ESI Preprints **Not Peer-reviewed**

Sustainable tourism supported by the drafting of the Cross-border Sustainable Mobility Plan (PTMS) between southern Italy and Epirus in Greece

Fabio Carlucci
Department of Economics and Statistics,
University of Salerno, Italy
Domenico Gattuso
Mediterranea University, Italy
Luigi Senatore
Barbara Trincone
Department of Economics and Statistics,
University of Salerno, Italy
Elisabetta Venezia
Department of Economics and Finance,
University of Bari Aldo Moro, Italy

Doi: 10.19044/esipreprint.10.2024.p588

Approved: 25 October 2024
Posted: 26 October 2024

Cite As:
Carlucci F., Gattuso D., Senatore L., Trincone B. & Venezia E. (2024). *Sustainable tourism supported by the drafting of the Cross-border Sustainable Mobility Plan (PTMS) between southern Italy and Epirus in Greece*. ESI Preprints.
https://doi.org/10.19044/esipreprint.10.2024.p588

Abstract

The drafting of a cross-border Sustainable Mobility Plan, developed within the framework of the European project, financed by the Interreg Greece-Italy Cooperation Programme 2014-2020, highlights the importance of a synergic and systemic approach to cope with the need to agree on sustainable accessibility models at international and local level for the development of tourism that is sensitive to the environmental, social and economic needs of the territories. The imperative from which the research starts is the imminent urgency of providing systemic sustainability solutions for which transport assumes a central role. The Cross-Border Sustainable Mobility Plan (PTMS) was drawn up taking into account international, national and local transport plans and programmes, with particular attention

to existing SUMPs (Sustainable Urban Mobility Plans), and then proposes alternative solutions to the most polluting ones and lays the foundations for the possible activation of new maritime lines connecting southern Salento (Italy) with Epirus (Greece).

Keywords: Sustainable tourism, Regional development, Environmental planning policies, Sustainable transport, Spatial planning, Connectivity

Introduction

Although the last few years have been hard from the perspective of liveability in Europe and the world, firstly because of the COVID-19 pandemic and then because of the latest war events in Ukraine that involve us very closely, Europe and the world need more than ever to feel connected and close, also thanks to the development of sustainable mobility. As noted by Fusté-Forné (2021) changes and challenges of the COVID-19 pandemic impact travel in the context of sustainable global tourism. The economic, socio-cultural, and psychological impacts affecting tourism systems may disrupt businesses for many years. Since the sustainability of tourism systems relies on all the elements that form its broader environment, the current situation requires that governments and stakeholders reshape the understanding of tourism by striving for more ethical, responsible, and sustainable management and marketing. Indeed, the uneven impacts of climate change in different places and the primacy of the local level in facing these impacts reinforce the need to understand ports in their local contexts (J. Manios et al., 2024). Connective infrastructures that cross sovereign borders acquire special properties, a life of their own and become more than just motorways or high-voltage lines. These become common utilities (Khanna, 2016). As for the effects of the Ukraine war, in accordance with the UNWTO, Russia and Ukraine represent 3% of global spending on international tourism as of 2020. A prolonged conflict could translate into a loss of US$ 14 billion in tourism receipts globally in 2022.

More than one-third of EU citizens live and work in Europe's border regions (European Commission, 2015). In the last 20 years, border areas have gained importance (Fadigas, 2010, 2015; Castro and Alvarez, 2015; Castanho et al., 2016) and cross-border cooperation (CBC), undertaken worldwide, achieved several political, economic, environmental and socio-cultural win-win-situations (Nave and Franco, 2021). The concept of Cross-Border Region and Cooperation has gained prominence in politics and academic discourse in several fields, such as management, geography, sociology, international relations and political and international economy (Medeiros, 2015; Nave and Franco, 2021). But if this permeability of borders allows for greater cultural and commercial exchange, this greater osmosis

must be observed and managed from the point of view of environmental sustainability, with respect to the ways in which these movements occur between more or less homogeneous areas. A correct conceptual basis for the methodological approach to connectivity lies in the fact that the development of transportation systems, as integrated networks at different scales, is deeply changing their operation and the way they induce urban and regional development patterns (Castanho et al., 2017).

Several authors have focused on understanding the impact of transport infrastructure on regional development, but despite these efforts no definitive conclusion has been reached (Freiria and Sousa, 2024). Simultaneously, ongoing economic and social crises are fostering collaboration approaches between countries (IGCC, 2020), affecting policies and processes related to trade and investment, migration, peace and security, regional integration, climate change, food security and the private sector (ECDPM, 2022). Many countries are trying to eliminate barriers associated with borders, to achieve integration and territorial cohesion, with exponential cross-border movements (Nave and Franco, 2021). Hence, countries should urgently find new strategies and approaches, through which they achieve territorial cohesion and cooperation. However, Cross-Border Cooperation is a complex issue to deal with (Castanho et al., 2016) and recent events are awakening old ghosts of the Cold War and the Second World War (Dale, 2016; Holmes, 2016; Wall Street Journal, 2022) with differences in languages, culture and socio-economics compromising cross-border cooperation (European Commission, 2015).

In recent years, moreover, the goal of countries has been to increase sustainable mobility, in particular (1) “avoiding unnecessary transportation volume, (2) shifting transportation norms and practices and/or (3) improving the carbon-efficiency of transportation systems” (Griffiths et al., 2021). Administrative borders also create barriers associated with cross-border mobility, and efficient cross-border transport can be crucial in reducing the barrier effect on citizens' mobility and increasing the territorial integration of the European Union (EU). We can consider different types of limitations. For Nijkamp et al. (1990), they can be 'physical' barriers (mountains, rivers, artificial walls), 'technical' barriers (incompatibility between the railway systems of different countries) and 'cultural, linguistic and information' barriers, 'congestion' (discrepancy between supply and demand), 'fiscal' barriers (visa costs), 'institutional' barriers (costs of crossing a border between different jurisdictions).

In McGahern’s article (2023) there is an important focus on the role of cross-border mobility with regard to different travel motivations and gender issues related to the area of Israel. The results of this analysis shed light on the importance of the role of complex interconnections that exist

between mobility and capital allocated in the transport infrastructures and on how gaps may be removed in order to favour equal and safe mobility. In this sense, therefore, more sustainable tourism is also a more socially integrated and culturally open tourism. According to Ap, (1992), Stylidis et al., (2014), tourism development also brings about sociocultural and environmental changes in the lives of local communities and individual residents.

Literature review and hypotheses

Many scholars and institutions acknowledge that Cross Border Cooperation (CBC) projects have multiple benefits for member states (Yigitcanlar et al. 2015; Castanho et al., 2016). First, they enhance possibilities to improve the quality-life. Second, CBC projects can reduce the deep economic deterioration that many developed countries have experienced lately. Third, they enable the achievement of resilient and collaborative border cities (Yigitcanlar et al. 2015; Castanho et al., 2016).

To create resilient and sustainable cities, some scholars identified critical factors of CBC, which are (i) the definition of clear common objectives and master plans; (ii) the promotion of political transparency and commitment towards the decisions related to the CBC project; and (iii) the promotion of connectivity and movement between cities (Castanho et al., 2016). The latter guided our research, especially providing systemic sustainability solutions for which transport and sustainable mobility play a central role. Mobility is generally described in geographical terms as a "crossing or displacement in space" (Kaufmann 2014; Beylier and Fortuné, 2022). Therefore, the quality/quantity of CB accessibility and means of transport play crucial roles in CB mobility changes, as it directly influences the potential number of CB commuters (Medeiros 2019). Although both areas fall within EU areas and therefore the movement of people is facilitated, joint planning in terms of the adoption of a Sustainable Mobility Cross-Border Plan facilitates the adoption of guidelines and regulations for developing transport that stimulate the economic, environmental and social sustainability of people. In this sense, Rietveld (2012) emphasises the importance of the generalised direct (transport, taxes) and indirect (associated with cultural, institutional and fiscal differences) costs of border crossing. Schiebel et al. (2015), listed travel characteristics (purpose of travel, cost of travel, departure time, distance, travel time, travel chain, weather conditions and interchanges between different modes of transport) among the various factors that influence citizens' behaviour and choices when crossing borders.

Medeiros (2010) proposes the subdivision of the barrier effect into five main dimensions: (i) accessibility; (ii) cultural-social; (iii) environmental-hereditary; (iv) institutional-legal; (v) economic-technological

while for Wassenberge and Reitel (2015), existing barriers are commonly understood as legal, political, economic, or cultural. The article considers barrier terms with respect to accessibility, not in the sense that the analysed areas are currently inaccessible, but to assess a more sustainable accessibility that can contribute to more sustainable economic, social and environmental development. Wanting to analyse which barriers prevail across EU borders after more than 25 years of implementation of EU cross-border cooperation Programmes, the online public consultation on border obstacles (2015–2016), conducted by DG REGIO (EC), revealed that EU citizens consider 'legal and administrative' barriers as the main obstacles to their daily lives when crossing the border, in addition to language barriers and physical accessibility barriers, which include transport (Medeiros, 2019). Wanting to analyse which barriers prevail across EU borders after more than 25 years of implementation of EU cross-border cooperation Programmes, the online public consultation on border obstacles (2015–2016), conducted by DG REGIO (EC), revealed that EU citizens consider 'legal and administrative' barriers as the main obstacles to their daily life when crossing the border, in addition to language barriers and physical accessibility barriers, which include transport. In another interesting geographical area, the results from the analysis of cross-border tourism show Chow and Tsui (2019) showing where Russian visitors crossing the border to visit China are attributed to the real gross domestic product and export volumes of Chinese cities at prefecture level, as well as to the transport infrastructure linking Russian visitors to Chinese destinations. With respect to this point on connections, concerns highlighted in the survey regarding the lack and/or poor quality/security of physical CB infrastructure, the lack of integrated public transport systems at the border, the presence of different rules and standards in relation to transport, and the inadequacy of existing physical CB connections to current traffic flows, in several EU border regions, the low frequency and excessive prices of existing CB transport connections (EC, 2016). A survey conducted by the EU (Eurobarometer) on the presence of border barriers in each EU-funded cross-border cooperation programme showed that respondents from all over Italy complained the most about the types of barriers related to accessibility.

Among others, Keeble et al. (1982) also highlighted the relationship between regional accessibility and economic competitiveness. From a governance perspective, the EU similarly believes that a well-functioning transport system connecting the EU and its neighbouring countries is crucial for sustainable economic growth and the well-being of EU citizens. 295), The main argument for EU transport and infrastructure policies intervention is rooted in three main goals: competitiveness, cohesion and sustainability Dühr et al. (2010). As Knippschild (2011) highlights, successful cross-border

cooperation can lead to development in various areas, such as "economic clusters, labour markets, education and training, transport, as well as tourism and public services". The METIS study, (2015), identifies six main analytical components relating to obstacles to cross-border transport, among which in point 2 are: road passenger transport and inland waterway ferry services (e.g. quality of the transport system, density of connections, etc.).

Sustainable mobility can be defined as “achieving an overall volume of physical mobility, modal splits and transport technologies that efficiently meet basic mobility needs while supporting eco-system integrity and limiting greenhouse gas (GHG) emissions to a level that is consistent with international efforts toward sustainable development” (Griffiths et al., 2021). In this scenario, cars are part of an intricate mobility socio-technical system (Geels, 2018; Noel et al., 2020) and account for approximately 7% of global GHG emissions and for more than 50% of total transportation emissions (Victor et al., 2019). With this regard Tang et al. (2023) bring us to reflect on the role of air transport following the current post-pandemic challenges, understanding the effect of air routes on tourism demand which might be incorporated into destination management strategies. They come to the conclusion that air routes have a positive decreasing effect on inbound tourism demand from long-haul markets, but they are not significant for short-haul markets. The analysis clarified the relative importance of factors other than transportation in shaping tourism demand (Mazzola et al., 2022). This behaviour consequently affects the impact on the environment.

Measures to prevent COVID-19 pandemic, such as forced stops in movements and car adoption, produced massive peak reduction in global CO_2 emissions (Le Quéré et al., 2020) and social behaviour and transportation patterns are changing alongside consumption habits (Wang and Wells, 2020). Among the others, many institutions foster strategies and green initiatives for long-term sustainable mobility in towns and cities around the world (Ibold et al., 2020). Among the strategies adopted by countries, some scholars have outlined some approaches to achieve transport demand and car use reduction, alternative transport mode, road network and vehicle technology improvement (Bakker et al., 2014; Marcucci et al., 2019). Alongside, Holden et al. (2020) have proposed three such sustainable mobility “grand narratives”, which are:

- electro-mobility, replacement of fossil fuel-based vehicles with electric vehicles using clean energy;
- collective transport 2.0, increasing the use of both public transportation and cars, the latter being shared mobility;
- low-mobility societies, reducing the number and length of trips by cars (and planes).

The references in the literature on accessibility performance and indicators, as well as the theoretical approach to interspatial accessibility models and disaggregated accessibility models, are also considered in Gattuso and Malara (2018), and more recently by Thiede et al (2023).

Theoretical foundation and hypotheses

Different sources report that at global level, mobility is one of the major sources of CO2 emissions (about 25% of total) and energy consumption (about 20%). Often Public Authorities and Mobility Operators do not have the necessary skills and knowledge to integrate energy efficiency into mobility planning and investments budgeting, therefore leave the energy efficiency improvement in terms of CO2 emission reductions out of the strategies and services offered. In particular, the planning process does not foresee direct involvement of major stakeholders (e.g. service and energy providers, transport operators, SMEs) and end-users. Although the Sustainable Energy Action Plans (SEAPs) and the Sustainable Mobility Plans (SUMPs) seek to overcome these criticalities, they do not find application and integration into implementation processes. This contributes to the inadequate promotion and implementation of sustainable mobility models and limits the use of related services. This is particularly critical in cross border areas characterised by poor cooperation, lack of synergistic transport planning and sustainable mobility services and segmentation of the transport system. There is a need to decrease environmental impacts of mobility activities through more systemic, integrated and efficient mobility services along the Adriatic seacoast. This article contains the summary results of the Cross-Border Sustainable Mobility Plan, developed in the framework of the [deleted to maintain anonymity in review process], in the Interreg Greece-Italy cooperation Programme 2014–2020, which improves public-private cooperation to develop a multimodal transport system in particular for the tourism sector, such as to improve connections between the main modal system, ports/airports/roads/cycle paths, to reach the main cultural-environmental destinations and to ensure continuity of services in both geographical and temporal terms. Stoffelen (2018) focuses on hiking and cycling routes and trails as prominent tourism products in cross-border contexts. It has been noted that the advantages of developing tourism trails across administrative borders are numerous. For example, tourism trails could utilise existing infrastructure and abandoned railway tracks for route development, join local stakeholders in a shared cross-border project and lead to increased cross-border mobility of not only tourists but also locals' tourism in general is regularly noted as one of the 'easier' ways of establishing cross-border contact.

The imperative from which the research begins relates to the imminent urgency to provide systemic sustainability solutions, cross-border integration and collaboration, for which transport assumes a central role. While this is true at the global level, a lunge at the local level is necessary to direct policies and provide implementation tools. With this regard, Stoffelen (2018) emphases how tourism routes with an open and inclusive decision-making network may stimulate cooperation and establish linkages between local communities, the tourism system and wider economic development.

Additionally, the research shows that there is potential for alternative tourism in the investigated areas (Gallipoli-Thesprotia) that stimulates travel as an alternative and sustainable experience to the possibility of quickly reaching a destination (e.g. by air transport) that is environmentally and economically unsustainable. To reach these two destinations, it would be necessary to travel by road to the airports of Brindisi in Apulia and Corfu in Greece, and then to the final destination. Furthermore, stimulating transport intermodality in these areas is particularly relevant, also through the use of joint planning, given the vocation of road transport in these areas of the countries. Although the South Salento and Epirus areas are sparsely populated and small areas, and therefore also low impact in terms of final results, what is interesting to highlight is the policy approach towards sustainable mobility and therefore sustainable liveability. Furthermore, these areas, although not large, are areas with a strong tourist vocation and therefore in terms of impact on seasonal movements, very significant.

What we would like to demonstrate with this article is not the validity of the accessibility model, which is a classical model and has no innovative character, but rather that by using established accessibility models, a transport convention encourages the use of more sustainable transport in an area with a tourist vocation and that, thanks to the Cross-Border Sustainable Mobility Plan, this planning facilitates the displacement of people by more sustainable transport modes. The approach to long-term planning for an industrial sector that is sensitive to climate change, the state of adjacent natural environments and the associated socioeconomic developments are of great importance (Hyytiäinen et al. 2022). The Cross-Border Sustainable Mobility Plan needs to consider the natural elements in order to achieve the sustainable goal.

Rather than being assessed as of interest by the authors of the article, this case study was considered worthy of attention by the European Commission as it was financed by funds from the Interreg Cooperation Programme. This is in line with the contribution of Stoffelen (2018) which underlines the role of Interreg projects for improving cross-border communication and social cohesion in many European borderlands.

The Cross-border Sustainable Mobility Plan (PTMS), which covers the transnational area of South Salento (Apulia region in Italy) and Thesprotia (Epirus region in Greece), has been elaborated considering international, national and local transport plans and Programmes, with a focus on existing SUMP (Sustainable Urban Mobility Plans). The PTMS has a strategic plan aiming to meet the mobility needs in the medium-long term, with periodic mid-term reviews. It has been developed on the basis of a set of coordinated actions, with specific reference to the tourist mobility component, and responding to the criteria defined by EU and national regulations; in particular:

- a clear vision of the objectives, shared by the European project partners;
- a participatory approach, involving citizens and stakeholders,
- a balanced and integrated development of the transport supply, aimed at favouring the most sustainable mobility components (pedestrian, cycling, public transport);
- a vision of sustainability in terms of economy, social equity and quality of the urban environment;
- an integrated planning approach that takes good account of existing spatial and transport planning tools;
- an adequate assessment of the Plan impacts and in particular of the expected benefits, considering the different components, including environmental and social ones.

Theoretical background

The analyses related to the scenario Plan have been carried out with the support of a network model and territorial accessibility indicators in the context of the planning area and its new structure of interregional transport services. The methodology for developing the Cross-Border Plan, although inspired by the principles of the SUMP, the Sustainable Urban Mobility Plan, should not be confused with it. In fact, the spatial dimension goes beyond urban areas and it is projected onto an interregional dimension, the integrated area of South Salento (Apulia Region) and the province of Thesprotia (Epirus Region). It started from a context analysis and was developed based on reputed transport models, the scenario design and impact assessment.

The scenario design is aimed at the development of cross-border relations, with specific reference to the tourism sector; it was elaborated in line with the indications emerging from specific surveys and with the indications resulting from communication and participation activities. It has been addressed towards the elaboration of an alternative transport supply (interregional transport services) able to induce positive effects; measures

have been identified to facilitate interchange by sea, accessibility to urban areas and main tourist sites, and tourist accommodation. We should consider that tourism has positive social impact in terms of the expansion of hotels, road transportation, air transportation, electricity, internet, banking, and other infrastructures and negative social impact in terms of the unequal access to the aforementioned social services, the expansion of prostitution, the persistence of theft and illicit trade in heritage, and the random adoption of the lifestyles and manners of tourists by residents (Alamineh et al., 2023). The relevance of sustainable tourism policies that aim to balance the positive and negative impacts of tourism has become particularly evident during the COVID-19 crisis, which has shown the need for more research on the impact of crises on tourism policy (Schönherr et al., 2023).

The design of the scenario was based on the analysis of the current state of tourist mobility flows and on the reconstruction of an ordered set of information regarding the transport supply between the two Greek-Italian coasts, the demand for passenger mobility, with a focus on the tourist component. The future scenario is illustrated in terms of intermodal transport supply (improvement and rationalisation of existing services, upgrading of services, guidelines with best practices to be implemented, etc.), the estimation of potential demand, and the approximate assessment of investment costs. The planning area, on a cross-border dimension, is illustrated in following Figure 1, showing the road map and the nodes of the traffic zones.

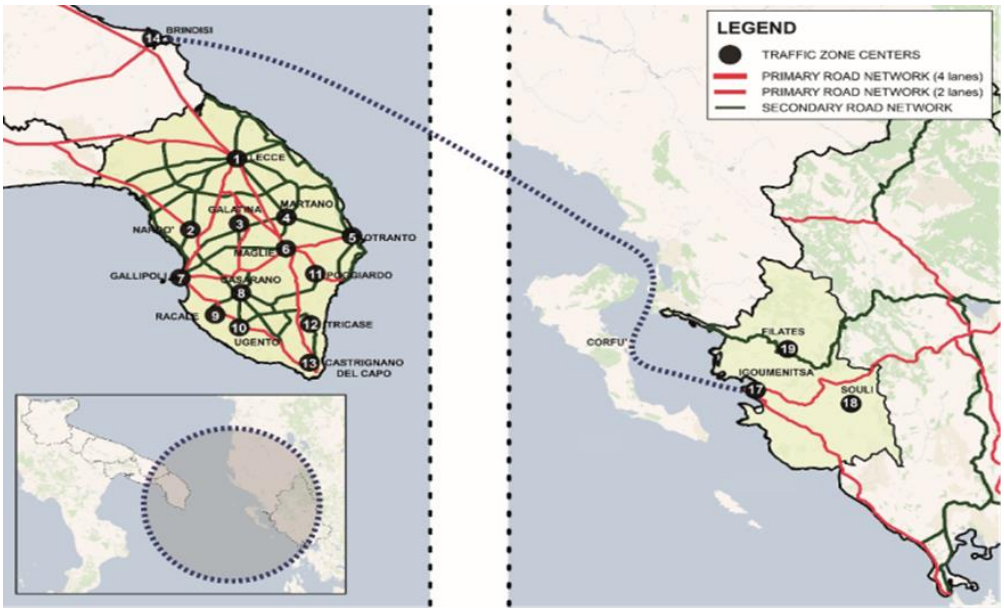

Figure 1: Cross-border Planning Area

It is worth recalling some socio-demographic data from the context of the plan (Table 1). Apulia covers an area approximately twice that of Epirus; the population is much larger (ratio of 12:1), resulting in a density five times higher than that of Epirus. A similar ratio is found in the sub-regional dimension: South Salento is 1.8 times larger than the regional unit of Thesprotia, but in terms of population even 18 times larger. The population density of South Salento is higher than that of the entire Apulia Region, while that of Thesprotia is even lower than that of Epirus.

Table 1: Land use data for the study area (Source: 2019 data from National Institute of Statistics_Italy)

	Area (Km^2)	POPULATION (inhabitants)	DENSITY (inh./km^2)	MUNICIPALITIES N.
APULIA	19.541	3.991.140	204,25	257
EPIRUS	9.203	336.856	36,60	18
SOUTH SALENTO	2.799	791.122	282,66	96
THESPROTIA	1.515	43.857	28,95	3

To build the current structure of the transport system in the analysis area, the existing plans have been analysed, and the main elements have been extrapolated and re-elaborated, with reference to passenger transport.

Method

Concerning accessibility models, the best-known accessibility indicators consist of cost functions associated with a transport network. Given a spatial system, divided into n zones, and its road network, the matrix of minimum routes can be considered the starting point for accessibility measures. The full accessibility index, introduced in 1971 by Ingram as an extension of the relative accessibility measure, makes it possible to compare the level of accessibility of different zones belonging to the region D.

Performance and accessibility indicators

Accessibility models

For the accessibility in interspatial models, the mathematical measures of accessibility were considered, that express the potential of the transport system, as functions only of the travel cost variable; but the experience shows that other factors, linked to the system of local activities, contribute to determining the possibility of travelling from a i zone to a j zone. These factors are job opportunities, accommodation, transport level of services, factors that can act in defining the impedance function Φ. The impedance function is a useful tool in transportation modelling and analysis. Considering our aim to build an analysis that can help the policymakers and planners to understand how people and goods transfer within a given

geographical area, our model facilitates us to better identify the cost that travellers' experience generates when they move between different places within a study area. This approach allows us to consider many aspects connected to time, cost and distance with the type of transportation used and the characteristics of the transportation network. Starting from a general form of the impedance function it is possible to assist the policymakers in considering and implementing numerous and different transportation projects, policies, and infrastructure improvements. In our analysis, in addition to costs of various kinds, accessibility is a key and relevant element, which characterises the construction of the impedance function.

Transport impedance is expressed as a linear combination of times and monetary costs and accessibility takes the following form:

$$A_i = \Sigma_j K_j^{\delta} \exp(\Phi(c_{ij})) \quad (1)$$

$\Phi(c_{ij})$ is an impedance function, usually decreasing with the cost c_{ij}, which over the years has assumed different expressions, depending on the authors. Among the different expressions of the impedance function $\Phi(c_{ij})$ some are mentioned here:

Hansen's expression (1959): $\Phi(c_{ij}) = c_{ij}^{-\alpha}$ (2)

Wilson's expression (1967): $\Phi(c_{ij}) = \exp[-(\beta_1 t_{ij} + \beta_2 cm_{ij})]$ (3)

Ingram's expression (1971): $\Phi(c_{ij}) = \exp(-d_{ij}^2/\Upsilon)$ (4)

A_i is the weighted accessibility for people living in zone i related to the zones j in region D;
K_j is a measure of activities and services located in zone j;
d_{ij} , t_{ij} , cm_{ij} are measures of costs (distance, travel time, monetary cost);
β, Υ are calibration parameters.

Regional accessibility to a touristic city on Apulia-Epirus region

Accessibility is a key factor for traveller destination choice. Factors influencing a touristic city choice can be roughly subdivided into two categories: a long-distance travel, which mainly reflects the service quality offered by interregional transport networks (motorway, train, maritime, air transport) as fares and service frequency, and local transport that mainly includes city accessibility, as access time and monetary costs from strategic nodes (main stations, ports, airports, main cities). A general approach can be

taken using generalised access cost as an indicator of accessibility. Here, all monetary costs for travel are considered and non-monetary costs such as travel time can be multiplied by the willingness to pay values of a traveller and added to the monetary cost. Accessibility measures may also consider other characteristics, such as reliability of travel times and departure time. The variability of travel time is important for maritime and air travellers because the cost of missing a ship or a plane is expected to be high; therefore, travellers apply large buffers to be sure that they are on time.

A possible cost function (average utility function) associated by a user departing from a zone *i* towards a destination *j* on an interregional transport network (see Figure 2) can be:

$$V_j = \beta_0 \log K_j - \beta_1 c_{ik} - \beta_2 t_{ik} - \beta_3 cp_k - \beta_4 t_{kl} + \beta_5 f_{kl} - \beta_1 cf_{kl} - \beta_1 c_{lj} - \beta_2 t_{lj}$$

or

$$V_j = \log [K_j^{\beta 0} \exp(-\beta_1 c_{ik} - \beta_2 t_{ik} - \beta_3 cp_k - \beta_4 t_{kl} + \beta_5 f_{kl} - \beta_1 cf_{kl} - \beta_1 c_{lj} - \beta_2 t_{lj})]$$

(6)

where:

K_j is an expression of attractiveness of the destination *j* (which can be expressed by population or touristic accommodation attributes of destination site);

c_{ik} = monetary cost to reach the main node *k* (port/airport/station) of departure (fuel, tolls, public transport fares, ...);

t_{ik} = travel time for access to the port/airport/station of origin *k* (by private vehicle, public transport, multimodal combination);

c_{pk} = parking fare of the private vehicle adjacent to a port/airport/station origin *k*;

f_{kl} = average or flight/ship/train frequency for a specific period (i.e.day or week) to move from the origin port/airport/station *k* to the destination port/airport/station *l;*

cf_{kl} = average fare of sea/air / rail transport to move from *k* to *l*;

c_{lj} = average fare of maritime/air/rail transport to move from *k* to *l*;

t_{lj} = travel time to reach the final destination *j* from the node *l* (by private vehicle, public transport, multimodal combination);

β_n = model parameters.

The travel time can include penalties for modal transfer and waiting, early departure penalties to limit the risk of losing the ship/plane/train.

Accessibility measures taking multiple transport modes (car, train, bus, etc.) into account must weigh the accessibility of the individual modes; this can be done using the so-called *LogSum formula* (Ben-Akiva et al., 1985):

$$LogSum = \log \Sigma_m \exp^{Vm} \quad (7)$$

where the sum is taken over all available modes *m*.

A case study: Gallipoli – Paramythia accessibility

We proposed, as a case study, an application of the modelling tools for the accessibility analysis in the context of the transborder planning area (Apulia-Epirus) in relation to different multimodal alternatives of mobility over the Otranto Channel. For computational simplicity, the generalised cost function 18 (average utility function V_j) was adopted as the accessibility measure.

The cities of Gallipoli as the origin and Paramythia as a cross-border destination were taken as a reference and accessibility was calculated considering the following seven route alternatives (Figure 2) and an ordinary user (single adult or component of a family of 4 persons):

- by own car, from Gallipoli to the port of Brindisi and on ferry to the port of Igoumenitsa, travel by car to Paramythia;
- by own car, from Gallipoli to the port of Brindisi; car set at the port; ferry to the port of Igoumenitsa, travel by bus to Paramythia;
- by bus, from Gallipoli to the port of Brindisi; ferry to the port of Igoumenitsa, travel by bus to Paramythia;
- by train, from Gallipoli to the port of Brindisi; ferry to the port of Igoumenitsa, travel by bus to Paramythia;
- by bus, from Gallipoli to the port of Brindisi; ferry to the port of Igoumenitsa, travel by rental car to Paramythia;
- by train, from Gallipoli to the port of Brindisi; ferry to the port of Igoumenitsa, travel by rental car to Paramythia;
- by bike, from Gallipoli to the port of Brindisi; ferry to the port of Igoumenitsa, bike ride to Paramythia.

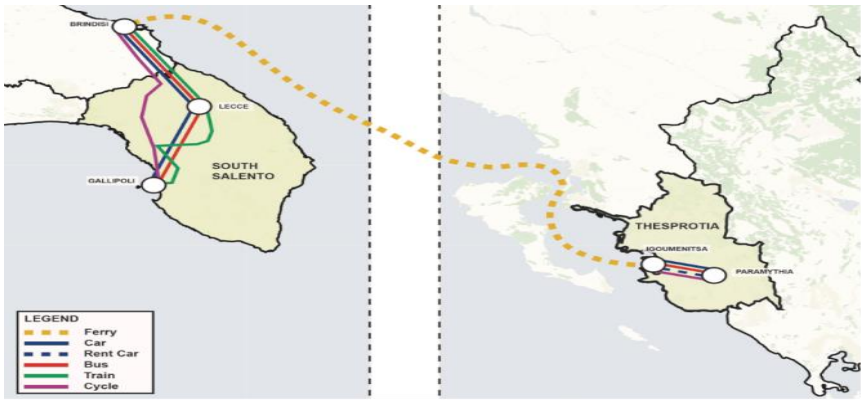

Figure 2: Outline of multimodal routes. Case study on cross-border routes

The results carried out form the basis of reference for the subsequent scenario analyses in relation to a scenario design, which provides for improvements on network connections. The following notation has been assumed, with reference to Figure 2, for the travel simulation from Gallipoli (Italy) to Paramythia (Greece):
Gallipoli (GAL) = node *i*;
Brindisi Port (BRI) = node *k*;
Igoumenitsa Port (IGO) = node *l*;
Paramythia (PAR) = node *j*;
C_{xy} = monetary cost associated with moving from node *x* to node *y*;
T_{xy} = time to move from node *x* to node *y*;
$T_{tot} = T_{xy} + T_a$ (where T_a is waiting time);
C_{pk} = parking cost.

The following departure data are also assumed:
Distances: Gallipoli-Brindisi 79.8 km; Igoumenitsa - Paramythia 31.9 km;
Partial travel time: Gallipoli-Brindisi 1h 6min, Igoumenitsa - Paramythia 27min;
Average speed: Gallipoli-Brindisi 72.5 km/h, Igoumenitsa - Paramythia 70 km/h;
Energy consumption (litres of fuel): Gallipoli-Brindisi 5.8lt; Igoumenitsa - Paramythia 2.5lt;
Car parking time at the port: 1 week;
Transfer time from the car park to the port: 5min;
Train fare: €7.30 per person;
Gallipoli-Lecce: Salento by bus 52 min; €2.90 per person;
Lecce-Brindisi 40 min; €8.69 per person;
Car rental: € 135 for a week;
Fuel costs: Igoumenitsa - Paramythia = € 3,27.
Routes on roads suitable for cycling.

In summary, the following overview of overall costs and travel times was obtained.

Table 2: Monetary costs and travel times in the relationship Gallipoli-Paramythia, with different travel alternatives

Travel alternatives	People n.	C_{ij} (€)	T_{ij} (hh:mm)
Travel by own car (small car) for the whole route	1	76,83	12:32
	4	169,83	12:32
Gallipoli - Brindisi by car/Igoumenitsa - Paramythia by bus	1	130,56	12:45
	4	238,56	12:45
Gallipoli - Brindisi by train/Igoumenitsa - Paramythia	1	52,20	13:48

by bus	4	181,80	13:48
Gallipoli - Brindisi by bus/Igoumenitsa - Paramythia by bus	1	56,59	13:12
	4	199,36	13:12
Gallipoli - Brindisi by bus/Igoumenitsa - Paramythia by rental car	1	189,86	12:59
	4	317,63	12:59
Gallipoli - Brindisi by train/Igoumenitsa - Paramythia by rental car	4	317,63	12:59
	1	189,86	12:59
Whole journey by bike	1	45,00	17:12
	4	180,00	17:12

It follows that family (of 4 persons) travel is cheaper in terms of overall impedance, since the monetary cost associated with the use of a shared car is less important; it is also generally convenient to use public transport (train and bus) for inland travel. The travel time appears as a whole not too different for motorised travel (range of 12:30 - 13:50 hours), as the travel times inland are not too dissimilar; the penalties relating to the advanced departure times of the ships are of the same order of magnitude. The trip by bike is certainly the cheapest one, but the travel time increases significantly (about 4–5 hours).

Assuming the accessibility function:

$V_j = \beta_0 \log K_j - \beta_1 c_{ik} - \beta_2 t_{ik} - \beta_3 cp_k - \beta_4 t_{kl} + \beta_5 f_{kl} - \beta_1 cf_{kl} - \beta_1 c_{lj} - \beta_2 t_{lj}$

with parameters $\beta_0 = 1$, $\beta_1 = 1$, $\beta_2 = 15\ €/h$, $\beta_3 = 1$, $\beta_4 = 5\ €/h$, $\beta_5 = 5$ and with the attractiveness parameter equal to the population of the destination city (Thestroptia) Kj = 7.900 inhabitants, the following utilities (accessibility levels) result, with reference to destination j (Paramythia), for each alternative multimodal travel, having assumed the daily ferry frequency equal to 2. The accessibility values are expressed as the Euro.

Table 3: Accessibility for single traveller

Multimodal travel alternatives	V_j
By car for all travel	-141,322
Gallipoli - Brindisi by car, Igoumenitsa - Paramythia by bus	-200,452
Gallipoli - Brindisi by train, Igoumenitsa – Paramythia by bus	-135,152
4. Gallipoli – Brindisi by bus, Igoumenitsa - Paramythia by bus	-130,092
Gallipoli - Brindisi by bus, Igoumenitsa - Paramythia by rental car	-260,212
Gallipoli - Brindisi by train, Igoumenitsa - Paramythia by rental car	-265,272
Gallipoli - Brindisi by bike, Igoumenitsa - Paramythia by bike	-193,302

Table 4: Accessibility for a traveller as component of a 4 people family

Multimodal travel alternatives	V_j
By car for all travel	-114,622
Gallipoli - Brindisi by car, Igoumenitsa - Paramythia by bus	-191,452
Gallipoli - Brindisi by train, Igoumenitsa – Paramythia by bus	-128,402
Gallipoli – Brindisi by bus, Igoumenitsa - Paramythia by bus	-123,342
Gallipoli - Brindisi by bus, Igoumenitsa - Paramythia by rental car	-149,752
6. Gallipoli - Brindisi by train, Igoumenitsa - Paramythia by rental car	-154,810
Gallipoli - Brindisi by bike, Igoumenitsa - Paramythia by bike	-193,302

Looking at both Tables 2 and 3 we can underline that accessibility values are generally higher for a user travelling with his family, due to the distribution of some monetary cost items (e.g. car in common). Accessibility is greater for users who use public transport or their own car in case they travel with their family (Table 4) and in case they use only public transport as well, but the gap between the values in the tables shows a smaller discrepancy especially in the combination characterised by the use of train utilised together with the bus; the use of a rental car drastically reduces the values of accessibility especially in the Table 3. The own car is convenient because travel costs are reduced; in particular in the case of the family travel as the monetary cost is shared. The bike trip occurs in an intermediate position; the lower accessibility compared to the private car is due to the longer travel times (4–5 hours longer).

A special thought should be given to bicycle travel. In both tables, the accessibility value is identical, and from a sustainability perspective, action should be taken on the components that most affect accessibility values. Obviously, the choice of a sustainable means of transportation is influenced by a tourism demand and supply that is strongly characterised by sustainability features. To summarise, the use of rental cars significantly reduces accessibility both in the case of an individual's trip and in the case of the trip of a family of 4 individuals (Table 4). This suggests that, in the pursuit of a sustainable vision, policies founded on the empowerment of public transportation and mobility aimed at reducing greenhouse emissions, such as the construction of bicycle lanes, could be key strategic choices. Based on the results obtained, we can identify three different development scenarios of the multimodal transport system in the Planning area:

- Passive scenario;
- Proactive future scenario;
- Reactive future scenario.

Results

Passive scenario. The most unfavourable scenario

This refers to the scenario if no action or measures will occur. An important factor hindering this process is also the lack of funding while there is great opportunity at the policy level offered by the Rural Development Program in both areas.

The implementation of the Passive scenario assumes the impossibility of increasing the funds on the development overall and more specifically concerning linear and nodal infrastructures. This may limit the producers and industry in the area from planning the investments. No new models will be created, allowing more goods or individuals to be transported by the most efficient means or a combination of such transport means.

Proactive future scenario, focused on short-term economic growth

This scenario assumes that there will be a slight change in terms of development measures in the area, with more focus given on short-term economic stability at national-local level considering the negative effects of COVID-19 in this regard. This could be now maybe the most realistic scenario.

This scenario focuses on the following sectors:

- transport that provides the upgrade of the area in terms of the available infrastructure;
- domestic tourism with a focus on local development.

Reactive future scenario for promoting multimodal Transport and Tourism

The Reactive scenario assumes an increase in all factors considered to be determinants of the development of multimodal transport in the area. This scenario assumes that there is an increase in transport accessibility of the cross-border area, with particular emphasis on the development of transport corridors based on multimodal infrastructures and services. This is the best-case and more ambitious scenario.

Against this background, it is assumed that there is space for developing Multimodal Transport and Tourism at a cross-border level.

Discussion

We are aware that both transport and tourism sectors and their interactions are problematic. Each sector has rising emissions, weak responses reliant on technological innovation, and are locked into mind-sets that perpetuate business-as-usual, characterised by exponential growth. Coupled with issues of global climate change are more localised issues such as urban air pollution, with some research suggesting that while tourism-transport contribute to emissions, air pollution might also reduce tourism

activities as destinations become less appealing (Hopkins, 2020). Nevertheless, some solutions can be implemented and here following we provide policy makers with some suggestions.

Transport field

Concerning transport in terms of connectivity and Multimodal Transport, the following actions could be considered.

Enhancement of the current connectivity. This will aim at increasing the flow of passengers among the areas that can be achieved via the increase in time timetable and trips that can operate more months during the year. This can apply to the operations of the port and airports operating in the area. Of course, this factor will work together with other actions to promote touristic activities and other forms of tourism that can occur all year long and are being mentioned in more detail below. This will be achieved with the following actions:

- Increased frequency in ferry lines among the project areas (GR-IT).
- Increased frequency of flights of neighbouring airports of Ioannina and Aktio (also seek the potential of seaplane flights among the project areas).
- Usage of neighbouring sea and land Trans-European Transport Networks (Connection of Italian ports with neighbouring Greek ports).
- Seek the potential of seaplane flights among the project areas.
- Creation of cycling routes that will be linked to a cross-border network of cycling routes planned upon common specifications for the Plan areas (linked to the project).

Enhancement of Multimodal transport in the project areas. This can be achieved by a number of actions and activities including the below:

- Activities promoting the reduction of the transport intensity of the economy.
- Activities promoting better organisation of transport services (e.g., degree of use of logistics and intelligent technologies, especially traffic management technologies, organisation of last mile transport).
- Modernisation and creation of new railways, especially in the case of Thesprotia able to connect the area to the rest of the network, as well as to waterways.
- Reduction of train journey times and therefore increase the competitiveness of rail transport against other less environmentally friendly modes of transport.
- Activities improving technical solutions for vehicles (powertrain and fuel) and infrastructure.

Tourism and Environment fields

Concerning Tourism and Environment (promotion of Sustainable Tourism Destinations), the following actions have been considered.

- Promotion of tourism alternative forms enables to increase tourist flow all year long. Such actions are also coherent with the national policies and will enable the economic growth of the planning area in a sector considered important and which still has a lot of potential. Nature can offer the potential for developing forms of tourism such as cycling, hiking and horseback riding, by boat, by canoe.
- Measures for protecting the natural environment and areas of cultural importance. This can also be achieved via several projects or other related actions. RDP programmes and other related sources offer a great potential.
- Promotion of sustainable tourism enhances the idea of safe destinations. Sustainable tourism is also linked to safe experience. Additionally, the promotion of the touristic destinations will also be linked to the alternative forms of tourism as also mentioned before. At this stage, the role of touristic accommodation and services is a key. It will not only be the monuments and sites of touristic importance but also the services that the hotel sector, restaurants, and coffee shops will provide in terms also of safety rules.
- Enhanced use of digital technologies. Digitalisation and the wider use of social media and apps will continue to play a key role in this context. Considering the previous case, it is assumed that passengers have learnt to manage their trip to the final detail having all the tools and information in place to do so.
- Networking among stakeholders of the Planning area and sharing of best practices. Regarding sustainable tourism development, it requires the informed participation of all relevant stakeholders, as well as strong political leadership to ensure wide participation and consensus building. Achieving sustainable tourism is a continuous process and it requires constant monitoring of impacts, introducing the necessary preventive and/or corrective measures whenever necessary.

Conclusions

In the context of an Interreg cooperation programme Italy-Greece 2014-2020, one of the objectives of which was the development of a cross-border plan for sustainable mobility, travel alternatives between southern Italy (Salento) and Greece (Epirus) were analysed in order to verify more sustainable travel modes between the two areas, aimed at stimulating a sustainability sphere, related to transport, one of the most polluting assets

globally, and to verify the potential of an agreed and shared cross-border planning.

The results show accessibility indices and multimodal travel alternatives between the two areas analysed, for a single traveller and an average family of 4, providing identify three different development scenarios of the multimodal transport system in the Planning area (passive scenario, proactive future scenario and Reactive future scenario), seeing in the proactive scenario a more realistic and immediate solution and in the reactive scenario, the most innovative and ambitious.

Accessibility on cross-border routes increases and the cycling alternatives become more important in some geographical areas of Europe, as the central and northern European countries (ESPON, 2009) compared to the peripheral areas of Europe. The results presented here could be interesting for policy makers at different levels: cross-border, for European policies and regional/national for Italy and Greece. They represent a potential for economic development both in terms of tourism and of support to residents in terms of better accessibility to services and natural assets.

The reorganisation of the transport supply system involves impacts on the social system and the environment, both on the internal dimension of the two sub-areas of the Transnational Plan and on the cross-border dimension. Increased accessibility favours mobility and this translates into social and economic benefits for local communities; as they are easier to reach from the outside and closer to each other, more incoming tourism flows are expected, but also more mutual exchange flows. Additionally, relatively an increase in income levels related to tourism activities and accommodation. It is therefore expected that the links between Thesprotia and South Salento, and more generally, between Italy and Greece, will be strengthened. The two regions can be seen, as two bridgeheads on the Otranto Canal, obligatory destinations for transit between the extreme South-East of the Italian peninsula and the extreme North-West of Greece, on the important transnational route between the three Mediterranean peninsulas, Italian, Balkan and Anatolian.

Conflict of Interest: The authors reported no conflict of interest.

Data Availability: All data are included in the content of the paper.

Funding Statement: The authors did not obtain any funding for this research.

References:

1. Alamineh, G.A., Hussein, J.W., Endaweke, Y., Taddesse, B. (2023). The local communities' perceptions on the social impact of tourism and its implication for sustainable development in Amhara regional state. Heliyon, 9(6), 17088.
2. Ap, J.(1992) Residents' perceptions on tourism impacts, Annals of Tourism Research
3. Bakker, S., Zuidgeest, M., De Coninck, H., & Huizenga, C. (2014). Transport, development and climate change mitigation: Towards an integrated approach. Transport Reviews, 34(3), 335-355.
4. Ben-Akiva, M. E., Lerman, S. R., & Lerman, S. R. (1985). Discrete choice analysis: theory and application to travel demand (Vol. 9). MIT press.
5. Beylier, P. A., & Fortuné, C. (2022). Cross-border mobility in Nogales since Trump's election. Journal of Borderlands Studies, 37(1), 187-208.
6. Castanho, R., Vulevic, A., Fernández, J., & Pozo, Gomez, J., Loures, L. (2017). Accessibility and connectivity – movement between cities, as a critical factor to achieve success on cross-border cooperation (CBC) projects. A European analysis. Sustainable Cities and Society. http://dx.doi.org/10.1016/j.scs.2017.03.026.
7. Castanho, R., Loures, L., Fernández, J., & Pozo, L. (2018). Identifying critical factors for success in Cross Border Cooperation (CBC) development projects. Habitat International, 72, 92-99.
8. Castro, D., L., Alvarez & Varela, E. (2015). Building Europolis on the Basis of Local "Informal" Cooperation in European Cross-Border Spaces: The Case of RIET. Geopolitical Magazine e Studies of Space and Power, 6(2), 225e246.Dale, G. (2016). Karl polanyi: A life on the left. New York, USA: Columbia University Press.
9. Chen, C.F., Fu, C., Chen, Y.C. (2023), Exploring tourist preference for Mobility-as-a-Service (MaaS) – A latent class choice approach, Transportation Research Part A: Policy and Practice, Volume 174, 103750.
10. Chow, C., K., W., Tsui, W., H., K., (2019). Cross-border tourism: Case study of inbound Russian visitor arrivals to China. Wiley, https://doi-org.unisa.idm.oclc.org/10.1002/jtr.2297
11. Dühr, S., Colomb, C., Vincent, N., (2010). European Spatial Planning and Territorial Cooperation. Routledge, London.
12. ECDPM (2022). "COVID-19 and international cooperation" available at: https://ecdpm.org/dossiers/Covid-19-international-cooperation/

13. ESPON (2009). Territorial Dynamic in Europe. Trands in Accessibility, https://www.espon.eu/sites/default/files/attachments/to-no2.pdf.
14. European Commission (2015). Cross-border cooperation in the European Union: an opportunity for Europe's border regions, available at: https://ec.europa.eu/regional_policy/en/newsroom/news/2015/09/cross-border-cooperation-in-the-european-union-an-opportunity-for-europe-s-border-regions
15. EC, 2016. Overcoming Obstacles in Border regions, summary report on the online public consultation on border obstacles. 21 September-21 December, Directorate-General for Regional and Urban Policy (DG Regio). European Commission, Brussels.
16. Fadigas, L. (2010). Urbanismo e Natureza e Os Desafios. Lisbon, Portugal.
17. Fadigas, L. (2015). Urbanismo e Territorio e As políticas públicas. Lisbon, Portugal.
18. Freiria, S., Sousa, N., (2024). The impact of accessibility changes on local development: A spatial approach. Journal of Transport Geography 120 (2024) 103975. https://doi.org/10.1016/j.jtrangeo.2024.103975
19. Fusté-Forné, F., Michael, N. (2021). Limited tourism: travel bubbles for a sustainable future. JOURNAL OF SUSTAINABLE TOURISM, 31(1), 73–90.
20. Gattuso, D., Malara, M. (2018). Transport-Tourism Integrated development. The accessibility analysis was based on costs and touristic attributes. International Journal of Research in Engineering and Technology.
21. Geels, F. W. (2018). Low-carbon transition via system reconfiguration? A socio-technical whole system analysis of passenger mobility in Great Britain (1990–2016). Energy research & social science, 46, 86-102.
22. Griffiths, S., Del Rio, D. F., & Sovacool, B. (2021). Policy mixes to achieve sustainable mobility after the COVID-19 crisis. Renewable and Sustainable Energy Reviews, 143, 110919.
23. Hansen, W. G. (1959). How accessibility shapes land use. Journal of the American Institute of planners, 25(2), 73-76.
24. Hyytiäinen, K., Kolehmainen, L. Amelung, B. Kok, K., Lonkila, K., Malve, O., Similä, J., Sokero, M., Zandersen, M. (2022). Extending the shared socioeconomic pathways for adaptation planning of blue tourism. Futures, 137, 102917.

25. Holden, E., Banister, D., Gössling, S., Gilpin, G., & Linnerud, K. (2020). Grand Narratives for sustainable mobility: A conceptual review. Energy Research & Social Science, 65, 101454.
26. Holmes, R. (2016). Fascism 2. Anthropology Today, 32(2), 1e3.
27. Hopkins, D. (2020), Sustainable mobility at the interface of transport and tourism, Journal of Sustainable Tourism, 28 (2).
28. Ibold, S., Medimorec, N., Wagner, A., Peruzzo, J., & Platzer, L. (2020). The Covid-19 outbreak and implications to sustainable urban mobility–some observations. Transformative Urban Mobility Initiative(TUMI).
29. IGCC (2020). "Global Cooperation in the Time of Covid-19" available at: https://igcc.ucsd.edu/news-events/news/global-cooperation-in-the-time-of-Covid-19.html
30. Kaufmann, V., Bergman, M. M., & Joye, D. (2004). Motility: mobility as capital. International journal of urban and regional research, 28(4), 745-756.
31. Keeble, D., Owens, P., Thompson, C., 1982. Regional accessibility and economic potential in the European community. Reg. Stud. 16 (6), 419–432.Khanna, P. (2016). Connectography: le mappe del futuro ordine mondiale. Fazi Editore.
32. Kim, H., Lee, K., Joh, C.-H., Kim, J., Moon, S., Lee, C., Lee, S., Lee, J., Lim, H. (2023), Spatial experience on tourism through MaaS (Mobility as a Service): Applying for a conjoint model of portfolio choice, Information Processing & Management, 60(39).
33. Knippschild, R., 2011. Cross-border spatial planning: understanding, designing and managing cooperation processes in the German–Polish–Czech Borderland. Eur. Plann. Stud. 19 (4), 629–645.
34. Le Quéré, C., Jackson, R. B., Jones, M. W., Smith, A. J., Abernethy, S., Andrew, R. M., & Peters, G. P. (2020). A temporary reduction in daily global CO_2 emissions during the COVID-19 forced confinement. Nature climate change, 10(7), 647-653.
35. Li, W., Guan, H., Han, Y, Zhu, H., Wang, H. (2023). Incorporating habitual effects into mode choice modeling in light of Mobility-as-a-Service in tourism transport: An empirical analysis in China. Transportation Letters, 1942-7867.
36. Monios J., Wilmsmeier G., Martínez Tello G. A., Pomaska L. (2024). A new conception of port governance under climate change. Journal of Transport Geography 120 (2024) 103988. https://doi.org/10.1016/j.jtrangeo.2024.103988
37. Marcucci, E., Gatta, V., Le Pira, M., & Elias, W. (2019). Modal shift, emission reductions and behavioural change: Transport policies and

innovations to tackle climate change. Research in Transportation Economics, 73, 1-3.
38. Mazzola, F., Cirà, A., Ruggeri, G., Butler, R (2022). Air Transport and Tourism flows to islands: A panel analysis for southern European countries. Wiley, DOI: 10.1002/jtr.2527
39. McGahern, U. (2023). Cross-border mobilities: mobility capital and the capital accumulation strategies of Palestinian citizens of Israel, Mobilities, 1745-0101.
40. Medeiros, E., 2010. Old vs Recent Cross-Border Cooperation: Portugal-Spain and Sweden-Norway, AREA, 42 (4): 434–443.
41. Medeiros, E. (2015). Territorial impact assessment and cross-border cooperation. Regional Studies, Regional Science, 2(1), 97-115.
42. Medeiros E., 2018. The Role of European Territorial Cooperation (ETC) in EU Cohesion Policy. In: Medeiros E. (Ed.), European Territorial Cooperation. The Urban Book Series. Springer, Cham.
43. Medeiros, E. (2019). Cross-border transports and cross-border mobility in EU border regions. Case Studies on Transport Policy. 1-12. https://doi.org/10.1016/j.cstp.2018.11.001
44. METIS, 2015. Easing legal and administrative obstacles in EU border regions, METIS, CASE, Panteia, AEIDL, ICF, Inception Report, Vienna.
45. Nave, E., & Franco, M. (2021). Cross-border cooperation to strengthen innovation and knowledge transfer: An Iberian case. Innovation: The European Journal of Social Science Research, 1-19.
46. Nijkamp, P., Rietveld, P., Salomon, I., 1990. Barriers in spatial interactions and communications. a conceptual exploration. Ann. Reg. Sci. 24 (4), 237–252.
47. Noel, L., de Rubens, G. Z., Kester, J., & Sovacool, B. K. (2020). Understanding the socio-technical nexus of Nordic electric vehicle (EV) barriers: A qualitative discussion of range, price, charging and knowledge. Energy Policy, 138, 111292.
48. Rietveld, P., 2012. Barrier Effects of Borders: Implications for Border-Crossing Infrastructures. Eur. J. Transp. Infrastruct. Res. 12 (2), 150–166.
49. Schiebel, J., Omrani, H., Gerber, P., 2015. Border effects on the travel mode choice of resident and cross-border workers in Luxembourg. Eur. J. Transp. Infrastruct. Res. 15 (4), 570–596.
50. Schönherr, S., Peters, M., Kuščer, K. (2023). Sustainable tourism policies: From crisis-related awareness to agendas towards measures. Journal of Destination Marketing & Management, 27, 100762.

51. Sharpley, R., (2014). Host perceptions of tourism: A review of the research, Tourism Management.https://doi.org/10.1016/j.jort.2023.100643
52. Stoffelen, A., 2018. Tourism trails as tools for cross-border integration: A best practice case study of the Vennbahn cycling route, Annals of Tourism Research, Volume 73, 91-102.
53. Thiede, R.N., Fabris-Rotelli, I. N., Debba, P., Cleghorn, C. W. (2023), A Markov chain model for geographical accessibility,Spatial Statistics, Volume 55, 100748.
54. UNWTO, https://www.unwto.org/impact-russian-offensive-in-ukraine-on-tourism
55. Victor, D.G., Geels, F.W., Sharpe, S. (2019). Accelerating the low carbon transition: the case for stronger, more targeted and coordinated international action. London, Manchester, and San Diego: California.
56. Wall Street Journal (2022), "In Northern Ukraine, Fears of a Russian Invasion Shatter Cross-Border Ties" available at https://www.wsj.com/articles/in-northern-ukraine-fears-of-a-russian-invasion-shatter-cross-border-ties-11644584400
57. Wang, L. & Wells, P. (2020). Automobilities after SARS-CoV-2: a socio-technical perspective. Sustainability, 12(15), 5978.
58. Wassenberg, B., Reitel, R., 2015. Territorial Cooperation in Europe. A Historical Perspective. European Commission, Brussels.
59. Yigitcanlar, T., Dur, F., & Dizdaroglu, D. (2015). Towards prosperous sustainable cities: A multiscalar urban sustainability assessment approach. Habitat International: A Journal for the Study of Human Settlements, 36e46.