

TCS Anthropogenic Hazards - Governance Services

In the current context of economic and social situation a sustainable development of European Union cannot do without exploitation of European geo-resources. This implies new challenges of compromising the need to increase economic viability of geo-resources exploitation with people, infrastructure and environment protection demands.

Our ambition and long-term plan are to integrate research group activities and research infrastructures to facilitate studies of the response of inorganic natural geological medium to exploitation and exploration of geo-resources.

The complex relationships between technological activities, such as geo-resources exploitation, and their impact on the solid earth require a holistic approach rather than separate studies within traditional branches of science. An insight into these relationships can result only from cross-disciplinary studies of technology-nature coupling. It is obvious that a serious analysis of the Earth's response being the result of technological activity, cannot be done without a simultaneous analysis of the cause, that is of conditions of this activity.

Top European specialists in the field decided to build the EPOS Thematic Core Service Anthropogenic Hazards (TCS AH) that will facilitate such a holistic approach.

EPOS Thematic Core Service Anthropogenic Hazards aims at integrating distributed research infrastructures to facilitate and stimulate research in the area of anthropogenic geo-hazards (AH), especially those associated with the exploration and exploitation of geo-resources. The innovation of TCS AH is drawing on the uniqueness of the integrated research infrastructures: (1) exceptional sets of data, called "**episodes**", comprehensively describing a geophysical process, induced or triggered by technological activity, which under certain circumstances can become hazardous for people, infrastructure and the environment and (2) problem-oriented, specific computer **applications** with the particular attention devoted to methods of analysing the connections between technology, geological response and the resulting hazard; and (3) **flexible computational platform** with an access to High Performance Computing resources, on which a researcher can process the integrated data using the implemented applications.

The episodes are linked to a wide variety of inducing technologies. Every episode consists of a time-correlated collection of geophysical data representing the geophysical process, technological data representing the technological activity, which is the cause of this process and all other geo-data describing the environment, in which the technological activity and the resulting geophysical process take place.

The bespoke applications (apps) are uniquely designed to study the anthropogenic geo-hazards' problems. They comprise, among others, a Multi-hazard Simulator for Multi-hazard/Multi-risk Assessment block, apps to rate interaction between technology operations and seismic deformations, apps for the probabilistic assessments of anthropogenic seismic hazard, but also apps for outreach, dissemination and communication.

The computational platform IS-EPOS provides resources allowing for i) user designed, tailored processing, based on the implemented specialized software apps and own software, ii) computationally demanding analyses by access to High Performance Computing Resources, iii) storing and handling in the private user's workspace the user's data, data products and results of analyses, including uploaded data and codes, and iv) visualisation of all types of AH data, data products and results of analyses. The platform supports also community social functions, e.g. sharing resources stored in user workspaces, project workspaces to be shared by the project members as well as e.g. project brokering and communication between users. The implementation plan assumes that TCS AH IT environment will become a virtual laboratory equipped with tools for intercommunity collaborative research and training in the field and will be also a source of competent information about anthropogenic geophysical hazards.

TCS AH is composed of three major components: (1) TCS AH Consortium, managing the integration of research infrastructures in the field and cooperating with EPOS-ERIC; (2) the platform IS-EPOS, which provides access of users to the episodes data deposited in data nodes, to applications and to its all other functionalities; (3) Data Nodes linked to IS-EPOS platform, which gather episodes with their multidisciplinary data, manage them and upon request, make them available to the platform. Presently three Data Nodes are in TCS AH: CIBIS, located in IGF PAS in Warsaw, Poland; CDGP Data Node located in EOST Strasbourg in France; an Data Node in KNMI in the Netherlands.

The access to the integrated research infrastructures of TCS AH is open for all, except to the resources of ongoing projects, which are usually embargoed until the project end. Anonymous visitors of TCS AH are able to preview the integrated resources. Registered users receive full access to these resources. The webservice of TCS AH is already available on: <https://tcs.ah-epos.eu/> (Fig. 1).

Fig. 1. Web service of Thematic Core Service Anthropogenic Hazards.

One of the main strategic goals while developing the EPOS Thematic Core Service Anthropogenic Hazards is to pave the way for the sustainable and interoperable usage of TCS AH within EPOS with other communities' TCS-s and EPOS Integrated Core Services (EPOS ICS). **This requires adaption and implementation of an appropriate legal framework and governance structure, which take into account the complexity of resources provided by the TCS AH and specific conditions in which TCS AH operates, and the specificity of the relations with stakeholders of TCS AH.**

The legal and governance issues of TCS AH have been approached from two different points of view:

1. Understanding the complexity of TCS AH components to identify the elements that need to be taken into account while shaping the governance model;

2. Looking from legal perspective to define which legal framework can be appropriate for such structure and all processes connected with the maintenance and operation of TCS AH within EPOS.

Legal and governance issues have been under considerations of TCS AH from the very beginning the EPOS IP Project. The Consortium Agreement has been prepared according to the general frame agreed upon during the meetings of WP 14 TCS AH Group in Naples (June 2016) and Nancy (September 2016; during that meeting governance structure was established) between the organizations which declared their participation in the Consortium. After the meeting in Nancy, the parties signed letters of intent confirming their intention to enter the consortium agreement within the frame agreed upon during the aforementioned meetings and to undertake the individual duties proposed therein.

The first draft of the Consortium Agreement was prepared in November 2016 and presented to the parties. A modified version of Consortium Agreement was prepared in September 2017, according to suggestions and comments of WP4 of EPOS IP. This version was sent to the legal departments of TCS AH members for consideration and a feedback until March 2018. After that the Consortium Agreement was discussed again during WP14 Annual Meeting in Oulu, Finland, June 2018. The resulting next version of the Consortium Agreement has been sent to legal departments of the potential Consortium Members; some of Partners have not provided yet the final decisions. Comments on the readiness to sign the Consortium Agreement should be provided within October 2018.

TCS AH Community is new and growing. It includes specialists from different branches of science, having different backgrounds and different interests in the Anthropogenic geo-Hazards. Operationally TCS AH has unique features. Episodes comprise very different kinds of data. These data are usually not from long-term monitoring but they are acquired from specific experiments or from special observational periods. The fact that the episodes contain compulsorily technological data incurs a necessity of close cooperation with industrial partners, based on mutual understanding. Integrating new episodes, opening cooperation with new partners is difficult and requires special efforts. This specificity of TCS AH and its community requires to adopt an appropriate governance structure to ensure a smooth and sustainable operation of the TCS AH within EPOS enterprise.

The proposed governance model for the first stage of EPOS-ERIC is as follows:

- a. **Consortium Board (CB)** - CB is the decision-making body of the TCS AH. It is composed of one authorized representative of each Party. Each Party has one vote. The Consortium Board elects a chair among its members. The term of their mandate is one year renewable unlimitedly. The elected chair cannot represent a Party in the Consortium Board. In case one of the representatives is elected as a Chair, the said Party is obliged to assign a new representative. The Consortium Board may also elect a vice-chair and entrust them with specific tasks from the general scope of Chair's tasks. The TCS AH Consortium Board's regulations are detailed in Annex 1.
- b. **The Innovation Advisory Committee.** The Consortium Council and representatives of TCS AH Stakeholders from academia, industry, science, local and central administration bodies, NGO-

- s and others, form Innovation Advisory Committee. The Innovation Advisory Committee consults long term strategies of TCS AH.
- c. **Coordinating organization** - The Consortium Board shall select the Party, which will be hosting the Executive management office. The selected Party shall be providing the human and financial resources for of the Head of the executive management office position and the staff of the management office. Selection of the coordinating organization shall be coordinated with election of the Head of the executive management office and the same selection procedure shall be applied. The hosting organization operate as such for the duration of the mandate of the Head with whom it was selected.
- c1. The Head of the executive management office** – the Head of the Executive Management Office (HEMO) has the overall responsibility for managing the activities decided by the Consortium Board and representing the TCS AH Consortium. They reports to the Consortium Board. The HEMO cannot make any legally binding decisions on behalf of any Party. The HEMO cannot represent a Party in the Consortium Board. In case one of the representatives is elected as the Head, the said Party is obliged to assign a new representative. HEMO is elected by the Consortium Board by 2/3 majority. The term of the mandate is five years (5) and may be renewable twice.
- c2. Sections** - a) Section for implementation of TCS AH Services; b) Administration law & accounting; c) Section for episodes and application integration; d) Section for promotion and dissemination; e) Section for projects & partnership.
- d. **The User Committee** - A User Committee shall be set up composed of main representatives of the community selected by the Consortium Board by 2/3 majority. The term of the mandate of every member is five years (5) and may be renewable unlimitedly. The User Committee shall designate a Spokesperson who shall advice the Head of the executive management office. They can be invited to attend the meetings of the Consortium Board. The User Committee shall form the policy for gaining User feedback concerning services of TCS AH.
- e. **The Infrastructure Provider Committee** - A Infrastructure Provider Committee shall be set up composed of main representatives of data and apps providers selected by the Consortium Board by 2/3 majority. The term of the mandate of every member is five years (5) and may be renewable unlimitedly. The Infrastructure Provider Committee shall designate a Spokesperson who shall advice the Head of the executive management office. They can be invited to attend the meetings of the Consortium Board. The Infrastructure Provider Committee shall form the policy concerning requirements as to the quality of the provided data and apps and quality control.

During the past meetings of TCS AH the Partners discussed the future governance. Some of institutions declared readiness to take part of this responsibility and they declared also in-kind contributions. This information is included in Table 1. TCS AH has one Governance Service which is composed of the activities covering the needs of AH community. During the meeting of TCS AH in Naples on 06.06.2016 it has been decided that the institution which will be TCS AH Coordinator during the first 5 years of EPOS-ERIC will be the Institute of Geophysics Polish Academy of Sciences (IG PAS). IG PAS declared a

significant in-kind contribution and proposed with other institutional partners of TCS AH to organize the governance within some sections.

Table 1. The potential coordination of the governance services of TCS AH together with the declared in-kind contribution and the total required budget for the coordination of governance services of TCS AH. *IGF PAS – Institute of Geophysics Polish Academy of Sciences, Poland; LTU – Lulea University of Technology, Sweden; EOST – Institut de Physique du Globe de Strasbourg (UMR 7516 CNRS-UNISTRA), France; ACK Cyfronet - Academic Computer Centre CYFRONET AGH, Poland; GFZ - GFZ German Research Centre for Geosciences, Section 4.2: Geomechanics and Rheology, Germany.*

| ID | SERVICE NAME | SERVICE DESCRIPTION | SP | FTE | DIRECT COSTS (k€) | | | | FUNDING OF DIRECT COSTS (k€) | | | |
|----------|--------------|--|--|----------------------|------------------------------------|--------|-----------|-------|------------------------------|------|------|------|
| | | | | | STAFF | TRAVEL | OTHER (*) | TOTAL | NATIONAL | ERIC | BETA | |
| | | | Service Provider | Full Time Equivalent | *Equipment, consumables, contracts | | | | | | | |
| GOV | WP14-SP-001 | TCS Governance & Coordination | Coordination, Administration and TCS Council (including innovation Advisory Committee) | IG-PAS | 2.2 | 100 | 58 | 20 | 178 | 91 | 87 | 0.49 |
| GOV | WP14-SP-002 | TCS Governance & Coordination | Section for projects and partnership | LTU | 0.3 | 18 | 20 | 0 | 38 | 9 | 29 | 0.76 |
| GOV | WP14-SP-003 | TCS promotion and dissemination | Promoting TCS in various environments: governmental, academia, industry, public; | EOST | 0.5 | 27 | 40 | 0 | 67 | 47 | 20 | 0.30 |
| GOV | WP14-SP-004 | Implementation of TCS services | Section for implementing TCS services | ACK CYFRONET | 0.3 | 18 | 8 | 0 | 26 | 8 | 18 | 0.68 |
| GOV | WP14-SP-005 | Episode integration and application implementation | Section for episode integration and application implementation | GFZ | 0.6 | 36 | 16 | 0 | 52 | 0 | 52 | 1.00 |
| SUBTOTAL | | | | | 3.9 | 199 | 142 | 20 | 361 | 155 | 206 | 0.57 |

During the last annual meeting of TCS AH, which took place in Oulu, Finland on June 2018, the future leaders of the governance sections discussed the detailed plan of the work organization and prepared Working Plans, which were approved by the TCS AH Partners. Below is the information about the proposed work plans for the governance sections of TCS AH.

Section of implementing TCS AH services

Leader ACK Cyfronet, members: GFZ, INGV, IGF PAS

Working Plan

- Evaluate technical and legal criteria and assess possible updates required to integrate new episodes and applications
- Evaluate the “completeness” of the set of services implemented in the TCS AH, aiming at the identification of critical areas in which there might be an opportunity to constructively widen the available pool of services
- Alter implementation to fit the new requirement from ICS-C implementation and ensure TCS AH components be presented at ICS-C in relevant manner
- Ensure data policy be clearly expressed, controlled and enforced
- Audit the system in respect to GDPR regulations and implement necessary means to operate privacy accordingly

- Design and implement tools for easy user feedback collection; manage user feedback and maintain a list of features and improvements that can be implemented
- Align AAAI mechanisms with EPOS and providers
- Integrate new data nodes and monitor availability of the connected nodes
- Operate the process of quality control with proactive improvements
- Maintenance of technical resources and software components that are used for delivery of services including monitoring security and upgrading the systems to avoid vulnerabilities.

Section of Promotion and Dissemination

Leader EOST Strasbourg, members KeU

Working Plan

- Set up communication plan & strategy
- Define stakeholders categories and target stakeholder organizations
- Establish a dissemination plan for each of stakeholder category
- Compile dissemination materials that include video, audio, flyers, posters, etc.
- Maintain and develop existing social media channels (Website –TCS AH webpage, Facebook, Twitter, LinkedIn, Newsletters - EPOS, others)
- Define ethically sensitive issues
- Trainings:
 - establish strategies to engage users;
 - organise annual AH workshops
 - establish training plan for selected stakeholders;
 - develop tools to attract trainees
- Participation in international events, conferences, initiatives to improve visibility
- Conduct webinars
- Publications in research papers
- Regular reports of activities (once a year)
- Track and analyse of impacts/ KPI's

Section of Section for Projects and Partnership

Leader LTU, members: INGV, IGF PAS

Working Plan

Aims

- To establish strategic partnerships
- To establish multi-sector collaboration (universities, industry, funding agencies etc)
- To attract new partners

Partners and collaborations should be not only within Europe but also outside Europe

Strategy

- Define possible groups of partners
- Prepare strategy together with the Promotion and dissemination section

- Prepare special strategy to collaborate with big organization (e.g. EAGE) and large experimental projects
- Prepare technical requirements for new data and software (in collaboration with the sections for Episodes Integration and Application Implementation and for implementing TCS AH services)
- Prepare strategy, define/adjust rules of collaboration depending on partner (academic, commercial – incl lawyers, IT, equipment companies; educational)
- Prepare rules for new partners to join TCS AH Consortium
- Consider the possible participation of the Consortium in international projects

Section for Episode Integration and Application Implementation

Leader GFZ, members IG PAS, ACK Cyfronet, EOST

Work Program of Section

1. Objectives of the section
 - a) Provide maintenance to episodes and applications already integrated in the IS-EPOS e-Platform, including (meta-) data updates and updates to application (e.g. error fixes).
 - b) Add and manage new episodes and new applications provided by the IS-EPOS e-Platform related to anthropogenic hazards
 - c) Harmonize the link between the Data Nodes and the IS-EPOS e-Platform (Server maintenance and upgrade to ensure the continuity of e-Nodes)
 - d) Enable, coordinate and stimulate the communication between data providers and e-Nodes
 - e) Integrate new acquired data centers into the IS-EPOS e-Platform
 - f) Update legal issues of data policy and data management if required
 - g) Continuously oversee and upgrade data format standards used within the IS-EPOS Data Platform in response to new data, internal and external requests from IS-EPOS partners
 - h) Develop tools for data visualization on the IS-EPOS e-Platform (specially for GIS data)
 - i) Guarantee the provision of required data converting tools on the IS-EPOS e-Platform for users and data providers
 - j) Communicate with e-Platform users to receive feedback on delivered products
 - k) Harmonize the collaboration and work flows of TCSs of different EPOS projects connected with the IS-EPOS e-Platform
 - l) Collaborate with other sections
2. Work plan for 5 years, Strategy:
 - a) Setting up a fixed strategy to keep episodes integrated in the IS-EPOS e-Platform updated
 - b) Setting up a procedure to integrate new episodes and applications
 - c) Establish procedures to regulate a common work flow for all involved Data Nodes
 - d) Compile a communication procedure to guarantee a harmonized collaboration with projects connected with the IS-EPOS e-Platform in the sense of maintaining improving and developing quality control routines, metadata preparation and the standardization of data formats

- e) Set up a communication strategy to receive IS-EPOS e-Platform user feedback on delivered products (e.g. Forum)
- f) Organize meetings for harmonizing work flows:
 - Annual meeting of section members and data providers
 - Annual meeting with all sections
- g) Participate in conferences to advertise episodes of IS-EPOS e-Platform and to exchange experiences with other EPOS work packages
- h) Work in close cooperation with section for Projects & Partnership and section for Promotion & Dissemination to contact new data providers to increase the number of episodes related to anthropogenic hazards and applications on the IS-EPOS e-Platform