High Speed Rail Stations in Territorial Areas: Sustainable Development and Quality of New Landscape

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Abstract. The High-Speed Rail (HSR) is the new mode of transport and is an opportunity for the sustainable development of the territory it crosses. HSR is an indispensable link to increase social and economic development and an opportunity to environmental sustainability. Transport net reshape the landscape and defines new distributions of functional areas on the territory. The HSR Stations (ST) are the fundamental nodes of connection with the territorial system.

This document analyses existing HSR ST with the aim of outlining the uniform characteristics and the specific characteristics found. This working method allows to define, a basic criterion to be applied in the planning process for new potential HSR ST. It is considered that the synthesis of uniform characteristics and specific characteristics can be useful, validated and replicable reference for potential new HSR ST that the planning process will locate. The main elements characterizing the reference criterion for the choice of a potential high-speed station were applied to the case study of Gioia Tauro. The planning process can use these categories to decide on the location of potential HSR ST. The integrated smart process allows to plan the transformations caused by the new infrastructure node. The planning process leads towards sustainable development of the territory and the composition of new quality landscapes. The paper understands the importance of HSR and proposes some useful references to the smart process for sustainable development of the territory and new quality landscapes by means of new stations. As a result of HSR, the territory becomes sustainable and smart.

Keywords: Hight Speed Rail Stations · sustainable development · new smart landscape · planning process

1 Introduction

High Speed Rail (HSR) is the most innovative national passenger transport system built in the last 30 years. Significant economic investment has been made in the infrastructure system. Around 60,000 kms (km) have been built all over the world: 20,000 km are under construction and 40,000 km, are in the planning phase. Italy has several line planned [1]. The financial programme, National Recovery and Resilience Plan (PNRR) aimed at Next Generation, allows to implement the planning of the HSR [2].

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One of the objectives of the 2001 National General Transport Plan (GTP) and the 2007 Guidelines for the Mobility Plan [3, 4] was to develop the HSR towards the regions of southern Italy (up to Calabria and Sicily). In fact, it was believed that extending the high-speed system to national territory could promote opportunities for economic and social development, and reduce the gap between the regions of northern Italy and the south, economically very different realities. HSR is a significant factor to the development of territories [5]. HSR is an indispensable mode of connection, for innovation and sustainable development of the national territory and local systems [6]. Transport networks increase connections, stimulate economic growth, assign new functions, redesign a new productive geography with a sustainable environmental development [7]. The location of HSR Stations (ST) is relevant for the integral sustainable development of the territory. The ST is the infrastructural node with which new development opportunities for the surrounding area are triggered. The choice of HSR ST location has a major impact on the added value that infrastructure can bring, and on the quality of the new landscape; it will make a difference for the host territory [8]. In summary, it can be said that the success or failure of HSR investments depends on city-region-nation integration and station - urban area connections [9, 10]. In order to ensure continuity between the HSR ST, the territory and society, it is essential to establish intermodal links, assign integrated functions and provide new territorial services [11]. Transport infrastructures are crucial systems to transform territories in smart direction according to smartness parameters of Commission Smart Cities and Communities [12] and pursue sustainable development, as outlined in the 2030 Agenda for Sustainable Development Goals [13, 14]. If we cross the smartness factors and the goals declined in the 2030 Agenda, with the effects induced on the territory by the construction of HSR, we have a full validation of the positive impact that HSR has to achieve innovation and sustainability. It has been observed that the construction of a high-speed rail allows for direct pursuit of certain objectives, such as: *7: affordable and clean energy; 8: decent work and economic growth; 9: Industry, innovation and infrastructure; 10: reduced inequalities; 13: climate action* [15]. Furthermore, if the HSR is implemented in coherence with the indications of the European cohesion policy, promoting the need to improve territorial accessibility of all regions by supporting the development of the Trans-European Network (TEN-T) [16] sustainable development will be the qualifying condition of HSR. The implementation of HSR causes such extensive developments that it affects the integral sustainable transformation of the territory. All 17 goals are involved, although with different levels of influence. Public decision-makers working on the potential 60,000 km, divided between those to be planned and those to be designed, can find useful proposals in the typological categories discussed in this paper [17].

This work identifies two main types of high-speed stations (Fig. 1). The first type of station constitutes the typology of the Territorial HSR ST; it is the station realized in the territory with two main motivations: may be near to other major transportation infrastructure; it may be a transit node for a neighbouring large city or for nearby medium-sized cities. The realization of a new architectural design has a significant effect to transforming the original territory. The urban planning, together with national policy choices, decide on a new site outside the city centre to build a new transport node. In

this case the node is completely dedicated to HSR and the new design has significant consequences on the territorial gravitation system [18, 19].

The second type of station is the Urban HSR ST. The historic stations, located in urban centers, are adapted with adding of new tracks dedicated to high speed. The new high-speed tracks are placed parallel to the traditional, dedicating an adjacent area, or they are built below the existing station. The type of Urban HSR ST does not change the surrounding territory because it fits into an existing node. The interference on the territory remains unaltered: the same infrastructure is used, same services, only the new mode of transport is inserted. The existing node is overloaded with new performance and therefore has the potential to become a node of development.

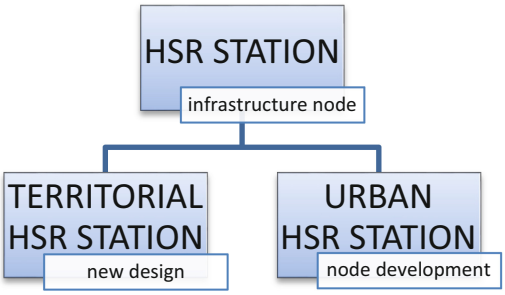


Fig. 1. Two types of HSR ST

The choice of location for the new territorial HSR ST, together with a good project, are decisive to transform the 'nothing' territorial, in smart and sustainable area. However, if the ST is designed without using a smart planning process and without an accurate evaluation, it will be itself the 'nothing' becoming what in literature is called a 'cathedral in the desert'. If the project does not make use of a planning process, instead of triggering opportunities for sustainable development, smart progress and valorization of the territory, it determines degeneration, decay, land consumption, urban sprawl [20]. Urban planning choices must be integrated with transport infrastructure choices, in comprehensive and integrated plan, for determining: benefits innovative; transformation of cities into smart cities [12]; new quality landscapes [21]; sustainable development of territories [17]. In Italy, important planning is underway to provide the country with a development of the HSR network. In this work, based on the observations and analyses of Italian ST, it is proposed a summary list of factors that define an identification protocol for two types of HSR ST. The uniform characters, or factors of similarity, are been differentiated from the specific characters, or exclusive factors; the differences distinguish the typology of the Territorial HSR ST. Some stations located in urban centres, have been adapted to allow the transit of trains. The most important are: Milano Centrale, Roma Termini, Firenze Santa Maria Novella, Bologna Centrale, Torino Porta Susa, Napoli Centrale. In the paper, this type is indicated by the name of Urban HSR ST. Instead, two new stations, Mediopadana-Reggio Emilia e Napoli-Afragola, have been designed ex novo and are totally dedicated to HSR. In the paper, this type is indicated with the name of Territorial HSR ST [8, 22]. The structure of the paper is as follows. Section 2 illustrates

methods to planning process for High-Speed Rail Stations. The section consistis of: 2.1 Planning process; 2.2 Organization of territorial systems; 2.3 Organized systems for sustainable territory development; 2.4 The HSR nodes; 2.5 Uniform characters of the Territorial HSR ST; 2.6 Specific characters of the Territorial HSR ST. Section 3 illustrates the Planning process: results for HSR ST and case study. It indicates the factors of sustainable development that the HSR ST can trigger on the territory and the quality of life generated by the new proposed landscapes. The section consists of: 3.1 Planning process: to identify place new HSR ST; 3.2 The case study of Gioia Tauro: organized territorial systems; 3.3 The case study of Gioia Tauro: organized system for sustainable territory development; 3.4 Characteristics: attractiveness and lacks for the future Territorial HSR ST; 3.5. Uniform characters of the HSR ST; 3.6 Specific characters of the HSR ST. Lastly, Sect. 4 shortly draws some conclusions.

2 Methods to Planning Process for High-Speed Rail Station

2.1 The Planning Process in the Territorial System

The planning process considers the territory as a whole: a set of interconnected systems. The planning process structure knowledge to articulate the complex system, in problems and solutions (problem solving), making choices and taking choices, according to the basic principle of strategic planning [23–25]. Furthermore, the smart planning process, following the EU's current Smart City guidelines [12] and sustainable development [13, 14, 16] evaluate systems, crossing smartness characteristics and the Sustainable Development Goals (SDGs), with the resources that characterize the systems. Then assign significant dimensions by value, number, role, function [20, 26]. Following the evaluation of resources, the plan defines strategic objectives and indicates priority project choices. The planning process and its phases are [27]:

- Process of knowledge: Organisational structuring by systems; functional interpretation for the organisation of territory into systems. Resource identification phase; interpretation of significant identities.
- Process of evaluation: Qualification phase of characterizing resources. They are the structuring factors of the planning process.
- Process of signification: Assignment to resources of the typological dimension; it is to determine which resources qualify the landscape. The resources assign signification to the systems, by value and criticality defining the degree of relevance.
- Process decision-making of the vision and consequent strategic quality objectives: Smart design scenarios (balance, coherence, identity). Selection of priorities for the transformation of territories in sustainable, based on the indication of smart characteristics and 2030 goals. Design of new quality smart landscapes.
- Process deliberative: legitimacy of decisions with the approval of the plan; shared policies participatory consensus.

2.2 Organization of Territorial Systems

The territory is a wole of systems connected to each other by infrastructures concerning functions and services. The systems are constituted of elements linked together in

different ways to achieve a community objective. The elements, interconnected with each other, adopt a functional behavior to the point of assuming the role of resource and constituting significant entities [28].

The behaviour of the elements is mainly determined by the synapses which are activated with connections and affinity. These interconnections, activated to establish functions and actions, allows the system to be thought of as an organization. The system, although it is formed of several elements, reacts and evolves as a whole, organized with coherent rules, both in terms of characteristics and functions to satisfy [29]. The organized system, composed of internally associated resources for homogeneous functions, is important for that specific territory. It makes the difference between a normal territory and a sustainable territorial heritage [30, 31].

The sustainability of the territory is determined by the internal balance of the system and the stable external connections between the different systems [32]. If the resource does not prevail over the others, but collaborates in an organized and implementative way, the system is in balance and expresses a high value, as well as being immediately recognizable and significant for the territory [33]. For example, an infrastructure node represents a recognizable system. The elements of the system have functionally homogeneous characteristics and contribute to the function to which they are called. The system is therefore organised; the internal balance between resources produces value and reveals to the outside, a new scenario for sustainable development.

Resources are of different types, from natural (exceptional value) to antropic (ordinary value); in both cases are of significant interest because they characterize the territory, assign typical places and constitute the mainstay on which establish the planning process [34]. The size of resources within the system (by role, number and importance) characterizes the system and assigns the name. Each specific territory is made up of several systems. The systems differ in terms of the size of their resources. Resources do not necessarily have to be equal; they are aggregated by function and objective and in this regard, can be described by homogeneous characters.

The components of the set, although different from each other, appear to be uniform regarding the functions they execute. This whole becomes a system, because the interacting elements give rise to a precise function. This function define the system and assigns an identifying name; for example: transport system. The resources are the elements that characterize that territory, which constitute the invariants; the framework for planning decisions. They range from excellence, easily recognizable by high value (e.g.: the nature park is composed of well-defined environmental resources) to common resources, which are essential to daily life; (e.g.: the transport infrastructure system or service infrastructure system or the infrastructure nodes system).

2.3 Organized Systems for Sustainable Territory Development

Resources characterise the identities of territories and assign qualities. The variety of systems expresses the level of the offering. The territory expresses value when there are many organized systems. Systems are organized when they are in balance both internally, between associated resources for coherent functions, and externally between systems. For example, the systems that make up the territory may be of the following types:

landscaped; cultural-historical; archeological; anthropic; transport; service infrastructures; touristic; manufacturing etc. If these systems are integrated with each other, they will produce incremental offerings that increase the quality of a sustainable territory. Normally, behind the integration between systems, there is an effective smart planning process, which plans the sustainable development of the territory [20, 27, 33].

The more each system works in equilibrium, because the resources are coherent compared to the functions to be fulfilled, the greater will be the propositive effects to have sustainable territories and new quality landscapes**.** When the territory is represented by a few organized systems, it is the task of the planning process to push for the use of the prevailing system (more organized), drawing up new connections in order to make the territory become increasingly functional. The plan uses the prevalent system to achieve progressively, on the basis of the priorities decided, the maximum level of development. The territory in this way increases sustainability and quality. Starting from the few systems in equilibrium, the plan decides the vision to be achieved over time, assigning the list of priorities to be implemented with precise projects. The realization of the projects will produce new quality landscapes to generate, incrementally, by aggregate multiplication, balanced systems, interacting, sufficient to repair the initial degradation of the imbalance. The more systems are organized and connected, the better the quality of life for people living in the territories. Interconnected systems determine the integral development, the connection between opportunities, sustainable development and the transformation of the territory into smart [35].

The study of the transport system is divided into three basic components: demand; supply; demand-supply interaction. The study of demand allows us to know the users who use or will use the reference infrastructure in the scenarios of possible development [6, 36, 37]. The study of the supply allows to know the role that the individual infrastructure assumes or will assume in different scenarios of development, and in the context of the overall multimodal system of transport infrastructures [5, 38]. The supply-demand interaction allows to analyse what is or will be the level of use of the individual infrastructure and then to assess the value of the relative investment in relation to the different objectives that the planning process poses [36, 39]. The network analysis system theory allows to study the centrality of stations in the overall system. It proposes indicators to recall the main quantities relating to connectivity. A basic indicator is:

$$c_i(t) = \frac{\sum_i a_{ij}(t)}{N-1}$$

on which given a station node i, we intend to define the number of stations, whose generic is j, with which it is connected. This measure is defined starting from Total Degree Centrality. Additional indicators talk about the centrality of the node. For example, a node is more central depending on the total number of services connecting it to other nodes in the network [40–42].

This premise is of conceptual interest to underline the decisive role that the network of transport infrastructures has for each territory and how important what is happening in Italy in recent years. The planning process integrated into the transport plan is key to sustainable development, innovation, economic growth, new quality landscapes [43].

2.4 The HSR Nodes

Rail system is an indispensable condition for the economic, social and environmental development of the territories. The quality of life in cities has always been linked to transport infrastructure and urban planning. The planning process connects the two disciplines and plan sustainable and smart development scenarios [44].

High speed is an important opportunity for the development of territories, both for the new transport supply and for the socio-economic growth of cities**.** The design of HSR ST is the further input that has a major impact on spatial dynamics. The station draws a new landscape and the territory takes on a new significance, both for the architectural sign and for the functions. The determining factors for successful choice of station place are: to be a node of responsive and flexible networks; to be an intermodal interchange node; have the ability to trigger new functions; offer a range of services and activities in surrounding (obviously interconnected) urban systems. Another important factor is the centrality formulated by the basic indicator referred before which reinforce the 'three competing theories' influencing social development processes [45].

The station becomes a hub of interest, especially for regional and national companies. It is a multi-scale dimension, convergence of multiple factors [46].

In many cases, the station assumes the additional role of location for new urban and territorial functions. The station spaces if they offer new services, could be used by daily users, but could also be used by citizens of neighbouring places. Station area is experienced by travelers, who use similar services and functions as those offered by the city. This new concept of station, urban function, supports the concept that the station, must be designed with function of 'node and place' [47, 48].

From the current analysis of the projects carried out in Italy it is considered interesting to build a reference paradigm to relate to new design approaches. The comparison between the main characteristics of uniformity makes it possible to distinguish two types of stations and synthesizes the basic affinities, which are to be referred to. The reference paradigm is based on case studies already carried out, tested and evaluated.

In Italy, new HSR ST are distinguished, usually on a territorial scale, from existing stations adapted to the transit of HSR. The two HSR ST Mediopadana-Reggio Emilia and Napoli-Afragola are newly built and constitute important infrastructural and architectural nodes. These ST have been located in extra-urban territory; in the remainder of the paper we will indicate them as Territorial HSR ST. Other ST, have been adapted to the needs of HSR. The new high-speed tracks have been positioned or in line with conventional tracks, by dedicating a contiguous area, the main examples are the stations of Milano Centrale and Roma Termini, or, they are in the axis below the pre-existing station. This is the case of Bologna Centrale where a passing railway dedicated exclusively to high speed was built, and Torino Porta Susa, although in this case the passing is not exclusive. These ST are located in the urban centre, potential focal points of urban regeneration; in the paper we will indicate it with the name of Urban HSR ST. In order to catalogue and define the uniform characters and specific characters, which represent the type of Territorial HSR ST, the cases of territorial stations, realized in Italy, were analyzed. The two HSR ST (Napoli-Afragola and Mediopadana-Reggio Emilia) are exemplary constructions, designed by international architects, they are the sign of a further historical moment that

the country is going through. The HSR ST is an opportunity to combine new quality smart landscapes, with functional and technological innovation and regeneration projects.

The comparison between the Mediopadana ST and the Napoli-Afragola ST allows to analyze some prevalent characters and differentiate them between uniform (confirmed in both stations and therefore replicable) and specific (found in one of the two ST; therefore, characteristic and exclusive for that given territorial context).

The Fig. 2) represents the two types of characters that describe Territorial HSR ST. Uniform characters are the same in the different analyzed contexts and therefore replicable in new future stations. Specific characters are exclusive of one context analysed.

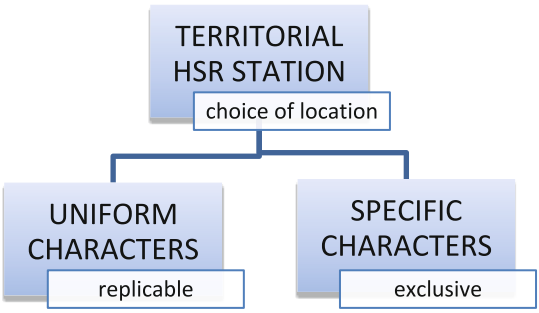


Fig. 2. Two types of characters of Territorial HSR ST in Italy

2.5 Uniform Characters of the Territorial HSR ST

In the following, a whole of uniform characters is proposed. They were deduced by the analysis of the two existing Territorial HSR ST in Italy: the Mediopadana-Reggio Emilia station located in Northern Italy [49, 50] and the Napoli-Afragola station located in southern Italy [51]. The uniform characteristics found in both stations, therefore confirmed and reproposed for the types of territorial HSR ST of future design are below. They constitute a first set of quantitative type characters, which can be developed and deepened with further work.

- International project signed by archistar. The stations are newly built. They are located outside the city centre and have been built on large area available. The Mediopadana Reggio Emilia station was designed by Calatrava and opened in 2013. The total planned cost was about 79 million euros, allocated by the Italian Railways and Emilia-Romagna Region. The Napoli-Afragola station was designed by Zaha Hadid and opened in 2017. The total planned cost has been of approximately 60 million euro, allocated by the Italian Railways. This descriptive synthesis allows to catalogue two constructions structurally and architecturally different, in the same category. Both are impressive signs on the territory, of architecture. The newly designed station is a relevant form of architecture; a new signification that transforms and determines a new landscape. In this case, the parameters are descriptive and the indicators qualitative.

- Railway service area. The railway service area for the transit of the HSR line is newly built. The station Mediopadana occupies an area of about 28.000 m^2; it has 4 tracks, the total length is about 500 m [52]. Napoli-Afragola station occupies an area of about 30,000 m^2; it has 4 tracks, the total length is about 400 m [53].
- Surface of parking areas. The ST have allocated large areas for parking, differentiating their uses between passengers, reserved areas and public transport.
- Surface of commercial areas. The infrastructure node is also diversifying from conventional ST for the new functions it performs. These station assign new signification; they aim to transform the station into an attractive pole, a new site, a new quality smart landscape. The Territorial HSR ST provide new urban functions, complete or replace those present in the surrounding urbanized territory.
- Availability of areas without urban constraints. The station can expand its margin over time, increasing offers and services, because there is a free area available to the boundary. The project has provided for the possibility of successive expansions in contiguous areas.
- Population density in adjacent areas. The surrounding areas have many urban centres. The ray of distance from the node is variable, the density is high.

2.6 Specific Characters of the Territorial HSR ST

From stations analysis, it was found that the Territorial HSR ST Mediopadana, has triggered more opportunities for sustainable development in the surrounding area, compared to the Territorial HSR ST Afragola. The elements of attractiveness and success, while specific and unique to the station analyzed, indicate some assumptions to consider in the choice of location and design of potential new stations [54, 55]. The specific characteristics, indicators of value, quality and development, can be proposed in a new future station, after evaluation.

The specific characters that may be initially proposed are:

- Intermodal node. The station is a node of an organized network linking different parts of the territory, connecting functional infrastructures, offering alternative mode and triggering conditions for development. The node plays its special role because it is interconnected to infrastructure network that distributes services and creates connections. The number and type of connected systems are significant to the role of the node; such as: taxis, private cars, car rental, car sharing; buses and how many lines; metro lines; conventional rail lines.
- Network linking urban areas. The territory near the node is surrounded by urban areas. Reach the localities by public transport, allows the development of smart mobility as well as social and economic sustainability. Service and transport infrastructures are the most important asset for the smart development of the territory. They promote profit in the socio-economic system.
- Connection of territorial supplied. The territory rich in organized systems, if they are connected to each other, implement the offers of services and economic development. If the systems are integrated with each other, they will produce incremental supply. The various places linked together, promote the development of systems and trigger the positive process of demand - supply - convenient allocation for integrated development. The type of systems are indicative for the role of the node; such as: Special

Economic Zone (SEZ), industrial zone; commercial area; areas for services destined by the urban plan; sports centers; etc.

- Areas constrained by the urban plan. It is necessary to specify that the constraint provided by the urban plan, can be a limit for the potential infrastructural node. The constraint obliges to respect the assigned urban destinations and allows to build in compliance with the parameters, and with the modalities, decided by the plan. Therefore, it may happen that around the node the plan has provided for the construction of volumetries not congruent with the future development of the transport node; or that has decided on urban constraints for the station itself, limiting the expansion of volumes and areas. On the other hand, if there is a vision open to the dynamics of socio-economic development of the territory, smart process planning assumes the specific character for the success of the area. For example, in the case of the Mediopadana Station, the plan has allocated some areas to urban regeneration, providing opportunities for territory qualification, new advantageous impulse and smart integration.

3 Planning Process: Results for HSR ST and Case Study

3.1 The Planning Process to Identify Place New HSR ST

The construction of a new HSR ST, if planned, promote socio-economic development but above all ensures the sustainable development of the territory [56]. The project establish new conditions that will impact on existing landscape. How can the Territorial HSR ST be integrated into the existing landscape, with the least possible impact and mitigate overlaps with quality alternative scenarios? To mitigate the impact of the new construction, it is necessary that this trigger benefits. The quality balance must be positive, compared to factors that promote sustainable development (DSG goals) to mitigate the negative effects of land use and degradation. The new infrastructure node mitigates negative impacts, if it offers a new wide range of services and functions; high-quality multifunctional equipment; new benefits for integrated territory development; architectural project, new aesthetic symbol of design, respect the pre-existing landscape. The new station becomes the new system characterizing for that territory; visible expression of a new landscape of quality. The new landscape is of quality when it transforms negative impacts into new forms of proactive landscape. By the term proactive landscape, it is intended to indicate that within the 'beautiful architectural project' are active new functions and supply of services, important elements to trigger sustainable development and smart innovation of the territory. The analysis of the social benefits costs, integrated with the evaluation of the new functions, supply and advantages, confirms the value that the new work imparts on the territory. These elements are guarantee of integral quality and therefore of a new smart quality landscape.

In this regard, it is interesting to recall what Latouche said in 2005 that defined development as the realization of the desires and aspirations of all, outside any historical, economic, social and cultural context [57]. Sustainability is researched by applying models and is certified with the results of evaluation techniques. Sustainability is likely, if the landscape designed by urbanism, produces quality. Planning and assure integral quality through planning is a complex operation; in fact, the quantitative indicator must

be integrated with the qualitative indicator. The quantitative evaluation is complemented by the qualitative evaluation; if the systems do not meet the full quality, they cannot be sustainable [58]. Urban planning to design sustainable cities must adopt new criteria. Urban destinations become functional urban areas to the 2030 goals. The integrated urban plan, after identifying and evaluating the resources existing on the territory, must plan smart way. The urban choices include new strategies that will transform the territory, in sustainable [35]. The project actions, coordinated by smart integrated planning, regenerate the comprehensive territory and qualify new smart landscapes.

3.2 The Case Study of Gioia Tauro: Organized Territorial Systems

Gioia Tauro is an urban centre which due to the construction of the port, has expanded increasingly occupying land, originally agricultural. The current population is 19.240 and the workers involved with port activities are about 1400 employees.The port was built in 1970 but commercial operations began in 1995. First Italian port for freight traffic, eighth in Europe, extends over an area of 620 hectares; from 2018 is part of the Special Economic Zone (SEZ) [59, 60]. The territory presents itself with two strong scenarios: on the one hand the port, an imposing infrastructural node for the intercontinental routes of the ships that load and unload goods; on the other hand the urban system. Urban areas have occupied the territory and provoked the urban sprawl phenomenon, causing decay [61]. The lack of process planning has led to excessive land use, causing disorder and degradation. The territory is not organized in systems; it appears to lack connections, services and infrastructure; lack of integration and balance between systems. The port is closed in its own border, it is a gigantic infrastructure without a territory that supports it. The infrastructure and the territory do not communicate; organized systems are not present. The state reveals two separate systems that would need to integrate and collaborate for sustainable development and new quality landscapes.

It is a special case in which the planning process could transform the state of places into smart territory: integrated system between port, urbanized areas and environment [62, 63]. The scenario has great similarities with that determined by the Territorial HSR ST Afragola, also closed in its project, with no connection to the local system.

3.3 The Case Study of Gioia Tauro: Organized Systems for Sustainable Territory Development

The territory of the Gioia Tauro plain is characterized by resources of various type, working in disaggregated way. This means that it is difficult to recognise organised systems and that existing activities are disconnected from each other. These conditions indicate the lack of a urban planning. The territory has grown over time without respecting urban standards and without a vision; without process planning. For this reason the undetermined prevails, the unfinished; the territory remains there as a container, it is not proposed as a heritage. Resources are presented as individual elements, not working together in organized systems. They have their own endogenous value, but do not produce sustainable development; do not collaborate in aggregating actions, do not perform organized functions; the territory is not organized in system of systems. For example, the port system is a closed system in its function, it is not integrated with other of the

territory in which it is inserted. Urban areas survive, adapting; they do not react to the opportunities of so presence. In the preceding chapter we underlined the concept that if the territory is not represented by organized systems the degradation overcome.

The method indicated by the planning process, makes the prevailing system the opportunity for development; the focal point on which to set up the planning choices. The plan uses the prevalent system (more organized and balanced) to decide vision and objectives, to assigne project priorities, to achieve with consecutive steps, the maximum level of development. The territory, starting from lighthouse system, will be able to design a new landscape of quality and trigger actions for sustainable development. The choices of the planning process determine the integral development, the integration of infrastructures, the connection between the offers, the sustainable valorization and the transformation of the territory into smart. The plan devises regeneration projects to convert urbanized areas, and equipe the territory for new sustainable offerings, with new development factors and new forms for quality landscape.

3.4 Characteristics: Attractiveness and Lacks for the Future Territorial HSR ST

The study area is characterized by some singularities that constitute the history of the place. They can inspire the name of the future station:

- Station 'Metaurus': to evoke the historic greek town of Gioia Tauro, already mentioned in the III century B.C. and then, in 130 B.C., for the Via Popilia.
- Station 'Medma': the historical archaeological heritage suggests this name. Medma was an ancient Greek city of the V–IV sec a.C. with a population of about 4000 inhabitants, located near the existing city of Rosarno.
- Station 'Eranova': to remember the preexisting town demolished to realize the mega infrastructure of the port of Gioia Tauro.
- 'Station – Porto': this name would give meaning to the need to integrate two important nodes such as the port, already of international level, and the HSR station.

In the following will be named the New Station which integrates two special functions becoming unique great opportunity. Great potential for sustainable territory development, for a huge change in the local, regional and national system. The territory has elements of attractiveness and lacks. The characteristic territorial systems are the intercontinental port; vast urban areas; exceptional environmental systems; resources with potential attractiveness. At present, the territorial system appears to be disaggregated, irregular, fragmented in functions with lack of transport and service infrastructures, of network connections. The citizen does not experience the advantages of the port; does not use public transport; resources are scattered randomly, they do not constitute common heritage. The process planning proposes scenarios of smart innovation, sustainable development, urban regeneration to design new quality landscape. In this paper the New HSR ST is proposed, composed from the infrastructural node of the port, already at international level, and the HSR station infrastructure node, future access core. The new Territorial HSR ST becomes an opportunity for system integration and open borders. The current boundary of the port system, will be integrated with the resources spread over the territory, through a new development project operated by smart process planning. A

New Station architectural sign of value, which integrates two special functions becoming unique great opportunity. High potential for sustainable territory development, for a huge change in the local, regional and national system.



Fig. 3. The study area

The Fig. 3) illustrates the study area with the future area for New HSR ST.

The proposal solves the high-speed node in Calabria, a crucial interchange to connect the South of Italy to Europe. The Calabria Region includes environmental resources at the moment lacking infrastructure network, not connected, difficult to access. It can be cited the exceptional resources of the: Archaeological Park Locri Epizefiri, National archaeological museum of Reggio Calabria and Locri, Aspromonte National Park, Serre Natural Park, Passo della Limina, Special Protection Zone of the Costa Viola, Monte Poro, promontory of Sant'Elia.

3.5 Uniform Characters of the HSR Station

The case study is therefore a special case in which the construction of a new territorial HSR ST can be conceived. Design of a single integrated station, to be done ex novo using the success categories described in Sect. 2. The design of a New HSR ST considers the uniform characteristics, tested and catalogued as a result of the comparison between the analysed HSR ST.

The uniform characteristics identified and replicable for the New HSR ST are:

- International project signed by archistar. The relevant architectural design of a new form to identify a new quality landscape. Creative commitment for a form of aesthetic

quality and at the same time, a functional node: Relevant transport infrastructure and location of services and new offers such as in Reggio Calabria: project of the Sea Museum designed by Zaha Hadid; National Museum of Magna Grecia designed by Piacentini; Casa del Fascio of the Razionalist Architecture. Other then the liberty and neoclassical architectures built after 1908 earthquake.

- Railway service area. The railway with 4 tracks HSR about 400 m long. It has the average standards found in the works carried out and tested on the national territory.
- Surface of parking areas. Extensive parking areas should be designed. The development of the area will also depend on the ease of use of the node.
- Surface of commercial areas. The station is a new site: new urban functions turn it into an attractive node, a new smart economy system.
- Availability of areas without urban constraints. It is necessary to have available free areas for future expansions. The vision is structured on a project that is implemented by step and priority. Land use potential is a positive element for development
- Population density in adjacent areas. The catchment area is extensive and is estimated to be around 0.4 million inhabitants. The area is populated; over time the area has been occupied by agglomerations without urban planning, sparsed as a 'leopard spot' without following a regular plan.

3.6 Specific Characters of the HSR ST

The design of a New HSR ST takes into account the specific characteristics already experienced by the comparison between the analysed HSR ST. The specific characteristic proposed for the future HSR station in the territory of Gioia Tauro plains are:

- Intermodal node. The area is served by linear and punctual transport infrastructures. Linear infrastructures comprehend TEN-T railway (Tyrrhenian line) belonging to Scandinavian-Mediterranean core network corridor and motorway roads (A2 Salerno -Reggio Calabria) [43]. The station becomes the important connecting point to link the transport of the Tyrrhenian area with those of the Ionic area; for the airport nodes of Reggio Calabria and Vibo Valentia; in addition to the many possible connections with the territorial system of the Piana of Gioia Tauro with about 165,000 inhabitant.
- Network linking urban areas. The station becomes intermodal interchange hub, for the new infrastructural network of the local system.
- Connection of territorial offers. The station, reference for the integrated network of territorial systems, such as environmental, landscape, historical, cultural and anthropic resources. Opportunity for new infrastructure endowment; new condition for the use of territorial services and landscape resources. The presence of the SEZ is highlighted as an additional element of attention.
- Areas constrained by the urban plan. The process smart planning proposes the node station for regeneration opportunities, qualification of the territorial system, new smart offers.

4 Conclusions

The work develops the analyses proposed in preceding works, on the two existing HSR ST in Italy (Mediopadana-Reggio Emilia and Napoli-Afragola) and on the territorial system of the port of Gioia Tauro, to define uniform and specific characters that can be employed in planning for potential territorial HSR ST.

From the interpretation of the analyses of existing HSR ST in Italy, it was possible to develop a reference paradigm for new design approaches. The choice of place to a new station is crucial to think of new opportunities for sustainable development and new quality smart landscapes. An important factor reference for the choice is the centrality model defined by basic indicator.

Comparison of the uniform and specific characteristics of existing stations provides reference categories for the success of new plans. An elements list is a useful reference for planners; the smart planning process cannot ignore the characteristics designated for the choice of the location of the new node and to include elements of positive attractiveness. The formulation of a reference paradigm for new quality smart landscapes is based on reality, on cases tested in the territory, evaluated and monitored to update and validate the effects on the surrounding territory.

The characters uniform, precisely because they synthesize quantitative data, are replicable for the realization of future Territorial HSR ST. These indications are useful to planners and decisions makers who can cite a working method for the choice of place. The quantitative characteristics and inter modal systems constitute a first step which can be developed and deepened with further work.

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