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Logical chains in territorial impact assessment

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ABSTRACT

In a way similar to the established impact assessment system (e.g. EIA, SEA), territorial impact assessment (TIA) explores the causal links between proposed actions and impacts. TIA constitutes a case of special interest in impact assessment as it operates at an uncommonly high tier of proposed action – e.g. EU directives – with a wide reach of potential outcomes, at various scales. Recent TIA developments have been using a causality analysis technique known as 'logical chains', and it is precisely here that a recent experimental application of TIA encountered shortcomings capable of compromising TIA itself. The article reports on these shortcomings, conceptual and practical resolutions, as well as case-study feedback from stakeholders.

1. Introduction

European directives are high-level action documents with an obligation to maintain an appropriate abstraction, so that they can be handed down to all EU member states and be adapted to national legislation. Often dealing with pressing and significant problems, the timeliness of the directives is key to their effectiveness, and the long procedure of their preparation cannot be further extended without significant reasons. One such reason, for instance, could be to add a special verification to the preparation process of EU directives due to their significant unintended effects 'on the ground', literally, and this points towards the territorial impacts of the EU directives.[1]

As the concept is still in active development, it is hard to come across a mature and converging definition of territorial impacts. A brief selection includes the following insights:

> 'spatial impacts of sector policies (horizontally) as well as across different levels of governance in the EU (vertically)' – Evers (2011, p. 2).

> 'the potential effect[s] of a given exposure (in the future) — caused e.g. by a certain policy – in relation to the sensitivity of a certain region. Thus, the impact is a function of combining the exposure of a policy with the sensitivity of a region. Basically the potential impact can be direct or indirect with a long cause-and-effect chain' — ESPON ARTS (2012, p. 7).

> '(a) direct and intentional impact[s] of EU directives, (b) indirect and mainly unintentional or unexpected impact[s] of the directives, (c) 'filtered impacts', or the response and adaptation capability of the regional context' — ESPON ARTS (2012, p. 8).

Territorial impacts can be technically assigned as the responsibility of territorial impact assessment (TIA), which constitutes a special case in impact assessment: (a) it operates at an uncommonly high tier of proposed action – e.g. EU directives – and (b) has a wide reach of potential outcomes, at various scales. In a way similar to the established impact assessment system (e.g. EIA, SEA), TIA explores the causal links between proposed actions and impacts, and it does so through a technique known as 'logical chains'. In resemblance to other impact assessment processes, TIA is founded on causal relations, and its good practice requires proper causal explanations (Perdicoúlis and Glasson, 2009, 2012) — only in this case, also with regards to space.

It is precisely in the logical chains technique that a recent experimental application of TIA encountered shortcomings deemed capable of compromising TIA itself. Hence, in this article we take a critical view on logical chains in the setting of TIA, substantiated through contact with a number of stakeholders and planners within the scope of EATIA — an ESPON[2] project about the territorial impacts of the EU

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[1] While this concern is expressed at the EU level, TIA also has relevance for the national and regional administrations.

[2] The European Observation Network, Territorial Development and Cohesion (ESPON), co-financed by the European Regional Development Fund, is intended to support EU policy development with regard to territorial cohesion.

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directives (Fischer et al., 2011a,b). Namely, we report on shortcomings of logical chains used in TIA, some conceptual and practical resolutions adopted in EATIA, as well as feedback from case-study applications.

2. TIA and logical chains

2.1. The TEQUILA and ARTS approaches to TIA

The TEQUILA model is central to the ESPON line of TIA projects and uses multi-criteria analysis (Evers (2011, p. 12)) to 'measure' policy impacts in space. Namely, TEQUILA considers territorial impacts as the product of potential impacts and sensitivity indicators (Evers, 2011, p. 9).

TEQUILA could potentially serve for the 'spatialisation' of information, but its model for calculating spatial impacts – i.e. a set of mathematical formulas – does not relate formally with the information from causal analysis, known as, and often referred to, in the context of TIA, as logical chains. The link between the spatial and the causal models is essential, but yet to be demonstrated.

On the other hand, the ESPON ARTS (2012) project produced a more promising implementation of TIA, featuring a simpler protocol than TEQUILA. This simplification of ARTS extends to the application of the key technique that lies at the heart of the methodology: the logical chains.

2.2. EATIA as the latest attempt

Steering away from the centralised approach of ARTS, the EATIA project featured the active guidance of stakeholders, selected from the respective national and regional governments of three EU member states (Fischer et al., 2011a,b, 2015). The project stakeholders insisted that TIA followed a procedure and methodology close to those of established impact assessment frameworks such as environmental impact assessment (EIA) and strategic environmental assessment (SEA). As a result, the design and implementation of TIA inherited techniques for screening, scoping, forecasting, and evaluation from the general impact assessment pool, as well as from the previous the ESPON TIA projects ARTS and TEQUILA.

The logical chains technique was found to be applicable to various tasks of the impact assessment process, and was proposed for use in EATIA from the beginning of the project. However, the simplified implementation of the technique inherited from ARTS, was found to be introducing some communicational uncertainty, so a revision of the technique was decided in EATIA. After internal discussions and development, as well as testing in workshops with stakeholders, logical chains were used in a different configuration than originally considered (v. Section 3.6). This article presents the experience with logical chains from the Portuguese development and experimental application of TIA, aiming for as low uncertainty as possible.

3. Analysis and arrangement of logical chains

3.1. Space, impacts, and the reduction of complexity

Continuing the tradition of impact assessment, territorial impacts (or effects) can be considered as special consequences or changes in relation to space. Hence, the concept of impact is extended by the explicit consideration of space – for instance, in the common concept of land use – to which people could be added as the authors of action and/or receptors of impacts. More complexity could be added with physical processes such as the water cycle or geological transformations, and more realism could be added via infrastructures and activities of special interest (e.g. economic sectors).

The progressive addition of complexity helps identify some structure in space, beyond the typical land use patterns, which may come as evidence that the space 'functions' through the relation of its elements — e.g., which may complement, compete with, or depend on each other. On the other hand, the addition of complexity may provoke a loss of focus or comprehension about the structure and function of space, which is not desirable. One way to avoid this can be through scoping of what is relevant to the planning problem and what could be excluded, as typically practised in impact assessment (Glasson et al., 2005; Thérivel and Partidário, 1996), or through an 'engineering' or technical approach based on the explicit representation (i.e. diagramming) of mental models regarding the structure and function of the systems of interest, as practised in Systems Thinking (Senge, 2006), System Dynamics (Forrester, 2007; Sterman, 2000), Systems Planning (Perdicoúlis, 2010), and other related methodologies (Checkland, 2000).

3.2. The causality premise in impact assessment

Impact assessment in general – including the spatial aspect that is central to TIA – observes a *causality premise* (Perdicoúlis and Glasson, 2009), which gives prominence to the (causal) relationships between action and impacts: i.e. in which way the impacts are caused by the action, or other intermediate impacts. The scope of the causal relationships may include complex dynamics such as impact interactions, cumulative impacts, as well as indirect impacts (Perdicoúlis and Piper, 2008; Perdicoúlis et al., 2007).

Observance of the causality premise brings desirable advantages to impact assessment, such as improvements in the impact statement, cost containment, verification of the integrity and coherence of the arguments in the impact statement, as well as efficiency in the mitigation measures. In addition, the readers – both statutory reviewers and the general public – are likely to comprehend the arguments made in the impact statement, easily and with confidence.

Causal diagramming such as logical chains addresses the causality premise in very clear, explicit, and transparent terms — perhaps more so than text or impact matrices. Nonetheless, the use of causal-diagram techniques in production environments (e.g. impact assessment consultancy) appears to be more of a preference than a technical challenge, and currently does not appear to be very popular (Perdicoúlis and Glasson, 2009). One of those rare occasions where the causality premise of impact assessment is honoured through explicit causal diagrams is precisely TIA, through the use of causal chains.

3.3. Logical chains in impact assessment

Logical (or causal) chains are generally used to register and communicate *mental models* with causality considerations — that is, both the 'undoubted' knowledge as well as any assumptions. Logical chains are often chosen for their advantages such as making ideas more visible – e.g. communicable, editable, verifiable, and open to judgement – as well as facilitating reasoning, argumentation, verification, and debate. Known drawbacks of logical chains include time consumption, specialised software, complexity of diagrams (Thérivel and Wood, 2005), special requirements to represent time and space (Perdicoúlis and Glasson, 2006; Perdicoúlis and Piper, 2008), a steep learning curve, and inappropriate simplification (Niemeijer and de Groot, 2008).

The main characteristics of the causal chains implemented in ARTS can be abstracted as in Fig. 1 to highlight some issues of uncertainty in practice — for instance: What semantic class of information is in the 'mixed text'? What does the bi- directional arrow mean? What exactly in the 'mixed text' produces 'effect B'? Which one of actions 1 and 2 is more responsible for 'effect A'? Why not separate the two actions? Are

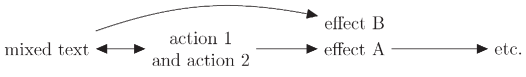

Fig. 1. The causal chains used in the ARTS project introduce significant uncertainty.