

SUSTAINABLE TRANSPORT PLANNING: A METHODOLOGICAL APPROACH

Jorge Díaz Tejada

Universidad Autónoma del Estado de Morelos, México.

Abstract: Sustainability is a goal that no one yet knows how to achieve. The act of sustainable planning and design is a heuristic process; that is, one in which we learn by doing, observing, and recording the changing conditions and consequences of our actions. Observation, recording, and monitoring are crucial elements of the sustainable design process. Therefore, our data comes mainly from the on-site analysis, which is supported on some theoretical basis, as following mentioned. From the sustainable perspective, we may recognize the following premises as basic ones. The key to sustainable design is the system approach-sometimes called a holistic view. The second premise on which sustainable design is base is that product and process are one. Therefore, the process by which an end is achieved is often given as much, or nearly as much, weight as the product, because it is recognized that only by changing the design process is it possible to change the design result¹.

- Cross-Sectorial Management (Social inclusive)

INTRODUCTION

From the very beginning, we should consider to shift our more conventional planning approach, based on:

Single Disciplinary theoretical basis (Quantitative basis)

- Obsolete Paradigms (Utilitarian function)
- Vertical Management (Social exclusive)

To a more inclusive model, based on:

- Multi-Disciplinary theoretical basis (Quantitative, Qualitative and Relational basis)
- New Paradigms (Valued-Based)

As stated before, observation, recording, and monitoring are crucial elements of the sustainable design process, in this sense I consider essential to incorporate data from the *observatories* that have been implemented in most cities lately¹, so that we can recognize main trends in terms of land use growth (residential, retail, etc), its impact on travel patterns, values related to environmental sustainability, safety, health, community sense, household income spent on transportation, etc.

We can not assume a city as a neutral recipient, of homogeneous nature and consistency, it is instead a more complex phenomenon, multi-

¹ The United Nations Settlement Program (UN-HABITAT) established in 1997 the initiative to raise urban observatories worldwide for monitoring some sustainability-related data.

dimensional (economic, social, environmental) which reacts to changing conditions, takes advantages of synergies, and where social behaviors (of non-linear nature) are a key driven force of mobility and transportation trends.

The multi-dimensional character of the planning process can be recognised from the definition of Sustainable Transportation itself²

A sustainable transportation system is one that:

- Allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- Is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.
- Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

As a synthesis of what has been stated, we can look at figure 1, which in turn is useful to show the methodological frame as a reference for further explanation to be developed.

² The Centre for Sustainable Transportation, Ontario, Canada. Report October 2002.

PROJECT IMPLEMENTATION

In order to link theoretical approach to the practice in terms of project implementation, I propose the frame shown in figure 2, where three main elements are suggested and are explained as follows:

Theoretical Basis

While software development, technical tools, modelling and cutting edge technology, in general have promote a sense of confidentiality, when applied for transport planning, I will remark some of the weakness and even misuse that this approach could lead us to.

We have to think about the paradigm which is rooted in this approach. (Epistemological Nature)

¿How do we conceive the city? ¿Can modernism³ still explains how the city functions? ¿Is the primarily function of the city a utilitarian one?

³ As a movement in the arts, 1929, from modern (q.v.). The word dates to 1737 in the sense of "deviation from the ancient and classical manner" [Johnson, who calls it "a word invented by Swift"]. It has been used in theology since 1901.

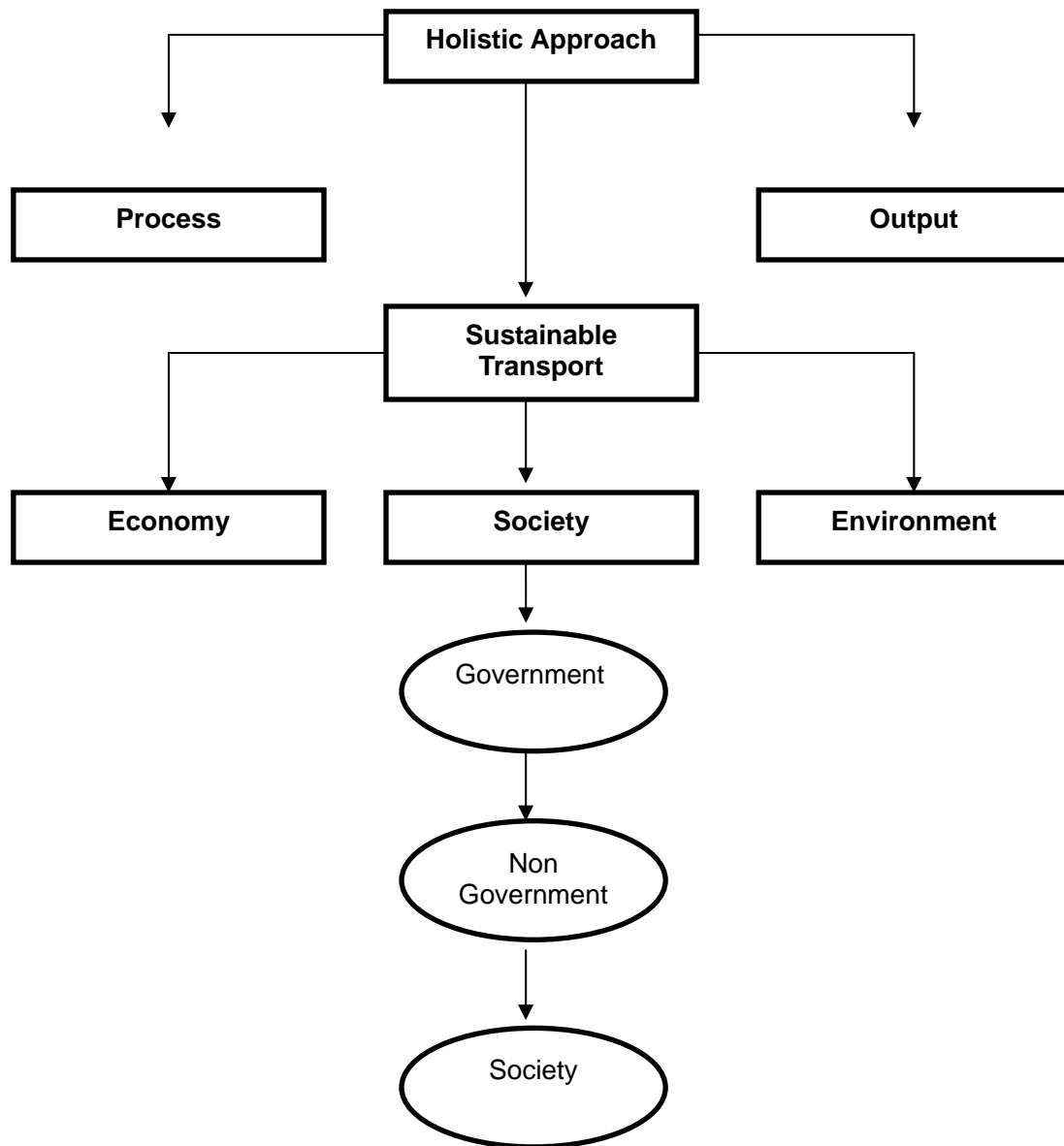


Figure 1: Methodological Frame

Since Le Corbusier pointed out in the Athens' Charta in 1933, that a city could be conceived as having three main functions (Residential, Work and Recreational) which are connected by the transport system, dramatic changes have occurred, not only in terms of

explosive urban sprawl, extremely densified urban areas, megalopolis formation, but also in terms of social disequilibrium, environmental risk, safety, all of which have had an enormous impact (externalities) on transport cost, because of new

technologies needed, travel time, health deterioration because of pollution, sedentary style of life derived from car dependence, among many other consequences.

On the other hand, we have to think about the strategies and operative tools derived from this paradigm. (Methodological Nature)

Quantitative tools have been the dominant basis in research, as much as, for plan implementation up to now, while qualitative explanation has remained underestimated for researchers, authorities, and the community in general.

I will remark some of the limitations when applying these tools alone, and which are related to the following issues:

- a. Linear behaviour logic
- b. Model calibration
- c. Variables Included
- d. Static forecasting
- e. No alternative scenarios

The logic, which explains how a city functions, is a phenomenon of a very complex nature. We have to think about some *reversible* processes that have arouse as the target for transport planning, in most countries, which do not respond to a linear logic, or even some new strategies with no precedents, as following mentioned.

- Lessen Car Dependence
- Pedestrianization
- Mixed-Land Use
- Traffic Tariffing
- Traffic Scheduling

Besides this, mathematical models still recognize some variables that are not measurable or are of a non-linear nature

causing forecasting to have a wider range of uncertainty.

Cross-disciplinary approach is not just an option but it is indispensable if we look for a neither neutral, nor idealized scenario, but a more comprehensible, social behaviour related territory.

Some of the most noticeable issues that arouse when thinking of the city as a more complex phenomenon are:

1. Social Behaviour is a key-driven force for changing conditions.
2. Synergies between Transport and Land Use, have some generalized features but there are others which are related to *local* conditions.
3. Transport should focus in moving people not in moving vehicles, so pedestrian circuits besides non-motorized modes should be included when planning the transport system.
4. Different territorial scales (Regional, Urban, Local) demand different transportation solutions (Edges, Nodes, Corridors) and modal integration (Rail, Subway, Buses)
5. Public Space is not just for transportation purposes but for social integration, leisure, diverse cultural manifestation.
6. Landscape should be considered as part of the transportation system.

Society

In the last few years, there has been a shift in the way different society groups are being incorporated during the planning process of the transportation system.

Urban Observatories are not collecting data in a mechanical way, just to add some more information to justify a

decision, but instead they are trying to perceive some value-based variables that different society groups consider extremely important and that are related to the concept of *life quality*.

We shall distinguish different society groups, as following suggested:

1. Users of the Transportation system
2. Transport Operators
3. Non-Government Institutions
4. Government Authorities

We still need to narrow our definition of these groups, as far as, quite different needs and interest are promoted within these groups, as following suggested.

1. Users of the Transportation system
 - Gender : Male/Female
 - Age Groups : Children/Adults/Elder
 - Activity : School
Students/Workers/Housewives/Retired People
2. Transport Operators
 - Private Companies
 - Public Companies
 - Local Services
 - Regional Service
3. Non-Government Institutions
 - Local Consultants
 - International Consultants
 - Academy
4. Government Authorities
 - Local Authorities
 - Federal Authorities
 - Central Government Authorities

We can figure out, how difficult could be to deal with different *interpretations* of the problem in a phenomenon of extremely complexity as it is the city itself, where disequilibrium, irregular processes, different income groups, or even different cultural beliefs are expressed.

Empirical evidence⁴ has shown that dialogue between all these different social groups is essential if a plan for an improved transportation system is to be implemented. There is also an indispensable consideration to be made, the one related to *Viability* of achieving the plan in terms of the budget available, its cost and benefits related analysis, the time needed for building all the facilities, the urban fabric, geographical features of the site, and so on.

To awake public awareness about the consequences of not doing anything, is of course a good way to begin promoting the change. Modal alternatives, opportunity of choice, connectivity between modes, non-motorized facilities, pedestrianization, public space availability, are among others attractive ways of revitalize and improve not only the transportation system performance but above all a good way of getting a better life quality.

⁴ Mexico City and Santiago de Chile City, exemplify the different outcomes derived from a successful process in the former, while an unsuccessful negotiation occurred in the later.

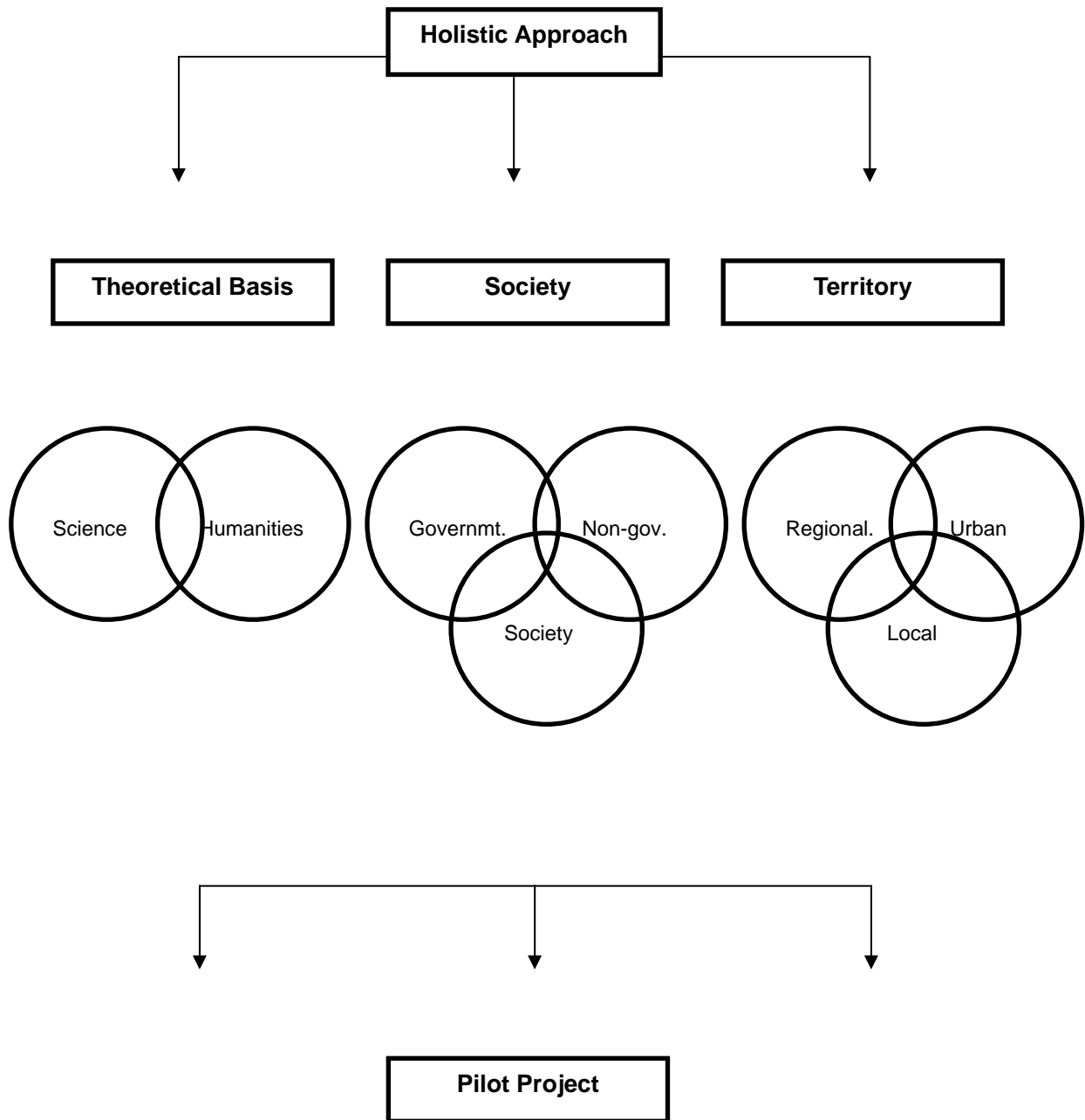


Figure 2: Project Implementation.

Territory

Phenomena as; Megalopolis formation, conurbation, globalized metropolis, thematic city, dormitory cities, or land

use patterns as; Shopping Malls, tourist corridors, industrial parks, make us thing about quite different transportation needs to attend to.

Nevertheless, we should consider all of them as part of a comprehensible transportation system. We can, of course, recognize at first three different territorial and functional scales:

- Regional (Megalopolis, Conurbation)
- Urban (Metropolis, City, Town)
- Local (Historic city center, a particular street, business district, etc.)

In correspondence with each one of them, I suggest the following concepts as part of the transportation system facilities.

- Edges
- Corridors
- Nodes

Edges are to connect different cities and are usually supply with a train system facility besides the toll highway system (and a toll-free highway if available).

In the case of Mexico City, travels between the capital city and surrounding cities as Toluca (69.8Km), Cuernavaca (85Km), have been steadily growing in the last few years. A remarkable issue from this is that these trips are made on a daily basis, typically from home to work, indicating a strong functional link between these cities.

Corridors are to connect different parts of the city, typically linking zones with the highest daily ridership. Bus Rapid Transit is a good example of a transport facility implemented in the last two decades in developing countries, as much as, in developed ones. In the case of Mexico City, it has been implemented the *Metrobus* (A BRT facility), along the *Insurgentes* Avenue (the longest avenue of the city).

Nodes are extensive pedestrian zones which primarily function is to serve as transfer stations, with intensive public space use, leisure amenities, among other possible features.

Considering as a whole, inter-modal connectivity is essential if we look for an improved transportation service. Despite the fact of considering it, an edge, corridor or node, an important issue to plan is to have alternative modal choices and not just one, so that vulnerability of a collapse will be of a lower probability.

We should incorporate two concepts besides what has been described before.

- Complete Neighborhood
- Complete Street

A *complete neighborhood* is a mixed-land use area of high density, including different kinds of dwellings, health care services, schools, shopping center, leisure amenities and workplaces, so that the majority of people living there can also work in the neighborhood. The idea is to allow, as much as possible, walking or travel on non-motorized modes within the neighborhood, minimizing transit ridership.

A *complete street* is a road where all (or most of) the transport modes are simultaneously included, so that people are able to choose the most suitable mode for their personal purposes. These modes may include in different lanes:

- A Subway
- A BRT
- A Cycling way
- A Walkway
- A lane for cars

REFERENCES

Thompson F. George and Steiner R. Frederick. Ecological Design and Planning. John Wiley & Sons, INC. USA. 2002

The Centre for Sustainable Transportation, Ontario, Canada. Report October 2002.

Amar, Georges. Movilidad Urbana Sustentable: Un Cambio de Paradigma. 2007

Willumsen, Luis. Regulación y Control del Transporte Colectivo: Lecciones de Transantiago en Chile. 2007

Schulze, Oliver. Reorganización del espacio, transporte no motorizado y accesibilidad. 2007

Kogan, Jorge. Tendencias y Retos de la movilidad en America Latina. 2007

Repogle, Michael. Lograr Transporte de Alto Rendimiento. 2007

AUTHOR BIOGRAPHIES

Diaz, Jorge.

Graduated as a Bachelor in Architecture in 1988, before being awarded a Master's Degree in Urban Planning in 1991 and a PhD in Urban Studies in 2004.

Membership:

World Scientific and Engineering Academy and Society (WSEAS)-USA.
International Institute for Mobility Training (IIFM)-Switzerland.
International Council for Canadian Studies (ICCS)-Canada.
Sistema Nacional de Evaluación Científica y Tecnológica (SINECYT-CONACYT)-México.

He has more than fifteen years of experience as a consultant for the government of México. He has been teaching and developing research for the last ten years. He has recently been awarded a Postdoctoral research fellowship by the embassy of Canada.

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