TRANSPORT SYSTEM TO RE-DIRECT THE “SPRAWL WITHOUT GROWTH”. COMPARISON BETWEEN ALPINE AND SOUTHERNMOST ITALIAN REGIONS

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SOMMARIO

First objective of the research is to conduct a meta-analysis of the relevant relationship between “urban sprawl and economic growth”. Second objective of the research is to derive possible systematic interventions to redirect the urban sprawl phenomenon that is still consuming all the scarce and costly natural resources of the planet. The same themes are investigated at international geographic scale as well as at territorial scale, by experimenting Case Studies in which the general framework is compared to specific local situations. Also, research designs and tests new set of criteria for multidimensional valuation of one possible policy responses to urban sprawl i.e. the integration of the settlement system with the public green urban transport.
1. Research general framework and specific study focus

The general research here introduced deals with the complexity of European (and not only) urban system and namely with urban sprawl phenomenon. General research, by performing meta-analyses and analyses at different scales, aims to:
- analyze sprawl trend overtime and assess its magnitude;
- try to understand sprawl causes, finding out the eventual causal relationship (or not) of localized sprawl with population increase as well as observed economic growth;
- search and detect mitigation measures as proposed policy responses to sprawl, relaying on some benchmark experiences;
- design and test new set of criteria for multidimensional valuation of policy responses.

The concentrated focuses of the general research, in the specific study here presented, are about one possible policy response to urban sprawl i.e. the integration of the settlement system with the public green urban transport. Before presenting the focus study, it follows a brief synthesis of the general research concerning urban sprawl at both geographic and local-territorial scales.

2. Meta-analysis at geographic scale

Meta-analysis, developed upon studies conducted by research centers connected to Institutions such as Governments of European Union and the United States of America, outlines the positive or (more likely) negative impacts of urban sprawl. In the latter case of negative effects, Institutions and Governments may suppose interventions of policy responses to mitigate both negative impacts (neutralization) and causal elements of sprawl (solution).

The geographic meta-analysis conducted identifies in some driving forces the causes of the world wide phenomenon of the sprawl. Some of them are:
- economic growth;
- demographic boom;
- re-localization of complex activities in semi-urban areas;
- housing shortage in central urban areas;
- high index of crowding, *i.e.* population filled in small areas.

Researches agree to identify and assess the following negative effects:
- environmental, in terms of land, water and air consumption, and also acoustic pollution;
social, in terms of dramatic increase of individual commuting by private car, time people spend for it, and the high human costs: psychological, health, mobility and familiar.

In the last decades strong policy responses have been addressed, in particular in Europe, to mitigate sprawl. Among them there are:

- consolidation, *i.e.* treasuring and revamping of the existing cities;
- containment, *i.e.* re-urbanization of suburban areas by enhancing street connectivity and reducing the enormous dimension of disorganized spontaneous wild urban blocks;
- new urbanism, *i.e.* construction of new compact and dense settlements characterized by a mix of various urban functions and only if served by urban rail, train-tram, metro systems;
- heavy urban rail system, *i.e.* collective sustainable inter-settlement infrastructure on rail.

As above shown, one paramount response at large scale, detected through meta-analysis, to face sprawl is a public urban heavy rail transport policy. Advocates call communities to build future development only and only if a public urban rail system crosses or serves directly new settlements and all its inhabitants and then residents. This response to sprawl is world-wide defined as Transport Oriented Development (TOD).

International analysis pay special attention to this world-wide response and strategic approach which makes a great difference in criteria to choice public transport, including and emphasizing as key criterion for valuation the number of residents and settlements directly served by urban rail or other connected and coordinated green transport.

In fact, since now often the most important and only important evaluation criteria and solely leverages in infrastructure decision have been their initial investment cost and transport cruise speed, omitting most relevant relationships between transport and inner settlement core. One of the latter is basic accessibility *versus* mobility. Accessibility is a structural characteristic for the city. Instead mobility is the individual solution, often the most socially and ecologically inefficient, for commuting daily and travel periodically.

### 3. Un-precedented analysis at territorial scale. Knowledge spill-over as outcome of study

Indirect studies by meta-analysis at geographic level has been deepened by direct investigation.

At territorial scale a Case Study has been developed analyzing the whole Calabria region, the Southernmost of continental Italy across Sicily, about sprawl and responses to it. Territorial research, strongly supported by GIS tools, has been focused on: dynamics 1870-2011 of urban expansions; 1829-2011 demographic dynamics; economic growth; degree of service by public transport.
These cross analyses have produced a great deal of direct unprecedented knowledge.

3.1. Urban expansion

Research has disaggregated and deepened the a pois sampling researches at continental level by performing systematic (total covering) investigations (not sampling), on regional settlements (of total Case Study area) by: consideration of all the inhabited places at unprecedented detailed scales, comprehensiveness of examination; total covering of territories; wide time span of urban history. Afterwards, the square meters are calculated for each inhabited settlement, even the smallest one, by taking a picture of the urban dynamics at different dates: 1870; 1954; 2001; 2009.

3.2. Demographic dynamics

Research has investigated the population dynamics in each settlement of the Case Study area between 1829 and 2009 (190 years). An important outcome of this step of the research has been the creation of a huge data warehouse of population censuses with total covering of time span of over 190 years, digging unknown astonishing historic censuses from 1829 and 1854 before country unification.

3.3. Economy growth

Research has investigated the dynamics of regional income level i.e. Gross Domestic Product (GDP) ranking of the region in the Country, to understand if there was a causal relationship between urban over-expansion and region wealth.

3.4. First results of investigation

Sprawl in the Case Study area has distinctive characteristics. Its causes seem to be different to those identified at geographic international scale. In fact, the driving forces are not confirmed and sprawl in the Case Study area is not connected to the level of ranking income, i.e. GDP ranking, singled out as the causes in other contexts at geographic scale, as it is described in the following paragraphs. Even driving forces at regional scale seem not to include growth, negative impacts of Calabria sprawl show the same negative aspects of the continental one, notwithstanding the causes seem to be quite different. One overall negative impacts seems to be the increase of individual mobility by private cars due to scattering of house on vast farm land territories.
3.5. Local policy responses. Why public transport can help?

Further objective concerns the possibility to detect policy response to the analyzed phenomenon. A goal might be to start-up a valuation framework based on geographic meta-analysis to verify if TOD is a possible local response to sprawl in terms of effectiveness in facing some heavy negative impacts, and in terms of getting popular consensus and Institutional approval, the latter defined by convergence among transport planning tools and acts concerning the area.

4. Comparison with other Italian regions and provinces of “Intermediate Italy”

Then, research has compared the results of the Casy Study concerning sprawl measurement, population dynamics and economic growth with other Italian regions belonging to the so called “Italia intermedia” (i.e. “Intermediate Italy”) for their medium size in terms of population, economy, production, inter-sectoral mix, way of life: Trentino, Valle d’Aosta, Friuli and Tuscany.

Table 1 – Case Study. Ratio sprawl/GDP per capita in some Italian regions

<table>
<thead>
<tr>
<th>Regions / Provinces</th>
<th>Sprawl % 1990-2005</th>
<th>GDP 2006 per-capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolzano</td>
<td>2.86</td>
<td>32.970</td>
</tr>
<tr>
<td>Valle d’Aosta</td>
<td>9.31</td>
<td>32.594</td>
</tr>
<tr>
<td>Friuli</td>
<td>14.42</td>
<td>28.068</td>
</tr>
<tr>
<td>Toscana</td>
<td>15.71</td>
<td>27.600</td>
</tr>
<tr>
<td>Italia</td>
<td>17.06</td>
<td>25.200</td>
</tr>
<tr>
<td>Sicilia</td>
<td>22.00</td>
<td>16.723</td>
</tr>
<tr>
<td>Calabria</td>
<td>26.13</td>
<td>16.478</td>
</tr>
</tbody>
</table>

Source: Istat; Unioncamere; research by authors


Source: Istat; Union Camere; authors direct investigation
The diagrammatic comparison between these regions with Calabria highlights an unexpected truth: the most virtuous regions in terms of smallest sprawl (the least land consumption 1990-2005) have the highest growth of GDP per capita (2006); the most vicious region, Calabria, in terms of highest sprawl (the largest land consumption 1990-2005) has the lowest growth of GDP per capita (2006).

Additionally, a specific parallel proxy, such as highly important foreign tourist percentage over the total of the country, validates the above outcome: Trentino shares 20% of the Italia total; Valle d’Aosta 18%; and Calabria only 2%.

5. First results of Case Study. Toward policy responses

Case Study conducted to some surprising results about sprawl in Calabria region that differ from the conclusions of continental geographic analyses.

− Sprawl is not proportional to GDP. In Calabria there is the most relevant percentage of sprawl of all Italy (26.13% of more built land from 1990 to 2005 over the total surface!, versus Italy average of 17.06%) to which corresponds the lowest regional GDP per capita. According to the Italian Department of Statistics, in 2006 Calabria GDP per capita was equal to 16.478 Euro, the poorest beneath Italian average of the same year (25.200 Euro), and far beneath one of the richest such as Bolzano province (32.970 Euro), according to reference data.
− Sprawl is not connected to population boom because in the last decade it hasn’t been recorded a demographic increase in Calabria.
− Sprawl has not an employment motivation, because endemic and even increasing is the unemployment in the region, the worst of all Italy, dramatic for young generations.
− The region has one of the highest surplus and percentage of unoccupied houses of Italy, and therefore there is not any shortage in the real estate supply.
− Notwithstanding, the urbanized land per resident has increased from about 30 m²\inhabitant in 1954 to over 400 m²\inhabitant in 2001, and therefore there is not overcrowding, i.e. high number of residents per unit of urbanized area, at any latitude.

6. Infrastructure and sprawl. Distinction of urban function mix as cause of mobility

At this point a specific question should arise about sprawl: why public green urban transport and TOD can help facing sprawl?

Continental research and territorial localized studies observed that, among many negative impacts of sprawl, one common consequence is particularly damaging: the spread-out of dis-
persed housing causes disintegration of urban function mix and the decrease of structural accessibility in the area, the zoning that produce the need of moving frenetically, counterbalanced by the increase of individual mobility by private cars and the related side effects.

In alternative to wild urban expansion, the connection of transport services to broad urban system might make a difference by consolidating existing dense settlement and enhancing their structural accessibility, and in so doing, helping to lower the individual traffic and the consequent congestion. It constitutes a new approach to rebuild a positive relationship (disappeared in the most recent contemporary age) between settlements and structural accessibility, namely the above introduced TOD, which also fosters-up a new valuation approach in broad transport field.

7. New valuation approach and new set of criteria

TOD is a new settlement-transport framework that might enhance the valuation approach, because until now, transport system has been seen as a separate sector and valuated under specific and insular aspects, often adopted as solely leverages to make choices for investments in transport infrastructures, such as:
- just initial cost of investment, as input;
- transport cruise speed, as output.

Research experience suggests shifting from just two assessments aspects for choice in transport field, to multiple dimensions, including new relevant criteria, for valuating of alternatives.

Table 2. Accessibility and infrastructures. Criteria for evaluation of transport alternatives

<table>
<thead>
<tr>
<th>TOD objective to face sprawl (requirements)</th>
<th>Criteria (and measures / indicators) to assess fulfillment of objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>a  Settlement and urban centers should be directly served by urban railroad, train-tram, S-Bahn</td>
<td>Ca Settlements crossed by transport infrastructure and services (number of)</td>
</tr>
<tr>
<td>b  Larger number of residents/inhabitants should be served by railroad</td>
<td>Cb Residents \ inhabitants served directly by infrastructures (number of)</td>
</tr>
<tr>
<td>c  Tracks and organization of accessibility infrastructures should get social consensus</td>
<td>Cc Level of social consensus toward accessibility infrastructures (yes \ not)</td>
</tr>
<tr>
<td>d  Infrastructure and accessibility should not only be admitted by plans but also shall help to implement planning</td>
<td>Cd Convergence of planning tools and acts toward the greenest alternative in accessibility and transport (how many)</td>
</tr>
<tr>
<td>e  Accessibility and transport alternatives should contribute to reducing CO2 emissions</td>
<td>Ce Potentiality of each alternative for CO2 reduction with respect to status quo (degree)</td>
</tr>
<tr>
<td>f  Accessibility and transport alternatives investments \ interventions should minimize landscape injuries and soil consumption</td>
<td>Cf Measure of Soil consumption for transport investments \ interventions, and consequent injuries to landscape (soil measure; injuries degree)</td>
</tr>
<tr>
<td>g  Accessibility and transport alternative must maximize both: population directly served; best possible connection with corridors as TEN, national, regional, local and with other strategic nodes</td>
<td>Cg Networking connection with other strategic nodes and corridors as Trans European Network (TEN), national, regional, local (yes \ not)</td>
</tr>
</tbody>
</table>
Criteria assess the fulfillment of important requirements by transport alternative in the framework of TOD approach to accessibility.

8. Case Study

General research has been called-on through a specific study and application to help the regional community of Calabria facing an overwhelming sprawl phenomenon. This region is the Southernmost of continental Italy, theater of the applied Case Study where objective analysis of regional sprawl has allowed to estimate in m² the impressive magnitude of soil consumption yearly destroyed by disordered and wild urban over-expansion in farm land, and coast land.

One paramount consequence of fragmented housing location is the skyrocketing of individual daily mobility of dispersed and scattered population by private cars with related inefficiency in social life, time wasted driving, road congestion, parking shortage, fuel consumption and dependence, heavy air pollution, increase of CO₂ emission, difficult parking in destination towns.

All these impacts call-on to evaluate possibilities of mitigating future sprawl by revamping and re-vitalizing existing settlements, and in particular historic centers today more often abandoned and neglected, by serving them as much as possible with public green transport to:

- enhance objective structural accessibility in the area for people and places;
- create a shifting option from individual mobility by private cars to collective accessibility.

Both urban revitalization and public green transport are complementary structural investments because they contribute in changing intrinsic characteristics of urban space and economy.

9. Surprisingly under estimated alternative

Then, Study looked-up to roads with the worst car traffic congestion of the region constituting the Case Study, to pre-figure selected structural interventions and investments.

In the central area of Calabria, Study has detected the largest and most congested corridor of individual mobility by private car, on the road, in the region, by daily and periodical commuters.

It has been really surprising to detect, also and additionally, that besides the main road corridor of car traffic, there is a parallel railroad corridor, connecting: many settlements having over 250,000 residents; the second and third towns of the region, of which one is the region capital; several scientific technological poles; University Schools; general hospitals. Moreover, this railroad corridor is a potential bridge between other paramount transport infrastructures such as the two main national and continental railroad corridors to Trans European Net-
work (TEN), as well as to international airport, the busiest and growing of the region (over 1,500,000 passengers each year).

This important potentiality is illogically neglected, depriving people and daily commuters of modal option and conserving bad and costly (in private as public budget) inefficiency of the only car-route modality to commute in the general system, all this generating a Pareto non-optimality condition.

First step must be to analyze and test the propensity of commuters driving car for modal shifting from individual to collective public transport both for inter-city and intra-city commuting.

10. Propensity to modal shifting by commuters

An immediate investigation has been performed asking commuters, by sample interview, the willingness to change (WTC) the commuting modality, from private cars to public transport, especially by railroad service integrated with light and fast feeder buses that enlarge, as positive effect, the range of inhabitants/users and area served.

Sample interview results have been encouraging for hint preference expressed by car commuters to shift from their present costly and risky individual modality to the collective one. This under condition of re-activation of railroad service characterized by:
- crossing-in settlements, by re-using existing urban track and stations-stops;
- timing and schedule coordination with all other transport modalities.

A relevant percentage of the total (68%) of local commuters (using their car) expressed willingness to change, i.e. to perform modal shifting from private car to adequate railroad service. This local outcome follows the Country (un-satisfied and un.answered) trends as investigated by “National Report on commuting 2007”.


Investigations at national level on 2,000 commuters, some of which regarding the Case Study area, have highlighted inadequacy of national-local policies not-oriented to the development of collective transport services, that have not provided any answer nor solutions to the increasing demand of agile and fluid connections to get train-tram to job places, service hubs, commercial centers, school, university.

With reference to the sample travelers not using the train, a wider number of commuters (68%) would be interested in shifting their modal transport if supply includes public transport system much nearer to their origin and need of transfer; and only 2% did not provide any answer.
Instead, just a smaller percentage (30%) is not interested in collective transport systems. One relevant issue is that the present infrastructure network is not sufficiently articulated, organized and spread, and somehow inaccessible and not well managed. More than half the sample not using the train would be interested in using the urban train if there were a nearby service in the town or if the stations were not far from their neighborhood. Train would be used by commuters (today using their cars) because:

- it avoids the road traffic jam and problems connected to private car parking within their destination place (41% of the answers);
- it arrives directly into the city innermost center or near job, service or study places (31%);
- it is much cheaper than private car (30.5%);
- it is less “stressing” and risky than driving the private car (28%);
- differently from the private car, train allows the commuters to work, study or reading during the trip (11%);
- because there are no alternatives (less than 7% of the interviews).

Data concerning the railroad transport system (used mostly by commuters and run-managed by Trenitalia and by other railroad companies) show that train passengers during year 2005 were 687 millions, of which 72 millions those with medium and long distance, with an astonishing ratio between regional demand (615 millions) and travelers on train with national route equal 9 to 1.

Therefore, it is evident that there is a great potentiality for improving the railroad commuting, in particular by combining private car and railroad (parking and intermodal nodes).

It flows that any kind of strategy of Local Public Transport (TPL) cannot but consider the empowerment of local railroad public transport in favor of commuting.

Key solution is to connect the main and regional railroad routes with the urban and sub-urban transport and railroad system by an integration similar to the structural multi-functionality of Stadt–schnell–Bahn, the so called “urban fast railroad”.

The investigation made shows how Italy occupies the lowest position compared to the major European nations in terms of supply of sub-urban railroad routes. With 188 km in Rome, 180 km in Milan, 117 km in Turin and 67 km in Naples, Italian cities and far beneath 3.000 km of Berlin; 1.500 km of Frankfurt, and 1.400 km of Paris.

11. Enhancement of existing but inefficient urban railroad. Planning framework

With specific reference to Calabria region, given the skyrocketing of private car traffic, the search has been started from roads with the largest traffic jam. Contextual intensity of popula-
tion and traffic in the Case Study perimeter has been detected in the sub-area between the two main towns of Lamezia Terme and Catanzaro.

In the same most crowded and congested corridor there is an infrastructure parallel to this main road. It is the today neglected inter-city railroad Catanzaro-Lamezia Terme that must play a key role in the Catanzano Isthmus as well as in the whole region, having a particularly interest, relevance and multi-functional potentiality, somewhat defined by transport engineers as “metro-ferrovia” or tram-train.

This urban railroad system has been considered in several transportation plans, programs and acts at different Government and Institutional levels.

It follows a review of all relevant plans and programs for transport and logistic at state, regional, provincial levels concerning the Case Study area as well as the enhancement of this already existing, but today badly neglected urban railroad system.

11.1. National Plan for Transport and Logistic (January 2001), PGTL [01]

[Piano Generale dei Trasporti e della Logistica (Gennaio 2001) nazionale e dei corridoi pa-neuropeei e magrebino]

The “National Plan for Transport and Logistic” (PGTL) issued by the Ministry of Transportation and Navigation in January 2001, refers to the planning activity of European Union.

During the nineties of XX century, European Union defined the Trans European Network (TEN), and singled out the paramount corridors and the main hubs within the whole transport system inside and outside the European Union, to be considered as invariants for the strategic choices of the plans at country and at a more detailed scale.

The Plan records the increase of the individual mobility with private cars, and considers as strategic top priority the re-launching of railroads.

For Italy the Plan gives recommendations and the following list about routes and tracks to be enhanced:

“TEN network at 2010; Ferrovie dello Stato [State Railroad] “strong network”, on which transits 89% of the total passengers and goods; Ferrovie dello Stato main and secondary national routes; routes not belonging to Ferrovie dello Stato connecting and completing goods and passengers routes with a national interest”.

With these criteria the Plan defines the priority National System of Infrastructures for Transport (SNIT) in which it includes explicitly the “rail track” of present Case Study from Lamezia Terme Central Station, to Nicastro, Sambiase, Germaneto and then to Catanzaro Lido, considered as strategic because it connects the Tyrrenian international corridor with the national Adriatic one, through the Ionian side. Then the transversal railroad is part of the European main network.


The “Operative National Program, PON. Transport Section. Planning period 2000-2006” issued by the Ministry of the Treasury in September 2001, concerning South Italy, prefigures the mobility and transport trend scenario at 2010, taking element from the Monitoring and Planning Information System of Transports, SIMPT. The result, particularly worrying, confirms for Calabria the absolute, and not desirable, prevailing (beyond 90%) of the monomodal transport road “vehicles” both for passengers and good traffic. It is highlighted (p. 36) the lack of inter-modal transversal connections between airports, railroad and roads.

PON Transport addresses objectives as strategic for Southern Italian regions: modal re-equilibrium; increase of attention toward planning and investments for railroad network (pp. 11-12); railroad investment to improve territory integration (p. 49) through the connection of local areas and transversal-longitudinal corridor as well as passenger railroad connections between urban areas and Trans-European Network (TEN). The latter is intended as key answer to the accessibility-mobility problems of the internal areas of South Italy.

In the analysis of the railroad network, PON takes from the PGTL of January 2001 the network of the National System of Infrastructure for Transport (SNIT) and confirms the clear (p. 17: “railroad sections of South Italy included in the present SNIT network”) inclusion of the strategic railroad section called “Lamezia Terme – Catanzaro Lido”.

In conclusion, PON Transport: highlights the modal disequilibrium due today present preference to road “vehicle” choice; catches as an opportunity the forecasted growth of global demand of mobility-transfer-transport; wishes for a strategic choice in favor of the railroad “iron” modality to answer the increasing need of transfer; foster-up the modal shifting from road “vehicle” to railroad “iron”.

Moreover it submits the specifications to the Regions recommending to:

- strengthen the transversal connection between the Adriatic and Tyrrhenian international and national corridors (where SAMBIASE-NICASTRO-CATANZARO track is included);
- connect railroads with airports, inter-ports, ports;
- plan railroad connections for passengers between local and Trans European Networks, with reference to inter-regional connections, crossing and directly serving settlements;
- organize railroad to cross settlements and to serve directly their residents.

11.3. Regional Operative Program for Development of Calabria 2000-2006, POR [03]

The Regional Operative Program, POR 2000-2006, for Economic Development of Calabria is the most important UE financial act 2000-2006 containing European structural investments in Calabria region, integrated at the end of 2001 by Calabria Region with the POR Programming Complements.

The Chapter VI “Networks and Nodes of Service” of the POR Programming Complements follows, coherently, the recommendations of the PGTM and of Transport PON.

It immediately synthesizes, in a direct and exemplary way (pp. 3-4), the intervention for:

“Rehabilitation and strengthening of the Transversal Ionian–Tyrrhenian railroad between Lamezia Terme and Catanzaro Lido”,

by emphasizing:

– its geo-strategic function to manage possible national crisis, and overcome bottleneck by connecting the two national Tyrrenian and Ionian-Adriatic corridors;
– its potential function to integrate the activities of Gioia Tauro Port with railroad network, Lamezia Terme International Airport, inter-port system.

11.4. Calabria Regional Plan for Transport. Updating 2003 [04]

[Piano Regionale dei Trasporti. Aggiornamento 2003]

From the analysis and forecast of future scenarios, the Regional Plan for Transport 2003 takes the neat consequences that are textually reported below, and directly regard regional transversal infrastructures and specially the accessibility-mobility-transport system Lamezia-Catanzaro.

“Transversal line Ionian-Tyrrhenian: Lamezia Terme – Catanzaro Lido. The growth of potentiality and improvement of the service are considerable and may be developed by the mean of a rehabilitation intervention of the same track and with some small and localized changes.” (I, 136)

The plan refers textually to Chapter VI of important POR 2000-2012, regarding the strategic role of the transversal railroad Lamezia-Catanzaro, having among its positive effects:

“the considerable improvement of the relationships with Gioia Tauro Port and Apulia”;
“the connection with the main Calabria commercial ports of Reggio Calabria, Gioia Tauro, Crotone, Corigliano”, (I, 137).

It adds the policy regarding the railroad direct connection, so-called “metropolitan” like commuter rail, between Lamezia Terme Central Station and Lamezia Terme Airport:

“[…] positive effect for a metropolitan connection between […] the railroad national Tyrrhenian corridor (Lamezia Terme Station) and Lamezia Airport.” (I, 137)

11.5. Regional Operative Program for Economic Development of Calabria.
EU Funds for Regional Development, FESR 2007-2013, POR [05]
The Regional Operative Program for Economic Development of Calabria 2007-2013, POR, is the most recent financial programming tool. It sets in its chapters the main objective for “Networks and Mobility” in Calabria region.

“Improve external as well as internal accessibility of Calabria, enhance Regional System of inter-modality and logistics, promote regional and urban sustainable mobility and better accessibility to internal and peripheral areas”.

This general commendable objective is regressed in a more detailed way and the plan gives specific directions for the enhancement of existing railroad Sambiase, Nicastro, Catanzaro treasuring and not changing the present track, and serving directly urban centres easing the modal shifting of residents from individual to public transport.

Treasuring of existing railroad is ranked among the principal priority of interventions:

“Catanzaro Lido – Lamezia Terme railroad transversal with completion in the same track with some localized improvements (no radical location change) and crossing and serving urban areas”.

11.6. Spatial Territorial Plan 2010 for Catanzaro Province, PTCP [06]

The PTCP is the Spatial Territorial Plan 2010 for the Province of Catanzaro, the central of Calabria, where the railroad Sambiase - Nicastro - Catanzaro is located.

The PTCP is a general planning tool for the Province, including all most important economic as well as spatial aspects, trying to design the future of local society, environment, economy and its spatial projections in land use, in structure of provincial settlements and in infrastructures.

In fact, a relevant part of PTCP is the specific plan regarding “Structure, infrastructure, transport and mobility” for which the most important accessibility infrastructure in the Province is the railroad connecting settlements and urban centres of Sant’Eufemia, Sambiase, Nicastro, Catanzaro and some important scientific and technological poles. The PTCP gives the clear direction for the enhancement of the existing railroad, of Sambiase, Nicastro, Catanzaro, the powering by electrical network, the amelioration of cuspidal parts, according to all other accessibility plans at regional, state and European Union levels, and the building-up of the second close parallel track.

12. Transport alternatives in the study area

Encouraging results of interview concerning propensity and willingness of private car commuters (some of them in the Case Study area) to modal shifting toward public transport, foster-up to
focus on transport planning and in particular to connect it more strictly to overall urban system management. Results also address to take into account all the existing and future designed alternatives for commuting in the area and to perform valuation through several criteria, not just two. Doing the census inventory of existing and future commuting alternatives, it has been surprising to discover the existence of a hypothetical blueprint (sketched by a railroad management public company) that conceived and designed a total new alternative railroad corridor in the area. It is located in the Southern part of the area, outside any transport planning acts and tools and does not connect any settlements being just the conjunction between region capital town (its historic center) and international airport.

In such a way three potential alternatives exist in the settlement-transport structure of the area:
- **Alternative 1 (A1): status quo**, with prevalence of a main road for individual inter-city commuting by private car, and doing nothing for the railroad;
- **Alternative 2, (A2):** enhancement of existing railroad (parallel to Alternative 1 that is the above main road); today this railroad is badly neglected even if it is a strategic asset for future spatial and economic planning and management of the area;
- **Alternative 3, (A3):** new blueprint (before unknown) for a new railroad on a southern alternative and totally new itinerary, outside all transport planning acts and tools, not serving settlements and inhabitants.

13. **Application of criteria for valuation**

In updated transport valuation approaches, new variables are taken into account in additional to traditional costs and speed data, such as the number of inhabitants\ residents served directly in their settlements and, also, the double consensus toward the infrastructure investment: first, social consensus; second, the convergence with transportation planning tools and acts. In the strategy for spatial management of this area a basic analysis is performed to detect the preferable one among the three. Each criterion, among the ones introduced above, is comparatively applied to each alternative (*status quo*; enhancement of existing railroad; project of new southern railroad).

13.1. **Crossed settlements**

A2 crosses all settlements (++) of the focus area. A1 is not a railroad and it is far from all settlements (−), as well as A3 is farer (−). Only A2 gets the goal.
13.2. Served population

A2 serves over 250,000 residents and other not resident inhabitants by urban railroad (++). A1 serves only indirectly (=) the area through car road network. A3 does not serve population at all (–). Only A2 gets the goal.

13.3. Social consensus of grass root organization

Public activities and media reports show the pro-active and unanimous consensus of social organizations toward the A2 (++), which costs 140 million of Euro. They oppose against A3 (– –) which needs the huge public cost of 450 million of Euro but leaves all the settlements of the area without inter-city\intra-city railroad service. Social consensus calls for a change: not to keep the status quo of A1 (–). Only A2 gets the goal.

13.4. Planning convergence toward an alternative

All six planning acts examined converge clearly toward A2 (++), in explicit alternative to and against A1 (– –) and not mentioning at all A3 (–). Only A2 gets the goal.

13.5. CO₂ lowering down

A2 leads to CO₂ reduction in the whole sector of transport in the area (++), both in lifecycle (including management) and in the investment step where no new track must be built-up. A3 impacts positively in the lifecycle but it requires the construction of a brand new infrastructure (–) far from the existing one than (A2) must be dismissed with consequent dis-investment of an existing capital. A1 will leave the present level of pollution without mitigation (– –). Only A2 gets the goal.

13.6. Landscape impact

A1 does not bring any change on landscape (+). A2 makes minor and not relevant change with injuries on landscape because it is just an enhancement of an already existing track (+ =). A3 is a new construction and the impact on landscape will be relevant, sometimes heavy (–).
A2 connects the pan-European, national and inter-regional corridors with the local services to all settlements, implementing the S-Bahn approach (++) of train-tram. A3 connects only the long-distance corridors (+) but does not serve local communities. A1 is not a railroad (–). Only A2 gets the goal.

The performance of criteria application gives the following Table of first results. The second Alternative A2 seems to match the goal of sustainable transport and train-tram approaches able to integrate commuter service and larger railroad system, like in the S-Bahn benchmark. The third Alternative A3 seems to fail some key goals, first of all the lack of connection between all settlements.

Table 3 – Criteria for evaluation of transport alternatives in Case Study area

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Status Quo. Modality through road by private cars</td>
<td>Ca: Crossed settlements, Cb: Served population, Cc: Social consensus, Cd: Planning convergence, Ce: CO₂ lowering down, Cf: Landscape impact, Cg: Networking with TEN corridors</td>
</tr>
<tr>
<td>A2 Enhancement of existing railroad</td>
<td>++ ++ ++ +++ ++ + ++</td>
</tr>
<tr>
<td>A3 Project of southern new railroad</td>
<td>– – – – – – – +</td>
</tr>
</tbody>
</table>

14. First results and considerations

The support of criteria in Case Study valuation process, concerning settlement-transport integration and connection, leads to preferability of the second Alternative A2 versus the third Alternative A3 i.e. the new designed railroad, located outside all settlements of the area and not planned in any accessibility-mobility plan, program or act.

The preferable alternative has the effective potentiality to serve, with public collective railroad transport, over 250.000 residents and at the same time to connect two main national corridors, Tyrrenian and Ionian, that are part of pan-European mega-corridors I (Palermo-Berlin) and VII (Skopie-Varna) and of general Trans European Network, playing the longed and virtuous double function international-national and local, like the Stadt-schnell-Bahn i.e. the urban fast railroad.
It is relevant to notice that the preferred second Alternative A2, the enhancement of existing railroad, costs around 140 million of Euro. Instead the third Alternative A3, a new designed southern itinerary outside settlements and planning acts, costs around 450 million of Euro given the need to get the area, and the even more difficult soil to build-up to it. Application of more comprehensive and broad criteria in transport alternative valuation leads to detect preferability of one alternative against the others on the basis of important goals such as: serving settlement-population; getting consensus from grass route social organization; having convergence of both general and transport planning tools and acts; lowering down consequences of individual mobility by car such as road traffic, car congestion, pollution, CO2 emissions; connecting the main continental railroad corridors and Trans European Networks.

In the Case Study the preferred alternative seems to be the most equilibrate in cost-effectiveness, and it is far from the status quo, that only apparently and directly costs nothing but leaves the problems and the huge private cost of car modal commuting as well as huge public cost of providing bus transport, as well as it is from the total new designed railroad that leaves away population and settlements.

15. Selected bibliography

Initial Studies Concerning Sprawl

Sprawl


**Transport Infrastructure Valuation**


Yeh A. (ed.) *Building a Competitive Pearl River Delta Region*. Hong Kong University Press, Hong Kong, China. ISBN: 978-9-627-58921-1


**Transport at Country and European Level**


**Transport at Regional and Provincial Level**


*Local Economy*


16. Figures

*Picture 1 – Case Study. Consultation of social organizations concerning the three transport alternatives*
Figure 1 – Central area of Calabria: Sambiase – Nicastro – Catanzaro. Transport Alternative A: mobility by private cars on route SS208, not serving towns (28,000 cars each day)

Figure 2 – Central area of Calabria: Sambiase – Nicastro – Catanzaro. Transport Alternative B: improvement of the existing urban railroad crossing urban settlements and serving 250,000 inhabitants

Figure 3 – Central area of Calabria: Sambiase – Nicastro – Catanzaro. Transport Alternative C: new designed blueprint for new railroad far from settlements
Figure 4 – Impact of the alternative transport at regional level. Infrastructures to connect and unify Calabria. The isthmus connection between the two national Tyrrenian and Ionian-Adriatic rail corridors and narrowest part of Italy (40 km)