The need for setting optimal geographical and temporal boundaries for infrastructure project design and EIA, and how science and technology can help

Venables R.K.

Director and Principal Consultant, Venables Consultancy

e-mail: roger@venablesconsultancy.co.uk

Abstract

All infrastructure projects generate significant effects on the environment and their surrounding communities, but to varying degrees depending on their nature, scale and context. The environmental impact assessment process, despite its title, attempts to assess the social effects of projects alongside environmental impacts.

However, EIAs are often undertaken after the overall scope of the project has been settled. Strategic environmental assessment (SEA), on the other hand, is a framework for ensuring that environmental and sustainability impacts are integrated into high-level government policy, planning and programme making, and provides a systematic process that is aimed at bringing up-to-date scientific methods to environmental assessments.

Major infrastructure projects lie somewhere in between, because they often have impacts at a wide range of scales, and often visit their benefits and adverse impacts *un*equally to different communities and other stakeholder groups.

This paper examines the challenge of optimising geographical and temporal boundaries for the overall framing of infrastructure projects with the objective of minimising the significant adverse impacts and the number of people affected, and maximising the benefits to the greatest number of people. It concludes with comment on how science & technology might help support this process.

Keywords: Infrastructure; Planning; EIA; SEA; Societal Impacts

1. Introduction

From the issues outlined in the Abstract (not repeated here to maximise the use of these two pages), the question arises: *How do we improve the project scoping process with the objective of, over an appropriate timescale, minimising the significant adverse impacts and the number of people affected, and maximising the benefits and provide them to the greatest number of people*?

I believe the answer lies in the hands and minds of clients – both private and governmental – and with their planners and designers. It lies in the way that they define the problem they are tackling or the opportunity they are seeking to exploit, and how they then develop and agree the scope and wider social purpose of their project.

2. Setting geographical and temporal boundaries in the right place

A particular issue in such a process for the overall framing of infrastructure projects and their impacts and benefits is the setting of geographical and temporal boundaries in which assessments of project impacts, benefits and effectiveness are made. This is especially important because as one changes where one sets those boundaries, the fundamental questions one should ask about the benefits, adverse impacts and viability of a project may change, and may give rise to alternative approaches to the challenges being addressed.

In addition, a connected challenge is that major projects in one sector – highways, railways, flood risk reduction projects, for example – are routinely dealt with individually, without sufficient thought given to the potential for combinations of projects being viable if done together or in a coordinated way over a longer timeframe, but non-viable if considered separately. Multi-client studies at the outset of how synergies across different sectors have the potential to significantly increase societal benefits and decrease adverse impacts.

Are these alternative ways of framing projects easy to do? No. Might it make project formulation and funding mechanisms more complicated, or even complex? Perhaps. But would they increase wider social benefits, reduce the extent of adverse impacts and the number of people adversely affected, and increase the sustainability credentials of projects? I believe so.

The challenges are being addressed by such bodies as the UK's National Infrastructure Commission. But it is early days and the following examples will, I hope, serve to demonstrate the change in thinking that consideration of projects inside different decision boundaries promotes.

To illustrate the potential, I set down below a couple of generic examples based on UK experience where I believe the project framing has been sub-optimal. They are presented in a generic way because the issues and opportunities they present can, I believe, be applied not only in the UK but also anywhere where major infrsatructure projects are needed, wanted, being challenged or need wider support.

2.1. New runway capacity scenario

A densely populated region already has two major airports and three smaller ones, where the two major airports are both promoting the 'need' for more runway capacity. They have identified that 'need' from a range of drivers: rapidly rising air travel volumes; increased utilisation of runays to near full capacity; increased number and length of delays when operating conditions become sub-optimal, through bad weather, plane or system failures, or other issues.

The conventional wisdom says "we need more runway capacity" but sometimes it seems that the scope – a new runway – is decided first and the selected 'evidence' chosen to support that scope. If one draws the decision boundary tightly around the airport, it may be clear and even obvious that the project is commercially beneficial to the airport operator over a chosen design life, but the impacts and benefits to the local communities or region, and how they will change over time, may be obscure.

If one draws the decision boundary around the region, the question of justifying the apparent need remains but the main question changes from 'Should we build a new runway at Airport X?', to 'Which is the best airport at which to add the extra capacity?'.

If one draws the decision boundary around the nation state, the question of justifying the apparent need may also remain but not only is the 'Where's the best place question' opened up to more possible sites, but it may also prompt the question 'Is building this new airport capacity for €XXX billion the best way to invest that €XXX billion to improve overall transport infrastructure in the nation, especially in the light of predicted climate change effects?'.

Alongside the challenges posed by setting the decision boundary, the root cause of the apparent 'need' for more capacity may be obscured. In one case I know, the reason identified for new runway capacity was the 'hub airport problem': to enable more small planes to bring people to the hub to fill long-haul routes that could not be filled with regional pasengers alone. But seemingly little effort was expended in considering the potential for new railways combined with through-ticketing and through-handling of baggage to bring those extra passengers in by rail. a solution that would have had much wider benefits to society over time than more short haul aircraft journeys.

2.2. A new high-speed railway network scenario

Despite my comments about rail being under-considered as a means to bring short-haul passengers to hub airports, new high-speed rail (at 300kph or even higher speeds) is being widely promoted at continental scales, not just national. But they can also be very unpopular in the communities between the widely-spaced new stations, who say they are having almost all of the adverse impacts visited on them for no gain. This is especially true when there is wide debate about – but no initial clarity on – whether the main motivation for the new network is increased capacity or increase speed, or a combination.

Drawing a decision boundary around the nation in which the network is to be placed seems to me to increase the desirability of a four-track, two-line-speed solution, with additional intermediate stations on the lower-speed lines and a lower top speed of, say, 225kph. The result? Benefits to outweigh the adverse impacts for the intermediate communities, much greater levels of new capacity as an asset for the nation, lower noise levels from and only modest reductions in journey times for the trains on the higher-speed tracks. And on costs, I have been told about a study that concluded that the track costs might also be similar because of the reduced loads arising from the reduced top speed.

What's important here is that such considerations can be treated as a nuisance or delaying tactic that 'get in the way' of delivering the original high-speed railway idea, rather than being welcomed as an approach that could unlock substantial additional societal benefit whilst also reducing opposition from communities along the route.

2.3. Other factors

Alongside this challenge of setting the decision boundary in the most appropriate place and time is the fragmented nature of the client base in many countries, coupled with planning systems that do not place responsibilities on those private owners to collaborate for the greatest benefits to the largest number of people. This is not a plea for all infrastructure to be owned by governments but for a commercial and regulatory regime that recognises that almost all major infrastructure is built to serve wider society, not just the narrow interests of the promoters, owners, designers and contractors who create it.

3. Potential contribution of science and technology

It seems to me that to effect the alternative approaches suggested here needs clients, national agencies and governments to be more innovative, more open-minded, and more prepared to work outside their normal mechanisms. But in doing so, they are likley to need or be able to exploit a wide range of science-based assessment techniques and techologies, including but not limited to:

- better environmental data on the impacts of infrstructure assets on the environment, and of the environment on those assets;
- social science studies of attitudes to the role of infrastructure in the lives of individuals and communities, and how their benefits and impacts are perceived;
- enhanced optioneering techniques and supporting technologies, for example, increased capability and sophistication in survey techniques, and simulation software for modelling, visualisation and evaluation of alternative project designs, all to enable project teams to explore options or show potential funders, neighbours and users an asset's likely performance.

Selected Bibliography of related websites

UK National Infrastructure Commission, www.nic.org.uk/

Sustainability Assessment & Rating Systems for Infrastructure

- CEEQUAL in the UK, www.ceequal.com
- Envision in the USA, https://sustainableinfrastructure.org/
- Infrastructure Sustainability, Australia, www.isca.org.au

United Nations Office for Project Services, Infrastructure Services at www.unops.org/expertise/infrastructure