

# An Innovative Solution on Geographical Indications for Environment & Sustainability (GIES)

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**Abstract:** Jointly organized by the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, and the World Federation of Engineering Organizations, the Forum on An Innovative Solution on Geographical Indications for Environment & Sustainability (GIES) was convened at the 2021 China International Fair for Trade in Services (CIFTIS). More

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than 80 experts from 30 organizations participated the forum on site and more than a thousand of people joining virtually. The participates focused on 6 key issues to emphasize the roles of scientific communities, governments, private sectors, technology innovation, education, scientific communications and civil societies. Representatives from 11 cases demonstrated the progress and experiences. A common understanding and agreement was made to launch the Decade Initiative on Geographical Indications for Environment & Sustainability 2021–2030 (GIES). The partners agreed to establish a best practices and cases network during the following 10 years. All agreed that it was a critical issue in using big data and internet of things technology to encourage cooperation and collaboration among the multi-stakeholders, which could archive the United Nations 2030 Sustainable Development Goals, especially Goal 1, Goal 2, Goal 14, Goal 15 and Goal 17.

**Keywords:** GIES; geographical indications; environment; sustainability; SDGs; decade initiative; cases

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## 1 Introduction

Jointly organized by the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, and the World Federation of Engineering Organizations, the Forum on An Innovative Solution on Geographical Indications for Environment & Sustainability (GIES) was convened at the 2021 China International Fair for Trade in Services (CIFTIS). More than 80 experts from 30 organizations joined the forum in person at the China National Convention Center, Beijing and more than a thousand of people joined virtually on 4<sup>th</sup> September 2021 (Figure 1).

Besides IGSNRR/CAS and WFEO, the co-sponsor organizations include the Big Data Working Committee of Geographical Society of China (GSC), China Centre for International Science and Technology Exchange, China Society of Natural Resources, Nankai University, Qiyuan Fishery Technology Co., Ltd., Yucheng Venture Capital Group Co., Ltd., governments of Feng county in Jiangsu province, Panshi city in Jilin province, etc.

Prof. Gong, K., President of WFEO, pointed out in his welcome speech at the forum that the aim of WFEO to organize such a forum at CIFTIS is to highlight the role of engineering innovation to archive the SDGs (Figure 2).

Prof. Liu, Y. H., former Vice Minister of the Ministry of Science and Technology of China (MOST) and professor of IGSNRR/CAS, delivered the keynote speech on Environment and Sustainability on Geographical Indications<sup>[1]</sup> (Figure 3). The participants exchanged opinions on how to take action for SDGs and discussed six issues focused on GIES. They were: opportunities and challenges for GIES; role of science, technology and engineering in GIES; role of enterprises and private sectors; role of scientific publications and communications; role of government; the role of education and civilization culture, etc.



**Figure 1** Co-organized by CIFTIS and WFEO, the Forum was convened in the China National Convention Center, Beijing, on 4<sup>th</sup> September



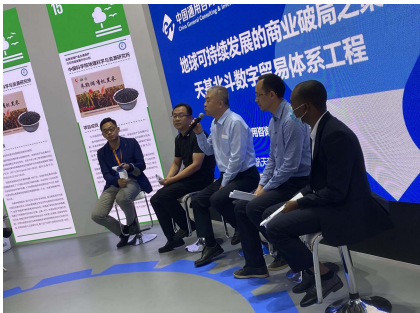
**Figure 2** Prof. Gong, K., President of WFEO, made a welcome address



**Figure 3** Dr. Liu, Y. H., former Vice Minister of the Ministry of Science and Technology, delivered a keynote speech



**Figure 4** Forum on role of government



**Figure 5** Forum on role of private sectors



**Figure 6** Group photo of panels at the forum on roles of science, technology and engineers

2 Challenges and Solutions

2.1 Challenges

Environmental protection and sustainable development are important parts of the UN Sustainable Development Goals. For the geographical indications, keeping the original geo-eco-bio-system and protecting the intellectual property are keys for sustainable development. China is a country with the richest geographic diversity in the world with its unique geographical civilizations. However, most of the areas are with health environment, but low income in socio-economics, and many have just been lifted out of poverty and are still at risk of falling back into poverty. How to achieve environmental protection while ensuring regional economic development is an important issue that needs to be addressed

immediately at present<sup>[3]</sup>.

China carries out international trade activities with more than 100 countries and regions in the world<sup>[4]</sup>, including quality geographical products in terms of geographical indications, geographical specifications and geographical traditional civilization products. In the international trade activities, health environment and health geographical products are highly valued and strictly regulated<sup>[5]</sup>. The China-EU Agreement on Geographical Indications<sup>[6]</sup> has been implemented since March 1, 2021. Till July 5, 2021, in just a few months, 110 products from China and 134 products from Europe entered the markets of the other party, which was exceeding the expectations by both.

At present, the protection of geographical indication products in China mainly lies in the hands of intellectual property and the business communities. Although the market trade has an urgent demand for the transparency of the information of ecological natural products, relevant research in this regard is rather rare and scarce, and geography research and service trade are not developed in a coordinated way. Journals related to sustainable development have broken through barriers among academic circles in science promotion, and effective mechanisms for meeting the local needs are still being explored. The driving force of independent and innovative technology application is not satisfactory and there is a huge gap between system integration and social needs. This is a comprehensive issue. It can be said that no single person or organization can solve such problem. Therefore, promoting consistent cross-boundaries communication and multi-stakeholders' cooperation become a crucial mechanism.

## 2.2 The Innovative Solutions

In driving health products, health environment and health life, especially in the post-epidemic era, an implementable, operable and sustainable mechanism and roadmap must be investigated, so that the protection of quality geographical products and their intellectual property could finally go to sustainable development. Thus, since January 2021, The Institute of Geographic Sciences and Natural Resources Research, CAS, has held a series of seminars<sup>[7]</sup> and show cases meetings<sup>[8]</sup> to discuss the integrated development mechanism for GIES. In the 2021 China World Trade in Services Fair, institute of Geographic Resources of CAS and United World Engineering Group, China Association for Science and Technology and the United Nations Consultative Committee on Information, Communication and Technology jointly launched the GIES action plan. Multi-disciplinary integration, multi-participation system, scientific implementation, technology and engineering implementation and reliable science communication as important guarantees are well embodied. Scientific communities work closed with local people, instead of focusing on the publications' impact factor<sup>[9]</sup> only. Scientific research should help the local development and central policy designation, and optimize the market, support the local sustainable development, upgrade the scientific decision-making, boost the development and communication of interdisciplinary sciences, and advance science popularization. Those best practices of diversity and individuality following common geographical laws<sup>[10]</sup> are well explanations of future earth.

The action plan, mainly through comprehensive geographical science and technology and based on the internet of things and big data systems, monitors the ecological environment related to the geographical habitat and product development. As a result, weather and disasters, air and soil and water conservation, biodiversity and habitat resources, etc, are well monitored and recorded. By utilizing information communication and data transmission technology, environmental factors of natural ecology (wind speed, wind direction, temperature, humidity, air pressure, light, rainfall, soil temperature, soil moisture, PM<sub>2.5</sub> and PM<sub>10</sub>, vegetation visible light, vegetation, etc.) are measured and transmitted. Besides, with

the help of artificial intelligence, internet of things, cloud computing technology, vegetation coverage, height and phonology could be automatically identified on the cloud platform providing users with information support and services. In this case, a safe, reliable and practical “digital ecosystem” can be established. We should drive the logistics of natural ecology by digital data and knowledge dissemination; boost tourism by quality research; foster a mechanism of ecological environmental protection and sustainable development by standardized management and traditions composed by culture. The mechanism is made with science as the foundation, technology as the support, multi-stakeholders as the main body, culture as the sediment, and product–origin–brand–reputation–culture as a whole.

The innovative solution is to take practices of habitat protection and sustainable development of quality geographical products as the starting point, achievement to SDGs, create a new mechanism with open science as the core, and adopt the implementation roadmap of multi-party participation, science empowerment, technological innovation, communication guidance, property rights protection, project accomplishment and people’s welfare.

### **2.3 Intellectual Property Protection and Science Promotion Infrastructure**

IGSNRR/CAS, the largest institute on geography and natural resources in China and the Global Change Scientific Research Data Publishing System (GCdataPR), a regular member of the World Data System (WDS), become the important scientific and technological strength in GIES program. In doing so, it resolves the major public scientific and technological problems concerning holistic and long-term development especially in the field of environment and resources. It also consistently enhances the institute’s capacity for independent innovation and sustainable development ability. Since the GCdataPR was officially launched in June 2014<sup>[11]</sup>, it becomes the China GEO Data Publishing Sub-center approved by the National Remote Sensing Center of the Ministry of Science and Technology and Regular member of WDS in 2016 and Data Publishing Sub-center of National Data Center on Earth Observations. It was honored the awards, including the WSIS Prize (*e-Science*, Champion) 2018 and 2021<sup>[12]</sup>, National Digital Publication Innovation Project Award in 2018, and outstanding application award in big data for research and education in 2017. The center provides services for the registration of international digital objects<sup>[13]</sup> by DOI:10.3974 and national digital objects by CSTR:20146 (China Science and Technology Resources)<sup>[14]</sup>. The special registration system<sup>[15]</sup> is composed of DOI-CSTR-GCdataPR, guarantees the intellectual property protection for GIES cases and products.

## **3 Show Cases**

For the GIES initiative, 11 cases were reported at the CIFTIS 2021, including 5 cases on best practices, 3 cases on the way of being evaluated, 2 cases for instrument, equipment development and services and 1 case for investment service.

### **3.1 Best Practices of Innovative Solution on Geographical Indications for Environment & Sustainability**

#### **3.1.1 Evaluation**

In January 2021, a joint evaluation group for GIES organized by IGSNRR/CAS, Geographical Society of China (GSC) and the Editorial Office of Journal of Global Change Data, the World Data Center announced the specification for evaluating GIES cases:

A. Fill the Case Form for Evaluation

Cases that may meet the following requirements:

(1) product should be one at least among the three: geographical indication, geographical

specifications or geographical civilizations;

- (2) product should come from original geographical area;
- (3) there are companies join the case team;
- (4) there are scientists or experts on the products join the case team;
- (5) any team member has no record of bad faith or academic misconduct in the past three years.

#### B. Peer Review

All of the cases should go to peer review process. Normally, the process conducts three rounds of reviewing and three rounds of checking<sup>[16]</sup> based on standards according to the international publication rules and open science principles. The contents reviewed are included for major pats: one is the physical geo-eco-system scenario dataset, such as climate, soil, water, land forms, land cover, bio-diversity, etc.; second one is the geographical indication product data, such as variety, quality, ecological habits, growth state, nutrients, etc.; the third one is the socio-economic and management data, such as socio-economic, population, product management, as well as standards in product management; and last one is the traditional or civilization information and data. All of these data should be available to be published and openly available to all. The *Digital Journal of Global Change Data Repository* provides services for this.

Besides the dataset, the knowledge about the product dataset should be clear and will be available to be published and openly available to all. The *Journal of Global Change Data & Discovery* provides services for this.

#### C. Registration

After passing the evaluation, relevant information will be officially registered, published and widely disseminated in both Chinese and English. Each case that has passed the review shall be issued with unique identification, which also includes identification of scientific data, scientific knowledge (article), geographical area and case specimen. In addition, labels of observation instruments and equipment, research bases and germplasm resources were added for cases with favorable conditions. These registrations are completed through the World Data Center, GCdataPR<sup>[17]</sup>.

#### D. Online Case Network Services

The online service system will be established for the GIES cases network. The case information also with local monitoring system will be watched openly for all. For cases of ecological degradation, environmental damage, falsification, academic misconduct, etc., termination and cancellation will be required according to relevant methods.

### 3.1.2 Yanchi Tan Sheep Arid Grassland Case (Ningxia Hui Autonomous Region of China)

The Yanchi Tan Sheep Arid Grassland Case is located at Huamaci township. The case dataset was published at *Digital Journal of Global Change Data Repository* with DOI:10.3974/geodb.2021.05.09.V1 and CSTR:20146.11.2021.05.09. The team members of the case study were from Ningxia University, the Agricultural and Rural Bureau of Yanchi county, Ningxia Yanchi Tan Sheep Industry, Village Committee of Wanjigou, Huamachi town, IGSNRR/CAS, and Communication Department of Ningxia Hui autonomous region.

Yanchi county, located in the northeast of Ningxia Hui autonomous region, is an arid grassland area at the border of Shaanxi, Inner Mongolia and Ningxia. The annual average temperature of Yanchi is 7.8 °C, the annual rainfall is 200–240 mm, and the annual evaporation is 1,800–2,400 mm, which is about 10 times more of the annual precipitation. Yanchi is of typical continental arid grassland climate. Groundwater in the region is generally alkaline, with the pH ranges from 7.85 to 8.17. The main soil types of yanchi soil are zonal limestone soil, non-zonal saline soil and aeolian sand soil. There are four grassland types in Yanchi: steppe grassland, desert grassland, sandy vegetation grassland and

halophytic vegetation grassland. There are 175 species of natural plants, belonging to 39 families, most of which are forage plants. Among them, 12 plants such as licorice and sophora alopecuroides are included in pharmacopoeia, and 4 plants such as setaria are used as folk medicines<sup>[18]</sup>.

Tan Yanchi Tan sheep is a geographical indication product, and Yanchi county is called as “the hometown of Tan sheep in China”. Yanchi Tan mutton, tan sheepskin and Tan ermao fur are the main products of Yanchi Tan sheep. Yanchi Tan sheep is closely related to people’s life and production for a long time. From breed identification to dining table, Yanchi Tan sheep are regulated by a series of standards (28 standards)<sup>[19]</sup>. Standardized management is an important guarantee for breed protection, ecological and geographical environmental protection, market credibility and herdsmen’s life and well-being. Ningxia Yanchi Tan Sheep Industry Development Group Co., Ltd. is a wholly state-owned enterprise established by Yanchi county people’s government in 2017. It is an industrialization enterprise of Tan sheep that serves the whole industry chain of Yanchi Tan sheep, integrating breed preservation, purchase, processing, reserve, sales and promotion. At present, the company has a slaughter plant of 300,000 Yanchi Tan sheep, and 5,000 Yanchi Tan sheep ecological pasture. In 2006, it was listed in the protection species of national livestock and poultry genetic resources by the Ministry of Agriculture. In 2017, “Ningxia Yanchi Tan Sheep Breeding System” was selected as the fourth batch of China’s important agricultural cultural heritage. When President Xi, Jinping visited Ningxia in 2020, he instructed that “The meat quality of Tan sheep in Ningxia is good, and the tan sheep should have the characteristics of Tan sheep. We should protect this breed.”.

### **3.1.3 Baoshan Arabica Coffee Dry-Hot Valley Case (Yunnan Province of China)**

The Baoshan Coffee Xinzhai Village Dry-Hot Valley Case is located at Xinzhai village of Baoshan county. The team members of the case study were from Baoshan University, Meteorological Bureau of Longyang district, Baoshan Quality and Technical Supervision Comprehensive Testing Center, Baoshan Chunzheng Coffee Industry Co., Ltd., Coffee Association of Yunnan province and IGSNRR/CAS. The case dataset was published at *Digital Journal of Global Change Data Repository* with DOI:10.3974/geodb.2021.05.10.V1 and CSTR:20146.11.2021.05.10.V1.

Coffee came to Yunnan in around 1900s and began to be planted in large scale in Lujiang dam, Xinzhai village of Baoshan prefecture after 1952. Baoshan Arabica coffee is mainly planted in the dam area of Lujiang town, Longyang district, Baoshan city. Xinzhai village is not only home to a large number of coffee gardens, but also forms a vertical ecological zone with an altitude of 760 to 1,640 m, which enables the cultivation of different coffee varieties. Over the years, Baoshan coffee has formed a cultural and geographical tradition with regional characteristics for the protection of dry and hot valley habitats and the production and life of residents in Xinzhai village. Yunnan Baoshan Arabica coffee, a national geographical indication product, is the only coffee geographical indication product in China and one of the best coffee products in the world. It has been granted the World Eureka Gold Award, USDA Certification and China Agricultural Exhibition Silver Award, it also on the list of China-EU Agreement on Geographical Indications in 2021<sup>[20]</sup>.

### **3.1.4 Lanjia Rice Permanent Farmland Case (Jilin Province of China)**

The Lanjia Rice Permanent Farmland Case is located at Panshi city of Jilin province of China. The team members of the cast were from IGSNRR/CAS, Jilin University, Nanjing Agricultural University, Agriculture and Rural Affairs Bureau of Panshi city, Lanjia Rice Planting Cooperative, Beijing Tianhang Huachuang Technology Co., Ltd., and Beijing Machinery Industry Automation Research Institute Co., Ltd. The case dataset was published at *Digital Journal of Global Change Data Repository* with DOI:10.3974/geodb.2021.06.01.V1



and CSTR:20146.11.2021.06.01.V1.

The Lanjia village is located in the black land zone of transition area from Changbai Mountains to Songnen Plain, with an altitude of 237–384 m. Due to the geographical location, natural precipitation, snow water and other clean water sources, as well as the leaching of forest in Changbai Mountain and volcanic basalt, the water quality of paddy fields in the village outperforms the urban drinking water supply standard, and the soil is free from heavy metal pollution. The good combination of air, water and soil and the integration of traditional and modern management of paddy fields ensure the rice so high quality. The rice variety is a middle-late maturing rice variety suitable for Jilin area, with the transplanting time at 20–26 May and the harvesting date at around 10 October. The yield can reach 7,000–7,500 kg/hm<sup>2</sup><sup>[21]</sup>.

### 3.1.5 Fengxian Burdock Ancient Yellow River Flooding Case (Jiangsu Province of China)

The Fengxian Burdock (*Arctium lappa*) Ancient Yellow River Flooding Case is located at Fanlou town of Feng county. The team members of the case study were from Agriculture and Rural Affair Bureau of Feng county, Burdock Breeding Base, IGSNRR/CAS and Nature & Science Consulting Co. Ltd. of Japan, and Xuzhou Kanghui Bainian Food Co., Ltd. The case dataset was published at *Digital Journal of Global Change Data Repository* registered with DOI:10.3974/geodb.2021.06.06.V1 and CSTR:20146.11.2021.06.06.V1.

Fanlou town of Feng county, located in the northwest of Jiangsu province, is the hometown of LIU Bang, Emperor Gaozu of the Han Dynasty. Most of Feng county is an alluvial plain formed by the ancient Yellow River's repeated breach and flood (historical records on Yellow River breaches and flooding from 420 to 1938 AD). Burdock (*Arctium lappa* L.) is a biennial herb belonging to *Arctium lappa* L. in Compositae family. Its seed (*Furctus Arctii*) is a traditional Chinese medicine, and its fleshy root has been used as medicine and food. Feng county is known as the “hometown of burdock” in China. Fanlou town, Fengxian county, lies in the plain of the Yellow River flooded area, and has a tradition of planting deep-rooted crops such as burdock in history. In 2013, Feng Burdock was designated as a National Geographical Indication. The case states from the silt of the ancient Yellow River of several meters to tens of meters thick in Feng county to the data and knowledge of the growth and product sales of burdock, a special species in Fengxian county, which reflects the Feng spirit that the people of Feng county transformed a land suffering from the flooding of the Yellow River into a beautiful and livable county, and further promote the burdock products produced on this land<sup>[22]</sup>.

### 3.1.6 Yangxian Black Rice Crested Ibis (*Nipponia nippon*) Habitat Case (Shaanxi Province of China)

The Yangxian Black Rice Crested Ibis (*Nipponia nippon*) Habitat Case is located at Caoba village, Yang county. The team members of the case study were from IGSNRR/CAS, Organic Industry Development Office of Yang county, Zhuhuanhu Fruit Industry Professional Cooperation, and Chang'an University. The case dataset was published at *Digital Journal of Global Change Data Repository* with DOI:10.3974/geodb.2021.08.06.V1 and CSTR:20146.11.2021.08.06.V1.

Caoba village, Yangxian county is located at the southern foot of Qinling Mountains. In 1981, only seven crested ibis birds were rediscovered in the paddy fields of Caoba village, which were thought to be extinct. Since then, local villagers and government began to protect the crested ibis and its habitat, and a new mode of production based on a harmonious coexistence of human and crested ibis started to evolve. Caoba village is the first place for the crested ibis to settle down from high altitude to low altitude area, and it is also the core area for the protection of the crested ibis. Black rice has been cultivated in Yangxian county for more than 2,000 years. From the Han Dynasty to the Qing Dynasty, it was offered to the



court as tribute rice. Zhuhuanhu Fruit Industry Professional Cooperative of Yang county is a cooperative organized by Caoba village to produce and operate “Zhuhuan Lake” organic black rice. The planting base of “Zhuhuan Lake” organic black rice is located in the core area of the crested ibis reserve where there is no pollution in the soil, atmosphere, water source and surrounding environment. In the planting process, straws to be crushed and returned to the field, organic fertilizer, farmyard manure, biogas slurry and other organic fertilizers are adopted. Solar insecticidal lamps and plant-based insecticide spraying are used in combination to kill insects, and a traditional manual weeding method is applied. No fertilizer, pesticide, auxin, chemical pigment and preservative are used in the whole production process, fostering a pure natural and healthy food from nature. The atmospheric quality in the reserve reaches Class I and the irrigation water reaches Class I–II. Yang county black rice and red rice were approved as national geographical indication products respectively in 2006 and 2012<sup>[23]</sup>.

### 3.2 GIES Cases in Preparation

There are a number of cases on GIES in preparation. Three of the cases were demonstrated at the Forum,

#### 3.2.1 Yucheng Wheat and Maize Cropping Farmland Case (Shandong Province of China)

A joint team from Agricultural and Rural Affairs Bureau of Yucheng city, Shandong Bailong Chuangyuan Bio-tech Co., Ltd., Futaste pharmaceutical Co., Ltd., Shandong Long live Bio-technology Co., Ltd., Yucheng Shenzhuang Nutritional Maize Professional Cooperative, Wudeli Flour Group Yucheng Co., Ltd., Yucheng Maixiangyuan Food Co., Ltd., Yucheng Yufei Flour Co., Ltd., Dezhou Jinshengyuan Food Co., Ltd. and IGSNRR/CAS launched the Yucheng Wheat and Maize Cropping Farmland Case study. Yucheng City has a long history. In the first year of Tianbao of the Tang Dynasty (742 AD), Yucheng county was established, where Dayu succeeded in flood control. Yucheng city is located in the north latitude 37°, with wheat cropping in winter and maize cropping in summer in one year as the main farming mode. Thanks to the support of science and technology, Yucheng city promotes the cultivation and protection model of basic farmland in the Huang-huai-hai Area<sup>[24]</sup>, which is resistant to water logging, saline-alkali and sandstorm.

#### 3.2.2 Kenli Hairy Crab Yellow River Delta Wetland Case (Shandong Province of China)

IGSNRR/CAS cooperated with Qiyuan Fishery Science and Technology Co., Ltd. to initial the Kenli Hairy Crab Yellow River Delta Wetland Case study. Kenli district is located near the Yellow River Delta of Dongying city, Shandong province. The sediment carried by the Yellow River is pushed into the Bohai Bay at almost 3 km per year. A large area of shallow tidal flat and wetlands formed at the confluence of the Haihe River and the Yellow River<sup>[25]</sup>. The water can be classified into the weak alkaline water and contains a large amount of nutrients. Water quality in the area is excellent and pollution-free, rich in aquatic plants and bait. It is the main natural habitat of hairy crabs and the source of artificial breeding of parent crabs in the Yellow River Estuary. The Yellow River Estuary Crab (*Eriocheir Sinensis*) is the most productive freshwater crab in China. In 2008, the Ministry of Agriculture approved the Yellow River Estuary Crab as an agro-product geographical indication.

#### 3.2.3 Guanglu Island Sea Cucumber Marine Case (Liaoning Province of China)

The Sea Cucumber in Guanglu Island Marine environment in Changhai county is a geographical indication. A team consisted of IGSNRR/CAS, Haisen Electronic Commerce Co., Ltd., and Liaoning Normal University is working on the case study. The Guanglu Island is located at 39°N and 122°E, near the intersection of the Yellow Sea and the Bohai Sea. The sea cucumbers are residents with a water depth of 15–34 m in this area with biodiversities,

including sea cucumbers, cockles, shrimps, shellfish, fish, shrimps, crabs, algae and more local precious specialties. Guanglu Island is called the “hometown of sea cucumbers”, accounting for about 50% of the total sea cucumber in China. The annual average temperature of the sea water in the sea area is 12.1 °C at the surface and 8.8 °C at the bottom. The optimum temperature for the growth of sea cucumber is 10–18 °C. The annual average salinity in the coastal area is 30 PSU. The most suitable salinity for the growth of sea cucumbers is 27–30 PSU, and the salinity for survival is not more than 39 PSU and not less than 14 PSU. The exchange and self-purification capacity of seawater are better than those of other sea areas, and the nutrients are updated frequently. The turbulent current also creates the unique elastic and compact taste characteristics of Dalian sea cucumber<sup>[26]</sup>.

### 3.3 Ecosystem Observation Instruments and Equipment Development

There is a need for the GIES case studies to have a ecosystem monitoring system. Two systems were demoed at the Forum.

#### 3.3.1 Ecological Observation Station (Beijing, China)

The Thinsitu 600 Ecological Observation Station system was developed and served by Beijing Tianhang Huachuang Science and Technology Co., Ltd. It is a low-power consumption IOT sensing device that provides vegetation monitoring, meteorological monitoring, air quality monitoring, soil monitoring, water quality monitoring and is equipped with other IOT sensing modules. Utilizing networking and data transmission technology, real-time acquisition and wireless transmission of wind speed, wind direction, air temperature, humidity, air pressure, illumination, rainfall, soil temperature, soil moisture, PM<sub>2.5</sub>, PM<sub>10</sub>, vegetation visible light and vegetation near-infrared image data are realized. Taking advantage of artificial intelligence, internet of things and cloud computing technology, the automatic identification of vegetation coverage, height and phenology can be achieved in the cloud platform, featuring unattended operation, solar power supply, lightweight design and convenient installation.

#### 3.3.2 Buoy-Type Water Quality Spectral Monitor System (Tianjin of China)

The Buoy-Type Water Quality Spectral Monitor was developed and served by Tianjin Progoo Information Technology Co., Ltd. It is an online intelligent system integrating software and hardware for real-time comprehensive evaluation of water quality. It takes water quality parameter spectral extraction technology as the core and integrates sensor, intelligent control and network communication technologies. It consists of a water quality intelligent monitor (volume: 1 m×1.12 m×0.3 m) and a data analysis cloud service platform. The monitor can collect data regularly at a fixed location and transmit it to the cloud service platform in real time through the network to achieve 24-hour continuous online monitoring. Data analysis cloud service platform for different water quality models can be selected intelligently and water quality parameters can be calculated quickly according to the requirements of water body type and monitoring index. At present, it supports the monitoring of 15 common water quality indicators including water turbidity, pH, dissolved oxygen, COD, ammonia nitrogen, TP, TN, permanganate index, chlorophyll, SS, TOC, chroma, nitrite, BOD, comprehensive nutrition index and so on. Compared with the laboratory test approach, the detection accuracy of single index can reach 95% at most, and the average is more than 85%. It can realize 24-hour uninterrupted observation, and the data acquisition interval is flexible and adjustable.

### 3.4 Investment Consulting Service for GIES

China General Consulting & Investment Co. Ltd. demonstrated his experiences on consultant services for GIES, especially in supporting digital trade technology by satellite remote sensing, cold chain logistics, insurance services, cross-border settlement, as well as the mechanism system (including a map of material circulation, supply chain sharing and value compensation).

## 4 Launch of the Decade Initiative on Geographical Indications for Environment & Sustainability 2021–2030 (GIES)

After the discussions, a common understanding was made on Joint Action of Launching of the Decade Initiative on Geographical Indications for Environment & Sustainability 2021–2030 (GIES, Figure 7). The participants agreed to work together for archiving to Goal 1, Goal 2, Goal 14, Goal 15 and Goal 17 of SDGs, and should adhere to the integration of science, technology and engineering by innovative solutions. More detail implementation plan will follow.



**Figure 7** The GIES Logo

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