

# Industrial ecosystems for assessing economic impacts of tourism: A holistic approach

## The Industrial Ecosystems concept

In March 2020, the European Commission published its [New Industrial Strategy](#). The strategy aimed to support the transition to a green and digital economy, making European industry more competitive on a global scale.

The importance of the European Union's Single Market's functioning and global integration was sharply felt with the eruption of the COVID-19, affecting the European Union economy (see for instance [Eurostat statistics on the economy related to COVID-19](#)). Such a deep impact led the European Commission to publish an [update](#) of the Communication, in May 2021, with a clear approach towards how to capture the EU's economy and industry's impact. In order to achieve this, an analytical approach of industrial ecosystems was developed.

The industrial ecosystems approach sought to analyse and promote an integrated Single Market, accounting for how R&D and innovation, engineering, production, assembly and service activities can spread across different sectors and Member States.

The cornerstone of the concept of industrial ecosystem is the acknowledgement of the systemic importance of all the horizontal and vertical links among economic actors. Under this approach, industrial ecosystems encompass all players operating in a value chain. The approach recognises the importance of those activities often considered as ancillary to industry, such as supply of raw materials, research and innovation, the provision of business services, or access to distribution networks.

This exercise led to the identification of fourteen industrial ecosystems spanning across the EU based on their economic and technological relevance, and for their expected contribution to the decarbonisation, digitalisation and resilience of the EU economy (see [European industrial strategy](#)). In order to monitor the performance of the ecosystems on their path towards the twin green and digital transitions in the context of the Single Market, a statistical definition of each ecosystem, including tourism, has been developed. It is therefore an important perspective from which to look at Tourism. It provides an approach consistent with other industrial ecosystems that is designed from the outset to be cross-sector and cross-border compatible.

## Industrial ecosystems as a holistic approach

There are benefits in looking to economic activities as clusters (see for instance [The Case for Holistic Data Integration](#)) and considering cross-sector activities that can be linked back to such clusters in order to obtain a big, cross-cutting, perspective (see for instance [Holistic approach to machine tool data analytics](#)). The industrial ecosystems approach was also designed to account for the benefits of

creating these industrial ecosystem clusters for analysis, while maintaining the methodology neutral to any of them and thus avoiding the negative caveats from sector specific segregated methodologies (see for instance [Data Collaboratives as a New Frontier of Cross-Sector Partnerships in the Age of Open Data: Taxonomy Development](#)).

Within complex ecosystems, the health of the whole depends on the strength of each individual component, and on the ability of the system to swiftly support any weakened elements. The Single Market has provided the right environment for enterprises, citizens and institutions to create complex and resilient ecosystems able to do just that.

A coordinated policy must factor in these large interlinkages across sectors and enterprises, spreading across all Member States. The COVID-19 crisis has demonstrated that if parts of an ecosystem is held back due a difficult economic situation in one region or country, the whole ecosystem will suffer. The ties on which the ecosystem relies would be loosened by result weakening the single market. The lens of ecosystems allows us to identify bottlenecks across the single market and identify the critical policy levers to revitalise them.

## Industrial ecosystems' statistical definition

The boundaries and scope of the ecosystems are dynamic. For each ecosystem, the Commission has identified (based on literature review and expert judgement) their respective core activities, i.e. those that more than the others characterise each ecosystem. These activities have been mapped into a widely used statistical classification (*Nomenclature statistique des Activités économiques dans la Communauté Européenne*, NACE). This approach allows for a great flexibility. Industrial ecosystems are mapped at the 4 digit-level of NACE classes, however when necessary to analyse industrial ecosystems in a dataset that is lacking granularity of data (for instance only having data down to the two-digit NACE classes level), it is possible to use the granular NACE codes to attribute weights to the higher-level figures on the basis of the distribution of employment and value-added figures.

Ecosystems are also linked to each other, as some sectors (and related) activities are relevant for more than one ecosystem. A share of these “horizontal”, cross-cutting, activities is attributed to the different ecosystems based on their specific contribution to the core activities of the ecosystems. This notion of contribution has so far been calculated using input-output tables.

Because in the EU socio-economic statistics are aligned with the NACE classification, the statistical definition of ecosystems allows the calculation of ecosystem-level indicators as a weighted average of the values of the sectors included in the definition of each ecosystem; the weights are based on the share of value added that each sector has in the total value added of the ecosystem.

## Industrial ecosystems approach and tourism

The EU tourism ecosystem encompasses globalised and interconnected value chains comprising off-line and on-line products, information and service providers (for example tourist offices, digital platforms, travel technology providers), travel agents and tour operators, accommodation suppliers, destination managing organisations, attractions and passenger transport activities (for example,

airlines, trains, and cruises). It is a diverse ecosystem, in which micro, small and medium enterprises operate alongside large multinational corporations, and wherein private and public capital are intertwined.

The statistical definition of the tourism ecosystem is focused on the following NACE sectors:

- H49: Land transport and transport via pipelines; and other reservation service and related activities
- H50: Water transport
- H51: Air transport
- I55-I56: Accommodation and food service activities
- N79: Travel agency, tour operator
- N82: Office administrative, office support and other business support activities
- R90-R92: Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities
- R93: Sports activities and amusement and recreation activities

These classes of activity are then weighed in accordance with their contribution to Tourism specifically. In the past, 2-digit-sector-specific weighting factors for estimating the percentage contribution to the industrial ecosystems was used. Today, the European Commission is moving to maintain data at a more granular, 4-digit level and only calculating 2-digit level distribution, primarily based on added-value, when necessary due to the lack of granularity in a given dataset.

As a result, this approach allows for the analysis of Tourism across borders and for a variety of indicators, even if there is a low level of granularity available. Such is done all the while taking into consideration a big picture of Tourism that accounts not just for the straightforward activities like a tourist's stay in a hotel, but also the use of legal counsel by a hotel. This way not only is it possible to obtain a better perspective of the overall economic impact of tourism, but it also allows for a better understanding of the interdependencies of different sectors.

## Tourism economic impact as per industrial ecosystems

The paper proposes to present the following indicators calculated for the tourism ecosystem, using the industrial ecosystems methodology presented above:

- trade values for goods and services,
- turnover, integration of trade within the EU (trade versus turnover),
- value added,
- share of services' value added in final demand of EU manufacturing sector,
- number of enterprises,
- employment,
- SMEs' contributions to value added,
- producer output prices,
- consumer confidence.

## Industrial ecosystem in comparison with select methodologies

There is a great deal of literature for assessing the economic impact of tourism, see for example [Tourism and its economic impact: A literature review using bibliometric tools](#) and [Economic Impacts of Tourism](#)). Such is to be expected as tourism impact or lack thereof can be the topic of important discussion (e.g. [Estimating the Economic Impact of Event Tourism: A Review of Issues and Methods](#)). Even within the EU, the industrial ecosystems methodology is not the only approach to analyse Tourism. The EU's statistical office, Eurostat, defines "Tourism" based on a [selection of NACE classes](#). This is a straightforward approach that allows for easy implementation and replication by other actors, it is however limited in its consideration of accounting for non-tourist activities and of ancillary activities. Many of these activities in the NACE classes included provide services to both tourists and non-tourists, however. Consider how restaurants cater to not only tourists, but also to locals. Or, how rail transport is not just for tourists, but is also used by commuters.

It is for this reason, that when making a publication (ibid as an example), Eurostat only includes "selected tourism industries which rely almost entirely on tourism" (ibidem). However, as Eurostat themselves state, even these are not entirely tourism. Even entries that could seem more straightforwardly just tourism are more nuanced. Take for instance how "Air transport" (H51) also includes "Freight air transport" (H512), which accounts for 6.0 % of employment in "Air transport". Further, there are cases wherein it is not certain how the activities fit. As an example, "Other reservation service and related activities" (N799) accounts for 12.9 % of employment in "Travel agency, tour operator reservation service and related activities" (N79).

Furthermore, the approach of simply selecting the NACE classes in question ignores ancillary and support activities. Tourism activities use a number of activities such as lawyers and accountants. Tourism Satellite Accounts (TSA) methodology is designed in such a way as to take into account the output of other (non-tourism) industries as long as this output responds to tourism consumption (see [Tourism Satellite Account: Recommended Methodological Framework](#)).

The TSA approach provides a broader coverage, while still keeping a clear accounting of only that which can be directly linked to Tourism.

The possibility to estimate indirect and induced effects is actually mentioned under the TSA (ibid, Annex 6: The measurement of the economic impact of tourism). There it is positioned that such could be done through the use of input-output tables. This is indeed the approach with the industrial ecosystems, which was designed from the outset to capture also the indirect and induced economic effect.

The industrial ecosystems methodology uses a straightforward and pragmatic version of such modelling. Through the industrial ecosystem, activities are incorporated horizontally into different industrial ecosystems based on weights calculated through input output tables. A more complex version which would increase reliability of the figures, could be performed by taking into account both lengthier and more complex chains of effect, as well as connected sectors and activities that are not shared across all ecosystems. However, the current approach allows for recurring and automatised calculation of the weights as new figures in input-output, value added, or more are available.

It is then clear that these methodologies have been designed in different way, with different focus and subsequently different benefits and aspects that are, purposely, accounted for or not. It is important

to consider what one is trying to analyse and what questions to answer (see for instance [Understanding the Economic Impact of Tourism](#)).