be a surprise to any of us that our biodiversity - the variety of life in the world - continues to suffer from human greed, exploitation, encroachment and neglect - putting short-term profit above all else. All life on this planet interacts and interconnects. All life relies on the biodiversity that surrounds it to thrive and survive.

A critical juncture in our global crisis biodiversity loss, the Convention on Biological Diversity (CBD) COP15 is planned to be held later this year in Kunming, China. This meeting will be absolutely critical to determine how we as a global community impact biodiversity over the next ten years. To succeed, the CBD COP15 negotiations must ensure greater protections for Indigenous Peoples and local communities and their civil rights, particularly land rights. Greenpeace also supports the call for a 30×30 (thirty-by-thirty) policy to protect at least 30% of the world's land and 30% of the oceans by 2030, if it is in cooperation with Indigenous Peoples and local communities. Their knowledge, practices and stewardship make them the most qualified guardians of nature.

Here are 10 quick facts to keep you up to date on what's happening with biodiversity.

1. As of 2021, just 9% of the world's forests remain intact.

2. The Amazon has already lost 17 percent of its forest cover and an additional 17 percent of its rainforests have been degraded

3. Only 3% of the world's oceans are free from human pressures

4. The Deni, a community of Indigenous Peoples who live in what is known as modern day Brazil, took control of their local fishing areas in 2011. In eleven years, their sustainable management increased the local fish stock by 425%.

5. Under Indigenous stewardship, West Papua in modern day Indonesia has retained most of its natural forest cover and boasts a higher level of plant diversity than any other island on Earth.

6. Commercial fisheries kill tens of millions of sharks every single year – disrupting whole ecosystems and threatening the livelihoods of coastal communities who depend on healthy oceans and sustainable fisheries.

▲ *Deforested and burnt area already being used for cattle ranching in Porto Velho, Brazil*

7. The African Union (a coalition of 55 CBD member states), supported by many other developing countries and China, launched a proposal for a global biodiversity fund to finance protections in developing economies, with at least US$ 100 billion annually, rising to US$700 billion annually by 2030 and beyond. The Kunming Fund, established by China with an initial pledge of US$ 230 million, made modest efforts to finance biodiversity protection. Traditional donor countries in Europe and North America have disappointingly been tight-lipped so far.

8. False solutions are a big risk to biodiversity protection, including offsets, double-counting climate funds with biodiversity funds, and any conservation efforts that fail to cooperate with Indigenous Peoples and local communities. Any biodiversity protection targets, such as the 30×30 target, must hold to Indigenous Peoples' and local communities' rights and central roles.

9. Protecting the oceans presents a unique challenge. Greenpeace's "30×30 Blueprint for Ocean Protection" mapped the ocean (which covers almost half the globe) into 25,000 squares, each 100 × 100 km and then analyzed the distribution of 458 different conservation features, including wildlife, habitats and key oceanographic features. This enables researchers to generate hundreds of scenarios for what a planet-wide network of ocean sanctuaries, free from harmful human activity, could look like.

10. The CBD has 195 parties: the Vatican is not a signatory, while the US has signed but not ratified the Convention. The US does, however, usually send a delegation to the negotiations ■

HỒNG NHUNG

Việt Nam strives to conserve endangered elephant species

Since 2012, August 12 has been recognized as World Elephant Day, which has become an opportunity for people to raise awareness about elephant protection and seek solutions to reduce conflicts between elephants and humans, as well as efforts to preserve the species in the wild.

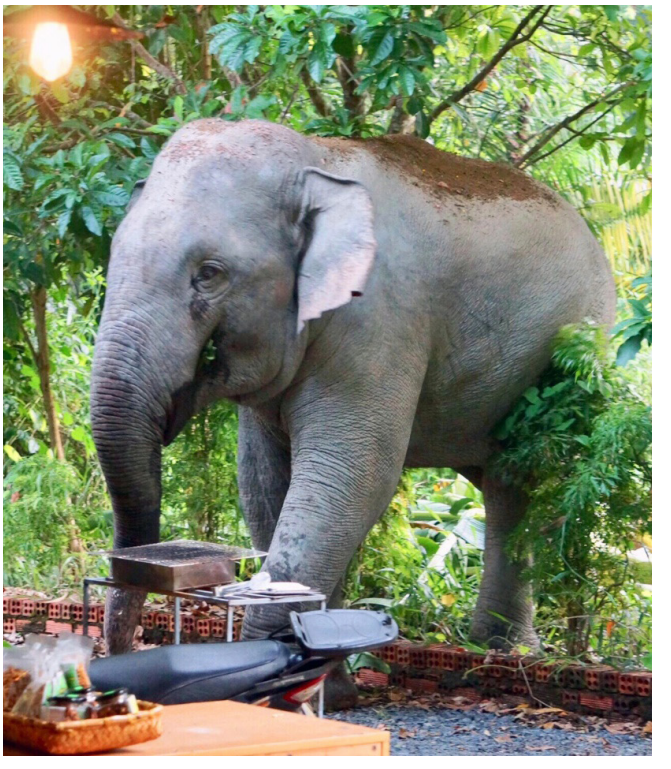
Three species of elephants still exist: the African prairie elephant, the African forest elephant, and the Asian elephant. Việt Nam is one of 13 countries where Asian elephants still live. In Việt Nam, elephants are classified as endangered on the IUCN Red List, critically endangered according to the Vietnam Red Book, and are included in the group with the highest conservation status, prohibiting exploitation for commercial purposes.

Apart from conservation regulations, the Government of Việt Nam has action plans for conservation activities for each period. A National Action Plan on Elephant Conservation in Việt Nam for 2023 - 2032, with a vision for 2050 is also being developed.

The recent efforts of State agencies have also received support from non-governmental organizations such as WWF, AAF and USAID. Particularly, the Việt Nam Administration of Forestry and Humane Society International (HSI) has provided support for a project on "protecting Asian Elephants in Đồng Nai Province" through solutions to reduce and prevent human-elephant conflict sustainably.

The project is currently piloting a Population Monitoring Program in Đồng Nai to identify individual elephants with the support of Dr. Pruthu Fernando, President of the Sri Lanka Elephant Development Center and a member of IUCN's Asian Elephant Expert Group. "The images obtained from the monitoring program are quite clear and diverse, showing that the elephant population in Đồng Nai is quite good, with young, semi-adult children and children of childbearing age. Reproductive, mature males and a few males in estrus. The special thing is that all these individuals are in good condition", said Dr. Pruthu Fernando.

Director of HSI in Việt Nam Thẩm Hồng Phượng said: "We are working together with the Vietnam Administration of Forestry and other stakeholders so that the elephant population in Việt Nam can self-recover and develop outside nature". HSI is working with the General Administration of Forestry to develop a National Action Plan on elephant conservation in Việt Nam from 2023 through 2032 with a vision for 2050.



▲ *An elephant enters a residential area in Đồng Nai Province*

According to the summary report of the General Department of Forestry, the number of elephants in Việt Nam has reduced by 95 percent. It is in danger of extinction without proper conservation plans. In Đắk Lắk alone, at least 23 wild elephants died in the period 2009 - 2016, accounting for about 25 percent of the total current herd and in Đồng Nai, about nine wild elephants died before 2014.

Research of the Center for People and Nature (PanNature) showed that, in the 1990s, the number of wild elephants in Việt Nam was about 1,500 - 2,000 individuals. However, at present, Việt Nam has less than 120 wild elephants. The cause of elephants' status, near the brink of extinction, is the shrinking habitat of elephants and the increasing illegal ivory trade and consumption in Việt Nam and some Asian countries ■

BÙI HẰNG

Top 25 nature conservation facts of 2022

Nature provides us with countless services, supplying us with fresh water, clean air, food, medicine, energy and above all, life itself. Ecosystem services contribute an estimated US$ 125 trillion to US$ 140 trillion a year to the world's economy - nearly 7 times the GDP of the US. But ultimately, natural resources are so fundamental to our lives that we could never express their value in dollars. And yet, every six seconds, the world loses a soccer field size of primary rainforest. Every minute, the equivalent of a garbage truck of plastic is dumped into the ocean. Every day, dozens of species go extinct.

We benefit constantly from the services that nature offers us. But as a species, we are failing to preserve the exact thing we are so dependent on. Learn more about the state of nature conservation today, reflecting the most recent trends in deforestation, wildlife preservation, greenhouse gas emissions and pollution.

DEFORESTATION

Forests are primarily cleared for cattle ranching, farming and logging. However, the destruction of forests accelerates climate change, fragments delicate ecosystems, erodes soil and disrupts lives all around the world.

1. Globally, 1.25 billion people depend on forests for food, water, shelter and fuel.

2. The global rate of deforestation between 2015 and 2020 was 10 million hectares a year, a decrease from 16 million hectares a year in the 1990s.

3. Despite a downward trend in deforestation in the 2010s, 941 square kilometers of the Brazilian Amazon were deforested in the first quarter of 2022, a record 64% increase compared to the same period in 2021.

▲ *Forests are primarily cleared for cattle ranching, farming and logging*

4. Scientists predict that the Amazon Rainforest may soon reach a tipping point, permanently reducing rainfall and forest composition. This would intensify global warming by releasing 90 billion metric tons of carbon dioxide into the atmosphere while decimating the forest's native populations and biodiversity.

5. The Amazon Rainforest's tipping point is estimated to be somewhere between 20 - 25% of rainforest lost, and we are approaching 20% of forest cover in the Amazon lost.

ENDANGERED SPECIES

It's impossible to know exactly how many species exist or have gone extinct. However, experts estimate that the rate of extinction is between 1,000 and 10,000 times greater than it would be without humans.

6. Between 1970 and 2020, populations of mammals, fish, birds, reptiles and amphibians decreased by an average of 68%. At-risk populations can experience even more rapid declines.

7. In an analysis of 27,600 terrestrial vertebrate species (like mammals, birds and reptiles), scientists discovered that 32% were experiencing population decline.

8. In a sample of 177 mammal species, all 177 had lost at least 30% of their geographic range.

9. In the past 100 years, anywhere from 200 to 500 terrestrial vertebrate species have gone extinct. This is at least 100 times greater than the natural rate of extinction.

10. 40.7% of amphibian species are endangered or at risk of becoming endangered.

11. 21.1% of reptiles are considered to be vulnerable, endangered or critically endangered. Scientists believe that over half of all turtles and crocodiles will be considered at risk in the coming years.

12. Reports suggest that insect abundance is decreasing at a rate of 1 - 2% annually, leading to losses in

some terrestrial regions of more than 10% each decade. These declines are especially concerning because of insects' importance in supporting food chains, pollinating plants and healthy soil.

THREATS TO MARINE LIFE

The ocean is an incredibly important resource for humans, producing more than half of the world's oxygen and absorbing 50 times more carbon dioxide than our atmosphere. However, human activities are threatening complex ocean ecosystems.

13. At least 800 marine species are threatened by debris in the ocean - mostly plastic - that causes suffocation and starvation when ingested by species like sea turtles.

▲ *At least 800 marine species are threatened by debris in the ocean*

14. A third of all marine animals could go extinct in the next 300 years if greenhouse gas emissions continue to rise.

15. Luckily, if greenhouse gas emissions are slashed and efforts are taken to restore ecosystems, the rate of marine extinctions can decline by 70%.

16. Since the 1950s, half of all living corals have died.

17. 99% of coral reefs will die within 10 years if drastic measures to reduce carbon emissions are not taken.

CARBON DIOXIDE EMISSIONS

When humans burn fossil fuels like coal, natural gas and oil to generate power, carbon dioxide is released into the atmosphere. High levels of greenhouse gases like CO_2 in the atmosphere have been linked to extreme weather events and record temperatures that are already altering the landscape of our planet.

18. In 2021, global carbon dioxide emissions reached their highest level ever.

19. Nature provides us with some very important carbon sinks. Tropical forests absorb 1.4 billion metric tons of carbon dioxide, and globally, forests remove up to 30% of the carbon dioxide emitted by humans.

20. Oceans, land plants and trees absorb about 50% of the carbon dioxide released into the atmosphere by humans.

21. Most greenhouse gas emissions in the U.S. are from burning fossil fuels for electricity, heat and transportation. Although 80% of overall energy production worldwide comes from fossil fuels, renewable sources like solar and wind energy now account for 29% of our electricity.

AIR POLLUTION

Even low levels of air pollution have been found to increase the risk of heart disease, stroke, lung cancer, asthma, respiratory infections and premature death. Although legislation like the Clean Air Act has helped restrict sources of air pollution in the US, more Americans are exposed to unhealthy or hazardous air quality conditions than ever before.

22. More than 137 million people in the US live in areas with unhealthy levels of ozone or particle pollution.

23. People of color are 61% more likely than their white counterparts to live in a county with poor air quality.

24. 97.3% of the world's population is exposed to an unsafe amount of air pollution (as defined by the World Health Organization's safe exposure guidelines of under 5 micrograms of airborne particulates per square meter).

25. Air pollution decreases the global average life expectancy by more than two years compared to a world that meets the World Health Organization's guidelines for safe particulate pollution exposure.

Although we have made some progress to slow the rate of emissions and deforestation, we have a long way to go. Rising sea levels, unsafe air and water, extreme weather events and global mass extinctions are all quickly becoming a reality. We must take action to ensure that we leave a cleaner world for future generations ■

HƯƠNG TRẦN

Catching the morning sun at Mũi Né Fishing Village

Enjoying the exciting feeling of riding under the burning sun in the all-terrain Jeep in Bàu White, immersing in the clear blue sea in Rơm Island or checking-in in the vast pitaya garden are great experiences for all visitors who come to Mũi Né (Bình Thuận Province). Not only that but catching the sun early in the coastal Fishing Village is truly an unforgettable experience.

From the early morning, the beach stretching about 1 km along Huỳnh Thúc Kháng Street has already been busy with people working and laughing. The beach becomes a lively area that is completely different from the still sleeping hotels, resorts and residential areas. Hundreds of small boats followed one after the other to catch the morning market. Batches of shrimp and fish after a night of fishing are quickly poured out and sorted to immediately move to wholesale markets or into restaurants... The pace of life in the Fishing Village every morning is quick and busy. At the same time, it is also peaceful, although everyone is busy.

Just then, the sun came up, lighting up the seaside market. The sun gleams on the fresh shrimp, the sun's light bounces on the leaf hat, the sun shines on the blue painted boats lying peacefully on the edge of the sea... The whole busy area will leave visitors feeling energized.

Mũi Né Fishing Village market meets every day. This is the gathering point of small and medium-sized

▲ *Mũi Né Fishing Village market meets every day*

▲ *The fishermen at the market is energetic and happy*

boats sailing from the afternoon before to the next morning. The seafood here is fresh and very cheap. A few hundred thousand VNĐ is enough for a delicious meal for a family of a dozen people, featuring a wide variety of sea products such as clams, snails, fish, crabs and lobsters... The fishermen spoke quickly and spoke a lot. The voice was refreshing but extremely friendly. Whether you can find a good price for the seafood or not, you will still feel happy because of the people's warmth. Tourists who travel from far away to the market are all sorry because everything is cheap and can't be brought home. Everyone at the market is energetic and happy, as if they have known each other for a long time...

The rising sun gradually returned to the Fishing Village, a quiet space where the sky and the sea blended into a peaceful blue. This is also the time for fishermen and boats to rest and regain strength for the next journey. Visitors leaving the Fishing Village bring with them beautiful moments and the great energy of a peaceful morning in a sunny and windy sea ■

PHƯƠNG NHI - NHÂM HIỀN

Vietnam's most attractive tourist destinations

After Việt Nam officially reopens to welcome tourists from March 15th, 2022, many unique destinations of Việt Nam are truly worth visiting, especially for international travelers.

Đường Lâm Ancient Village

Đường Lâm Ancient Village, about 60 kilometers West of Hà Nội City, is one of Vietnam's oldest and most intact villages, with a 1,200-year history. Nowadays, Đường Lâm Ancient Village is a destination for tourists who love to learn more about cultural and historical values. The appeal of this village is contained within a peaceful rural community in Việt Nam, where traditional customs thrive. Visitors can explore the unique and ancient architectural features of the gate of Mông Phụ Village, Mông Phụ Village Hall, Đường Lâm ancient well and the historical beauty of the ancient houses.

Visitors can experience the lives of the people of the Ancient Village of Đường Lâm by making scarecrows from straw, watching and participating in traditional activities, reading ancient parables during the festival, or chasing buffalo through the open land. At Đường Lâm Ancient Village, visitors can also enjoy their amazing cuisine with roast meat, chicken cane, soy sauce and green tea…

▲ *Đường Lâm Ancient Village*

Sailing on the underground river in Tam Cốc - Bích Động

Renowned as "Nam Thien II Cave", Tam Cốc - Bích Động (Ninh Bình Province) is the perfect combination of underground river systems, mysterious caves and the scenery of valleys and fields to create majestic natural scenery; at the same time, it is the perfect destination for those who want to fully explore the beauty of natural rivers.

▲ *Visiting Tam Cốc, visitors will be taken by boat down the Ngô Đồng River*

▲ *Sapa Valley City in the mist*

Tam Cốc is a scenic complex with 3 natural caves, including Cả Cave, Hai Cave and Ba Cave. Visiting Tam Cốc, you will be taken by boat down the Ngô Đồng River, drifting through the cliffs, caves and rice fields before stopping at the mouth of the Cả Cave. As the boat travels through the cold atmosphere of the caves, tourists will be delighted by countless stalactites from the ceiling of the Cave, gleaming like magical pearls. In particular, if you come to Tam Cốc in the last days of May or early June, you will be overwhelmed by the dazzling colors that are harmoniously combined between the blue of the young paddy fields and the golden glow of the ripe rice fields on both sides of the Ngô Đồng River.

On your journey to visit Tam Cốc - Bích Động, you will stop at Thái Vi Temple - a place of worship for the kings and generals of the Trần Era; Thiên Hương Cave - one of the favorite destinations of many travelers; Bích Động Pagoda - a dry cave on the back of the mountain.

Sapa scenery

Located at the foot of the majestic Hoàng Liên Sơn Mountain Rangen (Lào Cai Province), Sapa is an ideal destination for tourists at any time of the year. Sapa is relatively busy, but if you follow the roads that lead into the countryside, visitors will soon come across the villages on the hillside. Coming to Sapa, you will encounter ethnic Mông people, Tày, Dao Đỏ and Giáy in bright, colorful costumes. Besides the terraced fields in the ripe rice season, Sapa also attracts visitors with the beauty of many attractive tourist spots.

With its magical and obscure landscapes, Hàm Rồng Mountain, with a height of more than 1,800m, is suitable for organizing a picnic climb. Don't forget to visit the Sapa stone church, which was built in the Gothic style. Those who love trekking can visit Cát Cát and Tả Văn to learn the customs and traditional crafts of the people here. Visiting Sapa, Fansipan Peak, Silver Waterfall and Love Waterfall is also a must-visit for any traveler ■

TUẤN HÙNG - XUÂN THẮNG

Water quality in rivers of the Red River Delta
Research topics and recommendations…

Assessment of water quality

Water quality should be conducted at least monthly over the annual water cycle. Seasonal variability can provide important information for hydrology and water quality management. The most polluted river sites around Hanoi should be a priority for water quality improvement.

Stable isotopes for tracing the Red River water cycle

The Day River drainage system should be upgraded to allow faster water release during storms and infrastructure for water storage put in place to mitigate against flooding.

Identifying sources of nitrogen pollution

The application of inorganic fertilizers to paddy fields in the Day River area should be re-evaluated to moderate application when this is an option. This is particularly important when fertilization practices are taking place in the rainy season, where rapid and large scale delivery of nitrate is demonstrated.

Nitrogen use efficiency in the Red River Delta

The MFA model is a useful platform to quantitatively determine how changes in agricultural and domestic practices will change the flows of nitrogen in the environment. Scenarios from the MFA can help to develop policies on environmental management, raise awareness and change the behaviors of the local delta dwellers on resource efficiency.

Pollutants in the suspended sediments of rivers

The elemental composition of suspended solids in the RRD should be monitored, with a focus on elements such as Cr and As that exceed current regulatory limits. Further research into how these metals pass between dissolved and particulate forms in this river delta is necessary.

How and why do carbon dioxide concentrations vary in RRD waters?

Increases in pCO_2 and risks of toxic cyanobacteria xcould be mitigated through active water management to increase water flows in urban rivers during dry periods.

Organic pollution

Increasing emerging contaminants (pharmaceuticals) and sewage could be mitigated through greater waste treatment processing. Hydrocarbon pollution requires greater control of urban run-off into waterways and rivers.

Sediment retention and water quality in Hoa Binh reservoir

The rate of sediment infilling does not pose a short-term concern for infilling of the reservoir, but monitoring of the reservoir should be conducted to assess eutrophication.

Introduction and case study download on back cover

New case study published on water quality in rivers of the Red River Delta

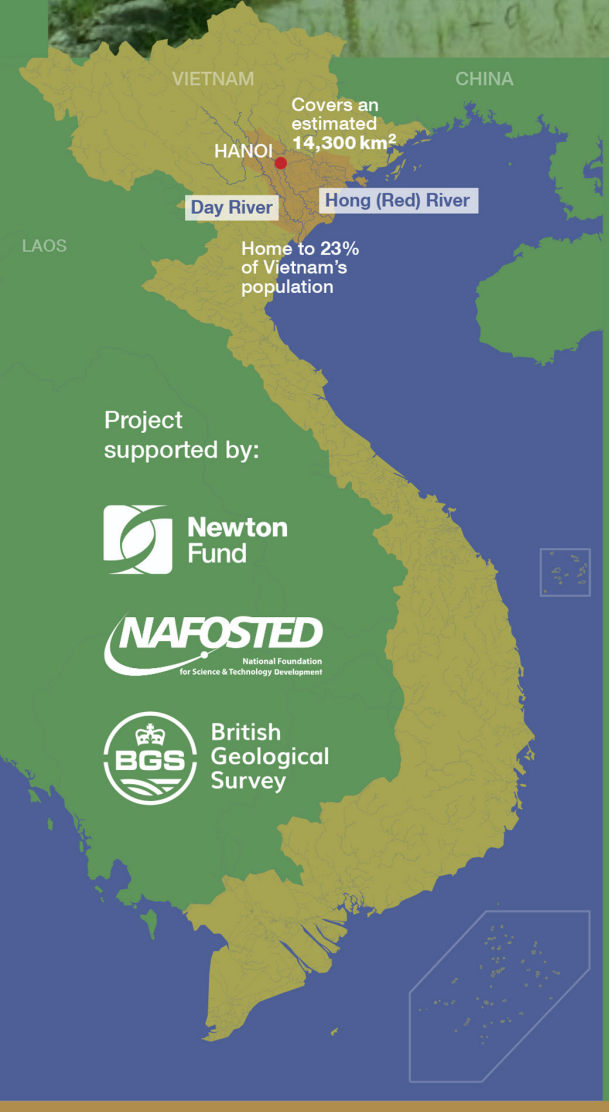
Since 2018, researchers from Vietnam and the UK have been collaborating to investigate water quality in rivers across the Red River Delta. The findings identify hydrological characteristics, pollution hotspots and help to understand how water quality links with greenhouse gas production.

Read about topics and recommendations

Turn to inside cover

Download the case study

Also at https://bit.ly/3q3TPgF



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Newton Fund

NAFOSTED National Foundation for Science & Technology Development

British Geological Survey

In the Red River Delta depletion and pollution of groundwater resources is increasing future reliance on surface waters from rivers. Good river water quality is vital for regional water security and for safeguarding food production in the "rice-bowl" of northern Vietnam.

- Rice farming is widespread across the delta
- Includes the city of Hanoi which is growing rapidly
- River water quality monitoring has been conducted for 20 years
- Thac Ba (in 1963) and Hoa Binh (in 1988) dams created reservoirs upstream of the delta
- Drainage patterns heavily modified by agriculture and infrastructure development

Authors: Suzanne McGowan, Do Thu Nga, Trinh Anh Duc, Virginia Panizzo, Jorge Salgado, Lucy Roberts, Melanie Leng, Andi Smith, Christopher Vane

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