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Alpine Space

H2MA

Deliverable D.1.5.1

METHODOLOGY AND TOOLS

Organisational and thematic guidelines for the joint development of the 'H2MA planning tool'

Activity 1.5

July, 2023

DOCUMENT CONTROL SHEET

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Short description

H2MA brings together 11 partners from all 5 Interreg Alpine Space EU countries (SI, IT, DE, FR, AT), to coordinate and accelerate the transnational roll-out of green hydrogen (H2) infrastructure for transport and mobility in the Alpine region. Through the joint development of cooperation mechanisms, strategies, tools, and resources, H2MA will increase the capacities of territorial public authorities and stakeholders to overcome existing barriers and collaboratively plan and pilot test transalpine zero-emission H2 routes.

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- PP2 BSC, Business Support Centre, Ltd, Kranj (SI)
- PP3 EUROMÉTROPOLE DE STRASBOURG (FR)
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- PP6 Turin Metropolitan City (IT)

GLOSSARY

IEA	International Energy Agency
OPEC	Organization of the Petroleum Exporting Countries
GHG	Green-house gas
FCEV	Fuel Cell Electric Vehicle
BEV	Battery Electric Vehicle
NUTS	Nomenclature of territorial units for statistics (Eurostat)
HRS	Hydrogen refuelling station
OEM	Original equipment manufacturer (OEM)
EUSALP	EU Strategy for the Alpine Region
TEN-T	Trans-European Transport Network

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ABSTRACT

In the context of Activity 1.5 titled “Joint development of the ‘H2MA planning tool’ to cooperatively design transnational green H2 mobility supply and distribution networks across the Alpine space”, the Metropolitan city of Torino is responsible partner of the 1.5.1 Deliverable: Organisational and thematic guidelines for the joint development of the ‘H2MA planning tool’.

Across this document CMT will deliver organisational guidelines, including tools to facilitate collaborations, on how partners can develop (jointly with stakeholders and experts) the H2MA planning tool in a workshop.

The deliverable provides:

- A description of the Metropolitan City of Turin and its role in the project.
- The definition of the "H2ma planning Tool."
- The guidelines for developing the H2MA planning Tool.
- The organisational guidelines for experts and stakeholders workshop

1. INTRODUCTION

Mobility is an essential factor for the economic and social growth of a territory. The free movement of people and goods across internal borders is a fundamental freedom within the European Union (EU) and its single market. Traveling within the EU has fostered greater cohesion and a strengthened European identity. As the second-largest expenditure category for European households, the transportation sector contributes 5% to the European GDP and directly employs approximately 10 million workers.

While mobility offers numerous advantages to its users, it comes with costs for our society. These costs include greenhouse gas emissions, air, noise, and water pollution, as well as accidents and road collisions, congestion, and biodiversity loss – all of which impact our health and well-being. Previous efforts and policy measures have not adequately addressed those costs. Greenhouse gas emissions from the transport sector have increased over the time, and presently they account for as much as a quarter of the EU's total emissions.

Under the European Green Deal, the Commission has set the goal of reducing greenhouse gas emissions by at least 55% by 2030 and achieving climate neutrality by 2050. Specifically, this includes a reduction of 90% in greenhouse gas emissions.

For this reason, the European Commission has adopted a Sustainable and Smart Mobility Strategy, establishing short, medium, and long-term milestones, namely by 2030:

- At least 30 million zero-emission vehicles will be in circulation on European roads.
- 100 European cities will achieve climate neutrality.
- Doubling of High-speed rail traffic capacity.
- All scheduled collective journeys under 500 km should be carbon-neutral within the EU.
- Automated mobility will be widely adopted.
- Zero-emission ships will be market-ready.

And by 2035:

- Large-scale zero-emission aircraft will be market-ready.

Furthermore by 2050:

- Nearly all new cars, vans, buses, and heavy vehicles will be zero-emission.
- Rail freight traffic will double.
- High-speed rail traffic will triple.

- The Trans-European Transport Network (TEN-T) will be a multimodal network equipped for sustainable and intelligent transport with high-speed connectivity, operating as part of the global network.

Currently, the fleet of Battery Electric Vehicles (BEVs) in Europe accounts approximately 1,200,000 units, meaning 10% of the total vehicles on the road. This market is rapidly expanding, primarily due to the incentives provided by member countries. The electric cars available on the market can replace internal combustion engine vehicles, especially for urban travel. However, a limitation for long-distance journeys remains due to the current underperformances of energy storage and charging systems times. Consequently, they are not as competitive as fossil fuel-powered vehicles are.

Range is a hard to overcome issue, particularly for long haul freight transport vehicles, that could be overwhelmed by adopting zero-emission fuels such as, among others, hydrogen, in aviation, maritime, rail, and road.

An advantage of hydrogen is its versatility across different propulsion technologies. It can be used to generate electrical power (via fuel cell technology) or directly used as fuel for internal combustion engines. Furthermore, its transport is not as complex, and it can benefit of existing natural gas distribution networks.

The challenge of production cost and the substantial amount of energy required for electrolysis still remains topics to be addressed, with a strong needs in finding innovative solutions to increase performances and investment costs.

2. METROPOLITAN CITY OF TORINO

The Metropolitan City of Turin is an administrative entity established on January 1, 2015, replacing the former Province of Turin. It is located in the Piedmont region in northwest Italy.

The Metropolitan City of Turin covers an area of approximately 6,830 square kilometres and it includes 315 municipalities, and the capital city of Turin. It is the fourth most populous metropolitan area in Italy, with a population of about 2.3 million inhabitants.

The Metropolitan City of Turin is situated at the foothills of the Alps and is surrounded by breathtaking landscapes and natural attractions such as the Gran Paradiso National Park.

The territory of the Metropolitan area is indeed very heterogeneous. In addition to the urbanized areas, there are also mountainous, hilly, and rural areas.

It is also a major industrial and commercial centre, with a wide range of manufacturing industries actives in automotive , engineering, food, fashion and electronics markets .

2.1 The Mobility Network of Metropolitan City of Torino

The Metropolitan City of Turin has an efficient public transportation system, including a network of train, buses, trams, and subways, which facilitates travel and commuting in the metropolitan area.

The Metropolitan City of Turin is served by a well-developed highway system that allows connections to major Italian and European cities and logistic nodes.

Main public transportation in the metropolitan area services are the suburban train network (SFM), which includes 8 lines connecting around 100 cities. In addition bus network, accounting over 100 lines enabling, is particularly developed to serve mountain and rural communities. A renewal of the bus fleet is currently ongoing. Over the next 10 years, the metropolitan city is going to invest around 80 M EUR in purchasing of new zero and low emission buses. Since fossil fed buses cannot be replaced with BEV ones for suburban lines (over 100 km per single trip) and in hill / mountain areas, the Metropolitan City of Turin is investigating investments for the acquisition of hydrogen buses.

The metropolitan city is crossed by the Mediterranean TEN-T corridor, an important infrastructure of the European transport networks, connecting various cities and regions along the Mediterranean coast and eastern EU. Due to this asset, Torino benefits of excellent connection with core EU economical areas, namely Lyon to thee west and Milan and Venice to east.

Furthermore, the A5 highway, known as the "Autostrada della Valle d'Aosta," connects Turin to the Mont Blanc Tunnel, which provides an additional access to France and San

Bernardo Tunnel, going north through Switzerland to Rotterdam and the Rhine valley. Those infrastructures are also connected with the harbours of Genoa and Savona.

2.2 The Metropolitan city of Torino SUMPS (Sustainable Urban Mobility Plans).

According to national law, the CMTO is the entity responsible for developing the SUMPS (Sustainable Urban Mobility Plans).

The purpose of the Sustainable Urban Mobility Plans (SUMPs) is to promote more sustainable mobility and improve the quality of life and environment.

SUMPs define a strategic vision and a set of actions to efficiently deploy and manage the urban transport system, reducing polluting emissions, alleviating congested traffic, and enhancing accessibility and the quality of public transport.

CMTO adopted the Metropolitan SUMPS on 2022, with a target to reduce by 27,8% CO2 transport related emission and by 33,9% PM10, within an horizon of 10 years (2032).

To achieve these objectives, a shift to zero-emission mobility is a must.

While electric vehicles are presently an efficient solution for urban areas, alternative zero-emission fuels are necessary for medium to long-distance metropolitan routes. Therefore, the development of a mobility system based on sustainable fuels (among others hydrogen) is a challenge for the Metropolitan City in order to achieve the objectives of the Sustainable Urban Mobility Plan (SUMP) and EU targets.

Thus, the Metropolitan City of Turin will profit of H2MA project outcomes to design and enhance its transportation strategies for adoption zero-emission mobility solution based on hydrogen. Furthermore, H2MA Planning Tool will also allow to design an expansion strategy for both the production and distribution network of hydrogen both for public and private transport purposes.

3. THE H2MA PLANNING TOOL

H2MA Planning Tool will be a computer tool designed to support decision-makers involved in design of local strategy for hydrogen mobility development, in order to contribute to the creation of Hydrogen Routes within the Alpine Space Region.

The starting point of the H2MA Planning Tool will be the development of a multilayer geographic portal that, through parametric processing of the available information, will

suggest sites having good potential for green hydrogen production and the construction of Hydrogen Refueling Stations (HRS).

As defined in Deliverable D1.3.2, the geographic portal will be based on a GIS system (Geographic Information System). The GIS the acquisition, recording, analysis, visualization, retrieval, sharing, and presentation of georeferenced data.

Furthermore, it associates data with a unique geographic location, allowing to and processing and extract information at geographical scale.

GIS datasets contain 3 levels of information:

- Geometric: pertaining to the cartographic representation of the represented objects, such as shape, size, and geographic position.
- Topological: related to the mutual relationships between objects.
- Attribute: involving texts and numbers associated with an object.

The GIS manages these level of information in a relational database that can be exported or imported through the processing of standard formatted files (shapefiles) .

GIS technology is highly advantageous, and I can use Open Source programmes and platforms, widely diffused since many years. The use of open source and standard file format do not require additional software development, allowing H2MA data and information availability for public use well beyond the duration of the project.

3.1 Guidelines for H2MA planning tool

The structure of the H2MA Planning Tool will be organized according to project deliverables 1.1, 1.2, 1.3, and 1.4.
This analysis has led to the decision to create **three main layers**, to which secondary level layers containing homogeneous information will be connected. The three main layers will group specific information on:

- Infrastructure
- Demand
- Strategies - both public and private - for development and research

Regarding the **infrastructure layer**, datasets concern strategic information regarding:

- Transportation networks: This entails indicating high-traffic roads (especially for freight transportation), railway networks, ports, and interports.
- Key hydrogen-related infrastructures: As described in deliverable 1.1.1, the main hydrogen-related infrastructures can be divided into production sites, distribution networks, hydrogen refueling stations (HRS), and storage locations.
- Green energy production infrastructure: This includes the presence of solar or wind parks, hydroelectric energy production, and energy communities.

Regarding the **demand layer**, it should include information on public transport and road freight transport, particularly:

- Public transport services
- Medium to long haul logistics companies (heavy veichle)
- Non-electrified railway networks
- Oil refineries and hydrocarbon storage facilities

Regarding the s**trategies** layer, the following information should be included:

- Areas covered by hydrogen development strategies
- Presence of associations that bring together public and private entities for hydrogen mobility development
- Presence of public and private research centres focusing on hydrogen development

All the aforementioned information should combine geographic data with textual and numerical information. The combination of information from the three main layers will lead to the creation of a database that, appropriately parameterized, can provide a final information output in the form of a spider diagram, indicating the readiness of a location to host a H2 production plant and/or the implementation of HRS.

3.2 Structure of layers and information

Here is the layer structure defined by the Metropolitan City of Turin, which is adopted as a starting point for discussion among partners in order to achieve a final outcome that will materialize in the planned project workshop.

Code	Name	Information
Layer A Infrastructure		
Layer A1	***Transport network***	
Layer A1.1	highway network	name of hyghway, distance, ten-t network (yes/no)
Layer A.1.1.1	compressed natural gas (CNG) refueling station	name of natural gas (CNG) refueling station , coordinate, connecting by pipeline
Layer A.1.2	railway network	name of railway, distance, ten-t network (yes/no), electrificated (yes/no)
Layer A.1.3	interport (intermodal terminal)	name, coordinate, connecting by highway (yes/no), connecting by railway (yes/no)
Layer A.1.4	Ports	name, coordinate, connecting by highway (yes/not), connecting by railway (yes,not) , connecting by pipeline (yes/not/in program)
Layer A2	***Hydrogen system***	
Layer A2.1	production site	see deliverable 1.1.2 – table on pag. 29
Layer A2.2	HRS	see deliverable 1.1.2 – table on pag. 21
Layer A3	***Green energy production infrastructure***	
Layer A3.1	Solar farm	Name, coordinate, MW production

Code	Name	Information
Layer A3.2	Wind farm	Name, coordinate, MW production
Layer A3.3	Hydroelecrtric power plant	Name, coordinate, MW production
Layer B Demand		
Layer B.1	***public transport***	
Layer B.1.1	bus service	company, depot coordinate, fleet description (on kind of powertrain)
Layer B.2	***logistics companies (heavy veichle)***	
Layer B.2.1	haul logistics companies (heavy veichle)	name company, depot coordinate, fleet description (on kind of powertrain)
Layer B.2.2	Consolidation goods sites	name, coordinate, supply chains type
Layer B.3	***Oil refineries and hydrocarbon storage facilities***	name, coordinate, rafinaries or storage facilieties
Layer C Strategies		
Layer C.1	***H2Strategy***	see deliverable 1.1.2 – table on pag. 14
Layer C.2	***R&D private e public***	name, coordinate
Layer C.3	***H2 Association***	name, coordinate

4. TURIN WORKSHOP

4.1 The aims

As part of activity 1.5, the Metropolitan City of Turin is charged with organizing a workshop to discuss the guidelines in support of development of the H2MA toolkit. The creation of the H2MA toolkit is one of the main outputs of the project and will be foundational for achieving all the project partners' objectives.

Given the complexity of the software model being developed, the H2MA project partnership, in agreement with the project lead, decided during the virtual meeting on July 4, 2023, that a single work session wouldn't allow for a detailed analysis of the parameters that will be adopted in the Decision Support System. As a result, an internal working group (Expert group for the development of the H2MA planning tool) within the project was formed and conducted multiple virtual sessions to delve into this topic.

The working group convened for the first time on July 7, 2023, with discussions initiated by reviewing the presentation produced by the project lead:

"1st Expert group meeting for the development of the H2MA tool .

In this meeting, the structure of the Decision Support System devised by the Metropolitan City was then presented and described in this document in section 3.

Subsequently, two additional virtual meetings were organized on July 13 and July 27, 2023.

The project meetings were attended by:

Name	**Project Partner**
Martin Schloffer	4ward Energy Research Ltd
Blanka Odlazek	Business Support Centre, Ltd, Kranj
Matevz Silc	Energy Agency of Savinjska, Saleska and Koroska Region
Chiara Darco	Energy Agency of Savinjska, Saleska and Koroska Region
Ilaria Leonardi	Codognotto Austria
Matteo Benvenuti	Codognotto Austria
MELOUNOU Jean	EUROMÉTROPOLE DE STRASBOURG
Angeles Casulli	Italian German Chamber of Commerce Munich-Stuttgart
Silvia Galante	Regione Lombardia
Mita Lapi	Lombardy Foundation for the Environment
Domenico	Exsternal for Lombardy Foundation for the Environment
Giuseppe Estivo	Metropolitan city of Torino

The workshop organized by the Metropolitan City of Turin closed the task's activity steps. To enhance the quality of the outcome, it has been decided to use the workshop as a moment of participatory design, in which project partners will collaborate closely with a group of external experts on the three main pillars mentioned in section 3.1: Infrastructure, Demand, and Strategies. Together, parameters of the H2MA Toolkit have been validated.

The Metropolitan City of Turin has invited project partners to indicate which experts they would like to involve in the workshop. Subsequently, the Metropolitan City has sent an invitation letter that outlines the H2MA project, the workshop's objectives focusing on the three main pillars: Infrastructure, Demand, and Strategies.

4.2 The workshop program

The workshop will be held at the premises of the Metropolitan City of Turin on October 12, 2023. The meeting will be divided into three working sessions.

The first session will involve opening remarks from the hosting partner's institution and will include a description of the project and its objectives.

The second session forsight the distribution of attendees into three working groups, each aligned with one of the project's main pillars. The assignment of experts to these groups is organized beforehand based on each participant's expressed preference in response to the invitation email. Each table is managed by a designated representative of project partners, who is assisted in the elaboration of conclusions and minutes.

The closing session will debate summaries of discussion topics from the three working groups. These summaries will lately be used to the development of the upcoming Deliverable.