3.6 ITALY 1

GRAVITY-BASED ACCESSIBILITY MEASURES (GRABAM) FOR SUSTAINABLE DEVELOPMENT OF ROME'S URBAN AREA

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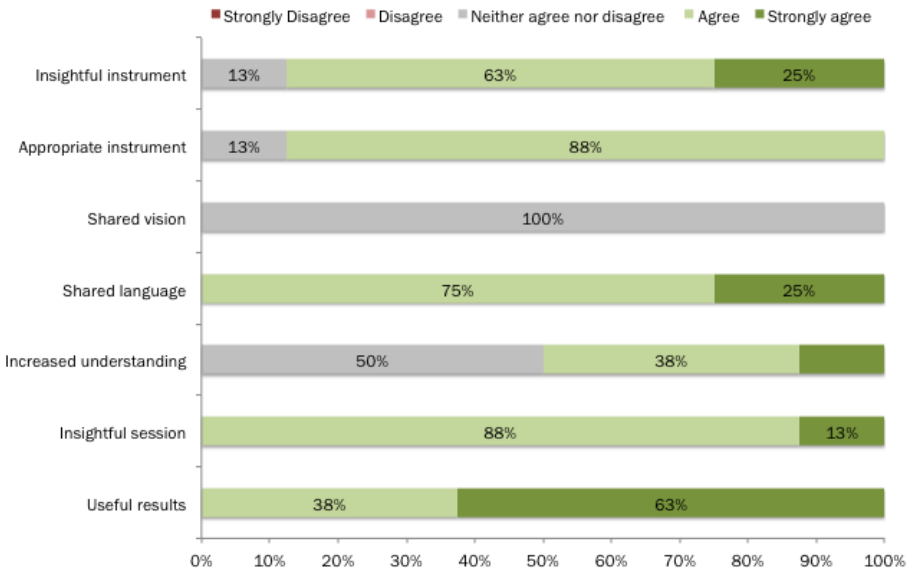
Participants' profile	# Participants: 8
Male | Female	6 | 2
31–45 | 46–60	7 | 1
Transport planner | Urban planner | Urban & Transport planner	5 | 2 | 1
Public organisation | Private organisation | University	4 | 2 | 2

Views about the session and the instrument



GraBAM

The accessibility instrument GraBAM (Gravity-Based Accessibility Measures) can be used to answer the following planning question: Who reaps the benefits from investments in the transport system, and where are these benefits localised?' It can be applied in a variety of operational planning and public involvement activities of transport agencies. The tool can identify the interrelations between transport infrastructures (changing zonal accessibility) and the spatial distribution of the impacts on socio-economic activities. GraBAM can also assist urban planners in identifying optimal locations for new development areas. Moreover, it can also support the analysis of the real estate market dynamics. In fact, GraBAM can be integrated in comprehensive Land Use Transport Interaction (LUTI) modelling architecture, simulating the impacts of changing accessibility on the spatial distribution of residential and economic activity as well as on dwelling prices (Nuzzolo and Coppola 2005).

GraBAM is based on gravity-based accessibility measures (Hansen 1959), which are based on the spatial distribution of activities within the study area (e.g. residents and jobs) and on the travel times and costs between zones. Two different accessibility measures have been considered, 'active' and 'passive' accessibility (Cascetta 2009). The active accessibility of a given zone i is a proxy for the ease of reaching the activities and opportunities located in different zones j of the study area for a given purpose. Here we considered the active accessibility of residents towards workplaces:

$$A_{act,i} = \ _j E\ j\ ^{\alpha_1}.\exp\ \alpha_2.C\ \ i,j \qquad (1)$$

$E(j)$ is the number of jobs in zone j; $C\ \ i,j$ is the generalised travel cost, derived by the weighed sum of the travel time and travel costs on different modes of transport between zone i and zone j; α_1 and α_2 are estimated parameters (Coppola and Nuzzolo 2011).

The passive accessibility of a zone i is a proxy of the opportunity or an activity located in a given zone i to be reached from the potential users coming from all the other zones j of the study area for a given purpose. Here we considered the passive accessibility of services and commerce with respect to the residents in the study area:

$$A_{pas,i} = \ _j Res\ j\ ^{\gamma_1}.\exp\ \gamma_2.C\ \ j,i \qquad (2)$$

$Res(j)$ is the number of people residing in zone j (i.e. the potential users of the economic activities in i); $C(j,i)$ is the above generalised travel cost; γ_1 and γ_2 are estimated parameters (Coppola and Nuzzolo 2011).

The feature that makes GraBAM usable for planning practice is first of all its flexibility: accessibility can be calculated for private transport and/or for public transportation system, for different trip purposes (home-to-work and home-to-other purposes), and for different aggregation of Traffic Analysis Zones (TAZ). Another characteristic of this kind of measure is that it can be easily represented using thematic maps in a GIS environment.

The tool has already been used in several applications and different contexts: in transport planning decision-making processes, in feasibility studies for transport infrastructure assessments, and for the evaluation of master plans at different scales (urban, provincial and regional). One of the latest applications is the assessment of the Transport Plan of Rome (Nuzzolo and Coppola 2008).

Setting the scene

The local workshop involved a panel of experts in the fields of Land Use and Transport planning; the goals were to evaluate LUTI policies for the sustainable development of the metropolitan area of Rome and to test the usability of the GraBAM tool (Papa and Coppola 2012).

The workshop took place in Rome in May 2013 and involved twelve participants: eight practitioners from different backgrounds and from different cities (Naples and Rome) plus four members of the WU: two as observers and two moderators. The practitioners had similar ages (30–45 years old) and professional positions. Some of them already knew each other, which produced a more informal and comfortable atmosphere and facilitated the discussion.

To guarantee different perspectives on the usability of the instrument, both transport and urban planners from the private sector (consulting), public sector (municipal planning offices) and academia were involved. The heterogeneity of the group was a key factor for the success of the workshop. Nevertheless, this required a more complex preliminary activity to organise three ‘customised’ pre-workshops with selected groups of participants in Rome and Naples. The organisation of different pre-workshop was necessary because participants had dissimilar backgrounds and experiences in using accessibility in their daily practice. Some of them were not familiar at all with the use of accessibility tools, while others had used basic accessibility measures, such as isochrones and contour measures. Only the academics were already familiar with the GraBAM tool and the other accessibility-related concepts.

Moreover, the participants had a different level of knowledge. In some cases it was necessary to describe in details the case study, i.e. the transport networks and the policies adopted by the public administration of Rome.

Describing the workshop

The 4-step protocol was administered in two main stages, the customised pre-workshops and the workshop itself. During the pre-workshops we carried out the first two steps of the protocol.

The pre-workshops

Step 1

The first step aimed at creating shared understanding of accessibility concepts and a common language to define and identify sustainable planning strategies. The land use and transport system was presented with the aid of thematic maps, describing current and future socio-economic scenarios and displaying the planned interventions of the master plan. We identified and discussed with the participants the main threats and opportunities (i.e. high concentration of jobs in the city centres, unsustainable auto-oriented transportation system, urban sprawl, etc.) and asked them to suggest strategies to tackle these problems towards more sustainable urban development. The goal during this session was to translate individual thinking on the planning question into a shared accessibility language.

Step 2

In this step, the definitions of 'active' and 'passive' accessibility were given to the participants, stimulating discussions on the meanings and definitions of 'accessibility' and 'mobility'. Then, GraBAM accessibility maps were shown, focusing the attention on their potential usability in the evaluation of LUTI plans.

The pre-workshops ended with the submission of the pre-workshop questionnaires. Assisting participants in filling in the survey was very useful to get people more involved, to tackle new issues that did not emerge previously, and to clarify further questions.

From the pre-workshops to the workshop

After the pre-workshops, several strategies based on the participant's proposals were identified to achieve sustainable urban development in Rome. Most of them dealt with integrated LUTI policies, only a few, mainly proposed by transport planners, focused on transport network interventions. Such scenarios were simulated and represented with the use of accessibility maps. Since GraBAM requires computation times that were not compatible with the real-time simulation during the workshop, scenario setting and simulations runs were carried out in advance (i.e. before the workshop). In the time

between the pre-workshops and the workshop, the tool developers produced the accessibility outputs, using LUTI models and GIS.

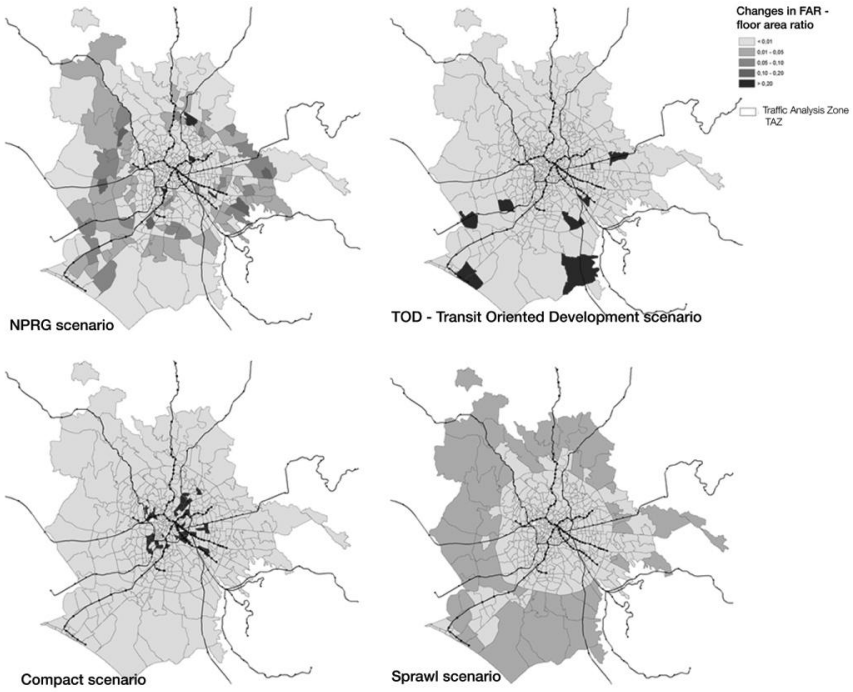


Figure 3.13: Development strategies for the urban area of Rome proposed by the participants

The workshop

The local workshop was held in Rome. After a brief presentation of the simulated scenarios, resulting from the different strategies proposed during the pre-workshops, the accessibility maps with the outcomes were displayed and discussed.

A crucial issue in this phase was how to make the presentation of accessibility sufficiently simple without losing the necessary qualities of the model simulation. Due to the large number of outputs resulting from the simulation and the different presentation options, more than 30 thematic maps were produced. So much information might lead to misunderstanding and confusion. For this reason, only a few maps were shown to get the debate going; the other maps were presented upon request by the participants.

The accessibility maps showed how the levels of accessibility were affected by the interventions on the transport and land use system (see figure below). To provide a better understanding of the outcomes, accessibility maps were compared to thematic maps of more familiar indicators, such as travel times

and distances, commonly used by the practitioners. What participants clearly understood from this comparison was that while mobility indicators focus only on the ease of movement over the network, accessibility indicators take into account both the transport network performances and the spatial distribution of activities. This concept emerged when accessibility and mobility levels of peripheral areas targeted by new development were compared.

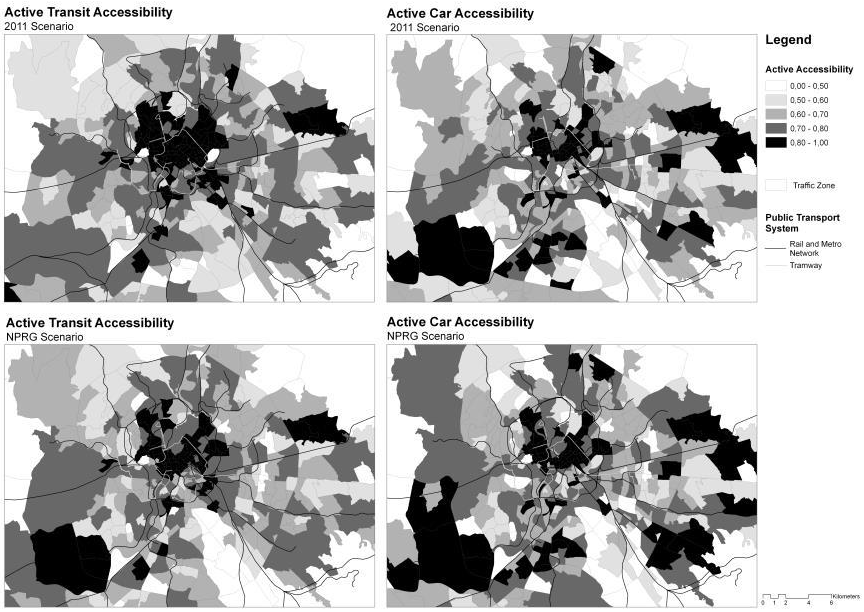


Figure 3.14: GraBAM outputs: comparing car and transit active accessibility in different scenario: 2011 scenario vs. NPRG scenario (i.e. the Master Plan of Rome)

Step 4 was held in a plenary session, during which the group of planners agreed upon a set of interventions for Rome, based on the simulation results and the maps presented. This phase was marked by a stimulating discussion on the possibility to apply the instruments in planning practice. Many participants found that the tool can offer new insights for their daily practice. Furthermore, some participants identified specific projects in which they would like to use the instrument to evaluate alternative scenarios.

Lessons on usability

Despite accessibility being acknowledged as a key concept in describing the relationships between land use and transport systems, it is still difficult to fully understand and apply it in planning practices. During the selection of the main characteristics of the study area, it became evident that different disciplines have different perception of accessibility and concepts of mobility.

Figure 3.15: Measuring, interpreting, analysing accessibility and designing integrated solutions

Although the participants were satisfied with the workshop because of the high degree of interactions with each other, in some cases transport and urban planners seemed to speak a different language: the former were more interested in issues such as modal split, while the later in the 'relation between green areas and urban structures'.

Transport planners demonstrated stronger theoretical background knowledge of accessibility measures, asking very detailed and technical questions (e.g. 'the influence of zoning on the measure'). On the other hand, land use planners were more interested in potential application of the instrument in their daily practice. In this regard, transport planners perceive accessibility measures as complementary to other usual assessment indicators, while urban planners see the use of these measures as a new way for tackling recurring planning problems, in particular in decision-making on optimal activity locations.

While there was a general agreement on the potential of the instrument, there was still some uncertainty about its use in current practice. Transport planners, for instance, saw accessibility as 'too ambiguous' to be used for evaluating plans, while land use planners found it 'difficult to be measured'.

GraBAM proved to have good usability, but low real-time capability. In order for it to integrate a LUTI model and carry out a simulation of one or more land use–transport scenarios, it has to complete an update of the databases, run the model, and present the results in thematic maps. These operations cannot

be performed in real-time, which is an important limitation in these kinds of workshop settings. To improve the usability of the tool it would be necessary to increase its real-time interactivity. This could be done by developing a user interface for viewing, interacting and playing with the tool in real time.

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