

Case Study: How to plan and design a Hydrogen Valley

Integral part of the
Hydrogen Summer School

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Programme & contact details

Visit www.idic.org.il/events/dutch-israeli-summer-school-on-the-design-planning-and-implementation-of-hydrogen-valleys for the full programme on 17, 18 & 19 August.

If you have any questions feel free to contact Jochem Durenkamp (j.durenkamp@newenergycoalition.org) or Racheli Kreisberg (racheli@nost.org.il).

Introduction

Hydrogen Valleys have started to form first regional “hydrogen economies”, as bottom-up steppingstones in the development of the new hydrogen economy. Over the past several years, the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) has been setting up, in collaboration with European cities and regions, so-called Hydrogen Valleys – a concept that aims to enable the emergence of locally integrated hydrogen ecosystems for climate change mitigation and regional economic development.

Hydrogen Valleys typically comprise a multi-million EUR investment, spread across a defined geographic scope and covering a substantial part of the value chain, from hydrogen production, storage and transport to its end use in various sectors (industry, mobility, energy).

Over the past few years, Hydrogen Valleys have gone global, with new projects emerging worldwide.

Background

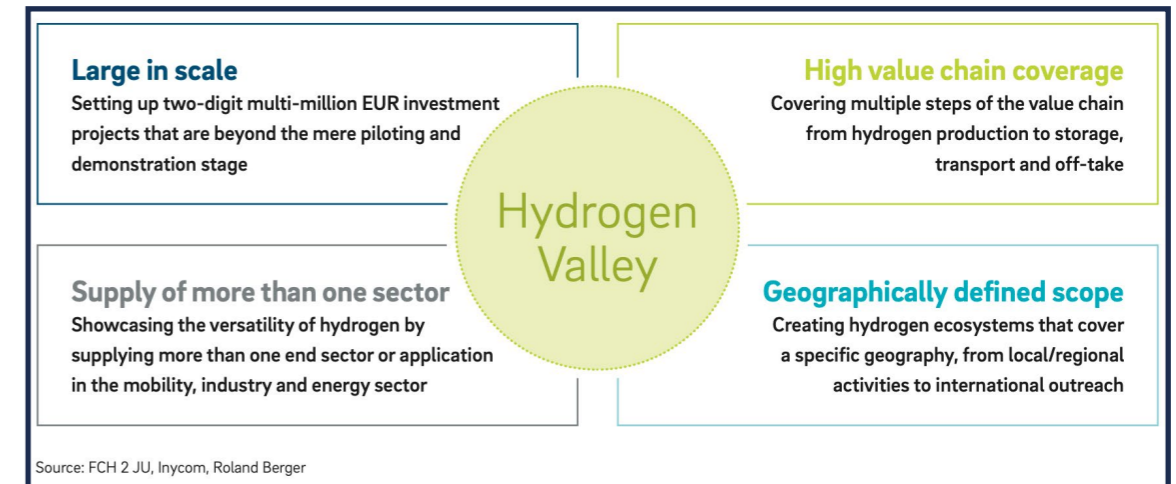
Hydrogen is universally considered an important energy vector for combating climate change.

It enables the decarbonisation of hard-to-abate sectors such as fuel or feedstock and, moreover, holds vast potential for industrial development and job creation.

Its benefits are also acknowledged through the many dedicated national and international hydrogen strategies that have been published globally in recent years, as well as the recently published Hydrogen Act. Simultaneously, the emergence of a hydrogen market, economically stimulates regions where hydrogen is produced, and associated technologies are deployed by creating new jobs and showcasing the regions as environmental forerunners.

Background: What makes a Hydrogen Valley?

Although Hydrogen Valley concepts are always adapted to cater to specific regional circumstances and the overall objectives of a project, there are common characteristics of what constitutes a Hydrogen Valley, see the picture below.

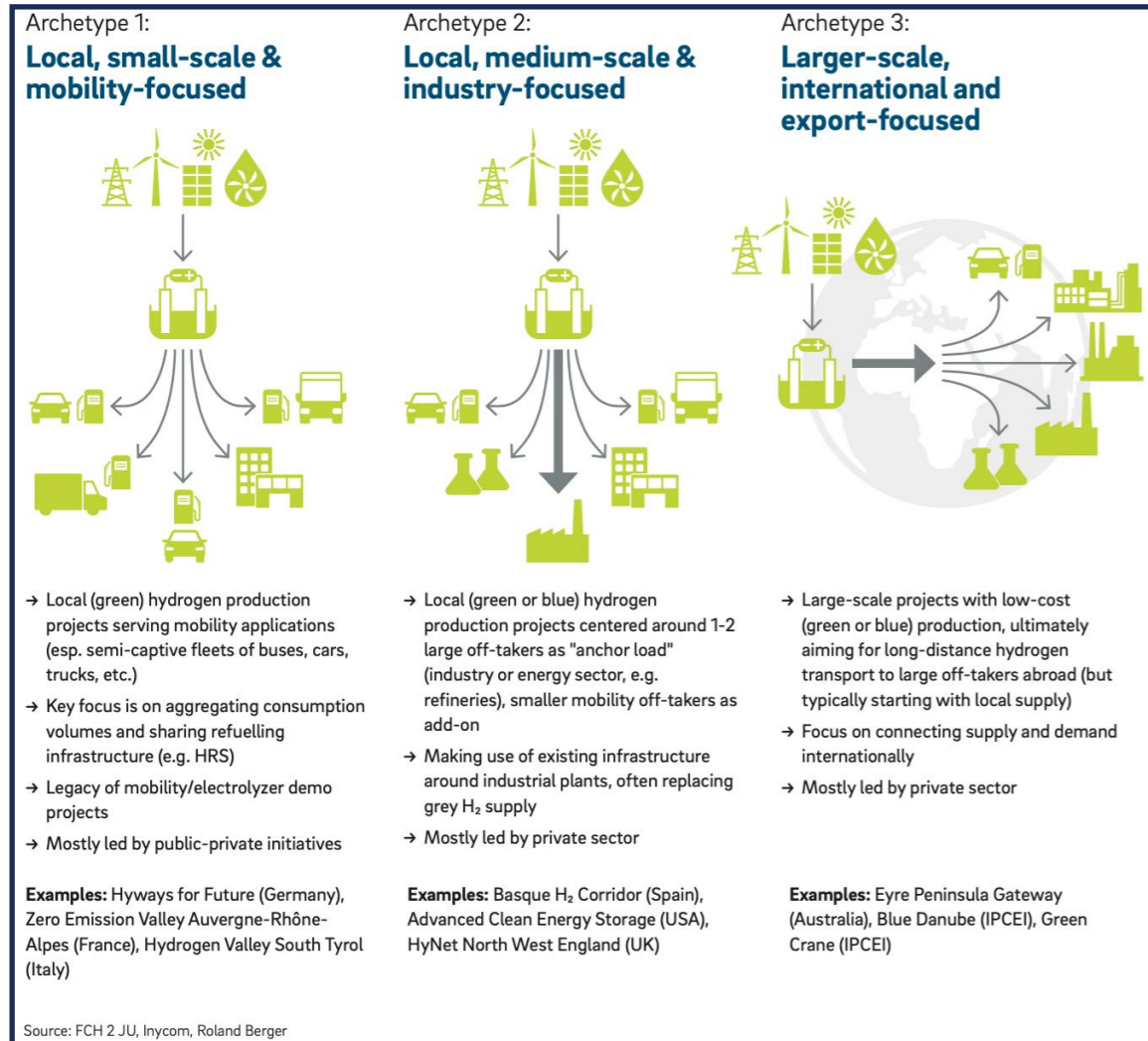


- Large in scale: The project scope goes beyond mere demonstration activities and entails at least a two-digit multi-million EUR investment. It typically also includes several projects that make up the larger Valley “portfolio”.
- A clearly defined geographic scope: Hydrogen Valleys are hydrogen ecosystems that cover a specific geography. Their footprint can range from a local or regional focus (e.g., a major port and its hinterland) to a specific national or international region (e.g., a transport corridor along a major European waterway).
- Broad value chain coverage: Across their geographic scope, Hydrogen Valleys cover multiple steps in the hydrogen value chain, ranging from hydrogen production (and often even dedicated renewables production) to the subsequent storage of hydrogen and distribution to off-takers via various modes of transport.
- Supply to various end sectors: Hydrogen Valleys usually showcase the versatility of hydrogen by supplying ideally several sectors in their geography such as mobility, built industry and energy end uses. Thus, Hydrogen Valleys are ecosystems or clusters where various final applications share a common hydrogen supply infrastructure.
- Management of Hydrogen valleys: the establishment, management, maintenance, and development of Hydrogen valleys require a unique variety of management consulting services – from corporate strategies to project development and investor support. In addition, they require excess of funding to establish the infrastructure, to carry our R&D projects and to scale up.

Hydrogen Valley archetypes

Generally, there are three different archetypes of hydrogen valleys that can be observed in today's global landscape of integrated hydrogen projects:

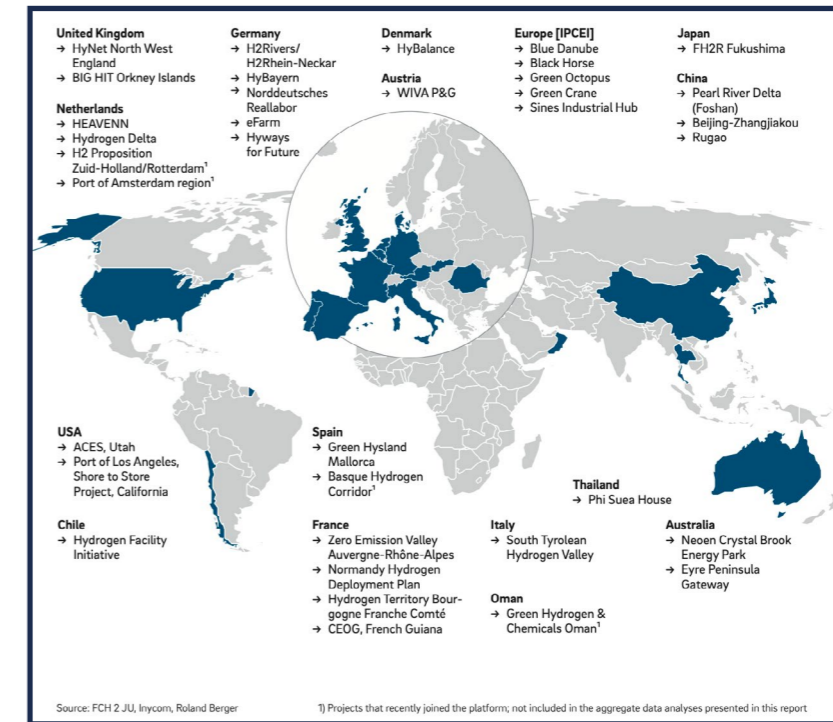
- local, small & mobility focused;
- local, medium-scale & industry focused (with mobility as add-on hydrogen use);
- larger-scale, international and export-focused.



These archetypes have complementary effects on the hydrogen market. While the first archetype establishes local hydrogen infrastructure and builds acceptance within the population, the second archetype enables the local scale-up of the market and reaps the benefits of hydrogen at a larger-scale by decarbonising the industry and energy sector.

The third archetype increases the overall geographic coverage of hydrogen products and services while tapping into the most cost-efficient hydrogen potential. In the short to midterm, it is reasonable to expect that due to the limited local green hydrogen production potential in some Hydrogen Valleys, archetypes will interconnect and create interfaces between the as-yet isolated initiatives. This will be more obvious in regional blocks with traditionally strong infrastructure links and bonding policies (e.g., the European Union). This will provide an additional push for the hydrogen market and will establish the necessary infrastructure and interconnection for the economy to reach maturity.

Inspiration: Hydrogen Valleys around the world



Go to <https://www.h2v.eu/> to find more information about hydrogen valleys.



Go to <https://www.h2v.eu/hydrogen-valleys> for the interactive map with all hydrogen valleys in the world

Best practice: HEAVENN – the first integrated Hydrogen Valley in Europe

Learn from the best! Watch the video about the Hydrogen Valley in Europe by clicking the picture below or visit www.newenergycoalition.org/en/hydrogen-valley/



The Case

The case explained

In this case you will design and plan your own hydrogen valley. This valley must meet the following requirements:

I. Location: Choose a location for your hydrogen valley.

This location may not have a hydrogen valley already and must meet the definition of the FCH-JU.

“Hydrogen Valleys are hydrogen ecosystems that cover a specific geography. Their footprint can range from a local or regional focus (e.g., a major port and its hinterland) to a specific national or international region (e.g., a transport corridor along a major European waterway).”

Describe in why you have chosen this location for your hydrogen valley. Describe why this location has the potential to become a successful hydrogen valley. In particular, describe the unique local/regional needs or assets that drive your choice of location.

Go to <https://www.h2v.eu/hydrogen-valleys> for the interactive map with all hydrogen valleys in the world

II. Focus: Choose your own archetype as a guideline.

Archetype 1: Local, small-scale & mobility-focused

Archetype 2: Local, medium-scale & industry-focused

Archetype 3: Larger-scale, international and export-focused

Choose a focus for your hydrogen valley depending on your location. You can take one of the archetypes as a guideline, but you can differentiate from this. Describe in 1 page where your hydrogen valley focuses on that leverage local assets and address local needs.

For more information go to page 27 & 28 of the report: <https://www.h2v.eu/media/7/download>

III. Make sure you cover multiple steps of the value chain from hydrogen production to storage, transport, and off-take

Across their geographic scope, Hydrogen Valleys cover multiple steps in the hydrogen value chain, ranging from hydrogen production (and often even dedicated renewables production) to the subsequent storage of hydrogen and distribution to off-takers via various modes of transport, supply to various end sectors

For more information go to page 19 & 30 of the report: <https://www.h2v.eu/media/7/download>

IV. What to do with the hydrogen? Define the various end sectors

Hydrogen Valleys usually showcase the versatility of hydrogen by supplying ideally several sectors in their geography such as mobility, industry (i.e., steel production), the built environment (i.e., heating), and energy end uses (i.e., data centers). Thus, Hydrogen Valleys are ecosystems or clusters where various final applications share a

common hydrogen supply infrastructure and together justify larger-scale investments into supply capacities, thereby bringing down the effective cost hydrogen.

For more information go to page 24, of the report: <https://www.h2v.eu/media/7/download>

V. You can't build a hydrogen valley on your own. Make a list of partners and stakeholders involved. Think about partners and stakeholders from both the industry, SMEs, academia and the government. See also point VI of the success factors below.

VI. Make your hydrogen valley a success. Make sure you meet at least 3 of the 5 following key success factors and explain in 1 or 2 Alinea's for each single success factor how you deal with it:

1. A convincing project concept with a value chain coverage and technology choices that leverage local assets and address local needs
2. A viable commercial structure that enables first real business cases for developers (include relevant public funding and venture capital, if applicable)
3. Public-private financing from multiple sources that includes enough public funding to close all gaps
4. Partnering and stakeholder cooperation that covers the entire project scope and ensures continuous commitment from all parties involved
5. Political backing and buy-in of the general public for smooth and continuous project development

For more information go to page 30 – 36 of the report: <https://www.h2v.eu/media/7/download>

VII. Sustaining your hydrogen valley project. Describe what next steps you take to keep it successful.

For more information go to page 29 – 36 of the report: <https://www.h2v.eu/media/7/download>

VIII. Breaking down barriers. Describe your main barriers and how you will overcome them. Possible barriers are

1. Securing public funding
2. Securing off-take commitments
3. Securing private funding
4. Mitigating technological readiness and technological performance

For more information go to page 36 – 42 of the report: <https://www.h2v.eu/media/7/download>

In other words, your hydrogen valley must meet the 4 common characteristics of what constitutes a Hydrogen Valley:

1. A well-defined and justifiable scale
2. A clearly defined geographic scope
3. Broad value chain coverage
4. Supply to various end sectors

Colophon

Commissioned by:
Energy Delta Institute
Nijenborgh 6
9747 AG Groningen
The Netherlands

+31 (0) 88 11 66 800
info@energydelta.nl
www.energydelta.org

Israeli-Dutch Innovation Center &
Netherlands Innovation Network

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Marcel van den Berg
Grafisch ontwerp
www.joostmarcellis.nl

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