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VIỆT NAM HAS TWO NEW UNESCO- RECOGNIZED BIOSPHERE RESERVES



**CIRCULAR ECONOMY:
A SOLUTION FOR WASTE TREATMENT IN VIỆT NAM**



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Việt Nam has two new UNESCO-recognized biosphere reserves

UNESCO has designated the Núi Chúa National Park in Ninh Thuận Province and Kon Hà Nừng Plateau in Gia Lai as global biosphere reserves.

The two were among 20 new sites approved at the ongoing session of the International Coordinating Council of UNESCO's Man and the Biosphere Program in Nigeria.

New biosphere reserves are designated each year to promote sustainable development, protect terrestrial, marine and coastal ecosystems and encourage conservation. The two new sites take the number of global biosphere reserves in Việt Nam to 11, one of the highest in the world. In Southeast Asia, it is second only to Indonesia.

Other sites approved this year are in Canada, France, Italy, Kazakhstan, Malaysia, Peru, Russia, South Korea, Spain, Thailand and Uzbekistan.

Situated at a height of 1,000 meters above sea level, Núi Chúa National Park is seen as a green lung of the Central Ninh Thuận Province. It has over nearly 20,000 hectares of primeval forests and is home to 300 animal species and 600 plant species.



▲ Núi Chúa is world biosphere reserve in Ninh Thuận Province overlooks Vinh Hy Bay

Kon Hà Nừng Plateau, around 400km to Ninh Thuận's North, includes the two core zones of Kon Ka Kinh National Park and Kon Chư Răng Nature Reserve that cover 65,000 hectares. It has hundreds of animal and plant species, including rare ones like the gray-shanked douc langur.

There are now 727 UNESCO biosphere reserves in 131 countries and territories■

GIÁNG HƯƠNG

COP15: Develop new global goals on biodiversity in a framework

From 11/10 - 15/10/2021, the 15th meeting of the Conference of the Parties to the UN Convention on Biological Diversity (COP15) was held online in Kunming (China), with themed "Ecological Civilization: Building a shared future for all life on Earth".

The meeting reviewed the outcome and implementation of the Convention on Biological Diversity's strategic plan from the previous decade regarding biodiversity and made the decision on its post-2020 global biodiversity framework. The framework includes a set of global goals, targets and indicators that will guide conservation efforts for the next 10 years. It will replace and update the Aichi Biodiversity Targets

- the previous global strategic plan for biodiversity created in 2010.

In addition to agreeing to this new biodiversity framework at COP 15, countries negotiated financing arrangements and establish a mechanism to implement the plan of action to bring about a transformation in society's relationship with biodiversity and to ensure that, by 2050, the shared vision of living in harmony with nature is fulfilled.

At the meeting, 196 countries also looked for the implementation of the protocols of the Convention on Biological Diversity (CBD) that deal with the fair and equitable sharing of benefits from the use of nature and the safe transport, handling and labelling of Living Modified Organisms. Simultaneously, the meeting addressed agenda items essential to the continued operations of the biodiversity convention and its two Protocols■

GIA LINH



MONRE proposes local authorities to strengthen the treatment of waste from the COVID-19 epidemic with the slogan “Fighting the epidemic is like fighting against the enemy”



▲ Mr. Nguyễn Thượng Hiền -
Deputy Director General VEA

The situation of the COVID-19 epidemic is being very complicated in many localities across the country. Accordingly, the amount of waste generated during the epidemic increased significantly, especially medical waste from hospitals, isolation areas..., putting pressure on local waste treatment systems. Facing this situation, in order to ensure the safety in the epidemic and environmental sanitation, the Ministry of Natural Resources and Environment (MONRE) promptly directed provinces and cities to urgently organize the implementation of plans for collection, transportation, storage and adjustment of methods of medical waste treatment to suit the situation of the COVID-19 epidemic in each locality. To find out about this issue, Vietnam Environment Administration Magazine (VEM) had an interview with Deputy Director General Vietnam Environment Administration (VEA) Nguyễn Thượng Hiền.

VEM: Facing the increasingly complicated situation of the COVID-19 epidemic in many localities across the country, how did the MONRE and the VEA advise and direct to promptly treat the amount of waste generated in localities, especially in epidemic areas?

Mr. Nguyễn Thượng Hiền: Following the direction of the National Steering Committee for COVID-19 Prevention and control and the conclusion of the Prime Minister, MONRE has coordinated with the Ministry of Health (MOH) and related agencies in completing report to the National Steering Committee to issue guiding documents on epidemic prevention and control, specifically on the management of medical waste and domestic waste from the COVID-19 epidemic in the following areas: workplaces, dormitories for workers, households, commercial centers, supermarkets, markets, restaurants, apartment buildings and at funerals.

Right from 2020, when the COVID-19 epidemic occurred, the MONRE coordinated with the MOH to issue technical guidelines related to epidemic prevention and control and infectious medical waste

management at medical facilities. The Ministry also issued documents directing, recommending and urging local authorities to strengthen the inspection and investigation, guide the collection, transportation, storage and treatment of domestic solid waste especially infectious medical waste from medical facilities, centralized isolation facilities.

Facing the situation of the COVID-19 epidemic caused by Delta mutations, the Ministry has continued to issue a number of documents guiding and recommending local authorities to increase collection and treatment of waste, especially medical waste. With the slogan “Fighting the epidemic is like fighting against the enemy”, in the guiding documents of the MONRE on the treatment of infectious medical waste, priority should be given to on-site treatment at medical facilities and clusters of centralized medical facilities in the localities that have medical waste treatment facilities and equipment in accordance with regulations, or at hazardous waste treatment facilities with the function of treating infectious medical waste, ensuring the shortest collection distance from the point of origin to the treatment facility. In case the local waste treatment facilities do not have sufficient capacity or do not have adequate infrastructure to treat medical waste from the COVID-19 epidemic, the provincial people’s committee should actively contact other local authorities having medical waste treatment facilities to support.

VEM: *With the current spike in waste, please tell us about the current regulations to ensure safety in the treatment of waste from the COVID-19 epidemic at medical facilities, centralized isolation facilities?*

Mr. Nguyễn Thượng Hiền: Currently, medical waste generated by the COVID-19 epidemic from medical facilities treating COVID-19 patients, centralized isolation areas, home isolation and other isolation areas must ensure compliance with the provisions of Decision No. 3455/QĐ-BCĐQG promulgating “Guidelines for waste management and hygiene in the prevention and control of COVID-19 epidemic”. Also, waste from workplaces, dormitories for workers, households, commercial centers, supermarkets, markets, restaurants, apartment buildings, at funerals must be collected to ensure the requirements under the guidance of the National Steering Committee for COVID-19 Prevention and control and the MOH according to the above documents. In particular, medical waste must be collected, transported and treated safely and ensured to comply with the provisions of Joint Circular No. 58/2015/TTLT-BYT-BTNMT dated 31st December 2015 of the MOH and the MONRE on medical waste management; Circular No. 36/2015/TT-BTNMT dated 30th May 2015 of MONRE on hazardous waste management and in accordance with relevant regulations.

In the documents of the MONRE, local authorities have been requested to adjust and organize the implementation of plans on collection, transportation, storage, and treatment of waste, especially for medical waste in accordance with regulations; strengthen inspection and supervision of the operation of environmental protection works for medical facilities, medical waste treatment facilities, domestic solid waste treatment facilities; disinfect wastewater after treatment at medical facilities, centralized isolation facilities and infectious medical waste treatment facilities to ensure that no pathogens are released into the environment; direct medical facilities

and centralized isolation areas to arrange collection and storage points for medical masks in accordance with regulations; instruct people to visit medical facilities for examination before leaving must dispose medical waste in storage devices to be treated in accordance with regulations to prevent the risk of spreading pathogens; strengthen inspection and supervision in order to promptly detect and prevent organizations and individuals from violations on waste management to ensure safety and prevent epidemics.

VEM: *Could you tell us about the solutions of the MONRE in the coming time to strengthen the management of waste from the COVID-19 epidemic?*

Mr. Nguyễn Thượng Hiền: To strengthen the management of waste from the COVID-19 epidemic, the MONRE will continue to request every cadre and civil servant to strictly implement the guiding documents of the Secretariat, the Government and the Prime Minister, National Steering Committee for COVID-19 Prevention and control, guidance of the MOH on epidemic prevention and control. Accordingly, the MONRE continues to coordinate with relevant agencies and local authorities to strengthen the treatment of waste from the COVID-19 epidemic to ensure environmental sanitation and epidemic prevention, including:

First, coordinate with local authorities in developing plans for collection, transportation and treatment of medical waste and organizing the implementation and supervision of the classification, collection, transportation and treatment of medical waste from the COVID-19 epidemic in the localities to ensure epidemic prevention and environmental sanitation.

Second, coordinate with the MOH and local authorities in the inspection, supervision, implementation of the collection, storage and transfer of waste from the Covid-19 epidemic at medical facilities, areas for patient treatment and care, isolation areas in accordance with regulations.

Third, continue to direct and guide hazardous waste treatment facilities with medical waste treatment functions to enhance treatment of medical waste from the COVID-19 epidemic; continue to support the collection, transportation and treatment of medical waste from the COVID-19 epidemic in case other localities do not have sufficient capacity or do not have adequate infrastructure for waste treatment.

VEM: *Sincerely, thanks the Deputy Director General!*

CHÂU LOAN



▲ Waste collection at the isolation area of the Vietnam National University Hồ Chí Minh City Dormitory



Strengthen plastic waste management in Việt Nam

On 22nd July 2021, Deputy Prime Minister Lê Văn Thành signed Decision No. 1316/QĐ-TTg approving the Scheme for strengthening plastic waste management in Việt Nam.

The Scheme's objective is to strengthen plastic waste management from the Central to local levels, contributing to the successful implementation of the National Strategy for Integrated Solid Waste Management up to 2025, with a vision to 2050 approved by the Prime Minister's Decision No. 491/QĐ-TTg dated 7th May 2018; the Prime Minister's Decision No. 1746/QĐ-TTg dated 4th December 2019 on the National Action Plan for Ocean Plastic Waste Management; the Prime Minister's Directive No. 33/CT-TTg dated 20th August 2020 on Strengthening management of reuse, recycling, treatment and reduction of plastic waste. Also, contribute to developing a circular economy model in Việt Nam with the orientation of reducing the use of single-use plastic products and non-biodegradable plastic bags; enhance reuse, recycling and treatment of plastic waste. To 2025, strive to use 100% environmentally friendly plastic bags, packaging in commercial centres, supermarkets in daily life instead of non-biodegradable plastic bags; ensure the collection, reuse, recycling and treatment of 85% of the generated plastic waste; reduce 50% of plastic waste in the sea and ocean; 100% of tourist resorts, tourist accommodation establishments, hotels do not use non-degradable plastic bags and single-use plastic products; gradually reduce the production and use of non-degradable plastic bags and single-use plastic products in daily life.

To achieve the above objective, the Scheme proposes solution tasks:

Survey and assess the state of plastic waste generation, collection and treatment and perfect policies and regulations on plastic waste management, including: Overall assessment

of the current situation of production and use of plastic products and environmentally friendly products, single-use plastic products and non-biodegradable plastic bags; Situation of production and import of products and goods containing microplastics and the impact of microplastics on the environment; Current status of plastic waste generation, collection, recycling and treatment and proposed solutions to improve management efficiency; Survey, statistics, classification and assessment of the situation of generating, collecting, treating and managing plastic waste from activities on seas and islands of Việt Nam; Implementation of tax collection activities for import and export of plastic products; Collection of environmental protection tax for the production of non-biodegradable plastic bags...

Implement communication activities to raise awareness about the harmful effects of products derived from plastic, plastic bags. The Scheme clearly states: Implement training, communication and international cooperation activities on plastic waste management, in which, promote training and communication activities to raise awareness about the harmful effects of plastic products, plastic bags and single-use plastic products to the environment, ecosystems and human health; raise awareness, change the habit of using single-use plastic products and non-biodegradable plastic bags to using environmentally friendly products. Propagate and mobilize enterprises producing and distributing single-use plastic products and non-degradable plastic bags to switch to producing and distributing environmentally friendly products; organize training, raise awareness and change the behaviour of discharging plastic waste, fishing gear and waste plastic products into the sea and ocean environment for businesses, coastal residents, fishers, sailors and tourists...

Produce environmentally friendly products through technology research and application, model deployment, plastic waste management activities. Specifically, plan and implement consistently across the country the model of shopping centres and supermarkets that do not use plastic bags or use environmentally friendly plastic bags instead of non-biodegradable plastic bags; establish and expand waste recycling organization models and movements against plastic waste. Also, research and apply advanced and modern technologies in plastic waste collection, recycling and treatment; technology to

recycle plastic waste into fuel, building and transport materials and other plastic products. Increase investment and develop technology to produce environmentally friendly products to replace plastic products; research, design, manufacture optimal plastic packaging and products to minimize the norm of plastic materials/products...

Also, according to Decision No. 1316/QĐ-TTg, Ministers, Heads of ministerial-level agencies, Government's agencies, Chairpersons of people's committees of provinces and centrally run cities, within the scope of their management responsibilities, actively plan and implement tasks according to the functions and tasks assigned by the Government; send annual reports on implementation results to the MONRE for summarizing and reporting to the Prime Minister.

The MONRE shall assume the prime responsibility for summarizing, evaluating, inspecting and supervising the implementation of the Scheme nationwide; Review, research, propose to promulgate or promulgate according to its competence regulations on plastic waste management; Research and propose a roadmap to limit the production and import of single-use plastic products, non-biodegradable plastic packaging and products and goods containing microplastics in the Decree detailing a number of articles of the Law on Environmental Protection in 2020; Research, develop and issue regulations or guidelines for the implementation of environmental regulations in the production of products and goods containing microplastics and environmentally friendly plastic bags; Monitor and evaluate the current status of plastic waste in a number of main estuaries, coastal areas and front islands with potential for tourist and marine economic development...■

NGUYỆT MINH

Currently, marine litter is present in all marine habitats with about 8 million tons, or about 3% of global plastic waste annually dumped into marine and ocean environments (Hannah Ritchie and Max Roser, 2018). Việt Nam is being considered as one of the countries with a large amount of plastic waste released into the environment and is polluting the environment, harming the ecosystem and degrading the beauty of many beaches. The Law on Environmental Protection (LEP) in 2014 does not have separate provisions on plastic waste management, but there are many related regulations on solid waste management such as regulations on solid waste classification, collection and treatment, encouraging the production of environmentally friendly products, controlling imported scrap... However, the plastic waste management still has many limitations such as not having strict control from the stage of plastic product manufacturing, product and scrap importation, the domestic solid waste collection and treatment are still weak... Overcoming these limitations, the LEP in 2020 (LEP 2020) continues to inherit the provisions of the LEP in 2014 and amends, supplements new provisions with many contents to strengthen the plastic waste control in our country. Two large groups of contents are specified in the LEP 2020, which are to limit the plastic waste generation and to effectively manage the generated plastic waste.

1. THE LEP 2020 AMENDS, SUPPLEMENTS WITH NEW PROVISIONS TO LIMIT THE PLASTIC WASTE GENERATION

Reducing the plastic waste generated right from the production stage or reducing the plastic waste generated during the production, consumption and importation of plastic products is one of the basic and long-term measures to reduce plastic waste generation. Therefore, measures such as promoting the circular economy development, encouraging recycling, reusing waste, expanding the responsibilities of manufacturers, encouraging the production of environmentally friendly products to replace plastic products and limiting the import of plastic products and plastic scrap from abroad are measures prescribed by the LEP 2020.

Developing a circular economy

For the first time, the circular economy is prescribed in the LEP 2020. The circular economy is prescribed as one of the State's policies on environmental protection, accordingly, the formulation and implementation of socio-economic development strategies, masterplans, plans, programs, schemes and projects must integrate and promote circular economy models. The LEP also clearly stipulates what the circular economy is and the responsibilities of organizations and individuals involved. Circular economy is an economic model in which design, production, consump-



New provisions in the Law on Environmental Protection 2020 to solve the plastic waste problem

PHẠM THỊ GẤM

*Department of Policy and Legislation
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tion and service activities are aimed at reducing the exploitation of raw materials and materials, prolonging the product life cycle, limiting waste generation and minimizing adverse impact on the environment. According to this definition, the stages from design, production, consumption and service, besides the goal of reducing input materials, all aim to prolong the product life cycle. When the product life cycle is prolonged with activities such as recycling, reuse, and closed its life cycle, there will be no, or very little waste generated into the environment. When the circular economy development is promoted, less plastic waste will also be generated to the environment.

To ensure the circular economy development, the LEP has stipulated specific responsibilities of relevant agencies. Ministries, ministerial-level agencies and provincial people's committees shall integrate circular economy right from the stage of formulating development strategies, masterplans, plans, programs and schemes, waste management, reuse and recycling. 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 formulation, product and goods design to production and distribution. In addition, to facilitate the smooth implementation of these provisions, the National Assembly assigned the Government to stipulate criteria, roadmap and mechanisms to encourage the implementation of the circular economy in accordance with the country's socio-economic conditions.

Encouraging plastic waste recycling and reuse

In addition to the provisions that continue to encourage waste recycling and reuse activities in general, which are stipulated in the LEP 2014, the LEP 2020 also specifically stipulates the plastic waste recycling and reuse to reduce the generation of plastic waste into the environment. Even in the principle of environmental protection, the principle of increasing waste reuse and recycling is confirmed to exploit the resource value of waste. Also, the State's policy on environmental protection also affirms the policy of strengthening scientific research, developing technology for pollution reduction, waste recycling and treatment. As for plastic waste, the LEP 2020 stipulates that the State encourages the plastic waste reuse and recycling in service of production of goods, building materials, and transportation works with policies to promote the plastic waste reuse and recycling.

Provisions on expanding manufacturer's responsibilities

In addition, the LEP 2020 for the first time has provisions on expanding manufacturer's responsibilities. Specifically, organizations and individuals that manufacture and import products and packages with recyclable value must recycle according to the mandatory recycling rates and specifications, except for products and packages that are for export or temporary import for re-export or production or import for the purpose of researching, studying or testing. These organizations or individuals may choose to recycle products and packages in one of two forms: Organize the recycling of products and packages by themselves; Provide financial contribution to the Vietnam Environmental Protection Fund to support the recycling of products and packages.

In case organizations and individuals choose the form of financial contribution, the contribution and use of financial contribution to support the recycling of products and packages must ensure the following principles: Level of financial contribution and the level of funding to support recycling are determined by volume or unit of product or package; Financial contribution used to support the recycling of products and packages is specified in Clause 1 of this Article; The receipt and use of financial contribution must be public, transparent and for the right purposes in accordance with the Law.

Regulations on expanding manufacturer's responsibilities have been applied by many countries and are highly effective in reducing generation of waste in general and

plastic waste. Especially, plastic packages in Việt Nam are generating too much plastic waste, therefore, good implementation of regulations on expanding manufacturer's responsibilities for recycling waste after generation will reduce the amount of plastic waste released into the environment.

Promoting eco-friendly products

Replacing plastic products with environmentally friendly products will reduce the risk of generating plastic waste, especially persistent plastic bags. Therefore, the LEP 2020 stipulates that environmentally friendly products, substitutes for single-use plastic products and certified substitutes for non-biodegradable plastic packages shall enjoy incentives and supports in accordance with the Law.

Restricting the import of plastic products and plastic scrap from overseas

In recent years, the increased import of plastic scrap, along with the backlog of plastic scrap at ports, has put great pressure on the environment. To solve this problem, for the first time, the LEP 2020 stipulates that the Government prescribes a roadmap to limit the production and import of single-use plastic products, non-biodegradable plastic packages, products and goods containing microplastics. With this restriction, non-biodegradable plastic products are restricted step by step from being imported into our country, avoiding the risk of generating non-degradable plastic waste.

In addition, the import of scrap from overseas has been stipulated in the LEP 2014 and is stipulated with stricter conditions to reduce the risk of losing control over scrap after being imported, causing harm to the environment. Specifically, scrap imported from overseas into Việt Nam must meet environmental technical regulations and be on the List of scrap permitted for import from overseas for use as production materials promulgated by the Prime Minister. Also, organizations and individuals may only import scrap from overseas as production materials for their production facilities and must satisfy the following environmental protection requirements: (1) Having a production facility with technology and equipment for recycling and reuse, warehouses and yards dedicated to scrap collection meeting requirements on environmental protection; having a plan to deal with the accompanying impurities suitable for imported scrap; (2) Having an environ-

mental license; (3) Having deposit for environmental protection as prescribed before the time the scrap is unloaded at the port for import via sea border gate or before the time of import into Việt Nam for other cases; (4) Having a written commitment on the re-export or treatment of scrap in case the imported scrap does not meet the requirements on environmental protection.

2. THE LEP 2020 HAS NEW PROVISIONS TO EFFECTIVELY MANAGE THE GENERATED PLASTIC WASTE

New provisions on domestic solid waste management

In recent years, the largest source of solid waste released into the environment is from domestic solid waste. With limited resources for domestic solid waste collection and treatment, the LEP 2020 has breakthrough provisions to improve the domestic waste classification, collection and treatment.

On the one hand, the Law stipulates the general requirements of waste such that waste must be managed in the entire process of generation, reduction, classification, collection, storage, transshipment, transportation, reuse, recycling, treatment, disposal; Organizations and individuals transporting domestic solid waste, which must be treated, are responsible for transporting waste to establishments with appropriate environmental functions and licenses or transferring them to other transport organizations and individuals for transportation to such establishments having appropriate environmental functions, licenses... On the other hand, the Law has its own provisions on domestic solid waste management. Domestic solid waste from households and individuals is classified according to the following principles: Solid waste capable of being reused and recycled; Food waste; Other domestic solid waste.

Households and individuals in urban areas must store and contain domestic solid waste after sorting into packages for transfer as follows: Solid waste capable of being reused or recycled shall be transferred to organizations or individuals for reuse or recycling or to establishments having the collecting and transporting functions; Food waste and other domestic solid waste must be contained, packed in packages according to regulations and transferred to establishments having the collecting and transporting functions; Food waste can be used as organic fertilizers, as animal feeds.

The Law stipulates that the classification of domestic solid waste contained in certain packages according to regulations is a new management method for domestic solid waste. This packag-



ing is the basis for strengthening the management of the classification and pricing of the packaging to collect the fee of collection, transportation and treatment services. The service fee for collection, transportation and treatment of domestic solid waste from households and individuals is calculated on the basis of: Provisions of Law on prices; Weight or volume of the sorted waste; Solid waste that can be reused, recycled and hazardous waste generated from households and individuals that have been classified separately are not required to pay for collection, transportation and treatment service fee.

New methods and approaches in domestic solid waste management, if effectively implemented, promise to improve significantly the domestic solid waste management and avoid releasing plastic waste into the environment as it is at present.

Responsibilities for waste collection and treatment of producing and importing organizations and individuals

In order to strengthen the responsibilities of producers and importers for certain types of waste with high risk to the environment produced or imported by them, the LEP 2020 stipulates that organizations and individuals producing and importing products and packages containing toxic substances that are difficult to recycle or cause difficulties for collection and treatment must make financial contribution to the Vietnam Environmental Protection Fund; The level of financial contribution is determined by volume or unit of product or packaging to support the following specified activities (except for products that are for export or temporary import for re-export or production or import for the purpose of researching, studying or testing): Collecting, transporting and treating domestic solid waste from households and individuals; Researching and developing technology, techniques and initiatives for domestic solid waste treatment; Collecting, transporting and treating packages containing pesticides.

Regulations on responsibilities of organizations and individuals involved in plastic waste collection

The LEP 2014 stipulates the solid waste collection in general, there is no separate provision on the plastic waste collection. The LEP 2020 has specific provisions on the plastic waste collection from different sources. Specifically, the Law stipulates that plastic waste generated from marine tourism and services, maritime economy, extraction of oil and gas and marine mineral resources, aquaculture and commercial fishing must be collected, stored and transferred to facilities licensed for recycling and treatment. Plastic waste must be collected and classified for reuse, recycling or treatment purpose as prescribed by Law. Unrecyclable plastic waste must be transferred to licensed facilities for treatment as prescribed. Plastic waste from economic activities at sea must be collected for reuse, recycling or treatment and must not be discharged into the sea. Organizations and individuals are responsible for limiting the use, minimizing, classifying and disposing of single-use plastic products and non-biodegradable plastic packages according to regulations; not dispose plastic waste directly into drainage systems, ponds, lakes, channels, rivers and oceans.

In addition, the LEP 2020 also has a new provision on the responsibilities for collecting plastic waste after it has been released into the environment to solve the problem of plastic waste pollution in the environment. Specifically, the provincial people's committee is responsible for directing the organization of collection and treatment of plastic waste in the area; propagating and advocating on the restriction of the use of non-biodegradable plastic packages and single-use plastic products; propagating on the harmful effects of disposing of fishing gear directly into the sea, plastic waste on the ecosystem.

In summary, the LEP 2020 has many new contents compared to the LEP 2014, specifically the provisions related to the issue of plastic waste. On the one hand, the Law has focused on new provisions, amendments and supplements to the provisions of the LEP 2014 with new approaches to solve the problem of plastic waste arising such as waste classification, collection, transportation and treatment; collection and treatment of plastic waste that has released into the environment. On the other hand, the Law stipulates many revolutionary contents to prevent and minimize the generation of plastic waste right from the production and import stages, such as: promoting the circular economy development, regulations on expanding responsibilities of manufacturers, encouraging recycling, reuse, production of environmentally friendly products, and restricting the import of plastic products and plastic scrap. Effective implementation of these provisions will bring a new step forward in the plastic waste management, protection of the environment, ecosystem and human health■

Circular economy: A solution for waste treatment in Việt Nam

Assoc. Prof. Dr. NGUYỄN THẾ CHINH
Former Director General
MSc. NGUYỄN THẾ THÔNG

Institute of Strategy and Policy on Natural Resources and Environment

Waste treatment in Việt Nam is still a difficulty to meet practical requirements. After significant efforts to find suitable solutions for waste treatment, up to now, landfill of domestic solid waste still accounts for a high proportion, about 70% compared to other methods. The question for the future is which policies and mechanisms should be applied so that waste is no longer an obsession for occupying land, causing many environmental and social problems?

The goal to be achieved is that solid waste becomes an input material for economic activities. From the experience of countries around the world and the practice in Việt Nam, the most effective approach is to encourage the application of the circular economy (CE) model instead of the “linear economy” model to solve the waste problem.

Waste generated in the economic system

In terms of physical form, the economic system receives inputs from natural resources in the natural environment through production into goods for consumption. Thus, waste is basically generated in two stages: Post-production and post-consumption. With the “linear economy” model, post-production and post-consumption waste is ultimately discharged into the natural environment. This is an outdated economic model,

causing damages to natural resources and the environment. The CE model focuses on post-production and post-consumption waste that will be recovered and put back as inputs for economic activities.

With the CE model, waste will be reused, recycled and not released into the environment. However, to implement waste reuse and recycling, it is necessary to prepare from the stage of design for production to consumption to reuse waste but taking the criterion of economic efficiency as the main basis on principles of the market.

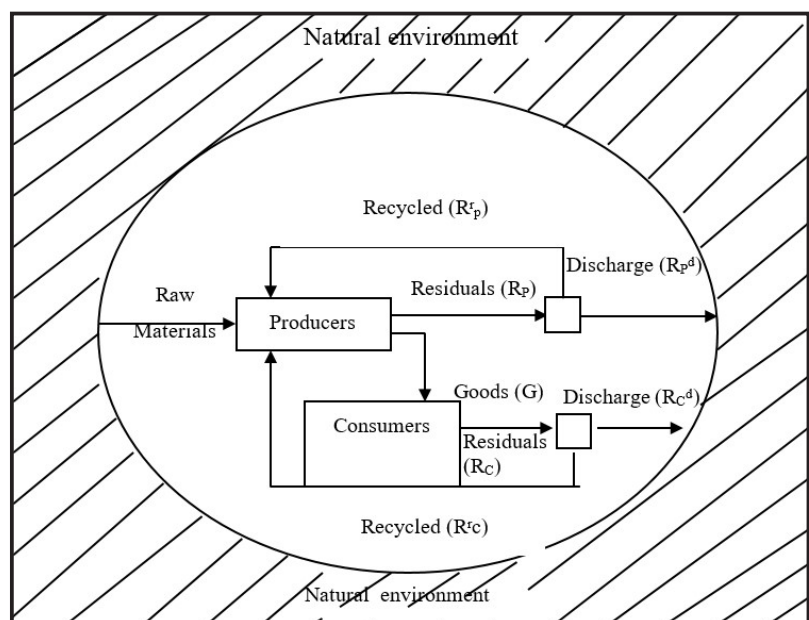
From the perspective of economic activities based on the principle of material balance, the flow of waste in the economic system is shown in Figure 1.

From the generalization of Barry C. Field’s version, it shows that to improve the efficiency and sustainability of economic activities for the natural environment, the economic system must exploit and use efficiently raw input resources from the natural environment and minimize waste from economic activities to the environment. To do so, waste must be reused and recycled. This can be done based on the principles of dynamics, the Law of conservation of matter and energy, the practicality of economic activities. The following balanced equation shows more clearly:

$$M = R_p^d + R_c^d \text{ (according to the symbols in Figure 1)}$$

Substitute \bar{M} according to the flow of matter as follows:

$$R_p^d + R_c^d = M = G + R_p - R_p^r - R_c^r$$



▲ Figure 1: Flow of waste in the economic activity

(Source: Barry C. Field, 1994)



That is the quantity of raw materials from the natural environment (M) equals to the output of goods (G) plus post-production waste (R_p) minus the total recirculated amount of the manufacturing activity (R_p^r) and consumption (R_c^r).

There are 3 main ways to reduce M , including:

First, reducing G means reducing the quantity of goods produced, which is not possible because it will reduce economic growth.

Second, reducing R_p means reducing post-production waste. Basically, there are only 2 ways to do this: research, manufacture and apply new technologies and equipment to production to generate less waste per unit of finished product, called as reducing the “waste intensity” of production. In fact, much can be done to reduce the CO_2 intensity in the production of energy input to produce a unit of product... The second way is to change the internal composition of the product. Product G now includes many different goods and services, between which there is a large difference in the waste generated in the production process. Therefore, to reduce the total amount of waste, it is necessary to change the composition and service method of G in the direction of increasing the life of G , designing the waste to be reduced as much as possible after production. The shift from a manufacturing economy to a service economy is a step in this direction.

Third, increasing $(R_p^r + R_c^r)$ means that instead of releasing production and consumption waste into the environment, the waste is recirculated, returning to the production process. Thanks to recirculation, we can replace part of the original flow of untapped materials (M), thereby reducing waste, while maintaining the flow of goods and services (G). In the modern economy, recirculation offers a great opportunity to reduce effluent, and to do so, it is necessary to innovate technology with no or little waste in the production process and waste recycling technology. CE is an ap-

proach to reduce M and increase $(R_p^r + R_c^r)$, but still ensure to increase G in the economy. Because the nature of the CE is to reduce the exploitation of natural resources, increase the reuse and recycling of waste by designing from the beginning of the production process to the final stage and without releasing waste into the environment.

Incentive policies for the implementation of the CE, opportunities to solve solid waste problems in Việt Nam

In the Document of the 13th National Congress of the Communist Party of Việt Nam, the 10-year Socio-Economic Development Strategy 2021 - 2030 on directions, tasks and solutions for socio-economic development, in the seventh content: “Effective management and use of resources; strengthening environmental protection and responding to climate change, preventing, combating and mitigating natural disasters” has clearly indicated “encouraging the development of a CE model for integrated and efficient use of the out put of the production process”. For solid waste, the specific task set is “the rate of reuse and recycling of domestic solid waste reaches over 65%”. Thus, compared with the report of the Vietnam Environment Administration in 2019 on the assessment of the situation of waste sources, waste generation and waste source control and waste management, the rate of waste treatment by landfill is 71%, incineration is about 13%, composting and other methods is 16%. By 2030, Việt Nam needs to increase the recovery, reuse and recycling of solid waste by at least 49% to achieve the set target. With the Party’s policy, in order to successfully implement the CE, by 2030, the target of 65% of domestic solid waste to be reused and recycled will be achieved.

In addition, in the Law on Environmental Protection (LEP) 2020, Article 142 on the CE, Clauses 2 and 3 stipulate that Ministries, Ministerial-level agencies and provincial people’s committees shall integrate the CE right from the stage of formulating development strategies, plans, programs and projects, waste management, reuse and recycling. Production, business and service establishments shall be responsible for establishing a management system and taking measures to reduce resource exploitation, reduce waste and improve the level of reuse and recycling of waste right from the project development, product and goods design to the production and distribution stage. The Government shall stipulate criteria, roadmap and mechanisms to encourage the implementation of the CE in accordance with the country’s socio-economic conditions.

Currently, Ministry of Natural Resources and Environment (MONRE) is developing and finalizing a Draft Decree detailing a number of articles of the LEP 2020 (Draft Decree) to submit to the Government. Thus, from the Party's policy to the LEP 2020, the promotion of the implementation of the CE to reduce waste into the environment has been clear to Ministries, sectors, provincial people's committees and production, business and service establishments.

Proposed solutions to reduce solid waste through implementing CE

In order to implement the Party's policy and legal provisions on the CE to reduce solid waste, it is necessary to implement basic solutions such as:

First, in terms of awareness, although the Document of the 13th National Congress of the Party has been issued and deployed to each Party cell, Party members have mastered the basic contents of the 10-year Socio-economic development strategy 2021 - 2030. However, in order to understand the nature of the CE, especially its role in waste reduction, it is necessary to continue to implement thematic dissemination in the seventh task of the Leadership Strategy and Party members. In particular, for the whole society, the transmission of the Party's policy and the LEP 2020 on the CE is the basic solution to reuse and recycle waste. This issue needs to be done right before the LEP 2020 takes effect in January 2022. The role of the press and communication channels must be further promoted, pioneering industries, sectors, businesses and localities that have been implementing the CE model should be

disseminated and encouraged to replicate.

Second, urgently complete the contents specified in clauses 2 and 3 of Article 142 of the LEP 2020 to include in the Decree detailing a number of articles of the Law. Specifically, for the provisions in Clause 2, it is necessary to review and consider the provisions already related to the content of this Clause, to avoid duplication and overlapping. On the other hand, for provisions on requirements for implementation to plans and programs of Ministries, ministerial-level agencies and provincial people's committees, this is a very important content, there should be specific guidance in the Decree on integrated implementation mechanism so that it is feasible.

As for the provisions in Clause 3, it is necessary to detail in the provisions of the Decree to encourage production, business and service establishments to implement the CE model to replace the current "linear economy" model. Provisions related to Clause 3 need to be linked with other provisions that have been encouraged in some other laws such as the



▲ *With the CE model, waste will be reused, recycled so as not to be discharged into the environment*



Law on Investment, the Law on Land, the Law on Enterprises... Therefore, the review of the provisions of these laws is very important to avoid overlapping or inconsistencies. However, with the content of the CE in Clause 3 focusing on reducing and improving the level of waste reuse and recycling, it is necessary to strengthen new regulations by encouraging production, business and service establishments to implement.

For Clause 4, provisions on criteria and implementation roadmap suitable to the country's socio-economic development conditions, in which, it is necessary to stipulate general criteria to determine production and business and service models under the CE as a basis for prioritizing development. On the basis of general criteria, for specific fields, there should be separate criteria according to waste groups in accordance with provisions on waste in other articles of the LEP 2020.

In addition, in the Draft Decree, the implementation roadmap should be specified for types of solid waste based on the List of solid waste classification, compared with production, business and service establishments generating that type of waste to determine which types need to implement the CE model immediately and which takes time (For example, for organic waste from dairy farms, pig raising and chicken raising... The CE model can be implemented immediately; or the facilities that generate metal waste, plastic waste, glass waste..., also need to be implemented immediately, in order to gradually switch to the CE model before 2025). For waste such as e-waste, toxic waste..., it takes time and preparation of capital to invest in new technology, so the implementation of the CE model needs a longer roadmap for the production, business and service establishment to transform.

Third, in order to implement the provisions of Article 142, LEP 2020, on the transformation and development of the CE model in waste reduction, reuse and recycling, it is necessary to prepare right now a team of experts with knowledge, expertise, understanding of the contents of the CE, as well as the im-

plementation of the CE model. Specifically, in the Ministries, ministerial-level agencies and the People's Committees of the provinces, those implementing development strategies, master plans, plans, programs and projects; waste management, reuse and recycling must have adequate knowledge of the CE. For production, business and service establishments, it is necessary to have trained technicians with enhanced capacity and update knowledge about the CE for implementation in the coming time. For the production establishments that have implemented cleaner production, continue to develop the CE model at their own establishments.

Fourth, the CE has begun to be legalized and implemented in Việt Nam, so it needs international support, initially in terms of experts, financial resources and experience to develop decrees and relevant regulations, policies and laws. Especially, access to the successful lessons of the countries that have implemented the CE model that can be applied in Việt Nam to research, learn and follow in the coming time.

In the current conditions, to reduce, reuse and recycle waste through the implementation of the CE model, it is necessary to concretize the provisions in the Decree issued by the Government, to guide the Ministries, ministerial-level agencies, people's committees of provinces, production, business and service establishments to implement. Along with that is the preparation of internal resources in terms of knowledge, capacity, financial resources and calling for international support■

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Corporate Sustainability Index - Effective risk management tool for businesses

NGUYỄN THỊ QUỲNH NGA
Office for Business Sustainable Development

The fourth wave of the COVID-19 pandemic has caused the Vietnamese business community to face unprecedented challenges. This is the time when businesses need a “transformation” in thinking and doing business. Therefore, choosing sustainable development is no longer a matter of large businesses.

With the tool to assess the level of sustainable development of businesses as the Corporate Sustainability Index (CSI), the goal of the Program on Benchmarking and Announcing Sustainable Companies in Việt Nam is not only to praise businesses with humanistic business thinking, balancing economic benefits with social development, environmental protection, but also to raise awareness and promote business community to implement sustainable corporate governance. After 5 years of implementation, the Program has attracted many businesses (about 1,500 businesses) operating in different sectors across the country to apply for participation. Being voted in the annual “sustainable companies” list of the Program is a proud title, a recognition of the Government, Ministries, departments/sectors, business community, organizations and the society on the activities of pioneering businesses that have made outstanding contributions to the sustainable development of the Vietnamese business community. This title also opens up opportunities for businesses in improving their reputation and brand, attracting human resources and new business opportunities through increasing the trust of partners, investors and shareholders, contributing to business development in a sustainable way, improving the competitiveness of businesses in the context of current international economic integration. Especially, after 5 years of implementation, the greatest success of the Program must be mentioned first of all as the change in awareness and change in business thinking when businesses have more access to the concept of sustainable development. Businesses better understand the benefits of sustainable development, it is not the cost, but above all, it is their close opportunity. According to the Better Business, Better World report, successful implementation of the 17 Sustainable Development Goals could create a market worth at least 12 trillion USD per year and 380 million new jobs by 2030.

Additionally, through important programs such as Vietnam Corporate Sustainability Forum (VCSF), National Conference on Sustainable Development, the Vietnam Business Council for Sustainable Development (VBCSD) under the Vietnam Chamber of Commerce and Industry (VCCI) has contributed significantly to promoting dialogue on sustainable development at the national scale, thereby brought sustainable development of businesses into the agenda of the Government, Ministries and sectors and put sustainable development at the heart of business strategy of the business community. According to the results obtained from the Quick Survey on Business Situation Amidst the COVID-19 Pandemic and Recommendations from VBCSD members launched by the VBCSD in early 2020, businesses with strong commitment to sustainable development in general and sustainable corporate governance through the application of the CSI in particular have been suffering less from the COVID-19 pandemic. Typical businesses of the Vietnamese business community such as PAN Group, PNJ, Bảo Việt and Traphaco all affirmed that their sustainable development orientation has promoted the most obvious effectiveness in the “heart of the storm” of the COVID-19, businesses are more resilient to the challenges of the pandemic. Thus, it is obvious that CSI is an effective risk management tool for businesses. This has been proven through the operation situation of businesses in the current COVID-19 context.

This year, VBCSD continues to coordinate with the Ministry of Labour, Invalids and Social Affairs, the Ministry of Natural Resources and Environment (MONRE) and the Vietnam General Confederation of Labour to organize the Program on Benchmarking and Announcing Sustainable Companies in Việt Nam with many changes in selection criteria. The Program will accept registration applications from businesses of all sizes and sectors across the



▲ Delegates at the announcing Ceremony for Sustainable Companies in Việt Nam 2020

country, either via delivery of hard copies or online declaration, free of charge. Accordingly, businesses participating in the Program will declare information with 119 indicators in four areas: Sustainability, Corporate governance; Environmental; Social and labour indicators. However, the most important progress of CSI 2021 is the hierarchy of indicators into three levels for different sizes of businesses: 53 M indicators are common to all types of businesses and are the minimum indicators for small and micro businesses; 28 C indicators are basic for medium and large businesses; 38 A indicators are advanced indicating that businesses, in addition to complying with the Law, have also developed a healthy business ecosystem, ensuring sustainable business benefits for partners and other stakeholders. Thus, in order to participate, small and micro businesses need to ensure their full implementation of the contents of the M indicators, depending on the actual situation of production and business, they can declare more information according to the C and A indicators to get more bonus points from the Organizer. Similarly, medium and large businesses need to make sure to declare enough information according to the M and C indicators and can declare more information according to the A indicators...

With the hierarchy of indicators of the CSI 2021 according to different business sizes, VBCSD wants to emphasize and convey the message “Sustainable development is not a distant, big thing only for large businesses, which is very practical and can be made tangible through the good implementation of the legal provisions. Sustainable development can be done at all levels of businesses. This is especially useful for domestic businesses, which are more than 95% small and medium businesses. Now, instead of spending a lot of effort on researching the “matrix” of information, businesses can envision a roadmap to implement sustainable development on a small to large scale, thereby develop their own business strategy and plan in line with current capacity and future orientation. This helps businesses save a lot of time and resources in corporate governance towards sustainable development. In that way, the spirit and culture of sustainable development have been spreading more strongly, reaching



even those businesses who once felt “falling out of the net” of development assistance.

The new feature of the CSI Program 2021 also includes two sub-awards for “Gender equality in the workplace” and “Children’s rights in business”. These are all contents that the world business community is very interested in, demonstrating the vision of “Leave no one behind” in the culture of sustainable business. Because businesses can contribute to improving the lives of children through their responsible business policies and practices, contributing to sustainable development. Respecting children’s rights as part of a business’s sustainability program will help develop stronger communities, which is essential to creating an effective, inclusive and stable business environment. With the issue of improving gender equality in the workplace, this is a significant contribution to economic growth, labour productivity and talent attraction and retention, which are key factors for the sustainable development of businesses. The Award is an opportunity for Vietnamese businesses to get closer to international standards on gender equality, aiming to develop an equal, diverse and sustainable working environment.

Additionally, VBCSD will continue to focus a lot of resources to promote businesses to deploy the circular economy model in production and business activities because this is not only a preeminent model being pursued by the international business community, but it is also an important orientation that has been incorporated into the Government’s recent economic development policies. VCCI will also work to expand the circular economy sub-award within the framework of the CSI Program in the coming years.

Sustainable development is a common global goal with 17 goals, including 169 specific targets. Việt Nam has a national action plan that integrates 17 international goals and selects its specific goals to include in the Communist Party’s documents, the Codes, and the Resolutions on socio-economic development of the Communist

Party, National Assembly and Government. Việt Nam has reached the finish line early in implementing a number of UN Sustainable Development Goals and achieved a relatively high ranking in the region (just behind Thailand). Looking at the long term, to achieve the goals set out in the next ten years, we still have many great challenges. Despite many advances, the spread of sustainable development in the country is still not high. The country currently has about 800,000 businesses, but only about 2,000 businesses (accounting for more than 2%) are members of the sustainable development business community in Việt Nam and only about 100,000 businesses (nearly 15%) have access to information about sustainable development. Therefore, CSI will be a tool to help the business community be consistent with the sustainable development goals and spread, go together to the end on this path.

In the coming time, VBCSD will continue to promote more strongly its core activities: Communication - awareness raising, research, training, international cooperation and partnership to implement the new initiatives on sustainable development for businesses. Along with that, VBCSD will also continue to organize annual forums for dialogue on sustainable development so that the business community has the opportunity to exchange and share experiences in implementing sustainable development, as well as contribute their voices to policy recommendations to create a favourable investment and business environment for businesses. In order to be able to turn risks into opportunities, support businesses to quickly catch up with the development trend of global businesses, improve competitiveness to be resilient domestically and reach out to the world, VBCSD will focus its resources on implementation of 2 orientations: Promoting the implementation of the circular economy model in Việt Nam and developing a business community with a sustainable corporate governance foundation. Those are the “shortcuts” that Vietnamese businesses can “leapfrog”.

The reality of the Vietnamese business community’s operations in the context of the complicated developments of the COVID-19 pandemic also shows that businesses that develop their own governance model towards sustainable development will be more resilient and stronger, there are even businesses that not only stand firm, but also find opportunities to break through and overcome. CSI has not been “framed” after six years of voting and the change will continue as the vision of “Leave no one behind” will also bring other important changes to the strategic thinking of the business community ■



Strengthening national capacity in conservation and sustainable use of genetic resources

In order to contribute to the conservation and sustainable use of biodiversity, in the past time (October 2016 - May 2021), the Vietnam Environment Administration (VEA) has implemented the Project “Capacity building for ratification and implementation of the Nagoya Protocol on access to genetic resources and benefit sharing in Việt Nam (ABS)”. The Project has just ended with the achieved results such as development of a system of policies and documents on management, access to genetic resources and benefit sharing; Support to establish mechanisms for accessing genetic resources and benefit sharing, especially, the pilot implementation of the public-private partnership model on access to genetic resources and benefit sharing in Lào Cai. On this occasion, Vietnam Environment Administration Magazine (VEM) had an interview with Mrs. Hoàng Thị Thanh Nhân - Deputy Director of the Nature and Biodiversity Conservation Agency, Deputy Director of ABS Project.

VEM: *Could you please tell me, what does the implementation of the ABS Project mean in the current context of Việt Nam?*

Mrs. Hoàng Thị Thanh Nhân: The Nagoya Protocol on access to genetic resources and fair and equitable sharing of benefits from the use of genetic resources was adopted at the 10th Conference of the Parties to the Convention on Biological Diversity on October 29th, 2010, in Nagoya, Japan.

The objective of the Nagoya Protocol on ABS is to promote fair and equitable sharing of benefits arising from the use of genetic resources, in particular, emphasizing the sovereignty of the providing countries and the responsibility of the users who access to genetic resources must share benefits with providers of genetic resources, contribute to biodiversity conservation and sustainable use of its components.

Việt Nam is one of the biodiversity centers of the world with many precious and endemic genetic resources. Especially, genetic resources are even more meaningful to Việt Nam when the country's economy is still heavily dependent on natural resources and agriculture still accounts for an important part of the GDP. Many genetic resources of Việt Nam have been sent abroad for storage, research and development of commercial products. However, before the Nagoya Protocol took effect, Việt Nam did not have enough legal corridor to control and protect its sovereignty over the loss of genetic resources.

In order to promote the protection of the country's rights to genetic resources within its territory, Việt Nam has ratified and became the 31st member to join the Nagoya Protocol on access to genetic resources and fair and equitable sharing of benefits from the use of genetic resources. As required by the Protocol, the Parties should establish a legal system, administrative agencies and establish favorable conditions to promote ABS. Ministry of Natural Resources and Environment (MONRE) is the national focal point to advice the Government on implementation of these requirements.

The Project “Strengthening capacity for the ratification and implementation of the Nagoya Protocol on access to genetic resources and benefit sharing in Việt Nam” funded by the



▲ Represent of Sapanapro Company and ethnic groups grow raw medical plants



Global Environment Facility was implemented in the period 2016 - 2021, that has timely supported the MONRE to carry out the above task, contributing to support the strengthening of national capacity in the implementation of the Nagoya Protocol on access to genetic resources and fair and equitable sharing of benefits from the use of genetic resources.

Through the Project, the legal framework on ABS was formed, the awareness and capacity of stakeholders were developed and activities to implement the ABS Protocol were effectively implemented.

VEM: *Could you tell us about some outstanding results of the ABS Project?*

Mrs. Hoàng Thị Thanh Nhân: After 4 years of implementing the ABS Project, many activities have been implemented and achieved remarkable results, specifically:

Forming a legal framework for ABS management: Legal documents have been developed, submitted for promulgation and implemented within the support of the ABS Project including Decree No. 59/2017/ND-CP on management access to genetic resources and benefit sharing from the use of genetic resources, Circular No. 10/2020/TT-BTNMT providing guidance on reporting forms on access to genetic resources and benefit sharing, Circular No. 15/2019/TT-BTNMT stipulates the organization and operation of the Council for appraisal of dossiers of application for a license to access genetic resources for research for com-

mercial purposes and commercial product development. This is the necessary legal framework to carry out activities of accessing genetic resources and sharing benefits in Việt Nam.

Capacity to enforce ABS regulations has been strengthened:

Through the ABS Project, the capacity for management of access to genetic resources and benefit sharing of state management agencies, especially, the two national competent authorities, MONRE and the Ministry of Agriculture and Rural Development, has been enhanced to handle dossiers, applications for licensing access to genetic resources and benefit sharing, dossiers of transferring genetic resources abroad. Not only that, the ABS Project also promotes cooperation between national authorities and other agencies in the management of genetic resources and traditional knowledge associated with genetic resources such as the Department of Science and Technology for economic technical branches, the Department of Intellectual Property (Ministry of Science and Technology), Institute



▲ The Project supported Sapanapro Company to produce Dao's Spa pain relief massage oil



of Medicine (Ministry of Health)... In addition, the ABS Project also supports the establishment of tools to support management of access to genetic resources such as ABS website, national genetic resource database management software...

Awareness of ABS has been raised: Through communication, training and awareness raising programs, information about ABS has been disseminated to many stakeholders, including relevant authorities such as natural resources and environment, science and technology, agriculture and rural development at Central and local levels, research institutes, universities, private companies operating in the field of ABS. As a result, thanks to understanding of relevant stakeholders, the process of implementing ABS regulations is facilitated.

Creating a public-private partnership model on access to genetic resources and benefit sharing: In particular, the project has successfully implemented a pilot model of public-private partnership on access to genetic resources and benefit sharing in Lào Cai Province. Accordingly, the pilot project supports the establishment of ABS agreements (contracts), including: Supporting Sapanapro Company to develop the product of Dao's Spa pain relief massage oil. Benefit obtained from the commercialization of Dao's Spa Massage products is shared with local people in two forms: Benefit sharing contract between Sapanapro Company - a product manufacturing and trading products and 9 H'Mông and Dao healers - who provide knowledge about medicinal plants/pain relievers as the initial basis for research and product development; Contract on access to genetic resources and benefit sharing between Sapanapro Company and groups/households that grow and collect raw medicinal plants. These contracts have been negotiated, agreed between the parties and established in accordance with the form specified in Decree No. 59/2017/ND-CP.

Overall, the Project's results have contributed positively to the implementation of the Nagoya Protocol on ABS in Việt Nam and shared experiences at regional and international forums.

VEM: *How do you evaluate the effectiveness, impact and sustainability of the Project?*

Mrs. Hoàng Thị Thanh Nhân: The implementation of the Project has created a legal environment to develop the market for access to genetic resources and ensure the fair and reasonable rights and interests of all parties when accessing genetic resources in Việt Nam. The sustainability of the Project is reflected in the formation of a favorable legal environment for the implementation of ABS, raising the awareness of stakeholders and building the capacity of the competent authorities in Việt Nam to implement requirements on access to genetic resources and benefit sharing from access to genetic resources, especially in the implementation, compliance monitoring and supervising within the framework of national ABS regulations. Providers will be more aware of the value of the genetic resources in their possession and will be more competent in their ability to negotiate with users in consistent with ABS principles. Users will be more aware of their responsibility to share genetic resource benefits with providers, thereby creating Mutual Agree Terms (MATs) to make the use of genetic resources transparently for research and commercial purposes, as well as ensuring the benefits from the use of genetic resources in fair and equitable sharing between the state and the community. This will create the basis for ensuring the sustainable use of genetic resource and ABS management, contributing to biodiversity conservation and social security.

VEM: *From the results of the Project, what solutions would you like to suggest to effectively manage access to genetic resources and fair and equitable sharing of benefits arising from use of genetic resources in Việt Nam?*

Mrs. Hoàng Thị Thanh Nhân: In order to effectively manage access to genetic resources and the fair and equitable sharing of benefits arising from the use of genetic resources in Việt Nam, in my opinion, it is necessary to disseminate experiences and replicate the model of public-private partnership in genetic resources conservation and ABS; Continue to raise awareness of ABS, especially for the business community and relevant researchers to understand and implement ABS regulations; Establish mechanisms to protect traditional knowledge associated with genetic resources; Amend inappropriate content in the Law on Biodiversity on issues related to ABS, continue to research and to develop a mechanism to use benefits from ABS to support biodiversity conservation.

VEM: *Sincerely, thank you!*

NGUYỄN HẰNG

It is necessary to develop a clear and specific process on confiscating, handling and rescuing live tigers captured in Việt Nam

Prof. Dr. ĐẶNG HUY HUỖNH

Vietnam Association for Conservation of Nature and Environment

In the early days of August 2021, Nghệ An Provincial Police discovered and confiscated 24 tigers that were illegally bred and transported in 2 districts of Diễn Châu and Yên Thành. Unfortunately, eight tigers died during the confiscation process, raising public questions about the responsibility of the parties involved in the tiger's death. However, from the point of view of conservation, what is needed now is to draw lessons from the rescue and conservation of tigers, it's not just the story of the dead tiger.

THERE SHOULD BE A FAIR VIEW AROUND THE DEATH OF 8 TIGERS

For many years, the three districts of Diễn Châu, Yên Thành and Quỳnh Lưu have been known as the hottest spots in Việt Nam for the illegal tiger farming and trade. After the investigation and monitoring process, on 1st August, the Nghệ An Provincial Police arrested 2 people for illegally transporting 7 tiger cubs from Hương Sơn District, Hà Tĩnh Province to Nghệ An for consumption. Then, on August 4th, Nghệ An Provincial Police mobilized many forces to coordinate with functional agencies to inspect two houses in Đô Thành Commune (Yên Thành District, Nghệ An Province) and discovered that they were raising 17 adult tigers, each weighing hundreds of kilograms. These tigers, after being

anesthetized, examined and sampled for assessment, were transported to two eco-tourism areas in Diễn Châu District (Nghệ An) to take care of. However, unfortunately on August 6th, the authorities confirmed that 8 of them had died. These are two of many cases of Law violation related to tigers discovered and handled by the police force in Nghệ An Province recently.

The cause of the eight tigers' deaths has not yet been determined. However, initially, experts assumed that there were some possible causes for the death of 8 tigers, such as: Prolonged anesthesia, long-distance transportation in hot weather affecting the health of tigers, farmed tigers have weaker health than wild tigers... The investigation showed that the confiscated tigers lived for a long time in conditions of cages, care and inappropriate food. Each individual with an average weight of 200 - 250kg, but has to live in cramped, moldy, lack of light and do not enjoy basic animal rights. It is these living conditions that seriously affect their physical and mental health, increasing the risk of diseases

such as obesity, osteoarthritis, cardiovascular and neurological depression.

The discovery of 17 tigers and those who specialize in captive breeding and trading of tigers is a big step forward for the authorities of Nghệ An Province to eliminate the situation of captive breeding and illegal tiger trade that has been very complicated in Việt Nam in general and Nghệ An in particular. However, besides that, there are also conflicting information and opinions, there are opinions not in favor of illegal tiger farming and opinions in favor of illegal tiger breeding



▲ The case of 17 tigers was "rescued" in illegal captive households in Nghệ An Province



facilities, blaming the authorities for the deaths of 8 tigers. However, through this incident, we need to have a fairer view on this issue.

First of all, it is necessary to clearly recognize that the possession and trade of tigers and tiger products are an illegal act and criminally handled under Vietnamese Law. Therefore, the concurrence and support for illegal tiger farming facilities means that it does not respect the Law system in Việt Nam, as well as abets wrongdoings, causing serious and long-term consequences for tiger conservation in Việt Nam and around the world. Only when the use of tiger products and the illegal trade, transportation and keeping of tigers are prevented, can conservation of this group of species be effective. Without the above-mentioned arrests, not only all 24 tigers would be killed, but in the future, hundreds of other tigers would continue to be held captive and killed to gain illicit profits. It can be said that this arrest is the largest number of tigers in captivity and illegally transported in Việt Nam ever. Nghệ An Province's police are fierce in their work in sweeping and handling illegal wildlife trade, transportation and keeping activities in general and tigers in particular in order to join hands in Vietnamese wildlife conservation shows the spirit of respect for the Law and is highly appreciated.

Second, facilities that keep, or breed, tigers with the intention of providing tigers, tiger parts and products for commercial purposes, not conservation purposes. These tiger farms have no conservation value and are creating a major barrier to the protection and restoration of wild tiger populations, through stimulating markets for tigers and tiger products, as well as normalize the trade and use of tigers. This makes it difficult for Law enforcement and also abets the transcontinental illegal wildlife trade. It is the fourth largest type of crime in the world, behind only arms trafficking, drug trafficking and human trafficking. The growth of the wild species market has pushed many rare animals to the brink of extinction such as Java one-horned rhinoceros, Indochinese tiger, Asian elephant, Sao la, sarus crane...

Third, the tigers confiscated this time were born or domesticated in captivity, so they have lost all their wild instincts and natural behaviors. It can be confirmed that tigers in captivity do not have or have lost the ability to hunt and survive in the wild, leading to their very low chance of



▲ 7 tiger cubs are being cared for in special care at Pù Mát National Park's Wildlife Rescue Center



survival when they are released back into the wild. To survive, they need the skills of running, hunting, stalking and defending the territory. The release of these tigers back into the wild increases the risk of tiger attacks and endangers humans. Not only that, but the released tigers will also bring negative effects to the wild tiger population and other animals. Recessive gene in individuals born of inbreeding can affect and cause undesirable changes to the natural genetic resources. In addition, pathogens arising from illegal captive breeding, transportation and trade can spread dangerous diseases to wildlife and humans.

Fourth, transferring these tigers to licensed units with good care conditions and facilities that ensure animal welfare is the most appropriate and humane choice at the moment. In addition to provide a better life for them, opening for visitors to provide a financial resource to support animal care, as well as raising public awareness about wild nature conservation. However, in reality, not many units agree to receive these individuals. Most of the large zoo and safari units in Việt Nam have received enough tigers within the allowable limit. In addition, the cost of food, care and ensuring a suitable habitat for tigers is very high. This is a great burden challenging in transferring and receiving of confiscated tigers. Wildlife Rescue Centers managed by Government Agencies or non-profit organizations are no exception. Most of the centers have limited space, only receive a certain number of animals, so they cannot accept all the animals that are not able to re-release.

Some recommendations from the case of arresting captive tiger in Nghệ An

Currently, the legal regulations related to the illegal captive breeding, storage, transportation and trade of wildlife have basically been completed. Along with the Penal Code, the Law on Handling of Administrative Violations, the Law on Forestry, the Law on Biodiversity..., relevant legal documents on management of endangered, precious and rare plants and animals have also been widely disseminated and propagated for Law enforcement agencies and people to implement. Although there have been positive changes in the Law, people's awareness has been enhanced, but in reality, there are still many challenges in protecting rare and precious wildlife, more urgent and drastic solutions are needed to end this situation.

From the tiger capture incident in Nghệ An, it is necessary to draw profound lessons on animal rescue. It needs to develop clear, scientific procedures for the confiscation, handling and management of live tigers captured in Việt Nam, including their transfer to reputable rescue centers (not allowed to breed), take individual identification samples so that they can be compared with existing databases and continue to monitor to ensure that these tigers are not returned to the illegal market.

Conduct an inspection of existing tiger holding facilities. According to WWF, there are about 300 tigers in captivity in Việt Nam. Identifying all captive tigers by attaching an electronic chip, collecting genetic samples and take pictures to identify each individual's characteristic stripes to compile into a common database of captive tigers. In this way, it is possible to trace the origins of tigers in the market based on the database, while ensuring that tiger breeding facilities do not serve the illegal demand for tigers and products from tigers.

Private tiger breeding facilities should be closed, except for scientific research, education and conservation purposes. In addition, it is necessary to tighten the licensing of commercial wildlife farming; revoke licenses for tiger farms without sufficient legal evidence; strictly handle local officials who corrupt, cover up and collude for illegal tiger farming activities.

Enhance the responsibility of local authorities in controlling, managing and ending the illegal wildlife trade and consumption in the area. There should be strict penalties for violators. Strengthening the fight against internet crime related to wildlife trade, by shutting down websites that contain information for sale, advertisement, or purchase, selling wildlife; strengthen monitoring and block personal pages on social networks used to sell wildlife, including tigers.

Researching and completing legal provisions to improve the efficiency of state management of wildlife farming, including endangered, precious and rare species; perfecting the Law on Prevention and Handling to create a deterrent; strengthen propaganda on the practice of not hunting, catching, buying, selling, transporting, slaughtering, consuming, storing, advertising or infringing upon wild, endangered and rare animals and plants.

Increase resources in protected areas to prevent poaching and restore tiger prey populations to prepare adequate and safe habitats for small populations in the wild and to re-release tigers into the wild in Việt Nam in the future.

Wildlife conservation in general and tiger conservation in particular is a noble gesture of human towards nature in the era of the industrial revolution 4.0■



Environmental effects of some toxic chemical incidents in fertilizer production in the world and lessons learned for Việt Nam

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Toxic chemical incidents are part of environmental incidents arising in the course of human activities due to the leakage, fire, explosion, release and emission of toxic chemicals causing serious effects on the environment, human property and life. In recent years, in some countries, there have been toxic chemical incidents related to fertilizer production activities.

The article presents the analysis and assessment of the environmental effects of a number of toxic chemical incidents in fertilizer production that have occurred in the world in recent years. Thereby synthesizes some experience for Việt Nam in implementing measures to prevent and limit the environmental effects caused by these chemical incidents.

1. OVERVIEW OF TOXIC CHEMICAL INCIDENTS IN FERTILIZER PRODUCTION

Chemical fertilizer production includes production of nitrogen, phosphorus and potassium fertilizers and compound fertilizers (DAP, NPK). However, the production of nitrogen, phosphorus and DAP fertilizers causes many toxic chemical incidents. In contrast, the production of potassium and NPK fertilizers has less environmental impact and causes less chemical incident to the environment.

The production process of chemical fertilizers such as superphosphate, urea nitrogen fertilizers, DAP fertilizers, needs to produce or use intermediate materials/products that are toxic and dangerous compounds such as ammonia (NH_3), ammonium nitrate (NH_4NO_3), phosphoric acid (H_3PO_4)... The technological process of chemical fertilizer production has many stages using high pressure and high temperature, contains many risk factors, potential hazards dangerous to people, property and the environment. These are potential hazards that cause chemical emissions to the environment and the risk of environmental incidents.

In addition, the fertilizer production process, specifically the production of intermediate products, releases waste containing toxic chemicals, causing serious effects on the environment and human health. For example, in the production of phosphoric acid or phosphorus fertilizers, phosphogypsum waste (GYPs) is produced from dissolving phosphate rock in an acidic solution to form phosphoric acid, which contains many toxic components.

Therefore, the fertilizer production process (specifically, nitrogen, phosphorus and DAP fertilizers), has the potential to cause the following toxic chemical incidents:

- Production of nitrogen fertilizers: causing toxic chemical incidents such as NH_3 , NH_4NO_3
- Production of phosphorus fertilizers (superphosphate) and mixed DAP fertilizers: causing toxic chemical incidents such as yellow phosphorus (P_4); NH_3 (for DAP fertilizers); GYPs waste

The origin and cause of these problems may come from:

- Chemical storage or transport processes
- Chemical - related metabolic processes (production, reaction).
- Physical production processes that use chemicals as agents (deep cooling, heat preservation...).
- Industrial processes that generate highly toxic (chemicals) or hazardous waste (fire, explosion);
- Areas where transportation activities are involved (wharves, pumping stations, chemical transfer stations...).

For example, the NH_4NO_3 chemical explosion incident due to the following reasons: Exposure to strong shocks (from the shock waves of nearby explosions); Exposure to high temperatures in the absence of oxygen (in a closed pipeline); A smaller explosion can trigger an explosion with larger amounts of NH_4NO_3 stored nearby.



2. ENVIRONMENTAL EFFECTS OF SOME TOXIC CHEMICAL INCIDENTS IN FERTILIZER PRODUCTION IN THE WORLD

In the world, in recent years, there have been a number of chemical incidents from the production of chemical fertilizers that have caused serious damages to the environment, human health and property, for example: Explosion of chemical warehouse containing ammonium nitrate (NH_4NO_3) at AZF Company, Toulouse (France) in 2001; Ammonia (NH_3) explosion at the DAP Fertilizer Plant of Chittagong Urea Co., Ltd., Bangladesh; Phosphogypsum waste (GYPs) spill at ICL's Rotem Fertilizer Plant in the Negev region of Israel in 2017; Leakage of GYPs wastewater at Mosaic Fertilizer Plant, Florida, USA in 2016.

a) NH_4NO_3 explosion incident at AZF Fertilizer Plant, Toulouse, France

The AZF Fertilizer Plant is located in an industrial park, South of Toulouse, France, about 3km from the City centre and was established in 1924. The main activity of the Plant is to produce industrial nitrogen and nitrate fertilizers and synthetic compounds containing chlorine.

At 10:10 am on 21st December 2001, a series of explosions occurred at the Company's warehouse area No. 221, where 300 tons of NH_4NO_3 were stored. The entire Plant was destroyed, creating a crater about 7m (23ft) deep and 40m (131ft) in diameter.

The big explosion caused a large impact to an area many kilometres away, with a corresponding magnitude of 3.4 on the Richer scale. The explosion released a large amount of NH_3 gas, polluting the air, water and soil environment.

- *For the air environment:* Significant dust falls from equipment installation locations and craters observed outside the plant. A large cloud of dust from the explosion and red smoke spread to the Northwest. Atmospheric pollutants released after detonation lead to the formation of nitric acid (HNO_3), ammonia (NH_3), nitrogen dioxide (NO_2) and nitrous oxide (NO_2). Atmospheric monitoring results performed by ORAMIP (local air quality measurement laboratory) show that the parameters of HNO_3 , NH_3 , NO_2 , N_2O in the vicinity of the AZF Plant all exceed the permitted standards. For the NO_2 value, the monitored value is $200\mu\text{g}/\text{m}^3$.

The emission of NO_2 , NH_3 gases and particles released by the explosion are the cause of temporary eye diseases (such as conjunctivitis, vision defects) and respiratory diseases (such as tracheitis) in the people living around the Plant area. These health problems seemed to decrease within 5 weeks of the explosion.

The explosion at the AZF Plant caused many casualties; 21 people at the AZF Plant area; 1 people at SNPE and 9 people outside the AZF Plant site (including 2 people hospitalized) were killed after the explosion. In addition, about 30 people were seriously injured, of which 21 had to be hospitalized for more than 1 month.

- *For the water environment:* The explosion destroyed the NH_4NO_3 solution tanks and caused the leakage of nitric acid (HNO_3) into the water environment. On the day of the explosion, the release of HNO_3 into the Garonne River was recorded, which severely polluted the River. Out of 120 parameters measured in the Garonne River, only increase in NH_4 , NO_3 and COT parameters was observed. The highest values were observed in the section of Garonne River near the incident site of the AZF Plant. Contamination was determined for NH_4 , 331mg/l in the River section and 16mg/l in other areas of the Garonne River; for NO_3 , 1,277mg/l in the River section and 63mg/l in other areas of the Garonne River; for COT, 23mg/l in the River section and 8.7mg/l in other areas of the Garonne River.

NH_3 concentration in the Garonne River has exceeded the permissible value, affecting the water supply for people living around the Garonne River area. An instrument used to monitor ammonia levels from water supplied from the Garonne River showed that the water in the area was significantly contaminated with ammonia.

- *For the soil environment:* The explosion made the soil environment in the area contaminated with hydrocarbons, lead, arsenic and mercury. In July 2006, after 2 years of work, more than 750,000m³ of soil has been treated, nearly 90% of contaminated soil has been treated through on-site washing at 805°C. The pollution remediation process was completed in 2008, with an estimated cost of the clean-up at €100 million.

- *For the aquatic ecosystem:* NH_3 contamination has caused many species of fish in the Garonne River to die. Fish mortality due to the effects of NH_3 contamination in water is associated with a high pH (up to 8.6), thus promoting chemical balance towards the non-ionized form of NH_3 (free NH_3), very toxic to fish. It is estimated that about 9 tons of NH_3 seriously contaminate the Garonne River and affect the aquatic ecosystem.



- *Estimated damages:* 6 months after the explosion, the direct damages from the explosion estimated include: Nearly 1,300 companies, 20,000 workers were affected. The French Government has spent €10.4 million to help affected companies and proposed €1.7 million to exempt this group of people from tax. According to a statement by insurance companies, the total estimated damages from the explosion were between €1.5 and 2.3 billion.

The environmental damages caused by this toxic chemical incident have not been specifically and fully estimated. Up to now, the environmental damages have only been estimated for the soil environment through the actual costs paid to restore the soil environment around the incident area and damages to the water environment through methods to restore and clean the water environment.

b) NH_3 explosion at the DAP Plant of Chittagong Urea Fertilizer Limited (CUFL), Bangladesh

Around 10 pm, on 22nd August 2016, a large amount of toxic ammonia gas was released due to the overpressure explosion of a 500-tons ammonia tank from the Di-ammonium Phosphate (DAP) Plant. The Plant was established in 2006 on the basis of Chittagong Urea Fertilizer Limited (CUFL) located on the South bank of Karnaphuli River, Bangladesh.

The DAP-1 Plant has a production capacity of 1,600 tons of DAP per day. The Plant has two ammonia tanks (NH_3) with a capacity of 500 tons to supply to the fertilizer production through pipelines. At the time of the incident, one of the tanks storing 325 tons of anhydrous NH_3 exploded.

Cause of explosion: There are many causes that can lead to tank explosion, for example, faulty tank, internal corrosion, external corrosion, flow interruption, control valve failure, drain valve failure, overheating temperature/overpressure and/or error caused by human. However, an explosion at the CUFL Plant's NH_3 tank indicates that the tank was over-pressurized due to an operational error or mechanical failure. In addition, there is no additional layer of protection that can prevent or minimize the release of NH_3 and minimize the consequences.

The NH_3 explosion spread a large amount of NH_3 gas into the air environment, forming giant clouds that spread, affected the ambient environment.

For the air environment: Based on published reports, ammonia gas concentrations were recorded as 600 ppm in the vicinity 5 hours after the incident, still well above the tolerable or threshold limit value (TLV). This indicates a fairly high concentration of ammonia at the time of the explosion.

It is also worth noting that the toxic NH_3 gas spread for several kilometres and the wind carried this gas to the other bank of the Karnaphuli River, causing nearly 250 people affected by inhalation of the toxic NH_3 . Fifty-two of them were Plant workers who were required to be hospitalized the same night. Locals in the affected area have severe eye irritation and breathing problems.

For the water environment: Fire fighters are trying to prevent emissions by spraying water on the fire to dissolve NH_3 into the water. Diffusion of ammonia into water bodies will increase the pH and have a negative impact on the overall aquatic ecosystem. The environment and biodiversity in the area surrounding the incident were seriously affected. The fishermen found a lot of dead fish in the nearby polluted ponds.



▲ Fishermen collect fish from the river, about 50 meters from the Plant, died because of NH_3 explosion at DAP Plant, Chittagong (Bangladesh) on 22nd August 2016



c) Phosphorus spill at ICL's Rotem phosphate Fertilizer Plant in the Negev region of Israel

ICL (Israel Chemicals Ltd.) is a global company in fertilizers and chemicals. ICL products and solutions are used in key agricultural and industrial markets such as phosphorus, potassium and special fertilizers that ICL produces and sells, very important for farmers around the world, improving crop yield and quality.

On 30th June 2017, a serious environmental incident occurred at ICL Rotem, a subsidiary of ICL located in the Negev region of Israel. According to ICL's report, an embankment has partially collapsed at the Plant's lake No.3. This reservoir is used to store GYPs wastewater, a by-product of phosphate fertilizer production. Immediately after the incident, the Company was ordered to halt operations of the relevant reservoir and stop the flow of wastewater. However, it is estimated that around 100,000 cubic meters of GYPs (equivalent to 35,000 tons) have been released into the surrounding environment. GYPs waste contains many impurities (residual acids, fluorine compounds, trace elements such as mercury, lead and radioactive components). These impurities and significant amounts of phosphates can be released into the environment (soil, groundwater and surface water).

- *For the water environment:* The incident caused wastewater containing toxic substances to flow into the Ashalim Stream bed. The results showed that the acid concentration was high in the Ashalim Stream bed after the incident. The highly acidic toxic water flows through the desert, picking up anything in its path, before flowing into a reservoir a few dozen kilometres from the Dead Sea.

Local authorities estimated more than 200 million NIS to rehabilitate the river and its ambient environment. Toxic, highly acidic liquid from the ICL Rotem Plant seeps into groundwater systems, or aquifers. Groundwater contamination can appear many years after the initial contamination event occurs.

- *For the soil environment:* After the incident, the ground is still dyed a dark brown colour and emits an unpleasant sour smell, more intense than a chlorinated swimming pool.

- *For the ecosystem:* Toxic wastewater destroyed everything in its path as it crossed the desert, poisoning one-third of the local ibexes as well as other animals and plants.

The ecosystem surrounding Bokek Nature Reserve was also severely affected. Bokek Nature Reserve's freshwater habitat once allowed rare flora and fauna communities to thrive in a dry and salty environment. But salt level rose from about 500 - 600mg/l in the 1990s - at that time, the highest permissible level for drinking - to 4,550mg/l recorded in the aquifer at the end of 2017. According to the Court's ruling, the ICL must pay an amount of US\$400 million to compensate for damages caused by water pollution in the Bokek conservation area.

d) GYPs wastewater leakage incident at Mosaic Fertilizer Plant, Florida, USA (2016)

Mosaic Fertilizer Company, Florida is based in Tampa, Florida. Mosaic is currently the largest producer and distributor of phosphorus and potassium fertilizers in the United States and around the world.

According to a report by Mosaic, on 27th August 2016, their workers discovered a pit in the GYPs waste storage area at the New Wales Facility, Mulberry Town, Florida. The sinkhole is as deep as Florida's groundwater, which is the source of drinking water for millions of people in this State. The hole allowed wastewater containing GYPs to leak into the drainage system and gradually seep into the State's aquifer. An estimated 980 million litres of radioactive water passed through the sinkhole, leaking into the main groundwater source, one of Florida's main aquifers.

GYPs waste leakage has a huge impact on the surrounding environment, ecosystems, specifically wetlands, water quality and quantity as well as wildlife habitat.

- *For the water environment:* The incident causes pollution to the surface water environment of the Alafia River, with pH of two, the wastewater of the discharge process significantly changes the pH through-



▲ An animal carcass was found near Ashalim Stream after the ICL incident on 30th June 2017



out the length of the Alafia River. The incident seriously affected surface water quality within a radius of about 7 miles. An excess of phosphorus in the aquatic environment caused algal blooms and increased chlorophyll concentrations in both rivers and bays until May of the following year.

- *For the ecosystem:* The incident resulted in large numbers of fish deaths along the length of the River from Mulberry to Hillsborough Bay including approximately 1.3 billion small fish (fish as bait, food for other animals) and shellfish (shrimp, crab) and 72,900 fish caught. With habitat loss and mass mortality of small fishes that are food for various species, the spills can also cause fish-eating birds in the Alafia River and surrounding wetlands to indirectly affect, including reproductive activity.

In addition, the open waters of Hillsborough Bay that provide important habitat for seabirds, marine fish and mammals have also reported negative impacts.

3. SOME EXPERIENCE FOR VIỆT NAM

It is obvious that the above incidents have leaked and released a large amount of toxic chemicals (such as NH_3 ; NH_4NO_3 ; GYPs waste...) into the environment. The leaked chemicals will then be released into the atmosphere or seep into the soil or groundwater, river water causing serious damages. In addition to direct damages to the natural environment, the above incidents also cause damages to human property and health due to pollution and degradation of the natural environment.

In Việt Nam, in recent years, there have been a number of toxic chemical incidents in fertilizer production (mainly in the production of nitrogen, phosphorus and NPK fertilizers). These toxic chemical incidents mainly arise from production materials (NH_3); yellow phosphorus (P_4) and GYPs waste. Some typical incidents are: Spill, leak of GYPs waste at Lâm Thao Superphosphate and Chemical Company (2009); NH_3 leak incident at DAP Joint Stock Company of Đình Vũ Industrial Park, Hải An District, Hải Phòng City (2011); The incident of spilling GYPs waste dam causing a big fire at Lào Cai Yellow Phosphorus Joint Stock Company in February 2012; Breaking incident of GYPs dam at DAP Fertilizer Company, Đình Vũ, Hải Phòng (2013); NH_3 leak incident at DAP Joint Stock Company No. 2, Tăng Loỏng Industrial Park, Bảo Thắng District, Lào Cai (2015)...

In the coming time, in order to limit the environmental effects caused by toxic chemical incidents in fertilizer production, enterprises in this sector need to:

First, need to develop a plan to prevent and respond to chemical incidents suitable to the type and scale of production and business activities of the enterprise.

Second, strictly comply with legal regulations and guidance of competent agencies on the implementation of safety measures in the management and use of chemicals, especially toxic chemicals. Because when a chemical incident occurs in fertilizer production, the level of damages to the water, soil, air environment, ecosystem and other indirect damages such as human health, life or infrastructure is great.

Third, in case of incidents, it is necessary to do early zoning of the effects, especially for plants located in sensitive locations such as near water sources (rivers, streams, ponds, lakes), or placed in the windward position... The implementation of zoning will soon prevent and limit the spread of chemicals in the environment, significantly reducing the effects on the environment, people and the ecosystem ■

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11 biggest environmental problems of the Earth in 2021

The climate crisis is accelerating at an unprecedented rate and there are some that warrant more attention than others. Here are some of the biggest environmental problems of our Earth lifetime in 2021.

1. POOR GOVERNANCE

According to economists, the climate crisis is a result of multiple market failures. Economists and environmentalists have urged policymakers for years to increase the price of activities that emit greenhouse gases (GHG), for example through carbon taxes, which will stimulate innovations in low-carbon technologies.

To cut emissions quickly and effectively enough, Governments must not only massively increase funding for green innovation to bring down the costs of low-carbon energy sources, but they also need to adopt a range of other policies that address each of the other market failures.

A national carbon tax is currently implemented in 25 countries around the world, including various countries in the EU, Canada, Singapore, Japan, Ukraine and Argentina. However, according to the 2019 OECD Tax Energy Use report, current tax structures are not adequately aligned with the pollution profile of energy sources. The OECD suggests that carbon taxes are not harsh enough on coal production, although it has proved to be effective for the electricity industry.

2. FOOD WASTE

A third of the food intended for human consumption (around 1.3 billion tons) is wasted or lost. Food waste and loss accounts for 4.4 gigatons of GHG emissions annually. Food waste and loss occurs at various stages in developing and developed countries; in developing countries, 40% of food waste occurs at the post-harvest and processing levels, while in developed countries, 40% of food waste occurs at the retail and consumer levels.



▲ Food waste and loss accounts for 4.4 gigatons of GHG emissions annually

At the retail level, a shocking amount of food is wasted because of aesthetic reasons. In fact, in the US, more than 50% of all produce thrown away in the US is done so because it is deemed to be “too ugly” to be sold to consumers - this amounts to about 60 million tons of fruits and vegetables. This leads to food insecurity, another one of the biggest environmental problems on the list.

3. BIODIVERSITY LOSS

A recent WWF report found that the population sizes of mammals, fish, birds, reptiles and amphibians have experienced a decline of an average of 68% between 1970 and 2016. The report attributes this biodiversity loss to a variety of factors, but land-use change, particularly, the conversion of habitats, like forests, grasslands and mangroves, into agricultural systems. Animals such as pangolins, sharks and seahorses are significantly affected by the illegal wildlife trade and pangolins are critically endangered because of it.

A recent analysis has found that the sixth mass extinction of wildlife on Earth is accelerating. More than 500 species of land animals are on the brink of extinction and are likely to be lost within 20 years; the same number were lost over the whole of the last Century.

4. PLASTIC POLLUTION

A report by Science Journal - Nature - determined that currently, roughly 11 million tons of plastic make its way into the oceans every year, harming wildlife habitats and the animals that live in them. The research found that if no action is taken, the plastic crisis will grow to 29 million metric tons per year by 2040. If we include microplastics into this, the cumulative amount of plastic in the ocean could reach 600 million tons by 2040.

Shockingly, National Geographic found that 91% of all plastic that has ever been made is not recycled, representing not only one of the biggest environmental problems of our lifetime, but



another massive market failure. Considering that plastic takes 400 years to decompose, it will be many generations until it ceases to exist. There's no telling what the irreversible effects of plastic pollution will have on the environment in the long run.

5. DEFORESTATION

Every minute, forests the size of 20 football fields are cut down. By 2030, the planet might have only 10% of its forests; if deforestation isn't stopped, they could all be gone in less than 100 years.

Agriculture is the leading cause of deforestation, another one of the biggest environmental problems appearing on this list. Land is cleared to raise livestock or to plant other crops that are sold, such as sugar cane and palm oil. The three countries experiencing the highest levels of deforestation are Brazil, the Democratic Republic of Congo and Indonesia. However, Indonesia is tackling deforestation, now seeing the lowest rates since the beginning of the Century.

6. AIR POLLUTION

Research from the World Health Organization (WHO) shows that an estimated 4.2 to 7 million people die from air pollution worldwide every year and that 9 out of 10 people breathe air that contains high levels of pollutants. In Africa, 258 000 people died because of outdoor air pollution in 2017, up from 164,000 in 1990. Causes of air pollution mostly comes from industrial sources and motor vehicles, as well as emissions from burning biomass and poor air quality due to dust storms.

In Europe, a recent report from the EU's Environment Agency showed that air pollution contributed to 400,000 annual deaths in the EU in 2012 (the last year for which data was available). In the wake of the COVID-19 pandemic, attention has been put on the role that air pollution gases has in transporting the virus molecules. Preliminary studies have identified a positive correlation between COVID-19-related mortalities and air pollution and there is also a plausible association of airborne particles assisting the viral spread. This could have contributed to the high death toll in China, where air quality is notoriously poor.

7. GLOBAL WARMING FROM FOSSIL FUELS

Increased emissions of GHG have caused temperatures to rise, which are causing catastrophic events all over the world, just this year has seen Australia experience one of the most devastating bushfire seasons ever recorded, locusts swarming across parts of Africa, the Middle East and Asia, decimating crops, microplastic being found in Antarctic ice for the first time, warnings of advancing permafrost melt in Arctic regions, the Greenland ice sheet melting at an unprecedented rate, news of the accelerating sixth mass extinction, increasing deforestation in the Amazon rainforest, 13% of deaths in the EU being linked to various forms of pollution...

The climate crisis is causing tropical storms and other weather events such as hurricanes, heat waves and flooding to be more intense and frequent than seen before. However, a study has found that even if all GHG emissions were halted in 2020, global warming would only be halted by around 2033. It is absolutely imperative that we reduce GHG emissions; thankfully, this year is set to see the highest uptake of renewable energy projects around the world.



▲ Roughly 11 million tons of plastic make its way into the ocean every year



8. MELTING ICE CAPS AND SEA LEVEL RISE

The climate crisis is warming the Arctic more than twice as fast as anywhere else on the planet. Seas are now rising an average of 3.2mm per year globally and are predicted to climb to a total of 0.2 to 2m by 2100. In the Arctic, the Greenland Ice Sheet poses the greatest risk for sea levels because melting land ice is the main cause of rising sea levels.

According to satellite data, the Greenland ice sheet lost a record amount of ice in 2019 an average of a million tons per minute throughout the year, one of the biggest environmental problems that has cascading effects. If the entire Greenland ice sheet melts, sea level would rise by six meters.

Meanwhile, the Antarctic continent contributes about 1 millimeter per year to sea level rise, which is a third of the annual global increase. The sea level rise will have a devastating impact on those living in coastal regions. According to research and advocacy group Climate Central, sea level rise this Century could flood coastal areas that are now home to 340 to 480 million people, forcing them to migrate to safer areas and contributing to overpopulation and strain of resources in the areas they migrate to.

9. OCEAN ACIDIFICATION

Global temperature rise has not only affected the surface, but it is the main cause of ocean acidification. Our oceans absorb about 30% of carbon dioxide that is released into the Earth's atmosphere. As higher concentrations of carbon emissions are released thanks to human activities such as burning fossil fuels as well as effects of global climate change such as increased rates of wildfires, so do the amount of carbon dioxide that is absorbed back into the sea.

The smallest change in the pH scale can have a significant impact on the acidity of the ocean. Ocean acidifi-

cation can have a ripple effect across marine ecosystems and species, its food webs and provoked changes in habitat quality. Once pH levels reach too low, marine organisms such as oysters, their shells and skeleton could even start to dissolve.

However, one of the biggest ocean acidification effects can be seen with coral bleaching and subsequent coral reef loss. This is a phenomenon that occurs when rising ocean temperatures disrupt the symbiotic relationship between the reefs and algae that lives within it, driving away the algae and causing coral reefs to lose their natural vibrant colors. Higher acidity in the ocean would obstruct coral reef systems' ability to rebuild their exoskeletons and recover from these coral bleaching events.

Some studies have also found that ocean acidification can be linked as one of the effects of plastic pollution in the ocean. The accumulating bacteria and microorganisms derived from plastic garbage dumped in the ocean to damage marine ecosystems and contribute towards coral bleaching.

10. AGRICULTURE

Studies have shown that the global food system is responsible for up to one third of all human caused GHG emissions, of which 30% comes from livestock and fisheries. Crop production releases GHG such as nitrous oxide using fertilizers. 60% of the world's agricultural area is dedicated to cattle ranching, although it only makes up 24% of global meat consumption. Agriculture not only covers a vast amount of land, but it also consumes a vast amount of freshwater. While arable lands and grazing pastures cover one-third of Earth's land surfaces, they consume three-quarters of the world's limited freshwater resources.

Scientists and environmentalists have continuously warned that we need to rethink our current food system; switching to a more plant-based diet would dramatically reduce the carbon footprint of the conventional agriculture industry.



▲ Higher concentration of carbon emissions are released by burning fossil fuels



11. FOOD AND WATER IN-SECURITY

Rising temperatures and unsustainable farming practices has resulted in the increasing threat of water and food insecurity. Globally, more than 68 billion tons of top-soil is eroded every year at a rate 100 times faster than it can naturally be replenished. Laden with biocides and fertilizer, the soil ends up in waterways where it contaminates drinking water and protected areas downstream.

Furthermore, exposed and lifeless soil is more vulnerable to wind and water erosion due to lack of root and mycelium systems that hold it together. A key contributor to soil erosion is over-tilling, although it increases productivity in the short-term by mixing in surface nutrients (fertilizer), tilling is physically destructive to the soil's structure and in the long-term leads to soil compaction, loss of fertility and surface crust formation that worsens topsoil erosion.

With the global population expected to reach 9 billion people by mid-Century, the Food and Agriculture Organization of the United Nations (FAO) projects that global food demand may increase by 70% by 2050. Around the world, more than 820 million people do not get enough to eat. So, countries must rethink their food systems and encouraged more sustainable farming practices.

In terms of water security, only 3% of the world's water is fresh water and two - thirds of that is tucked away in frozen glaciers or otherwise unavailable for our use. As a result, some 1.1 billion people worldwide lack access to water and a total of 2.7 billion find water scarce for at least one month of the year. By 2025, two-thirds of the world's population may face water shortages■

NAM HUNG (*Earth. org*)

Việt Nam aims for safe treatment of 100 percent solid waste in 2050

The Vietnamese Government has set a goal to raise the rate of solid waste collected and safely treated to 100 percent in 2050 as part of the freshly approved National Strategy on Green Growth (NSGG) for 2021 - 2030. Overall, the Strategy aims at restructuring the economy in connection with renewing the growth model to achieve economic prosperity, environmental sustainability, social equality towards a green economy, carbon neutrality and contributing to limit global warming.

As per the Strategy, by 2050, 100 percent of urban areas will have their drainage systems completed to remove the possibility of flooding. All waste water will be treated following technical standards.

In special-class and first-class municipalities, public transport will handle at least 40 percent and 15 percent, respectively, of passenger volumes. Meanwhile, by that time, at least 45 urban areas will ratify and implement their own master plans on developing green growth cities.



▲ Workers collect solid waste in Hạ Long City, Quảng Ninh Province

According to the Ministry of Planning and Investment, the previous NSGG for 2011 - 2020 helped raise public awareness about the significance of green growth after eight years of implementation. Measures to cut greenhouse gas emissions were carried out widely, resulting in a reduction of 12.9 percent in such emissions compared to the normal development scenario. Energy consumption per unit of GDP declined by an average of 1.8 percent each year, while 46.9 percent of businesses targeted cleaner production by 2020 compared to 28 percent ten years earlier. In particular, outstanding loans funding green growth stood at nearly VNĐ 238 trillion (US\$ 10.3) by 2018, or 235 percent higher than the figure in 2015■

PHƯƠNG TÂM

Geological characteristics and geoheritage potential of Pù Luông Nature Reserve

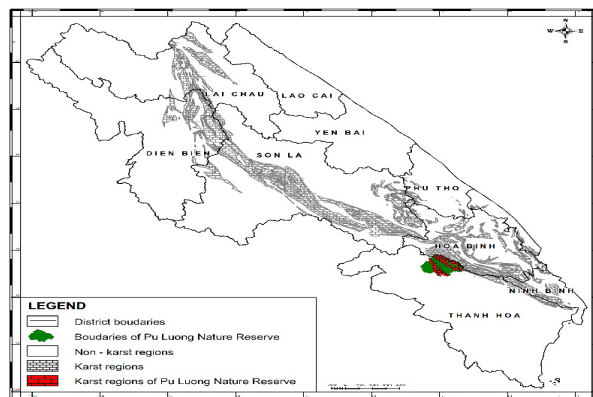
ĐỖ THỊ YẾN NGỌC, PHẠM THỊ THÚY, TRẦN TÂN VĂN
NGUYỄN XUÂN NAM, CAO THỊ HƯỜNG
Vietnam Institute of Geosciences and Mineral Resources

Geoheritage refers to places or sites where evidence and imprints of the formation and development of the earth over 4.6 billion years as well as the evolutionary history of the life of a region or an area on the planet are preserved. These sites or areas are valuable in terms of scientific, aesthetic, historic, cultural and economic values and are potential tourist attractions. They are called Geoheritage - the heritage type of top importance among different types of natural heritage. In North Việt Nam, three areas with high limestone exposures are Northeast, Northwest and North Central. The Pù Luông Nature Reserve (NR) is on the Northwest limestone strip, having an average width of 50km and extending more than 400km from the Sino - Vietnamese border down to the coastline of Thanh Hóa Province. The study on geological characteristics and heritage potential of Pù Luông NR is essential because this is the basis for choosing a socio - economic development model towards sustainable development, rational use and conservation of natural resources, environmental protection, effective adaptation to natural disasters and climate change and creation of new livelihood opportunities for local people.

This article presents the geological characteristics and the karst geoheritage potential of the Pù Luông NR in Thanh Hóa Province.

1. INTRODUCTION

Karst accounts for approximately 20% of Vietnam's territory. The Northern Việt Nam has 3 areas with large limestone exposures: Northeast (Ha Giang, Cao Bằng, Lạng Sơn, Quảng Ninh provinces...), Northwest (Lai Châu, Điện Biên, Sơn La, Hòa Bình, Ninh Bình, Thanh Hóa provinces...) and North Central (Quảng Bình)[1]. Pù Luông NR was established by the Thanh Hóa Provincial authority in 1999 in the territory of Bá Thước and Quan Hóa districts, about 130km to the Northwest of Thanh Hóa City. In the Northeast, Pù Luông borders Mai Châu, Tân Lạc and Lạc Sơn districts of Hòa Bình Province. Pù Luông NR consists of two distinct ecosys-



▲ Figure 1. Location of Pù Luông NR in the karst geological formation of Northwest Việt Nam

On one hand, the research, analysis of available data and assessment of geological characteristics and geoheritage potential of Pù Luông NR would enhance its values. On the other hand, the research results on geoheritage potential in the Pù Luông NR would be the basis for the selection of a socio-economic development model (geopark) towards sustainable development, rational use of resources, natural conservation, environmental protection, effective response and adaptation to natural disasters and climate change and new livelihood opportunities to local people.

tems: Karst mountain ecosystem and non-karst mountain ecosystem. 1,109 plant species have been recorded, including many rare and endemic ones, especially 4 new genera and 7 typical conifer species of concern for conservation in Việt Nam. Pù Luông NR also has rich wildlife which belongs to the North Central region and part of the Northwestern faunal region. Geologically, Pù Luông NR is in the Northwest karst strip that has an average width of about 50km and extends over 400km from the Sino-Vietnamese border down to the coastline of Thanh Hóa Province (Figure 1). This karst strip is very interesting with the existing Tràng An World Heritage Site, Cúc Phương National Park, Vân Long NR (all located in Ninh Bình Province), Ngọc Sơn - Ngổ Luông NR (Hòa Bình Province) and a few more potential areas that can be built into geoparks.



2. OVERVIEW OF GEOLOGICAL SETTING, CHARACTERISTICS AND EVOLUTION HISTORY

Pù Luông NR is located in the Northwest-ern tectonic structural zone. Similar to other places in Northwest, Pù Luông NR has experienced a very long and complex geological evolution history. Below is a brief introduction about the geological setting, characteristics and evolution history as well as some typical geoheritage values of this area.

2.1. Paleontological-stratigraphic characteristics

The area's long and complex geological history has generated a variety of rock types, from very ancient (up to 1,000 million years ago) to very young. In the order from bottom to top, the following 14 formations are

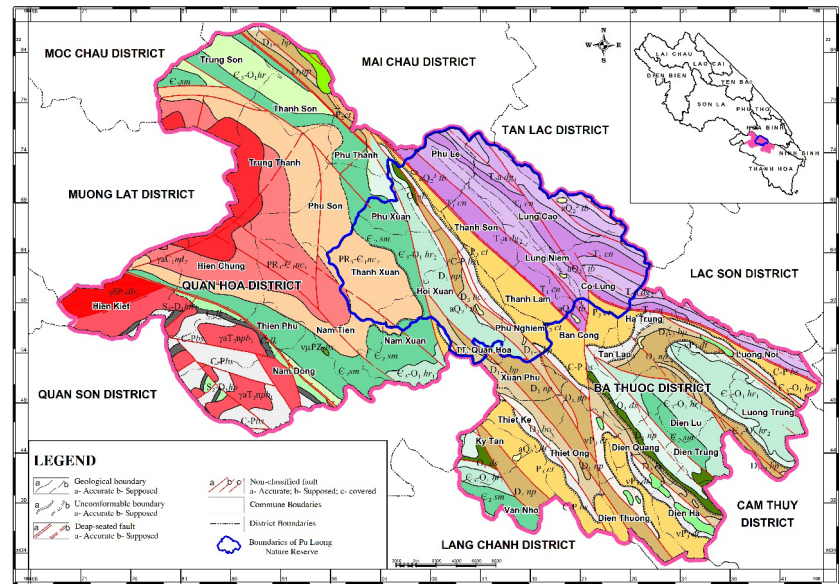
present in the study area: 1) Nậm Cô Formation (NP_{3nc}); 2) Mã River Formation (ϵ_{2sm}); 3) Hàm Rồng Formation (ϵ_{3-O_1hr}); 4) Đông Sơn Formation ($O_1\delta s$); 5) Nậm Pia Formation (D_1np); 6) Bản Páp Formation (D_2bp); 7) Tộc Tắt Formation (D_3tt) or Bản Cải Formation (D_3bc); 8) Bắc Sơn Formation ($C-Pbs$); 9) Cẩm Thủy Formation (P_3ct); 10) Yên Duyệt Formation (P_3yd); 11) Cò Nòi Formation (T_1cn); 12) Đồng Giao Formation ($T_2\alpha dg$); 13) Nậm Thảm Formation (T_2lnt) and 14) undivided Quaternary sediments (Q) (Figure 2).

Regarding the distribution of stratigraphic units, from the Pre-Cambrian to the present, there is an alternation in terms of both time and space between carbonate and non-carbonate formations. In the Southwest - Northeast (SW-NE) direction, Pù Luông NR has 3 carbonate strips namely: (1) Thanh Xuân - Hội Xuân - Quan Hóa strip with limestone of the Hàm Rồng (ϵ_{3hr}), Bản Páp (D_2bp) and Bắc Sơn ($C-Pbs$) Formations; (2) Núi Thung

Hang - Lũng Niêm strip; (3) Pù Bin - Lũng Cao strip both with limestone of the Đồng Giao Formation ($T_2\alpha dg$). Alternating between them are non-carbonate strips: Phu Pha Phong - Phu Ho strip with terrigenous-volcanic rocks of the Cẩm Thủy Formation (P_3ct) and the Cò Nòi Formation (T_1cn); Làng Lụa - Làng Cao strip with terrigenous rocks of the Cò Nòi Formation (T_1cn) (Image 1).

2.2. Structural-tectonic characteristics

The study area is located in the two regional tectonic zones namely: (1) Mã River zone in the SW; Đà River zone in the NE. They both form a large NW - SE synclinorium and Pù Luông NR occupies most of this structure.



▲ Figure 2. Geological map of Pù Luông NR



▲ Image 1. Terrigenous rock of the Cò Nòi Formation (T_1cn) in Lũng Cao (left) and limestone of the Đồng Giao Formation ($T_2\alpha dg$), in Lũng Niêm (right), Bá Thước District

The study area is dissected by some faults, including the Mã River deep-seated fault in the same NW - SE direction. Along such faults, basic eruptive-intrusive magmatic activity was very active in the Late Permian, resulting in the Cẩm Thủy Formation (P_{2ct}). The large NW - SE fault system in the Northeast of Hôi Xuân District town forms the boundary between the karst strips of the Bắc Sơn ($C-P_1bs$), Bản Páp (D_2bp) and Hàm Rồng (ϵ_3hr) Formations. The Sơn La deep-seated fault has developed in the study area in the direction of $320 - 330^\circ$, running through Lũng Niêm and serving as the Northeast boundary of the Cẩm Thủy eruptive Formation (Figure 2).

2.3. Geomorphological characteristics

The topography of Pù Luông area represents narrow mountain ranges which extend linearly and are separated from each other by tectonic faults in the same direction and expressed on modern topography in the form of river valleys, streams, long troughs.. The mountainous topography of the study area has both step and linear features with the alternation of high mountains surrounding plateaus and low mountains with tectonic-erosive valleys and depressions. On the other hand, exogenous processes strongly occur under the conditions of hot humid tropical climate and high rainfall (erosion due to runoff or surface water..., mass movement processes such as landslides, rock falls, debris..). Consequently, the topography of the study area has been strongly dissected (relative elevation difference $> 500m$, density of rivers and streams $> 1km/km^2$). Thus, slope surfaces are predominant in the area over remnants of planation surfaces on watersheds or flat surfaces at the bottom of valleys. This also confirms that in the present-day epoch, the study area's topography is undergoing a rejuvenation process.

A very unique feature of this area is the development of many types of karst landforms due to the presence of many types of limestone. Sloping or steep cliffs usually develop only on pure, massive karst of the Bản Páp (D_2bp), Bắc Sơn ($C-P_1bs$) and Đồng Giao (T_2adg) Formations. Recrystallized, marbleized limestone, clayey limestone or thin limestone interbeds in the terrigenous rocks of the Mã River (ϵ_2sm) and Hàm Rồng (ϵ_3hr) Formations often form hilly terrain with gentle cliffs and thin layers of residual soil.

In fact, the karst topography in the study area is of the tropical type that is rejuvenated at different levels depending on the am-

plitude of neo-tectonic uplift. It is evidenced by: The presence of karst plateaus on the surface of which are residual cones and towers, which are raised karst fields; The development of multi-layered, multi-phased caves; The shortage of surface water but excess of groundwater. The karstification process in the region is very strong. In many places such as Thành Lâm, Thành Sơn, Lũng Cao, Làng Kịt, the whole mountain massif has been dissolved and washed away to reveal the undissolved bedrock underneath, proving that the karstification process occurs at the same time with the erosion and denudation process.

Thus, it can be concluded that the geological structure along with the neotectonic movements have resulted in the main features of the topography of the study area. The highest and most majestic mountain range in the region ($> 1.500m$) was formed by the eruptive rock of the Cẩm Thủy Formation (P_{2ct}). Medium and low mountain ranges ($200 - 600m$) occupy most of the study area and are made of limestone. The rest is low mountainous terrain made up of terrigenous rocks and mainly distributed along river valleys or in closed intra-mountain valleys. In addition, these landforms are further complicated by exogenous and anthropogenic processes.

By origin, the area's topography can be divided into the following groups: (1) Tectonic landform; (2) erosional landforms; (3) karst and karst-erosional landforms; (4) depositional landforms.

Tectonic landforms: Tectonic landforms are of slopes and steep cliffs along faults, which are clearly shown, for example, along the Sơn La deep-seated fault, along Mã River deep-seated fault in Hôi Xuân, Trung Xuân, Phú Nghiêm, Thành Sơn - Lũng Niêm, Vân Mai - Làng Kịt, Mai Châu - Lũng Vân... They develop in the NW - SE direction, sometimes serving as a boundary between rock types of different composition and age, or even between different folds of the same rock, the same Formation. Besides, in the study area, there are many short and narrow slopes and cliffs along the NE - SW faults such as in ở Pù Bin, Phú Lâm - Lũng Vân, Thành Sơn - Nam Sơn, Lũng Niêm - Lũng Cao.

Erosional landforms: Erosional landforms develop on eruptive and terrigenous rocks. In addition, gravity slopes can also develop on hard and brittle rock along fault zones or on limestone.

Karst and karst-erosion landforms: Included in this group are karst plateau, karst-erosion valley and karst field, developing on carbonate and terrigenous-carbonate rocks.

- Karst plateau is the most common landform, developing in the NW - SE direction along both banks of the Mã River in Pù Bin, Phú Lâm - Lũng Vân, Thành Sơn - Nam Sơn, Lũng Niêm - Lũng Cao... Plateau surfaces are commonly found at three elevations: $900 - 1,200m$, $600 - 800m$ and $300 - 500m$, in the form of hills interspersed with valleys, sinkholes....

- Karst-erosion landform develops on the limestone bedrock of the lower Đồng Giao sub-Formation, which



is marbled and interbedded with calcareous-clayey shale and compressed into narrow NW - SE strips. This type of landform has very steep slopes, resulting in a unique series of high and low karst towers interspersed between narrow parallel karst-erosion valleys. Such valleys also develop in Làng Kịt, Làng Khuynh villages. At the intersection of the karst-erosion valleys, karst fields of 1 - 2 to 3 - 4km wide are sometimes formed with frequent surface flows. They are quite flat with up to 2 - 3m thick alluvio-proluvial deposition (karst fields in Phố Đoàn, Dịch Giáo) (Image 2); In addition, on the elongated sags where limestone is interbedded with other terrigenous rock, cone-shaped karst hills are also developed with gentle slopes covered with residual soil.

Accumulation landforms: Included in this group of landforms are alluvial floodplain, accumulation terraces of 1st and 2nd orders, erosional terraces of 3rd and 4th orders, deluvium and proluvium fans, formed mainly by the action of permanent and temporary flows and less by gravity processes.



▲ Image 2. Karst valley in Kịt Một, Lũng Cao Commune, Bá Thuộc (left) and typical karst fields in Pù Luông - Cúc Phương strip (right).

2.4. Cave development characteristics

The Cave system in the Đồng Giao ($T_2\text{adg}$) and Nậm Thảm ($T_2\text{Int}$) limestone has a long and complicated geological development history, heterogeneous bedrock composition and are quite diverse in form, length and depth. To date, 16 caves have been discovered and surveyed with a total length of 3,787.7m [4,5]. They can be divided into 2 groups: 12 wet (active) caves and 4 dry (inactive, fossil cave) caves.

- *Dry caves* (Dơi Cave in Kho Mường, Thành Sơn Commune; Làng Lặn 1 Cave in Lũng Niêm Commune) are often found at an altitude of 10 - 15m above the valley bottom with many beautiful stone pillars, stone bells, stone curtains... The cave floor is often covered by blocks due to ceiling collapse or has a layer of lime soil that accumulates several meters high.

- *Wet caves* often have water flowing all year round or in the rainy season; the cave entrance at the valley bottom is at the same altitude with the local erosion level. Caves develop along faults and often have high ceilings with numerous stalagmites and stalactites. In the Pù Luông karst area, most of the caves discovered and surveyed are wet caves, such as Bản Pồn Cave, Làng Lụa Cave and Làng Lặn 2 Cave.

Some caves have high potential for geotourism and eco-tourism, such as Dơi Cave in Kho Mường, Làng Lụa Cave in Lũng Cao. Along with other traditions and cultures imbued with national identity such as drinking *rượu cần* (wine drunk out of a jar through pipes), *múa sạp*, *xòe* (kinds of dancing), many beautiful caves in the region can certainly contribute to increase the attractiveness of this area. In fact, in a few communes nearby, local people have embarked on renovating beautiful caves to develop tourism.

2.5. Geological evolution of the Pù Luông NR

The geological development history of this area is quite complicated, including the following 5 periods [4]:

Late Proterozoic-Early Cambrian ($PR_3-\epsilon_1$): The regional subsidence regime occurred not only in the study area but also throughout the Northwest, facilitating the formation of very thick terrigenous rock layers of the Nậm Cồ Formation around Phu Kỳ mountain.

Early Paleozoic (PZ_1): The continental crust in the study area broke off and continued to subside, creating conditions for the formation of terrigenous-siliceous, terrigenous-eruptive rock types of the Mã River sub-formation. Right after that, although the whole study area was still in the subsidence regime, the seabed started to uplift contrastingly, thus forming the terrigenous-carbonate rock types of the middle and upper Mã River sub-formations ($\epsilon_{2sm_{2-3}}$) as well as the Hàm Rồng Formation (ϵ_{3hr}).

Middle-Late Paleozoic (PZ_{2-3}): During the Ordovician-Silurian periods, the study area experienced a regime of strong continental uplift and sedimentary disruption. But immediately after that, in early Devonian, it again subsided to form terrigenous-siliceous, terrigenous-carbonate rock types of the Nậm Pịa (D_{1np}) and Bản Páp



(D_2bp) Formations. In the late Devonian, there was a slight uplift and then the whole region slowly subsided from the beginning of the Carboniferous, extending to the end of the early Permian, forming the Bắc Sơn Formation limestone ($C-P_1bs$). In general, the tectonic regime of the region in this period is quite stable.

Late Paleozoic-Early Mesozoic (PZ_3 - MZ_1): Starting from the late Permian, tectonic activities in the region resumed, the faults re-activated in association with eruptions and basic intrusion, forming the Cẩm Thủy Formation and the Diễn Thượng Complex. At the end of the late Permian, volcanic activities ceased, the seabed became shallower with a slight uplift to form the coal-bearing terrigenous rock of the Yên Duyệt Formation. By the end of this period, during the Triassic, strong tectonic subsidence occurred in the Eastern part of the study area, resulting in the terrigenous-carbonate rocks of the Cỏ Nồi Formation (T_1cn), carbonate rock of the Đồng Giao Formation ($T_2đg$) and terrigenous-carbonate rock of the Nậm Thảm Formation (T_3nt).

Late Mesozoic-Cenozoic (MZ_2 - KZ): Since the late Mesozoic, the entire study area has become continental where the uplift regime was dominant with the evidence being in the form of planation surfaces. There were up to five such surfaces at the absolute altitude of 1400 - 1600m, 900 - 1.200m, 600 - 800m, 300 - 500m and 200 - 300m. Loose, unconsolidated formations accumulated along valleys with regular flows. The sub-meridian and sub-parallel fracture zones became active, causing quite significant left-lateral strike slip (with an amplitude up to 4km) along Ban Công - La Hán.

3. GEOHERITAGE POTENTIAL OF PÙ LUÔNG NR

Geoheritage is a type of geological resource with outstanding scientific, educational, aesthetic and economic values, including geomorphological landscapes, paleontological fossils, inactive or active volcanoes, caves, canyons of natural rivers and lakes, waterfalls, natural or man-made outcrops of rocks and ores, formations and landscapes recording special geological events and contexts, or even abandoned mines, places where past and present-day geological processes can be observed. Like other heritage types, geoheritage is a non-renewable and of limited resource, so it needs

to be preserved, exploited and used sustainably. Currently, with the development of the industry, the extent of human encroachment onto nature has become so serious, which threatens the lives of people and all species on Earth. To contribute to solving this problem, UNESCO, through the Global Geoparks Network (GGN), always encourages the establishment and development of geoparks aiming to achieve the three following objectives: Holistic conservation of heritage values (including geoheritage); Raising public awareness of geoheritage, natural heritage and environmental protection, protection of the common home - the Earth; Socio-economic development, hunger eradication and poverty reduction for local communities.

Geoheritage includes many types. Specifically, according to the "Provisional classification criteria of geoheritage" of the UNESCO World Heritage Convention (WHC) applied in Việt Nam in Circular No. 50/2017/TT-BTNMT dated November 30th, 2017 of the Ministry of Natural Resources and Environment, there are 10 geoheritage types: A. Paleontology; B. Geomorphology; C. Paleoenvironment; D. Rock; E. Stratigraphy; F. Mineral; H. Geoeconomics; I. Tectonic (geological history); K. Cosmic issues and L: Geological features of continental/oceanic scale. In Việt Nam, geoheritage is assessed quantitatively according to 6 scientific criteria: (1) Scientific and educational values; (2) Geological diversity; (3) Landscape and aesthetic values; (4) Cultural, social and historical values; (5) Threats and conservation needs and (6) Potentials for exploitation and use.

According to the research results, Pù Luông NR has 24 geoheritage sites that have been investigated and studied, including 13 that are recommended for national ranking and 11 recommended for provincial ranking. Below are some typical geoheritage values of the Pù Luông NR.

3.1. Paleoenvironmental heritage (type C)

- *The Vietnam's most ancient glacial sedimentary rock:* Located in the lowest part of the Mã River Formation (NP_3 - $Є_2$) at the Suối Tỏi, Suối Giá sections (Quan Hóa District). The shale unit containing mixed cobbles-pebbles-gravels of glacial origin, Sinian age (late Neoproterozoic) is the oldest and unique in Việt Nam and rarely seen internationally; valuable in many aspects (scientific, educational, cultural and economic) [2, 4].

- *The two Vietnam's most ancient biozones which lie in the upper part of the Nậm Cồ Formation*, in the sericite shale and the lower part of the Mã River Formation, in the black shale-marking unit, in the Suối Tỏi, Suối Giá sections. The first zone is *Protosphaeridium* (the highest zone of NP_3). The second zone is *Archaeohystrchosphaeridium* (the lowest zone of Lower Cambrian $Є_1$ [4, 2].

3.2. Stratigraphical heritage (type E)

- *The cross-section containing the boundary of Lower Cambrian and Upper Neoproterozoic $Є_1$ - NP_3 (PZ - PR)*. It is in the lower part of the Mã River Formation (NP_3 - $Є_2$) at the Tỏi Stream, Giá Stream sections. This boundary is rarely seen in the world, but it is very important to study because of its importance to many scientific disciplines (Images 3, 4, 5) [4].



▲ Image 3. Giá Stream (Quan Hóa): Sericite-quartz shale intercalated quartzite of the Nậm Cồ Formation of Proterozoic age - the oldest in the region



▲ Image 4. Luồng River (Quan Hóa): The coal shale marker unit containing the oldest fossil zone of the Lower Cambrian in Việt Nam



▲ Image 5. Tỏi Stream (Quan Hóa): Sericite-quartz shale - the highest part of the Nậm Cồ Formation - lining the bottom of the glacier-origin rock unit (left) and the glacier-origin pebble-bearing shale of Late Sinian age (NP33), base of Mã River Formation (Z3 - 2) (right).

- The cross-section containing the Cambrian - Ordovician boundary (Є-O): In the upper part of the Hàm Rồng Formation in Làng Vạc section (Cẩm Thủy District) and Diễn Lũ section (Bá Thước District). These boundary sections are of great scientific significance in determining the boundary between the Cambrian and the Ordovicia [4].

- Typical marine regression section Làng Vạc section (Cẩm Thủy): It is a section barely seen in fact, showing all the characteristics of the marine regression process - From shallow sea carbonate, gradually transitioning to terrigenous carbonate - fine-grained, coarse-grained terrigenous rocks, containing many fossil zones of very shallow to coastal facies.

3.3. Paleontological heritage (type A)

- The oldest macro - fossils in Việt Nam and the layers containing rich and typical macro-fossils, including: (1) The lower part of the Hàm Rồng Formation in Diễn Lũ section (Bá Thước District), containing many

Oncolites, Trilobites and Brachiopods in limestone and limestone shale of Middle Cambrian (Є₂) age; (2) The lower and middle part of the Đông Sơn Formation, at Hill 205 (Làng Vạc, Cẩm Thủy District), containing many Trilobites, Brachiopods, Bivalves and Crinoides of Lower Ordovician (O₁) age; (3) The middle part of the Nậm Pịa Formation in Làng Vạc; containing many Brachiopods and Bivalves of Lower Devonian (D₁) age; (4) The middle part of the Bản Páp Formation in Diễn Lũ and Làng Vạc, containing many kinds of Anthozoan of Lower Devonian D₁ age. Oncolites in limestone layers and Trilobites in limestone clayey shale aged Middle Cambrian (about 505 million years ago), are visible to the naked eye and have high scientific and educational values. They have not been preserved and are being strongly influenced not only by nature but also by humans.

3.4. Stone heritage (type D)

- Typical "pillow" basalt. The wide strip that surrounds Diễn Lũ anticline of Late Permian age. This type of basalt has a very characteristic "pillow" structure, which clearly shows many aspects of the history of formation and development and the palaeo-geographical and paleo-environmental conditions.... Rarely seen in Việt Nam, it has not been preserved and is being exploited in many places for many different purposes.



3.5. Geomorphological and tectonic heritage (types B, I)

- *Remnants of ancient river valleys*: Remnants of ancient river terraces are also found along the Phú Lâm - Thành Sơn - Lũng Niêm and Làng Lụa - Làng Độc faults and depressions in the form of flats high-rising on depression bottoms or creating steps on the slopes. On some such flats along the Phú Lâm - Lũng Niêm depression, alluvial sediment no longer exists but there are many round pebbles made from eruptive rocks. Along the Làng Lụa - Lũng Niêm depression is alluvial-proluvial remnants on the surface of 8 - 10 and 15 - 20m high flats. At the same time, along these depressions, many hanging valleys cut through these ancient river terraces. They demonstrate an ancient river once flowing here, probably the ancient Mã River that had to gradually retreat to the Southwest due to the subsequent uplifting movements. This heritage has scientific and educational significance to river activities along the fault.

- *Evidence of the Ban Công - La Hán sub-meridian fault*: This area is to the Southeast of Pù Luông NR. The expression of left-lateral slip along the fault is very clear, didactic and very meaningful in active tectonics research.

- *Dơi Cave, Kho Mường, Thành Sơn Commune, Bá Thước District*. Northeast of Kho Mường Village, Quan Hóa. Survey length: 232m; depth: -20m. From Cành Nàng District Town (Bá Thước District), visitors should follow Road 15 to the Northwest to Thành Sơn Commune, then go downhill for about 30 minutes to arrive at Kho Mường Village. From Kho Mường Village, boating down Kho River for about 15 minutes, visitors will reach the Cave entrance in the limestone of the Đồng Giao Formation (T_2adg). There are 2 caves: one dry and one with running water. The Cave must be connected to an underground river because all surface water in Kho Mường area flows into Kho River before completely disappearing into the ground. This underground River is exposed in Bản Pốn Village, Lũng Cao Commune, about 2.5km from Kho Village to the North-Northeast. Geological structure shows that Kho Mường - Bản Pốn - Lặn Trong cave system has at least two caves levels. The intersection of these two cave levels corresponds to the intersection of two fault systems in the NW - SE and NE - SW directions in Bản Pốn.

4. RESULTS AND DISCUSSION

Study results show that the geological formations in the Pù Luông NR have a wide age diversity, including 14 rock and soil formations from Proterozoic (very ancient) to Quaternary (present). The diversity is also shown in the rock compositions and rock types of all origins: magmatic, metamorphic and sedimentary. The diversity in geological age and paleo-environment of the NR has led to the record diversity of the

paleontological world here. Pù Luông NR, on the other hand, is dissected by many fault systems, especially the NW-SE system. The slipping along these faults has created a strip topography with alternating high and low areas. Other fault systems such as NE - SW, sub-meridian and sub-parallel, have complicated the geological setting of the area. The tectonic shifting has also changed the main structural direction of the region, creating many large valleys and countless interconnected caves as well as an underground river system. The topography can be divided into several landforms, especially the erosional slopes on basalt in Pù Luông strip and the karst/karst-erosion landforms on carbonate, carbonate-terrigenous rocks of Triassic age. It is noteworthy that the processes of erosion and denudation predominate over the process of accumulation, which proves the whole area is undergoing a tectonic uplift.

Study results on geoheritage potential show that Pù Luông NR has 6/10 types of geoheritage expressed in 24 geoheritage sites that have been investigated and researched, including 13 sites proposed for national ranking and 11 sites for local ranking [4, 5]. Along with other heritage values, this region has the potential to become a national geopark and in the future, with more detailed, specific and extensive investigation and research results, it can become a UNESCO Global Geopark. According to the geopark classification table proposed for Việt Nam, it can be classified as type 2 - mountain/volcanic systems; 5 - structural/tectonic features; 6 - fossil/stratigraphical sites and/or 9 - rivers and ice caps as imprints of the ice age can be classified [4].

Pù Luông NR has a very high biodiversity level on the basis of the equally rich geological diversity. The above presentations have contributed to confirm that Pù Luông NR has unique geological, geomorphological, hydrological, caves, characteristics, which make it a true candidate for a geopark of national and even international, level.

The values of geology, geoheritage, natural resource and traditional culture of the indigenous people in the Pù Luông NR will be a valuable resource for the local authority and people to choose a sustainable development model - a promising direction that not only benefits the local communities but also plays an important role in associating the goal of preserving the values of geoheritage and ecological and cultural diversity■



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G7 leaders commit to protect biodiversity and sustainability



At the G7 Leaders' Summit in Cornwall, G7 leaders have agreed a shared G7 Nature Compact (NC). This is a key agreement which brings G7 countries together to address the most pressing international and interlinked challenges of biodiversity loss and climate change. Leaders have also agreed to review progress against the NC to ensure delivery of its 2030 vision.

This next milestone marks a crucial commitment to supporting global consensus and taking bold action for the delivery of ambitious outcomes for nature in 2021.

The G7 NC commits world leaders to: Shift incentives and use all appropriate levers to address unsustainable and illegal activities negatively impacting nature, such as through tackling deforestation by supporting sustainable supply chains, and stepping up efforts to tackle the illegal wildlife trade; Work to dramatically increase investment in nature from all sources and to ensure nature is accounted for in economic and financial decision-making; Support and drive the protection, conservation and restoration of ecosystems critical to halt and reverse biodiversity loss and tackle climate change, such as supporting the target to conserve or protect at least 30% of global land and 30% of the global ocean by the end of the decade; Hold themselves to account for taking domestic and global action for nature through driving strengthened accountability and implementation mechanisms of all Multilateral Environmental Agreements to which they are parties.

For the first time, the G7 has committed to fight the loss of biodiversity in the next decade. This is a major step forward on the path to Convention on Biological Diversity COP15 and COP26 and is a sign of the dedication to accelerate action within the G7 - and beyond - to tackle the interdependent crises of climate change and biodiversity loss. Through existing G7 mechanisms, including at the G7 Leaders' Summit in five years, the G7 countries will review options to ratchet up action and ambition, as needed, to ensure delivery of the vision for 2030■

VŨ HỒNG



Coca-Cola introduces 100% recycled bottles

Coca-Cola Trademark brands (Coke, Diet Coke, Coke Zero Sugar, Coca-Cola Flavors) debut a 13.2-ounce (1 ounce (oz) = 30 ml) bottle made from 100% recycled PET (rPET) plastic in California, Florida (United States) and select states in the Northeast.

COCA-COLA NORTH AMERICA

“Challenges around plastic packaging waste and recycling continue to be top of mind for our consumers, customers and our system”, said Vice President and General Manager, Sustainability, North America Operating Unit Alpa Sutaria. “Introducing 100% rPET bottles is a big proof point of how recycling can help create a circular economy. We believe this innovation delivers the double benefit of convenience and sustainability”.

Coca-Cola North America’s rPET innovations spans the portfolio and includes multiple brands and packaging sizes: Coca-Cola trademark brands roll out 20-ounces. Bottles made with 100% rPET in California, New York and Texas in February 2021. DASANI will launch 20-ounces. 100% rPET bottles in New York, California and Texas in March; Sprite will launch a 13.2-ounce 100% rPET clear bottle in the Northeast, California and Florida in February. All Sprite packaging will transition to clear packaging, which is easier to be recycled and remade into new bottles, by the end of 2022.

Combined, these innovations represent a 20% reduction in the company’s use of new plastic across its North American portfolio compared to 2018. They will collectively reduce 10,000 metric tons of greenhouse gas emissions annually in the United States - the equivalent of taking 2,120 cars off the road for one year - based on internal Company tools and analyses.

More than 94% of the Company’s North American packaging is currently recyclable. To build awareness and encourage action, all 100% rPET package labels will include “Recycle Me Again” messaging. In fact, four different areas on the packaging will educate people about recycling. A primary goal of the “Endlessly Refreshing” Campaign - which also will include outdoor, radio, in-store and social/digital communications, plus touch-free experiential activations - is to boost recycling rates so rPET bottles can be used again and again to create raw material for new bottles, supporting closed-loop recycling systems and a circular economy.





COCA-COLA GREAT BRITAIN AND COCA-COLA EURO PACIFIC PARTNERS (CCEP)

Coca-Cola Great Britain and Coca-Cola Euro Pacific Partners (CCEP) have announced the transition to 100 percent recycled plastic in all on-the-go bottles of 500ml or less. The packaging will be made of fully recycled polyethylene terephthalate (rPET) plastic. The move covers the Company's entire portfolio of drinks brands including Coca-Cola Original Taste, Coca-Cola Zero Sugar, Diet Coke, Fanta, Sprite, Dr Pepper and Lilt.

The new bottles will continue to be entirely recyclable, with the rollout commencing in September, when the first 100 percent recycled 500ml bottles will start appearing on shelves. Bold messaging on-pack reminds consumers that the bottles are 100% recyclable and made entirely from rPET plastic.

Coca-Cola's increased use of these recycled plastics hopes to save approximately 29,000 tonnes of virgin plastic each year. The Company is also completing the transition from plastic shrink wrap to cardboard packaging across all multipacks. This action will mean that more than 30 million packs sold to consumers each year will no longer be wrapped in plastic.

To make it easier to recycle their plastic bottles, Coca-Cola has been working closely with the Scottish and Westminster Governments and industry partners on an operational Deposit Return Scheme (DRS). Such schemes function by adding a small deposit on top of the price of the product, which the consumer will receive back once the container is deposited at a designated recycling point. This will aim to encourage more people to recycle and ensure an increased collection of bottles, ready to be remade into new bottles. The DRS is planned for implementation in Scotland by July next year, with England and Wales following thereafter.

Strategic Technical Manager of the Waste and Resources Action Program (WRAP) Helen Bird said: "It takes 75 percent less energy to make a plastic bottle from recycled plastic and with plastic waste significantly contributing to fossil emissions when incinerated, it's never been more important to specify recycled content and keep packaging in a circular system".

"It's positive to see Coke, founding members of The UK Plastics Pact, continuing to push the boundaries on design and engaging with its customers to place the bottles in the recycling, since achieving 100% recycled content is going to be strongly reliant on getting those bottles back".

COCA-COLA OCEANIA AND COCA-COLA AMATIL NZ

Coca-Cola Oceania and Coca-Cola Amatil NZ have significantly reduced their use of virgin plastic by using only recycled plastic across some of New Zealand's best-known drinks brands.

In 2020, major brands such as Coca-Cola, Fanta, POWERADE and Sprite are now made from 100% recycled plastic in all its plastic bottles smaller than 1 liter. Water brands such as Pump, Kiwi Blue and Pure Drop are now using 100% recycled plastic across all its bottles in every size. The plastic used is high-quality recycled PET, meaning bottles can be recycled over and over again. This will reduce the amount of new plastic used by around 2,700 tons.

Country Manager of Coca-Cola Oceania Richard Schlasberg said he was proud of what the company had achieved since the recycled plastic goal was announced in July 2019, but this was just the start of the journey. "We want to help create a truly circular economy in New Zealand, where every plastic product we use is not only recyclable, but actually gets recycled so nothing goes to waste. And while we hope our plastic packaging never makes it into our waterways, through the Coca-Cola Foundation we have donated more than US\$ 300,000 each year to local environmental group Sea Cleaners, which removes more than 4.8 million pieces of litter a year from Kiwi waters" said Mr. Richard Schlasberg.

The Coca-Cola Company now offers 100% rPET bottles in more than 25 markets, bringing it closer to its World Without Waste goal of making bottles with 50% recycled content by 2030. Announced in 2018, the sustainable packaging platform also includes a goal to collect and recycle the equivalent of a bottle or can for everyone the Company sells globally by 2030 and to make 100% of its packaging recyclable by 2025■

HÔNG CẨM



Medical, plastic wastes skyrocket in Hồ Chí Minh City due to pandemic

There is a significant increase in plastic and medical wastes in the City amid the COVID-19 pandemic, which is piling pressure on its ability to handle them.

INCREASING IN PLASTIC AND MEDICAL WASTES

The surge in plastic and coronavirus-related wastes in Hồ Chí Minh (HCM) City is creating huge pressure on its waste treatment system. The HCM City Urban Environment Company Limited (CITENCO) collects and treats all wastes from hospitals and quarantine facilities.

Head of its Environmental Technology and Quality Control Department Cao Văn Tuấn said, the daily medical waste output had increased to nearly 40 tons a day, including 12 tons from quarantine zones, since the outbreak and the treatment capacity is 42 tons.

If coronavirus-related waste continues to grow, it would lead to an overload at the treatment plant. Besides having equipment prescribed for handling hazardous wastes, they also need to safeguard people handling the wastes. Wastes from locked-down areas are mainly collected by local authorities who spray them with disinfectants before sending to trash dumps. With social distancing in place the volume of goods packaged and delivered to consumers' homes and the use of plastic bags have increased exponentially.

According to Mr. Nguyễn Gia Thanh - an online seller in Tân Bình District, he has to use six kilogrammes of plastic bags a month for packaging now, twice the usual rate. Customers want goods to be covered with more plastic bags as a virus prevention measure. While normally plastic accounted for 50 percent of the garbage, it had now

increased to 60 - 65 percent. Wastes are now mainly in landfills and plastic wastes, though increasing, are not being sorted and this portends serious harm to the environment.

MORE COMPANIES NEEDED TO TREAT COVID-RELATED WASTE

The HCM City Department of Natural Resources and Environment is seeking approval from the Ministry of Natural Resources and Environment (MONRE) to add more companies capable of receiving and treating COVID-19-related waste.

Deputy Director of the City Department Nguyễn Thị Thanh Mỹ said the list of added businesses included Việt Úc Environment JSC, Mộc An Châu Company, Saigon Green Biotechnology Company and Tâm Sinh Nghĩa Investment Development JSC. These companies had invested in industrial waste and hazardous-waste incinerators, but they were still in the testing phase. But due to the growing coronavirus-related waste in the City, the Department asked the MONRE to approve the use of these companies' waste incinerators to treat waste related to Covid-19.

CITENCO is currently the only Company that receives and treats Covid-19 related waste in HCM City. According to CITENCO, the amount of garbage in quarantine areas and field hospitals is nearly 100 tons per day, exceeding its processing capacity. Director of CITENCO Huỳnh Minh Nhựt said the process of collecting and treating medical waste and waste from isolation areas was being carried out under strict safety standards and garbage collection workers all wear protective gear.

Medical waste is taken to Đồng Thạnh Waste Treatment Zone in Hóc Môn District where it undergoes chemical and thermal disinfection. After the trash is burned, the ash is solidified and buried in a location reserved for hazardous waste. Other waste, such as face masks and protective clothing, is treated separately according to regulations, while the rest can be sent to landfills to be treated by incineration and burial■

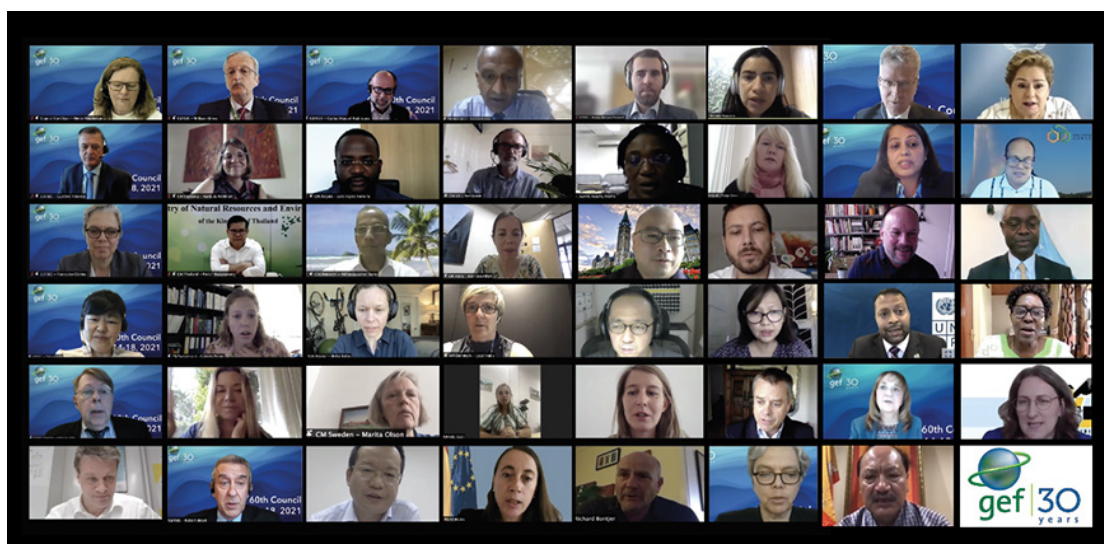
CHÂU LONG



▲ Medical wastes being delivered to a waste treatment zone in HCM City's Hóc Môn District



GEF Council supports US\$ 281 million for urgent environmental action



▲ The opening day of its 60th meeting of the GEF's governing body on June 16th, 2021

On the opening day of its 60th meeting, the Global Environment Facility's governing body approved a US\$ 281 million work program designed to further support developing countries' sustainable recovery from COVID-19 and to build on growing international momentum toward international climate and biodiversity goals.

GEF Council members welcomed the new set of initiatives which are set to benefit more than 18 million people while generating global environmental benefits.

The GEF's CEO and Chairperson Carlos Manuel Rodriguez thanked the 184-country partnership for working hard to keep environmental issues high on the agenda throughout COVID-19 and to find ways to efficiently design and advance priority initiatives for a strong pipeline of projects. The work program spans 92 countries, including 30 Least Developed Countries (LDC) and 35 Small Island Developing States (SIDS). Nearly half of the work program funding is allocated for international waters - with a focus on marine biodiversity and fisheries - and for chemical and waste management. It also includes support for projects related to biodiversity, climate change, land degradation and includes expansions of the ISLANDS, GOLD+, African Minigrids Program to additional countries.

Four climate adaptation projects supported by the GEF under this work program will

also be considered for support later this week from the GEF-managed LDC Fund, which provides dedicated climate resilience support to Least Developed Countries.

According to the GEF's Director of Programs Gustavo Fonseca, most of the trust Fund's impact goals for GEF-7 have already been met, with a year to go until the next four-year cycle begins. Fonseca noted that each project in the work program was subjected to COVID-19 screening to assess the risks and opportunities associated with the pandemic, with special attention given to initiatives contributing to a clean, resilient, blue and green recovery.

Included in the work program are two non-grant instrument projects related to climate adaptation. The first supports climate-resilient technology and sustainable land solutions through CRAFT, a new fund managed by Conservation International and Lightsmith Group LLC. The second includes first loss guarantees for green retrofits of small and medium-sized hotels, in partnership with IFC, a member of the World Bank Group.

Representatives of the GEF's 184 member Governments also approved more than US\$60 million from the LDC Fund for urgent climate adaptation projects in Bhutan, Central African Republic, Eritrea, Kiribati, Lesotho, Somalia and Timor-Leste. The LDC Fund is the only dedicated source of climate adaptation support for the LDC.

The GEF-supported LDC Fund and Special Climate Change Fund (SCCF) have provided more than US\$ 2 billion in targeted support to enhance the climate resilience of developing countries' agriculture, water, natural resource management sectors and to kickstart entrepreneurship and investment in climate adaptation products, services and technology. These initiatives have reduced the climate vulnerability of 30 million people to date. ■

NAM VIỆT

13 duties of countries when it comes to biodiversity and human rights

Unprecedented biodiversity loss, pollution, climate change and the rise of zoonotic diseases have showcased the symbiotic relationship between humans and nature. The human right to a safe, clean, healthy and sustainable environment, as well as other human rights, can only be realized where biodiversity thrives and ecosystems are healthy.

State obligations at the intersection of human rights and biodiversity come from international human rights laws, such as the International Covenant on Civil and Political Rights (ICCPR), the International Covenant on Economic, Social and Cultural Rights (ICESCR) and the Convention on Biological Diversity (CBD). According to these commitments and the responsibilities they encompass, states are obliged to do 13 key things.

1. ADDRESS BIODIVERSITY AND HABITAT LOSS AND PREVENT THEIR NEGATIVE IMPACTS ON HUMAN RIGHTS

Because of their negative impact on human rights, states must take urgent action to address biodiversity loss, habitat loss and species extinction. This includes ending deforestation; protecting and conserving

lands and oceans; moving to sustainable patterns of production and consumption; combatting climate change and pollution; preventing the introduction of invasive alien species; protecting land tenure and resource use of indigenous peoples, local communities, women and girls.

2. GUARANTEE EQUALITY AND NON-DISCRIMINATION

Because it affects some more acutely than others, biodiversity loss can widen inequalities that already exist between individuals, groups and even generations - with future generations inheriting the irreversible results of environmental degradation. Actions to address biodiversity and habitat loss must therefore consider age, gender and vulnerabilities - such as poverty, disability or marginalization and not exacerbate existing disparities.

3. PROTECT THE RIGHTS OF INDIGENOUS PEOPLES

Because of their close relationship to nature, indigenous peoples are both heavily affected by biodiversity loss and among those best-positioned to prevent it. The UN Declaration on the Rights of Indigenous Peoples (UNDRIP) affirms the right of indigenous peoples to conserve and protect their lands, territories and resources. This means that conservation actions with potential impact on human rights should be taken in consultation with



▲ *Deforestation in the Amazon rainforest (Brazil)*



indigenous peoples and with their free, prior and informed consent and should support their participation in the management and ownership of corresponding efforts.

4. PROTECT ENVIRONMENTAL HUMAN RIGHTS DEFENDERS

Those who take action to protect biodiversity, wildlife, habitats and the human rights and livelihoods that are dependent on a connection to nature have been subject to threats, violence, criminalization and retaliation, with particular impacts on women and girls and indigenous defenders. Instruments including the ICCPR and the UN Declaration on Human Rights Defenders require states to respect, protect and fulfill the rights of environmental human rights defenders to participation, access to information, freedom of expression, assembly and association. States are also obliged to take action against threats to lives, or wellbeing of environmental defenders; provide access to justice and effective remedy when their rights are violated and conduct timely investigations, prosecuting those responsible for violence and intimidation.

5. ENSURE EQUITY IN ACTIONS TO ADDRESS BIODIVERSITY LOSS AND IN THE USE OF THE BENEFITS OF BIODIVERSITY

Actions must consider the needs of children, youth and future generations - who have played little or no part in driving biodiversity and habitat loss but have no choice but to live with its consequences. The CBD and the Nagoya Protocol emphasize that the benefits of biodiversity should be shared in a way that is equitable, transparent and accountable. That considers the equal rights and differing needs of indigenous peoples, local communities and all persons, regardless of their gender.

6. ENSURE MEANINGFUL AND INFORMED PARTICIPATION, INCLUDING INLAND AND RESOURCE GOVERNANCE

The right to free, active, meaningful and informed participation in public affairs is guaranteed by the ICCPR, the UN Declaration on the Right to Development and other international instruments, multilateral environmental agreements, national laws and policies. This means that states should

provide public information about biodiversity in an accessible language and format; provide for and facilitate public participation, bearing in mind the barriers faced by indigenous peoples, local communities, children, persons with disabilities and those in marginalized situations; carry out all related policymaking in a manner that is transparent and accountable.

7. ENSURE ACCOUNTABILITY AND EFFECTIVE REMEDY FOR HUMAN RIGHTS HARMS CAUSED BY BIODIVERSITY AND HABITAT LOSS

The UN Guiding Principles on Business and Human Rights articulate states' obligations to guarantee access to justice and effective remedies when human rights violations or abuses occur, including those by business enterprises. Regional agreements including the Aarhus Convention and the Escazú Agreement specifically address access to justice in environmental matters. As well, nation-level accountability mechanisms should ensure access to justice and remedy for biodiversity loss and associated harm to human rights. Globally, environment-related human rights harms should be included in UN Treaty Body reviews, the Universal Periodic Review process, the work of Special Procedures and rights-based reviews of state compliance with the CBD and related agreements.

8. PROTECT AGAINST BUSINESS-RELATED HUMAN RIGHTS HARMS FROM BIODIVERSITY LOSS

Under international law, states are obligated to protect against human rights abuses by businesses and should require assessment of all social, environmental and human rights impacts of proposed projects that may affect biodiversity. When human rights abuses do occur - including those resulting from biodiversity and habitat loss - states must hold businesses accountable and ensure that those affected have access to effective remedy.

9. ENSURE REGIONAL AND INTERNATIONAL COOPERATION

Effective protection of biodiversity requires international cooperation and solidarity. Instruments including the UN Charter, the ICESCR, the ICCPR and the UNDRIP require states to cooperate on the realization of all human rights, addressing gaps in protection and trans-border and extraterritorial harms. In addition, the ability of developing countries to implement their biodiversity commitments depends on sharing of resources and technology transfers from developed countries. States should therefore establish and strengthen mechanisms and resources for addressing transboundary causes and impacts of biodiversity and habitat loss.

10. EFFECTIVELY MOBILIZE ADEQUATE RESOURCES TO PREVENT HUMAN RIGHTS HARMS CAUSED BY BIODIVERSITY LOSS

The ICESCR requires states to devote maximum available resources to the realization of economic, social and cultural rights. This includes the protection of biodiversity, because biodiversity is necessary to ensuring healthy ecosystems, and healthy ecosystems are necessary to ensuring the rights to life, health and livelihoods of billions of people around the world. States are obliged to act both individually and collectively, making international cooperation and financial assistance imperative.

11. GUARANTEE THAT EVERYONE ENJOYS THE BENEFITS OF SCIENCE AND ITS APPLICATIONS

Under the ICESCR, everyone has the right to enjoy the benefits of science and its applications. The Intergovernmental Panel on Climate Change affirms the value of traditional knowledge systems and holistic approaches. The CBD commits states to respect and maintain the knowledge, innovations and practices of indigenous and local communities toward the conservation and sustainable use of biological diversity. In particular, states should support the use of traditional knowledge with consent of the indigenous peoples concerned, ensuring that any economic benefits are equitably shared and support the transfer of methods and technology for an effective international response to biodiversity loss.

12. ENSURE EDUCATION WITH RESPECT FOR NATURE

The ICCPR guarantees the right of everyone to information and the Convention on the Rights of the Child calls for education to foster respect for human rights, fundamental freedoms and the natural environment. Understanding human rights and the environment is essential to ensuring human dignity, wellbeing and survival and requires the informed participation of all people. States must therefore ensure the right of all people to education - with respect for nature at its core - and to the information necessary to protect it.

13. RESPECT AND PROTECT NATURE FOR ALL ITS VALUES

Living in harmony with nature by 2050 requires the total transformation of humanity's relationship with nature. The diverse values of nature and the relationship between biological and human cultural and linguistic diversity must be better understood and duly reflected in policy. A thriving natural environment along with human diversity is not only the best long-term recipe for resilience and human survival. It is a prerequisite to living with dignity and the full realization of human rights■

ĐỖ HOÀNG

Natural World Heritage sites include some of the largest intact ecosystems on the planet, which store huge amounts of carbon while providing habitats to a wide diversity of animal and plant species. In addition, many cultural World Heritage sites overlap with key biodiversity areas. Ensuring their effective protection across generations, which is the primary objective of the World Heritage Convention, thus supports broader objectives for global biodiversity conservation.

However, the multiple threats affecting Natural World Heritage sites also demonstrate the challenges of achieving conservation objectives. For instance, the French Austral Lands and Seas - the largest World Heritage site covering an area bigger than mainland France - protects more than 50 million birds, including the world's largest populations of king penguins and endangered, yellow-nosed albatrosses. According to a 2014 IUCN study, forests found in World Heritage sites across the tropical regions, such as the Central Amazon Conservation Complex in Brazil or the Okavango Delta in Botswana, store 5.7 billion tons of carbon - more than other protected tropical forests.

The number of global sites facing threats keeps increasing and the severity of these threats is intensifying. The IUCN World Heritage Outlook 3, published in December 2020, revealed that climate change is now a high or very high threat in a third of natural World Heritage sites, overtaking invasive alien species as top threat. This is exacerbated by a range of human-driven pressures, such as tourism visitation, hunting, fishing, fires and livestock grazing.

To create synergies and increase the effectiveness conservation action, the IUCN World Conservation Congress was held in September 2021 in Marseille (France). The Congress was the first major environmental event to be held in a hybrid format, with both in-person and virtual participation, with around 6,000 participants on site in Marseille and 3,500 more people attending online.



IUCN call Governments to focus on protecting Natural World Heritage sites



The Earth Negotiations Bulletin reports that the Congress highlighted dual existential crises for the planet - climate change and biodiversity collapse - and drew significant political attention, as it took place ahead of key global meetings on these two issues: The Glasgow Climate Change Conference (UNFCCC COP 26) and the UN Biodiversity Conference (Convention on Biological Diversity (CBD), (COP 15).

The main outcome document of the Congress was the Marseille Manifesto, which highlights that humanity has reached a tipping point and the window of opportunity to respond to the interlinked climate and biodiversity emergencies is narrowing. The Congress also discussed over the IUCN's advice on 95 Natural World Heritage sites facing threats and eight sites proposed for inscription. In parallel, it will consider advice on broader issues affecting the conservation of World Heritage sites and adoption of 28 resolutions. Resolutions that attracted considerable discussion and/or attention included: On climate change, establishing a Climate Change Commission, as well as promoting integrated solutions on its linkages with biodiversity; On biodiversity, including contributions to the upcoming post-2020 global biodiversity framework (GBF); On rights,

recognizing and supporting the rights and roles of Indigenous Peoples and local communities (IPLCs) in conservation, as well as protecting environmental defenders; On the ocean, protecting deep-ocean ecosystems through a moratorium on seabed mining and taking acting for biodiversity in areas beyond national jurisdiction; On health, promoting the One Health approach and addressing the drivers of biodiversity loss to protect human, animal and environmental health and prevent pandemics; Renunciation of the Doctrine of Discovery to re-discover care for Mother Earth.

Currently in its draft stage, the post-2020 Global Biodiversity Framework highlights that protecting biodiversity and combatting human-induced climate change go hand in hand. The World Heritage Convention can make significant contributions on both the climate and biodiversity fronts, according to the advice prepared jointly by IUCN and UNESCO's World Heritage Centre. "Nature was declining globally at rates unprecedented in human history - we must ensure the efforts gathered through the post-2020 Global Biodiversity Framework would translate into meaningful impact on the ground", said Mr. Tim Badman, Director of the IUCN World Heritage Program.

"World Heritage sites play a leading role in achieving these ambitions as their conservation directly impacts the biodiversity and ecosystems they host. We call on Governments to focus on doing what is in their power to protect these exceptional sites, with international support if needed, as a crucial step in tackling global challenges" ■

NHẬT MINH

Consumption of wildlife drops almost 30% over links to COVID-19

A new World Wildlife Fund (WWF) commissioned report reveals that nearly 30% of people surveyed across China, Myanmar, Thailand, Việt Nam and the United States say they have consumed less or stopped consuming wildlife altogether because of the global health crisis.

Specifically, 28% of those surveyed in China consume less wildlife or have stopped consuming wildlife because of COVID-19, with numbers doubling over the last year in Thailand (to 41%) and remaining relatively stable in Việt Nam (39%). In the United States, 12% of participants say they consume less or have stopped consuming wildlife. There remains a committed contingent of wildlife consumers, however, with 9% of participants intent on buying wildlife products in the future in all five countries.

Research shows that up to three-quarters of emerging infectious diseases, including COVID-19, are zoonotic, meaning they jump from animals to humans. Key drivers of zoonotic disease include, high-risk wildlife consumption and trade and deforestation.

The new data shows strong global understanding that risky animal-human interaction, often connected to deforestation and high-risk wildlife trade, can lead to serious disease outbreaks.

Key report findings: 46% of all survey participants listed disease transmission from animals to humans as the root cause most likely to trigger future pandemics; Support is strong in all five countries to back Government efforts to close high-risk markets selling wildlife (85%) and stop deforestation (88%); In the United

States, 72% surveyed believe closure of high-risk wildlife markets is very or somewhat effective to prevent similar pandemic diseases from happening in the future; 59% of Americans surveyed said they would be extremely worried or very worried about a similar outbreak if measures weren't taken to close high-risk markets; 67% of Americans said they are more likely to buy from companies taking action to prevent pandemics, including implementing sustainable resource use and stopping deforestation.

"The world has gotten a crash course this past year in pandemics. Preventing future ones requires us to repair our broken relationship with nature and that starts with ending the trade and consumption of high-risk wildlife and stopping deforestation", said President and CEO of WWF-US Carter Roberts.

This new research shows that the public supports those changes and the survey confirms that when policy change happens, consumer behavior change often follows. The Chinese Government announced a broad ban on the consumption of wild animals in February 2020 and the survey found that in China, closing high-risk wildlife markets is seen as the most effective measure to prevent pandemics (91%).

In Việt Nam, where the Prime Minister also announced actions against the illegal wildlife trade last year, 84% of respondents agree that closing high-risk wildlife markets is crucial.

WWF-US is calling on Governments to adopt a One Health approach to deforestation and high-risk wildlife trade. WWF is also calling for the U.S Government, G7 Leaders and multilateral organizations to take immediate action to address high-risk wildlife markets and strengthen national legislation, regulation and enforcement to support these actions over the long term. WWF urges decision-makers to take the critical steps needed to address key drivers of zoonotic disease outbreaks in their pandemic prevention plans. Halting deforestation and closing

risky wildlife markets will help wildlife populations recover while maintaining local and global biodiversity that naturally helps regulate disease.

High-risk wildlife is defined as groups of species that pose a particular risk for the transfer of zoonotic diseases. They are rodents, bats, shrews and shrew-like relatives, primates, carnivores and ungulates. Rodents carry 85 known zoonotic diseases, carnivores 83, primates 61, ungulates 52, bats 25 and shrews 21■

MAI HƯƠNG



▲ Closing risky wildlife markets will help wildlife populations recover



Five coral reefs that are currently under threat and dying

Coral reefs are at risk of being completely wiped by 2050 as some scientists have estimated. Coral reefs play a significant role in ocean habitats and the ecosystem for marine life. But they have suffered devastating and possibly irreversible, effects within the last few decades due a number of man-made activities and influence. Overfishing, plastic pollution, rising global temperatures and coastal developments all have a hand in the degradation of coral reefs around the world.

The combination of these human factors has resulted in a mass phenomenon of coral bleaching, which is what happens when rising ocean temperatures disrupt the symbiotic relationship between the reefs and algae that lives within it, driving away the algae and causing coral reefs to lose its vibrant colours. The longer temperatures remain high, the more difficult it will be for algae to return and impossible for reefs to be revived. Warmer waters also lead to ocean acidification, preventing coral reefs the ability to rebuild its exoskeletons.

Some coral reefs are more resilient than others. The corals in the Gulf of at the Northernmost tip of the Red Sea have been found to develop higher thresholds in withstanding warmer temperatures than others. However, systems have been hit hard by the effects of climate change and are now some of world's most threatened coral reefs.

1. GREAT BARRIER REEF

The largest and longest reef system in the world, the Great Barrier Reef has also experienced some of the most severe effects caused by coral bleaching and climate change. The most notable mass bleaching events occurred in 2016 and 2017 and a stunning 50% of Australia's famous reef died as a result. While major efforts have since been put in place to reduce coral bleaching, the scale of mortality has proven difficult for the reef system to regrow and replenish.

2. INDONESIA

Up to 95% of coral reefs in Southeast Asia are currently under threat. Plastic pollution and overfishing are particularly severe in the region, the corresponding stresses and pressures on the health of coral reefs are equally high. As plastic pollution piles up, it can suffocate and restrict sunlight access towards the reefs. A 2017 study conducted on the Melinjo Islands found that the average coral cover was down to 22.2%. Scientists estimate that with worsening ocean acidification, only 15% coral reefs in the region will have the adequate ability for coral growth by 2050.

3. PACIFIC OCEAN

The longest and most destructive coral bleaching event occurred between 2014 and 2017 caused by a climate phenomenon known as El Niño, where warming surface waters arrive over the Central and Eastern equatorial Pacific Ocean. During that period of time, it was estimated that over 70% of the world's coral reefs were affected and experienced



▲ The Great Barrier Reef is the most severely affected coral reef in the world by coral bleaching and climate change



▲ *Coral reefs play a significant role in ocean habitats and the ecosystem for marine life*

permanent damage. El Niño occurs every three to seven years, which has both short- and long-term concerns for reef systems in the Pacific Ocean varying from the frequency of coral bleaching to the time span reefs need to revitalise.

4. HAWAII

A number of reef systems in Maui have recorded a loss of nearly 25% of living coral between 1994 and 2006, with the most notable example being Honolua Bay where its coral cover dropped from 42% to 9%. The dramatic decline of coral can be linked back to human activities. However, local Governments have since taken various measures to revitalise and protect its reef systems including banning the use of sunscreens that contain oxybenzone and octinoxate, which are chemicals that cause coral bleaching and other harmful impacts.

5. CARIBBEAN

Despite coral reefs being the main attraction for tourism in the Caribbean, the health of its reef systems has increasingly declined. A study conducted by the World Resources Institute has found that “nearly two-thirds of coral reefs in the Caribbean are threatened by human activities while an estimated one-third is threatened by coastal development” such as construction and sewage discharge. Furthermore, overfishing in the region contributes 60% of the reef’s health■

BẢO BÌNH

According to a 2019 study commissioned by Environment and Climate Change Canada (ECCC), about 3.3 million metric tons of plastic is discarded in Canada each year and less than 10 percent - about 305,000 metric tons - is recycled. The remainder goes to landfills, incineration, or leaks into rivers, lakes and oceans and about one-third of the plastics used in Canada are for single-use or short-lived products and packaging, including up to 15 billion plastic bags used every year and close to 57 million straws used daily.

PLASTIC IS TOXIC

A 2020 Canadian Government science assessment found ample evidence that plastic harms the environment, choking seabirds, cetaceans and other wildlife. The findings form the basis of the Government’s decision, as substances can be considered toxic if they harm the environment and biodiversity, human health, or both. The Government argues that voluntary measures, as championed by industry, are not enough to effectively counter increasing plastic pollution. Measures can be taken for individual plastic products. In other words, the Law needs to be enforceable on a case - by - case basis.

Canada is taking this revolutionary step so that it can further reduce the plastic in the environment. In doing so, Canada will follow a well-trodden path. A few years ago, plastic particles in personal care products were declared toxic by Law which paved the way for a ban.

The current list of toxic substances under Canadian Environmental Law - the Canadian Environmental Protection Act (CEPA) - will be extended to contain “plastic items”. This creates the space for plastic to potentially be declared toxic. This modification is the legal basis to evaluate each individual plastic product for risks to the environment and to human health. This will be the case if these products are found or may be found in worrying quantities in the environment. However, the new Law does not state that plastic is toxic. It is about having the option of carrying out a risk analysis for each plastic product from now on. Depending on the outcomes of the analysis, prevention measures can be put in place.



Canada declares plastic toxic and plans to ban single use plastic items



▲ *The new Law is viewed as a legal basis for banning certain items from single use plastic in Canada*

CANADA IS CONSIDERING BANNING CERTAIN ITEMS

The Canadian Government's goal is that there is no more plastic in the environment by 2030. The new Law is viewed as a legal basis for banning certain items from single use plastic (SUP). The country is considering a ban on some plastic items like straws, stirrers, cutlery, six-pack rings, thin supermarket bags, Styrofoam items and take-away food packaging. The list of toxic substances (CEPA) now paves the way for a ban on the use and sale of these items nationwide by the end of 2021.

The Environment Minister said the Canadian Government selected these items because there are already available and affordable alternatives and that while many items will have to continue to be single-use, they need to be items that can be recycled. The only way to prevent toxic substances from getting into the environment is to ban all of them. The Government wants to tackle the climate crisis, protect our oceans and move toward a circular economy, but as long as single-use plastics continue to be produced at current rates, there is no incentive for companies to transition to cleaner and healthier reuse models.

Calls for reductions and bans on single-use plastics are growing across nations and cities around the world and even from huge multinationals Canada joins a growing list of countries using bans to confront the problem of excess waste that often ends up littering oceans, lakes and other waterways. Some Canadian jurisdictions already have their

own bans in place. Prince Edward Island became the first Province in Canada to ban plastic bags outright, followed by Newfoundland. Tofino and Ucluelet in B.C have enacted bans on plastic bags and straws. Vancouver has approved a ban on plastic straws and will enact a plastic bag ban by 2021. Victoria has already banned plastic bags, along with Montreal.

NEW RECYCLED CONTENT REQUIREMENTS

When the Ban on single-use plastics was first announced, the Federal Government said it would be focusing on holding big companies responsible for their plastic production, requiring them to play a part in collecting and recycling their materials. The announcement includes a proposal to establish recycled content requirements in products and packaging, which the Federal Government says will spark investment in recycling infrastructure and innovation in technology to extend the life of plastic materials to keep them in the economy and out of the environment for longer. The Federal Government has a target of at least 50 percent recycled content in plastic products by 2030.

Under the new regulations the Canadian Government will require a minimum percentage of recycled content; rules for measuring and evaluating the amount of recycled content; guidelines and related tools to help companies meet their requirements.

The Federal Government will be publishing a proposed order to add "plastic manufactured items" to the list of regulated products under Canadian Environmental Protection Act 1999. The environmental organization calls on the Government to not only ban SUP items, but to actively bring about systems change■

PHƯƠNG LINH



Efforts to revive and protect coral reef ecosystems in Hạ Long Bay

Hạ Long Bay (Quảng Ninh) is home to 147 species of coral. Areas with high coral coverage of over 30 percent are located in Cống Đỏ - Trà Sắn, Hang Trai - Đầu Bê with a total area of about 5,108 ha. Coral reefs are distributed mainly in Trà Sắn, Soi Ván and Lưỡi Liềm areas.

In 1998, Hạ Long Bay still had some “good” and “very good” reefs (with coral cover reaching 51 percent or higher and 76 percent or higher, respectively). By 2013, it no longer had any reefs in the “very good” category. The situation deteriorated further in 2015 when a survey showed that coral cover in the best-maintained reefs was below 50 percent and the average rate in the Bay was just 20 percent.

The damage was blamed on the declining water quality and the emergence of *Drupella* snails that eat coral tissues. Both of which are considered the result of human activity including tourism, fishing, pollution, industrial and household wastewater. However, in recent times, with stringent management measures introduced, there have been signs of recovery. Some reefs have been discovered with coral cover as high as 60 to 70 percent. The flourishing of “branching” corals has also been observed.

To save the coral reef ecosystems in the Bay, the Hạ Long Bay Management Board in the Northern Province of Quảng Ninh is carrying various measures to protect coral reef ecosys-

tems in the area. The Management Board has surveyed and built a database of the ecosystems useful for implementing conservation solutions. In addition, it has also trained human resources specialising in the management and protection of the coral reef ecosystems. Patrols are regularly organised while violations in fishing and protection of aquatic resources are strictly handled.

The Management Board has regularly monitored and periodically supervised the conservation of coral reef ecosystems to promptly detect threats and carry out restoration measures. Along with zoning off and strictly preserving coral reefs with high coverage from 30 percent or more, it also erected warning signs and has stopped boats from operating as well as increasing the frequency of inspections.

Activities to protect the water environment of Hạ Long Bay have been enhanced to protect the habitat of coral reefs such as banning polluting acts or collecting floating waste, especially garbage at the foot of the islands where coral reefs are often distributed.



▲ *Coral in Hạ Long Bay (Quảng Ninh)*



In 2019, Quảng Ninh Province issued a regulation on the management of Hạ Long Bay, including a ban on fishing in the Heritage area. This rule is of great significance for the conservation of coral reef ecosystems because fishing boats might cause environmental pollution, especially oil pollution, which is one of the main reasons for coral death.

The Hạ Long Bay Management Board, in collaboration with the Municipal People's Committee of Hạ Long City have been diligently working to repair the reefs. The Management Board regularly monitors and supervises conservation of the coral reef ecosystem to promptly detect threats and carry out restoration measures. They have surveyed and built a database of the ecosystem which has proven useful for implementing conservation measures. In addition, it has trained people in the management and protection of the coral reef ecosystems and related agencies have regularly launched dissemination campaigns and instructed vessels not to anchor on coral reefs and prevent fishing in prohibited areas.

Deputy Head of the Hạ Long Bay Management Board Phạm Đình Huỳnh said thanks to the adoption of synchronised solutions, the coral reefs of Hạ Long Bay are showing signs of recovery. The number of coral reefs with coverage of over 60 percent and branched corals are growing, he said.

Hạ Long Bay, a UNESCO World Heritage Site located in Quảng Ninh Province, is one of Vietnam's most popular travel destinations, receiving 14 million visitors in 2019. Hạ Long Bay literally "descending dragon" Bay, was twice recognised as a World Natural Heritage site by UNESCO in 1994 and 2000. The Bay spans 1,553 square kilometres and includes 1,969 islands of various sizes. It features thousands of limestone karsts and islets in various shapes and sizes. The limestone in the Bay has



▲ *Hạ Long Bay (Quảng Ninh Province)*

gone through 500 million years of formation in different conditions and environments. The geo-diversity of the environment has created biodiversity, including a tropical evergreen biosystem, oceanic and sea biosystem.

According to Deputy Chairman of the Provincial People's Committee Cao Tường Huy, Quảng Ninh Province has outlined ways to increase its sea-based economy, focusing on tourism, sea services and coastal industries that are environmentally friendly. With a vision of becoming an international tourism centre with uniformed infrastructure, a kaleidoscope of high - quality tourism products and a competitive edge over rivals in the region and the world, the Province has invested heavily in tourism and trade facilities, developing eco-tourism in a sustainable manner and forming high-end tourism sites in Hạ Long, Vân Đồn, Cô Tô, Hải Hà - Móng Cái and Bái Tử Long.

The Province will prioritise turning Hạ Long into a modern tourism City while developing Vân Đồn - Cô Tô into an international entertainment centre. It is also studying how to develop new tourism products such as yachting, water taxis, seaplanes, hot air ballooning and scuba diving. Due attention will be paid to upgrading local fishing ports and anchorages, improving fisheries logistics in Cô Tô and Vân Đồn districts and forming three fishing centres in Cô Tô, Vân Đồn and Đầm Hà and two seafood trading centres in Hạ Long City■

PHƯƠNG TÂM



CÁT BÀ BIOSPHERE RESERVE

Cát Bà Biosphere Reserve (BR), designated on 2nd December 2004 by UNESCO has a total area of 26,241 ha (of which island area accounts for 17,041 ha and the sea 9,200 ha) including around 366 limestone islets of Cát Bà Archipelago in Hải Phòng City.

Cát Bà BR's rich biodiversity is attributed to its forest, marine, island ecosystems, thus giving a national and international significance. Current studies have recorded that as many as 3,156 species plants and animals are available, namely 1,843 land species and 1,313 marine species. Land species include 54 species of animals, 160 species of birds, 47 species of reptiles, 21 species of frog and 1,561 higher plants. Sea species consist of 196 species of fish, 193 species of coral, 538 species of zoobenthos, 89 species of zooplankton, 23 species of mangrove plants, 75 species of seaweed/algae and 199 species of plankton plants. Even extremely rare species such as Cát Bà lingers (yellow headed) being one in 25 primates most subject to extinction risks according to IUCN Red List. In 2011, UNESCO has nominated Cát Bà Archipelago to be one of World's Nature Heritages.



▲ Lan Hạ Bay - Cát Bà Island (Hải Phòng City)

Cát Bà Archipelago is one of the most typical examples of the natural landscape eroded by the sea. 366 islands have recorded history of sea events, karst and history of ancient Việt Nam people. Fenling, fengcon and varied shapes of stones best illustrate strong internal movements of mature karst, once developed on lands, then eroded and altered by the sea.

Narrow beaches with golden sand are romantically blended with valleys, accentuating the spectacular and wild landscape. A geopark is being shaped in Cát Bà to further study and enhance geological value of the area.



▲ Monkey Island is one of the must-see places when traveling to Cát Bà



▲ Charming beauty of Cát Bà Archipelago

Long standing indigenous culture with its own identity

Cát Bà indigenous culture is a fine example for the tradition of unity and support of people in the Northern coastal region. Many traditions remain strong in modern life such as festivals of fish village, boat rowing festival and festivals of wooden horse. Cát Bà major island has so far had 77 archaeological relic sites discovered. For example, Cái Bèo Relic site has cultural remains dating from 6,400 to 4,200 years, Đá Hoa Cave is the place where fossil of Pongo - Pygmaeus, porcupine and rhino was discovered. Relic of citadel of Mạc Monarchy was also found.

Cát Bà BR - a model for sustainable development

Cát Bà BR is considered one of the most dynamic in the network of MAB Việt Nam with many qualities' economic incentives such as brand recognition of Cát Bà BR, fund for the sustainable development of Cát Bà BR with a participation of concerned Governmental agencies, institutes, private businesses, non - Governmental organizations and the local population. Cát Bà BR was also the first in the world to pilot managing the BR like laboratories with an aim to study about sustainable development.

A visit to Cát Bà BR will provide tourists a chance to participate eco-community-based tours in Việt Hải, Xuân Đám, Hiền Hào, Khe Sâu communes in the buffer zone. Similarly, tourists can choose environmentally friendly tours in which they can do a wide range of activities such as visiting, discovering caves, watching birds and animals in Cát Bà National Park, hiking, kayaking, scuba diving and fishing or select spirit-based tours, taste local specialties such as trying Gia Luận orange, Liên Minh chicken, forest honeybee, Hibiscus tea and Cát Hải fish sauce.

In Cát Bà BR, where ideas and experience are exchanged and new ideas are tried out, development and conservation are well reconciled. Cát Bà, a living laboratory for researching the sustainable development is worthwhile destination for tourists■

LÊ THANH TUYÊN - NHÂM HIỀN



Ninh Thuận to expand protection-forest cover

Ninh Thuận Province plans to increase its forest-cover rate to nearly 50 percent, including 330 hectares of new special-use forest and protection-forest planted in response to climate change. The Province targets restoring 4,000 ha of damaged forest and 71,400 ha of forest under forest-protection contracts in 2021.

Promoting forest protection and development plays an important role in protecting water and soil resources, preventing erosion, limiting the impact of natural disasters, conserving biodiversity and maintaining natural habitats. The Province has 116,172 ha of protective forest land, accounting for 59 percent of its entire forest land. Of the figure, more than 30,192 ha of land has no trees. The Province is focusing on afforestation and management of protection- and special-use forests. Training courses in forest-fire prevention and fighting have been offered to local households responsible for protecting planted forests. The Province has in recent years detected and handled many cases involving illegal forest exploitation and forest land encroachment.

It has been growing drought-resistant trees with high economic value such as *trôm* (*Sterculia foetida*), *thanh thất* (*Ailanthus triphysa*), *muồng đen* (*Senna siamea*) and *keo lai* (*Acacia mangium* x *Acacia auriculaeformis*) in protection and special-use forests. The quality of local forests has improved, with poor forest areas restored and forest cover increased. Barren land and bare hills are now covered with trees. For example, *thanh thất* trees which can adapt to a dry climate have been planted on more than 650 ha of rocky mountains in Thuận Nam District's coastal areas for protection forests since 2015.

Deputy Head of the District's Protective Forest Management Board Lê Xuân Hòa said the planting of *thanh thất* trees was supported by the JICA 2 afforestation project under the Việt Nam's Support Program to Respond to Climate Change (SP-RCC). Many trees are now 2.5 - 3m in

height and will cover the rocky mountains in the next 10 years. The Province has also allocated forest land to local households for protection under contracts. On average, each local household receives about 30ha of forest to protect under a forest protection contract for VNĐ 400,000 (US\$17.4) per hectare each year.

Since 2016, local households have used additional income earned from forest protection contracts to develop forest-linked livelihoods such as breeding cows, goats, sheep and planting more than 22,500 fruit trees. The Department is expanding these effective forest-linked livelihood models.

However, forest management faces many challenges, including financial constraints and various policies. Ninh Thuận Province regularly experiences dry and hot weather that significantly impacts forest fire prevention and control, and afforestation. Dangerous terrain also causes problems for forest management and protection. Director of the Provincial Department of Agriculture and Rural Development Đặng Kim Cương said the Department would continue to raise the awareness of local residents about the importance of protection forests as well as legal regulations. It is also continuing sustainable forestry development to help local residents earn additional income by participating in forest protection under signed contracts.

Programs on how to plant special-use, replacement and protection forests are also being strengthened. Better coordination among forest-prevention forces, armed forces, local authorities and residents is also being implemented.

TRẦN HƯƠNG



▲ Mangrove forests planted in response to climate change and ecosystem restoration in Ninh Hải District, Ninh Thuận Province

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