The LUISA-RHOMOLO combination for the evaluation of territorial impact of European policies.

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Extended abstract

Recognition of the importance of the territorial dimension is at the core of the EU structural policies and has been since its inception. Growth and job creation depend on the capacity to make best use of all territorial assets and to build links with other territories to ensure that common assets are used in a coordinated and sustainable way.

The financial crisis has changed overarching territorial development trajectories and only now are we gathering data showing that the impact of policy and investments can vary if analysed at national or sub-national level. For example, the analysis of the national, regional and urban dimensions of Europe 2020 shows that the performance within a single Member State can vary widely. These differences show huge performance gaps within single Member States and suggest that some policies should be adapted to the specific situation of a region or a city via a place-based policy development and investments. Today policies need to include a larger territorial perspective as investment and growth often depend on opportunities in territories.

Increasing the levels of cohesion of the European territories presents several challenges because of the intrinsically dual-sided nature of the policies which might have direct or indirect impacts on the territory. From one side, the EU policies and programmes (e.g. TEN-T, CAP, ERDF/CF, EFSI etc.) respond to wider European frameworks where the broader continental dimension is considered. From the other side, national and sub-national policies set local strategies, priorities and plans and are often the ultimate implementers of EU programmes.

Whether or not European and local perspectives coincide, it is very much needed, and at the same time difficult, to correlate causes with observed territorial effects. Whilst EU Cohesion policy is designed to mitigate these differences and ensure that poorer regions have means to address regional challenges, investments decision may trigger asymmetric and unexpected territorial impact. Therefore, the need to measure the impact over time of the second largest EU budget investments in Member States and regions is more and more demanded by policy makers at EU, national and sub-national levels.

A number of sources provide information (quantitative and qualitative) on the effect of the Cohesion policy investments. These sources give an indication of how effectively these investments have addressed differences and imbalances, and whether they have strengthened the capacity of national and regional economies for sustainable development and long-term economic, social and territorial cohesion. Data at regional and urban level, if properly structured and analysed, can give valuable information to assess the local impact of Cohesion policy investments. This is the reason the

European Commission (specifically DG REGIO and DG JRC) has developed a number of models able to capture the effect of the investments in the regional GDP, employment, productivity plus also to measure the indirect effects on the economy of thematic and sectoral investments.

This territorial modelling capacity is a compendium of different "specialised" models that can be used individually in order to respond to specific policy questions, and can also dynamically interact with each other.

This interaction of models is facilitated through LUISA Territorial Modelling Platform.

LUISA is based upon the endogenous dynamic allocation of population, services and activities and can be employed both as a stand-alone model and as an integrative platform of inter-linked data, processes and models that allows analysis of the evolution of European territories (macro-regions, countries, regions or urban areas) triggered by investments at national, regional or urban level. This analysis is based on a number of indicators that can be projected in time (period 2010-2050).

The LUISA platform is equipped to integrate the inputs provided by other models combining them with spatial information on e.g. provision and access to services (e.g. public structures, ecosystems, recreational and cultural sites, etc.), availability of infrastructures for housing, transport, energy, etc. By using the LUISA platform it is therefore possible to monitor investments in different areas of interest. Moreover, the LUISA platform permits the monitoring of environmental indicators (e.g. pollution levels and mitigation measures) and the status of natural capital.

Economy is integrated in LUISA by using the sectoral gross value added (GVA) from any macro-economic model. The GVA is used to derive demand for industrial, commercial and services land uses, which is then spatially allocated using the allocation model of LUISA.

In the baseline configuration, LUISA is typically driven by the computable general equilibrium (CGE) macro-economic model (typically the 'GEM-E3' General Equilibrium Model for Energy-Economy-Environment model) and which provides annual GVA growth rates with national and sectoral detail. The growth rates are used to project GVA from the base year (e.g. 2015) and generate a trajectory of future GVA that describes the Reference scenario (baseline). Alterations to the baseline (or reference) scenario are created by introducing shocks (e.g. investments) in the modelling framework.

For scenario related to investments from E cohesion policies, this is by modifying the baseline GVA growth according to results from the RHOMOLO model.

RHOMOLO (Regional holistic model) is a computer-based economic regional economic model which simulates how the Cohesion Policy (and any other public policy) investments can boost the growth of EU regions' economy. It describes the impact of investment at the regional and Member State levels based on an analysis of decisions made at the level of households, companies and governments.

RHOMOLO deals and provides solutions for all the European NUTS2 regions. It takes into account factors of production like labour, capital and commodities. It includes a government sector, which collects taxes and pays subsidies, as well as households and firms. RHOMOLO dynamically links time periods through savings and investments and models inter-regional trade (exports and imports), thus allowing to analyse spill over effects between regions.

Typical outputs of RHOMOLO include Gross Domestic Product (GDP), Gross Value Added (GVA) per sector and employment and unemployment rates.

RHOMOLO interacts with LUISA to provides output indicators disaggregated at the regional level, e.g. income, GDP, employment/unemployment, investment, trade, migration, etc.. All socio-economic indicators are provided for specific industrial sectors, regions, and time periods.

Due to its regional and sectoral details, RHOMOLO's simulations are used by LUISA in order to estimate demand for resources (typically land, energy and others) from industrial, commercial and service (ICS) activities.

The RHOMOLO-LUISA workflow can be generally described as below:

1. Annual growth rates from an economic projection (e.g. GEM-E3) are used to generate a baseline scenario estimate of the GVA (2009 onwards);

2. RHOMOLO outputs consist of two separate results: a baseline (no policy is applied), and simulation (the policy is applied);

3. A 'policy effect' parameter is obtained by calculating the ratio between the baseline and the policy outputs, and it can be interpreted as the effect of Cohesion policy in regional economy;

4. The 'policy effect' parameter is used to modify the GEM-E3 baseline and obtain a policy scenario estimate of the GVA (region and sector specific);

5. The GVA per sector is 'translated' into demand for additional industrial, commercial and services land, by means of an 'intensity approach';

6. An interval of minimum and maximum land demand is generated per region, based on variance of observed past trends;

7. Land demand for new ICS land use is allocated using the discrete allocation module of the LUISA. The allocation is resolved regionally, and it is determined essentially by the overall suitability for ICS areas and competition between land uses.

In a more complex and complete configuration, RHOMOLO can in turn receive input from LUISA to facilitate the disaggregation of energy supply, demand and inter-regional energy trade in RHOMOLO.

As matter of example, the table below shows parameters derived from LUISA

Parameters from LUISA	**Use in RHOMOLO**
Mines, oil wells refineries and natural gas deposits Electricity generation by fuel type Electricity transmission Use, production and installed capacity of power plants Electrical network Electricity generation from renewable sources ✓ Current distribution ✓ Suitability maps	• Separation of sectors from the "Manufacturing and Construction" composite sector • Disaggregation of energy supply, demand and inter-regional energy trade • Representation of different substitution possibilities among fuels, between energy and non-energy resources in production and final demand • Evaluation of energy saving • Emission abatement : • e.g. CO2 as a function of activity levels, fossil fuel combustion (oil-coal-gas substitution), fuel-electricity substitution, etc.

Similar interaction can be achieved in other sectors, such as agriculture, transport and residential services.