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## Economic Commission for Europe

Inland Transport Committee

### Working Party on Transport Trends and Economics

**Group of Experts on Benchmarking Transport Infrastructure Construction Costs**

**Thirteenth session**
Geneva, 10–11 February 2022
Item 4 of the provisional agenda
**Collection and analysis of benchmarking data**

# How to visualise the benchmarking construction cost data onto the Geographic Information System based International Transport Infrastructure Observatory

**Note by the secretariat**

## I. Introduction

1. At its twelfth session (November 2021), the Group received more information about the recently established Geographic Information System (GIS) based International Transport Infrastructure Observatory (ITIO). The secretariat provided a detailed description of the Observatory, its purpose, functions, user groups and operational modalities. The Group requested the secretariat to prepare ahead of its next session a short note providing food-for-thought on the potential that this GIS platform offers to host and visualise benchmarking analytical data and information on national and regional benchmarking best practices. The present document provides such an overview.

## II. Background and mandate for the ITIO

2. During its twenty-eighth session (Geneva, 7–9 September 2015) the Working Party on Transport Trends and Economics (WP.5) organized a workshop on "Road and rail transport corridors along Europe and Asia". The participants agreed that despite the numerous initiatives that exist and operate for transport corridor development along Europe and Asia, cooperation among these initiatives is very low or non-existent. During its twenty-ninth session (Geneva, 5–7 September 2016, ECE/TRANS/WP.5/60, para. 37) the Working Party approved the development of a transport infrastructure observatory in Europe and Asia which should include all existing initiatives on transport infrastructure development in the region with main objective to foster cooperation among these initiatives. During its thirty-first session (Geneva, 3–5 September 2018) the Working Party was informed that the preparation of the observatory was being funded by the Islamic Development Bank in the framework of an Extra-Budgetary project entitled "Strengthening regional connectivity with the establishment of a Geographical Information System (GIS)" (ECE/TRANS/WP.5/60, para. 37). Three partner organizations so far, the Economic Cooperation Organization

secretariat, the UN Economic and Social Commission for Western Asia (ESCWA) and the Centre for Transportation Studies for the Western Mediterranean (CETMO), are supporting the secretariat on the geographical expansion of the observatory and the collection of relevant data, while promoting its usage among their member States. The Inland Transport Committee (ITC) at its eighty-third session (February 2021) requested the secretariat to prepare an official document about progress regarding the development of the International Transport Infrastructure Observatory, providing information about methodology, data sources, algorithms of actualization and mechanisms of data protection as well as responsibilities of stakeholders involved in this process. The present document provides such an overview. It contains many figures and maps directly derived from the Observatory. Any user of the Observatory needs to acknowledge the following disclaimer before being able to enter it: "The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations." This disclaimer also applies to the figures contained in this document.

# III. Main objectives of the ITIO and the services it provides

3. The Observatory offers a multi-stakeholder, web-based Geographic Information System (GIS) platform which hosts data on a large variety of transport infrastructure networks and nodes across different modes including road, rail, inland waterways, ports, airports, intermodal terminals, logistics centres and border crossing points. A geographic information system (GIS) is a system that creates, manages, analyses, and maps all types of data. GIS connects data to a map, integrating location data with all types of descriptive information. This provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication and efficiency as well as better management and decision making. (Esri, 2021).

4. The main objectives of the Observatory are:

(a) Support the implementation of pillars 1, 2 and 4 of the ITC Strategy until 2030, envisaging the role of the ITC as: a United Nations Platform for regional and global inland transport conventions, a United Nations Platform for supporting new technologies and innovations in inland transport and a United Nations Platform for promoting sustainable regional and interregional inland transport connectivity and mobility, respectively.

(b) Support the implementation of Sustainable Development Goal (SDG) 9 on "Building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation"; SDG 11 on "Making cities and human settlements inclusive, safe, resilient and sustainable; SDG 13 on "Taking urgent action to combat climate change and its impacts"; and SDG 17 on "Strengthening the means of implementation and revitalizing the global partnership for sustainable development".

(c) Offer to the United Nations system and Governments an innovative and inclusive tool that further facilitates transport infrastructure financing and enhances regional and interregional connectivity.

5. The main pillars of services that the observatory provides are being summarized in the schema below:

Figure I
**ITIO pillars of services**


*Source*: UNECE

(a) Offering an electronic repository of ECE inland transport conventions, project outputs, and deliverables of designated Groups of Experts:

- More specifically, the observatory provides an electronic platform that will be catalytical for the ongoing digitalization of different United Nations inland transport agreements and conventions, especially those covering infrastructure (AGR[1], AGC[2], AGTC[3] and AGN[4]) but also border crossing facilitation instruments such as TIR[5]/eTIR (customs systems location).
- Furthermore, it offers a digital environment that helps visualize specific outputs and deliverables, such as the work done in the framework of the TEM[6], TER[7] and EATL[8] projects but also the tangible outputs produced by the Group of Experts on Assessment of Climate Change Impacts and Adaptation for Inland (GE.3) and the Group of Experts on Benchmarking Transport Infrastructure Construction Costs (GE.4).

(b) Promoting sustainable regional and interregional connectivity: the observatory provides the possibility to all regional and interregional organizations to create their own maps illustrating their transport infrastructure initiatives, corridors, projects, reports and studies and anything else they consider useful for the purpose of further enhancing regional connectivity. This will enhance cooperation among the different transport infrastructure initiatives in Europe, Asia, and Africa.

(c) Financing transport infrastructure: the observatory operates as a marketplace for financing transport infrastructure by providing an electronic interface between Multilateral Development Banks and Governments. Governments can upload their transport infrastructure projects in need of funding as well as select which MDBs they wish to reach out to. By adding or removing GIS layers, data on transport infrastructure networks can be combined with data about the national and/or regional ratification and implementation rate of specific transport legal instruments or with the impact that climate change may have on planned infrastructure projects. For MDBs, the observatory functions as a clearing house granting them direct access to a centralized information platform assisting them to decide which projects to consider for funding. A secured electronic communication platform will be provided enabling all users to reach out to each other and exchange information.

[1] European Agreement on Main International Traffic Arteries
[2] European Agreement on Main International Railway Lines
[3] European Agreement on Important International Combined Transport Lines and Related Installations
[4] European Agreement on Main. Inland Waterways of International. Importance
[5] Convention on International Transport of Goods Under Cover of TIR Carnets
[6] Trans-European Motorways project
[7] Trans-European Railways project
[8] Euro-Asian Transport Links

# IV. User categories, profiles, and functionalities

6. Four user groups are foreseen in the observatory:

(a) Governments

(b) Multilateral Development Banks

(c) Regional Cooperation Organizations

(d) The wider public

7. Each of these user groups have access to a distinct set of functionalities, services, and possibilities. For Governments, MDBs and Regional Cooperation Organizations (RCOs) access will be granted to officially nominated/ accredited representatives only. A username and password will be provided only after receipt of nominations by the secretariat. The public, academia, private sector, independent experts, and others will not have to register but will only have access to high-level data and information. Upon entering the observatory, they may be invited through an optional online survey to provide some background and profile information for statistical purposes (reasons for using the observatory, their location, professional affiliation etc.).

# V. ITIO Government users

Figure II
**Government user interface**


*Source:* UNECE

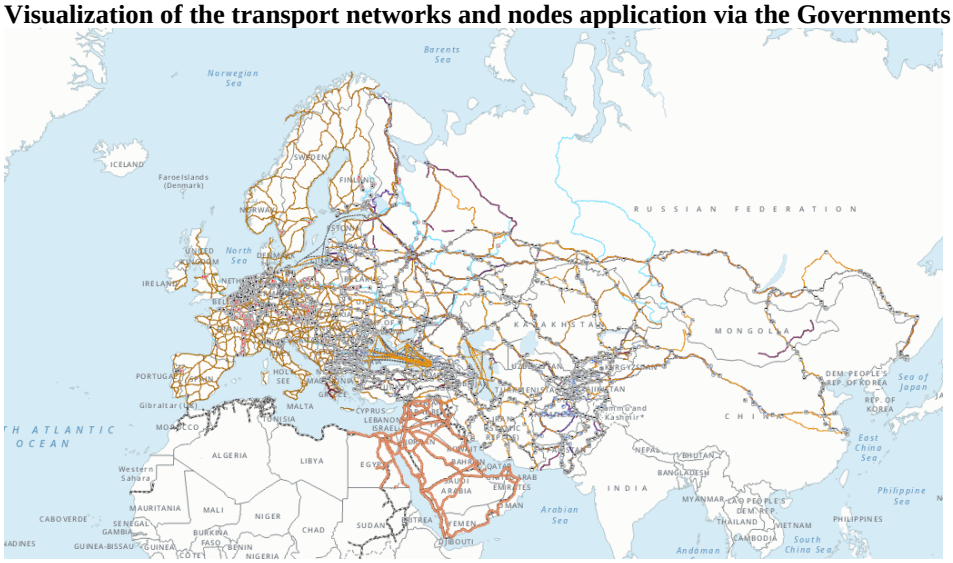
8. For the sake of this document, a brief overview of ITIO functionalities will be given for Government users only. Government users include accredited representatives from Governments agencies (e.g. Ministries of Transport, Infrastructure, Public Works and/ or Investment Agencies). Only accredited Government representatives/ national focal points are granted access to the observatory with a username / password.

9. Government users *inter alia* benefit from the following functionalities:

## A. Access and edit national data

10. Generate maps which visualise a large variety of transport infrastructure networks and nodes across different modes including road, rail, inland waterways, ports, airports, intermodal terminals**,** logistics centres and border crossing points in the Euro-Asian region, the Middle East and North Africa.

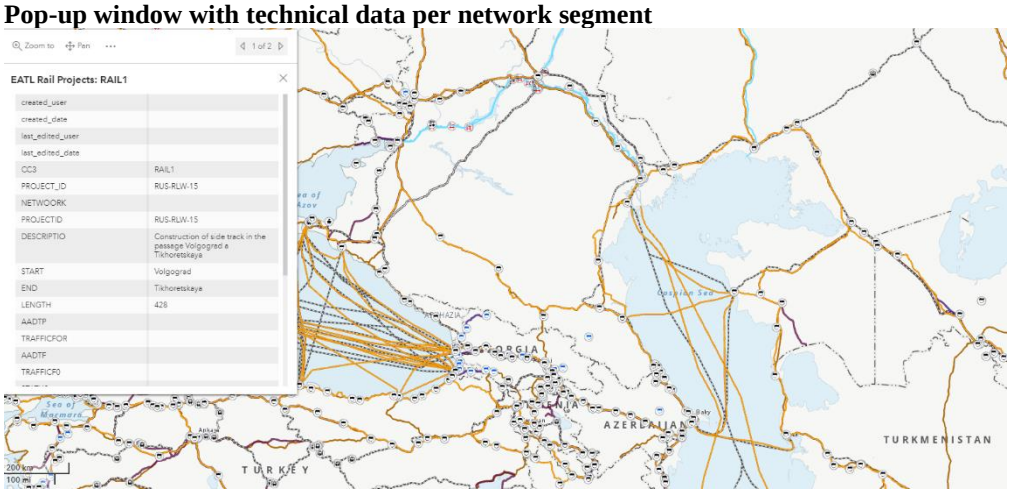
Figure III
**Visualization of the transport networks and nodes application via the Governments user interface**




*Source:* UNECE

## B. Visualize infrastructure networks and generate pop-up windows with technical data per network segment

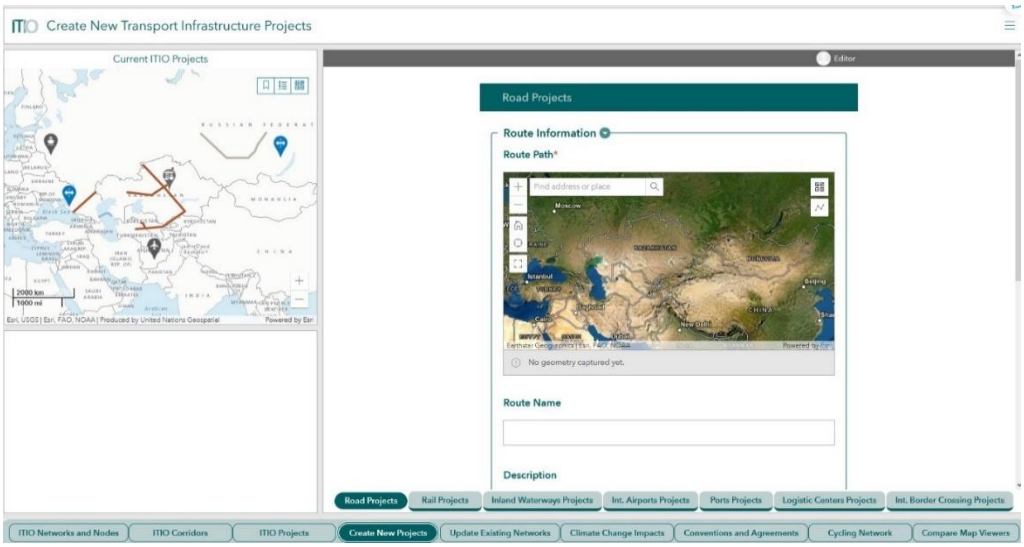
Figure IV
**Pop-up window with technical data per network segment**




*Source:* UNECE

## C. Create new transport infrastructure projects to be uploaded for fundraising purposes

Figure V
**Application to upload new transport projects, data fields to be filled pop-up**




*Source:* UNECE

11. Data fields to be filled for road projects, includes Section 1 "Route technical characteristics" and Section 2 "Project information". While section 2 is identical for project proposals relating to all modes of transport, section 1 differs by mode.

**Section 1. Route Technical Characteristics:**

1. Location (latitude/longitude)
2. Start point/node/city
3. End point/node/city
4. Major intermediate (economic) centres
5. Road Classification:
6. Length (in km):
7. Number of carriageways:
8. Number of lanes:
9. Design Speed/Average speed (km/h):
10. Annual Average Daily Traffic:
11. Estimated percentage of freight vehicles:
12. Annual Average Daily Traffic (passengers):
13. Annual Average Daily Traffic (tons):
14. Minimum overbridge height clearance:
15. Maximum axle load:
16. Road toll implementation: Yes/No

**Section 2. Project Information**

17. Project cost (USD):
18. Expected Starting Date:

19. Expected Completion Date:
20. Internal Rate of Return (IRR):
21. Project's stage: Construction Tendering Study/Design

Planning Identification

22. Expected Funding Sources (and the percentage of funding for each one):
23. Importance to regional connectivity, national economy and social needs

12. Data fields to be filled for railway projects, include:

**Section 1. Route Technical Characteristics:**

1. Location (latitude/longitude):
2. Start point/node/city:
3. End point/node/city:
4. Length (in km):
5. Track gauge (mm):
6. Number of tracks:
7. Traction: Electrified Non-Electrified
8. Signalling type: Automatic Manual
9. Maximum allowed speed - passenger trains:
10. Maximum allowed speed - freight trains:
11. Average Daily Train Traffic - Passenger trains:
12. Average Daily Train Traffic - Freight trains:
13. Volume of cargo moved (tons and TEUs):
14. Number of passenger journeys

13. Data fields to be filled for inland waterway projects include:

**Section 1. Route Technical Characteristics:**

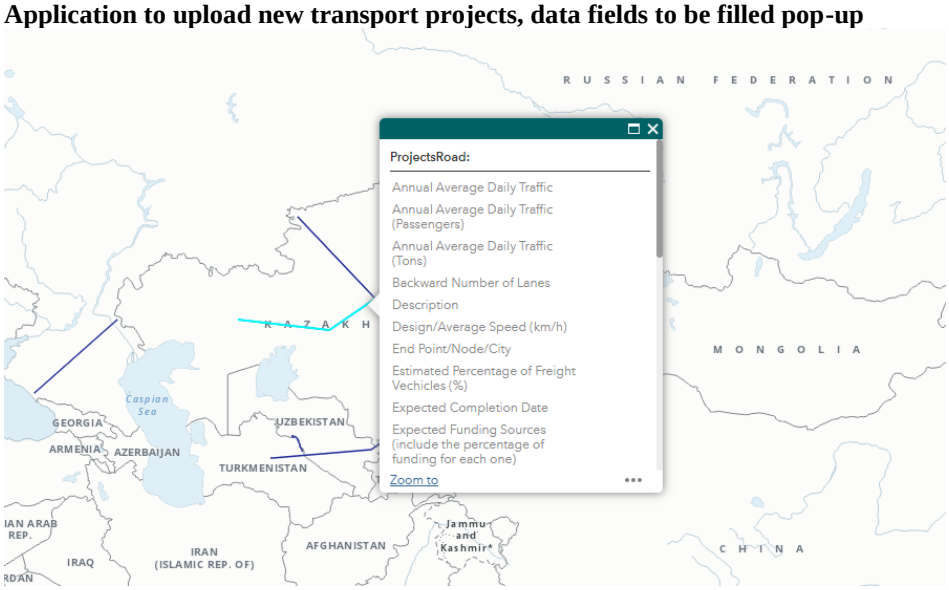
Route Name: Waterway name: Network e.g. (a) EATL Route: (b) other international route: (c) national importance: (d) combination of (a), (b), (c).

Route Description:

Section 1. Project Technical Characteristics:

1. Location (latitude/longitude or alternatively a map):
2. Start point/node/city:
3. End point/node/city:
4. Length (in km):
5. Maximum admissible LNWL:
6. Minimum bridge clearance at HNWL:
7. Lock dimensions:
8. Permitted operational speed (km/h):
9. Annual vessel traffic:
10. Annual freight tonnage

Figure VI
**Application to upload new transport projects, data fields to be filled pop-up**




*Source:* UNECE

# VI. Next steps

14. Develop additional functionalities for the ITIO, including related to visualising the benchmarking data and analysis prepared by the Group of Experts on Benchmarking of Transport Infrastructure Construction Costs (GE.4/WP.5).

15. Benefits to the ITIO include:

- Transport infrastructure construction cost data either at national/country level (i.e. average for a 10-year period) or at specific project level are of high interest both to Government users as they can compare and evaluate the costs of their own infrastructure projects with the associated costs in countries in their immediate (sub-)region as well as to International Financial Institutions (IFIs) and Multilateral Development Banks (MDBs) who may be interested in funding national and or (sub-)regional projects and want to understand how a given project proposal compares to project proposals from other countries.
- Adding a GIS layer to the ITIO that would provide such information would increase the attractiveness and usability of the platform and would also add value to Governments and MDBs since the benchmarking of transport infrastructure construction costs is a critical step for having realistic construction costs and a stable investment program without unexpected cost increases. The use of benchmarking of construction costs could also be useful for cost estimates as well as for control of projects' costs.

16. Benefits to GE.4:

- As the Group by May 2022 will have concluded its mandate, uploading its analysis and data findings onto the ITIO may be the best way to ensure that the work of the Group becomes sustainable and would in addition to resulting in a written report also live on in a virtual/ GIS based environment.
- Moreover, the ITIO could offer an automated user dashboard function that would allow Governments, in a secured IT environment, to continue sharing transport infrastructure construction cost information with one another.

17. Short overview of benchmarking visualisation options:

- GE.4 has gathered and analysed two types of transport infrastructure construction cost datasets: i) Multiple year country averages and ii) Specific project data (including

information on a geographical start and end point of a specific infrastructure project). The latter option provides better options for visualisation in a GIS environment as the infrastructure segment that is subject of a planned or ongoing construction project could be shown on a map. The former could be illustrated at national/ country level through a pop-up window which would illustrate average cost data.

# VII. Guidance by the Group

18. Ahead of its forthcoming thirteenth session, the Group may wish to provide guidance on:

- Whether or not it sees value in instrumentalising the ITIO for benchmarking of transport infrastructure construction cost data beyond the extended mandate of the Group which is expiring in May 2022.
- If deemed relevant the Group is invited to produce priority lists of road, rail, inter-modal transport, and inland waterway construction cost data that it wishes to make available on the ITIO.

19. The Group is invited to consider the information and proposals contained in this document and, if possible, individual Group members are invited to share their views and/ or additional proposals and feedback on this matter with the secretariat ahead of the forthcoming thirteenth session.