Annual Work Report of HIST

(2019)

This annual report was prepared based on the Biennial Work Plan (BWP) for 2018 and 2019 of HIST which was approved by the Board on November 5, 2018. It reflects all activities undertaken by HIST in 2019 in accordance with 6 actions in the BWP.

The agreement concerning the operation of HIST as a Category 2 Centre (second phase, 2019-2024) under the auspices of UNESCO entered into force on April 3, 2019. Article 14 of the agreement stipulates that it is concluded for a period of 6 years as of the date of its entry into force. Given the duration of the agreement, HIST conducts the 2nd-phase operation from April 2019 through April 2024. Thus, the time duration for implementing HIST's Mid-term Strategic Plan (MTSP) approved by the Board on 5 November 2018, for the period 2018-2023 should now be extended until April 2024.

Action 1: Consultation with UNESCO for signing the agreement between UNESCO and the Government of China on HIST's 2nd phase operation and other relevant issues.

The expected outcome of this action and the timeline foreseen, respectively, are:

The Signing of the Agreement between UNESCO and the Government of China represented by the Chinese Academy of Sciences before the end of 2018.

Implementation of Action 1:

The renewal agreement of HIST was signed by Prof. Bai Chunli, President of the Chinese Academy of Sciences, representing the Government of China and Dr. Flavia Schlegel, then Assistant Director-General for Natural Sciences, representing UNESCO on November 4, 2018. One copy of the agreement was sent immediately to UNESCO after the signing ceremony. It finally entered into force on April 3, 2019.

Action 2: Consultation with UNESCO on Composition of the New Governing Board of HIST for the Years of 2018-2020.

The expected outcomes of this action and timeline foreseen are:

(1) Composition of the New Governing Board completed by the end of October 2018;
(2) Two sessions of the Governing Board convened in 2018 and 2019, respectively.

Implementation of Action 2:

The reconstitution of HIST Governing Board was completed in 2018 and the 1st session of new Governing Board was convened by the end of 2018.

The 2nd session, set to be held on the 7th of January 2020, will examine and approve Annual report of 2019, Biennial Work Plan for 2020 and 2021, and discuss possible contributions that GB members may make towards the implementation of the MTSP for the 2nd phase of HIST's operations.

Action 3: Collaborating with UNESCO Member States on UNESCO Designated Sites.

The expected outcomes of this action and the timeline foreseen are:

(1) At least two developing countries from the Asia Pacific Region and Africa identified as partners for developing research and capacity building projects as indicated in MTSP objectives 1 and 3 (end of 2019);
(2) Negotiations and administrative arrangements for cooperative project development and implementation concluded in one country (end of 2018) and in another country (end of 2019).

Implementation of Action 3:

With the support of the research project "Conservation and Development of Cultural and Natural Heritage along the Belt and Road", HIST proceeded to advance collaborations with its partners from Myanmar, Sri Lanka and Italy in 2019. At the same time, the International Institute for Central Asian Studies（IICAS) was identified as a new partner of HIST.

In Myanmar, HIST carried out the cooperative research on the landscape evolution and the abnormal deformations of the pagodas in Bagan World Heritage site, which aimed at sharing the application of advanced space technologies with the Department of Archaeology and National Museum, Bagan Branch, and providing guidance for decision-making for sustainable tourism development.

With the backing of DBAR International Centre of Excellence Potenza (ICOE-Potenza) established in May 2019, a joint research project on space archaeology and digital heritage was conducted in the Mediterranean region. Based on the analysis of images taken by GF Satellite and UAVs, researchers discovered and verified a series of archaeological sites in Italy.

A research team from HIST carried out a field survey of Asian Elephant Habitat in Sri-

Lanka, with the assistance from the Arthur C Clarke Institute for Modern Technologies (ACCIMT) and Department of Wildlife Conservation in Sri Lanka. This joint survey was aiming to verify products of habitat change and human-elephant conflict using big earth observation data. The joint team visited several areas in the dry zone of Sri Lanka where elephant habitats are concentrated, including National Parks of Yala， Minneriya and Maduru Oyathe Hurulu Forest Reserve (a UNESCO Biosphere Reserve) and the strip land recognized as the Nelugala Corridor which connects the Maduru Oya National Park with the Somawathiya National Park.

Prof. Liu Jianbo, Deputy Director, RADI, has visited Sri Lanka during 10-13 November, together with one of Vice-Chairs of the Chinese Academy of Sciences to further progress of the project to establish a ground station for satellite data collection in Sri Lanka. They visited the site designed for the installation of the satellite antenna together with the Director of ACCIMT, Mr. Sanath Pannewennage and his staff.

At the invitation of IICAS, HIST has conducted several discussions with IICAS and reached preliminary consensus. First, IICAS hopes to sign a MOU with HIST to strengthen mutual cooperation on February 12, 2020 in Bern, Switzerland during the scheduled session of the Academic Council (AC) of IICAS. Both sides are discussing each item of MOU, and expect to make a final version in January, 2020. Second, IICAS invites HIST to monitor and preserve heritage sites along Silk Roads: the Routes Network of Chang'an Tianshan Corridor. HIST is beginning to monitor and make initial comparative analysis of 11 heritage sites that are part of the Chang'an-Tianshan Corridor in Kazakhstan and Kyrgyzstan during the period of 2014-2019 by using remote sensing and other data. It will share the findings thereof with IICAS in the coming months. Third, IICAS expresses its willingness to work together with HIST to take part in the nomination process of more heritage sites in Central Asian countries along Silk Roads to be added to UNESCO heritage list.

Following the launch of the Third Cycle of Periodic Reporting by the World Heritage Committee at its 40th session (Krakow, 2017 - Decision 41COM 10A), it was decided that the reporting period for Asia-Pacific region would be 2020-2021. After a series of discussions, HIST and WHITRAP drafted and signed a MOU regarding future collaborations in the framework for the implementation of the 3rd Cycle of Periodic Reporting in the Asia-Pacific Region. The first action under this MOU is to jointly organize two back-to-back workshops for National Focal Points of Northeast Asia, Southeast Asia and the Pacific sub-regions to familiarize them with the Periodic Reporting statutory processes of the World Heritage Convention and with the existing tools they can refer to for supporting World Heritage Site Managers in their reporting exercises.

To share the methodologies concluded from all demonstration cases of space technology application to World Heritage sites, an initial information service system has been developed by HIST for monitoring and evaluating the state of conservation of

world heritage sites. This system is designed to make unique contributions to information sharing and sustainable development among countries along the One Belt and One Road.

In summary, the work in Sri Lanka is being continued under the HIST-ACCIMT MOU signed in 2014 during the first phase of HIST's work as a UNESCO Category 2 Centre. Two new MOUs, one with ICOE, and the other with WHITRAP, have been signed in 2019; preparations are underway for an additional MOU between HIST and IICAS to be signed in 2020.

<u>Action 4:</u> Enhance Capacity Building for Space Technology Research and Applications for Developing Member States of UNESCO.

The expected outcomes of this action and the timeline foreseen are:

(1) 20-40 participants from Asian and African member states of UNESCO participate in short-term training workshops to be organized by HIST (end of 2019);
(2) At least 3 scholars from partner countries and organizations seconded HIST to collaborate on developing and implementing studies and research projects on space technology applications addressing conservation, management, monitoring and sustainable development of UNESCO designated areas (end of 2019); and
(3) At least 2 students from least developed countries start their doctorate studies under the supervision of HIST/RADI scientists on specific research issues pertaining to conservation, monitoring, management and sustainable development of UNESCO designated places with the aid of space technologies (end of 2019).

Implementation of Action 4:

Mr. Ibodullo Qaraev(Tajik) from Institute of Geological and Seismic Engineering, Tajik Academy of Sciences, is expected to get his PhD degree in Geology and Remote Sensing for Environment at HIST/RADI. Mr. Bachagha Nabil (Tunisia) from Institute of Arid Regions Medenine (IRA) Tunisia is expected to get his PhD degree in Geology and Remote Sensing for Environment at HIST/RADI.

Institutions such as ACCIMT, Department of Archaeology in Sri Lanka, speak highly of the previous training workshops organized by HIST, and have expressed their strong preference to send more staff and site managers to participate in future workshops.

Owing to the transitional period of HIST's first phase that ended in 2017 and the second phase which formally began in 2019, it has not been able to secure budgets for the organization of training workshops during the 2018-2019 biennium. This gap is to be filled during 2020-2021 by the workshops that are to be jointly implemented with WHITRAP, Shanghai and mentioned under the implementation of action 3. Aforementioned actions to implement the MOU signed with WHITRAP in 2019 are

designed for strengthening HIST's contributions to training world heritage managers and authorities with the exercise of statutory periodic reporting for the Asia-Pacific Region during 2020-2021. HIST believes that the shortfall in the number of trainees due to the absence of training activities during the 2018-2019 biennium will be compensated during the period of 2020-2023.

Action 5: Organizing International Activities for heightening the reputation and visibility of HIST.

The expected outcomes of this action and the timeline foreseen are:

(1) At least one expert meeting to promote applications of earth observation technologies for the benefit of UNESCO designated areas convened and the results and outcome of the meeting published and widely disseminated (end of 2018);
(2) Communications and dialogue for promoting collaboration with UNESCO and its international advisory bodies, partners, and other UN bodies strengthened or initiated, and joint events and activities organized (end of 2019); and
(3) At least one international/regional event organized in partnership with the Working Group on Natural and Cultural Heritage of RADI's Digital Belt and Road (DBAR) Scientific Program to promote space technology applications for natural and cultural heritage among countries along One Belt and One Road.

Implementation of Action 5:

HIST co-organized a side event during the 43rd session of World Heritage Committee in Baku, Azerbaijan with other UNESCO Category 2 Centres concerning World Heritage. A total of 8 centres participated in this event to introduce their respective work. HIST presented its background, space technology capability, international cooperation platform and network, as well as training courses to participants.

A DBAR/IMAA/HIST/ACCIMT Session: Big Earth Data Contribution to UN's SDGs for Monitoring, Conservation and Promotion of Natural and Cultural Heritage (HERITAGE) was jointly organized during the 4th Digital Belt and Road Conference convened in Shenzhen, China, from 16 to 18 December 2019.

Representatives from HIST participated in the 31st session of International Coordinating Committee (ICC) of UNESCO Man and the Biosphere (MAB) program held from 17 to 21 June 2019 in UNESCO, Paris. A potential program focusing on oasis ecosystems was formed and discussed during the session. HIST is in regular contact with the MAB National Committee of China to monitor further developments in this initiative.

Action 6: Dissemination of research results as well as other data, information and knowledge products for scientists and the general public.

The expected outcomes of this action and the timelines foreseen are:

(1) At least 3 multi-authored publications in internationally recognized journals on the work of HIST/RADI and their contributions to promoting international cooperation on space technologies for natural and cultural heritage (end of 2018);
(2) Publication and wide dissemination of HIST annual reports for 2018(end of 2018) and 2019 (end of 2019);
(3) Design and development of plans for the publication of a collection of satellite and air-borne images of World Heritage sites and biosphere reserves in one or a group of countries outside of China including image collection feasibility, image interpretation analyses and explanations on how such analyses could contribute to the management and sustainable development of the sites (end of 2019).

Implementation of Action 6:

HIST's brochures and newsletters (both in English and Chinese) were widely disseminated in a number of international, regional, and domestic events to promote its work and its interests in collaborating with a range of partners on the application of space technologies for UNESCO sites. Some of the important events are listed below

- 43rd Session of the World Heritage Committee, Baku, Republic of Azerbaijan, 30 June–10 July 2019
- 1st China Digital Earth Conference, Beijing, China, 18-20 November 2019
- 4th Digital Belt and Road Conference, 17-19 December 2019
- Inaugural meeting of HERITAGE Asia – Pacific (heritAP), 7-10 December 2019
- International LDE-Heritage conference: Heritage and Sustainable Development Goals, 26-28 November 2019

In order to develop and disseminate methodologies and demonstration cases on using space technologies to conservation and management of UNESCO sites, the research team of HIST published lots of papers in internationally renowned journals. The most influential 10 papers are listed below:

(1) Chen F, Guo H, Ishwaran N, et al. Understanding the relationship between the water crisis and sustainability of the Angkor World Heritage site[J]. *Remote Sensing of Environment*, 2019, 232: 111293.
(2) Chen F, Zhou W, Chen C, et al. Extended D-TomoSAR Displacement Monitoring for Nanjing (China) City Built Structure Using High-Resolution TerraSAR/TanDEM-X and Cosmo SkyMed SAR Data[J]. *Remote Sensing*, 2019, 11(22): 2623.
(3) Liu J, Xu Z, Chen F, et al. Flood Hazard Mapping and Assessment on the Angkor World Heritage Site, Cambodia[J]. *Remote Sensing*, 2019, 11(1): 98.
(4) Krassakis P, Kazana S, Chen F, et al. Detecting subsidence spatial risk distribution of ground deformation induced by urban hidden streams[J]. *Geocarto International*, 2019 (just-accepted): 1-13.
(5) Tang P, Chen F, Tian B, et al. Monitoring of surface instability in tourist zones in

Sanya (China) using high-resolution SAR interferometry[J]. *Remote Sensing Letters*, 2019, 10(2): 129-138.
(6) Luo L, Wang X, Guo H, et al. Airborne and spaceborne remote sensing for archaeological and cultural heritage applications: A review of the century (1907–2017)[J]. *Remote Sensing of Environment*, 2019, 232: 111280.
(7) Bachagha N, Wang X, Luo L, et al. Remote sensing and GIS techniques for reconstructing the military fort system on the Roman boundary (Tunisian section) and identifying archaeological sites[J]. *Remote Sensing of Environment*, 2020, 236: 111418.
(8) Yang X, Wang C, Xi X, et al. Extraction of Multiple Building Heights Using ICESat/GLAS Full-Waveform Data Assisted by Optical Imagery[J]. *IEEE Geoscience and Remote Sensing Letters*, 2019.
(9) Liu J, Ren H, Wang X, et al. Measuring and Predicting Urban Expansion in the Angkor Region of Cambodia[J]. *Remote Sensing*, 2019, 11(17): 2064.

Staff and cost

Staff changes:
After the renewal agreement of HIST entered into force, an executive team led by Prof. Acad. Guo Huadong was formed responsible for the implementation of MTSP and BWPs during the 2nd phase of HIST. Dr. Liu Jie has been appointed the new Secretary General of HIST and the Secretary for HIST Governing Board.

Budget Implemented in 2019:
Chinese Academy of Sciences (CAS), representing the Government of China, takes the responsibility for providing annual operational budget to HIST while the host institution – Institute of Remote Sensing and Digital Earth of the Chinese Academy of Sciences provides other funding (salary, office premises, etc) to HIST. In 2019, CAS allocated 500,000 RMB for HIST's daily operation. Costs for implementation of research projects in the biennial action plan for 2018-2019 were mainly funded by the CAS Strategic Priority Research Program of Big Earth Data Science Engineering Project.