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Research priorities in appraisal methodology

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ABSTRACT:

Appraisal in the transport sector has a history extending back around 60 years, in terms of application at scale, with antecedents going back to at least the French economist and engineer, Jules Dupuit, a century or so earlier. The magnitude of most countries' transport spending, both public and private, together with the pervasive influence of transport on life opportunities and scale of transport external benefits and costs, provides continuing impetus to the development of the art and science of transport appraisal. Appraisal is typically (not always) government driven. Accordingly, development and refinement of appraisal methodologies is commonly spurred by government expectations about the justification required to support allocation of scarce public funds. This is particularly so in jurisdictions where the national government controls most of the purse strings and distributes largesse to lower levels of government (often a reflection of vertical fiscal imbalance) and/or to other stakeholders (e.g. businesses). The US, UK, Sweden, the Netherlands and Australia, for example, all have long histories in this area, particularly associated with expectations around appraisals to support federal/national government own-project requirements and also around requirements required to support funding flows from the national/federal government for initiatives sponsored by lower levels of government or other stakeholders. In turn, governmental appraisal requirements are often supported by production of appraisal guidelines, which describe government expectations and ways of meeting those expectations. The UK Treasury Greenbook (HM Treasury 2018a) and associated transport webtag materials is a well-respected example. The existence of guidelines, in turn, has helped to stimulate the extensive back-end research evidence base needed by quality appraisal methodologies and to support the practical front-end applications of those methodologies that give credence to the value of both the guidelines and of appraisal as a process.

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1. Context

Appraisal in the transport sector has a history extending back around 60 years, in terms of application at scale, with antecedents going back to at least the French economist and engineer, Jules Dupuit, a century or so earlier. The magnitude of most countries' transport spending, both public and private, together with the pervasive influence of transport on life opportunities and scale of transport external benefits and costs, provides continuing impetus to the development of the art and science of transport appraisal.

Appraisal is typically (not always) government driven. Accordingly, development and refinement of appraisal methodologies is commonly spurred by government expectations about the justification required to support allocation of scarce public funds. This is particularly so in jurisdictions where the national government controls most of the purse strings and distributes largesse to lower levels of government (often a reflection of vertical fiscal imbalance) and/or to other stakeholders (e.g. businesses). The US, UK, Sweden, the Netherlands and Australia, for example, all have long histories in this area, particularly associated with expectations around appraisals to support federal/national government own-project requirements and also around requirements required to support funding flows from the national/federal government for initiatives sponsored by lower levels of government or other stakeholders.

In turn, governmental appraisal requirements are often supported by production of appraisal guidelines, which describe government expectations and ways of meeting those expectations. The UK Treasury Greenbook (HM Treasury 2018a) and associated transport webtag materials[1] is a well-respected example. The existence of guidelines, in turn, has helped to stimulate the extensive back-end research evidence base needed by quality appraisal methodologies and to support the practical front-end applications of those methodologies that give credence to the value of both the guidelines and of appraisal as a process.

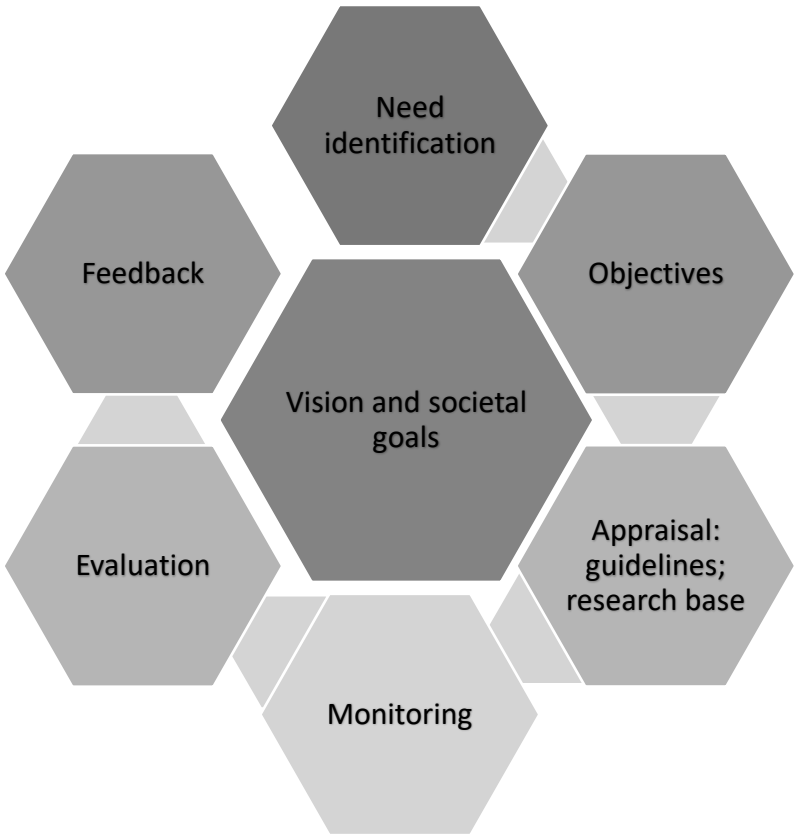
This *appraisal ecosystem* forms an integral part of the wider governmental policy development and implementation process (Figure 1). The strategic *goal setting* and *need identification* stages in this cycle are critical but are typically underweight in terms of the focus they receive, as compared to the fine detail of the appraisal stage. This runs the risk of relatively too much effort being spent on *doing things right* (the interface between operations and tactical) rather than on *doing the right thing (the interface between strategic and tactical)*. The goal setting/need identification stages of the cycle are the key focus of this chapter, in terms of shaping expectations of appraisal more around doing the right things.

Given its usual context as part of a policy cycle, appraisal is influenced by an evolving mix of societal values, political priorities, theoretical foundations and practical applications, with significant research opportunities present in all these areas. 60 or so years ago transport appraisals were most common for road projects, where the scope of included benefits and costs was narrow and research priorities focused on exploring a few benefit/cost items in some depth, particularly travel time savings and the way road maintenance costs varied with (for example) pavement type, road condition, weather conditions, traffic volume and mix. External costs were not the issue then that they are today, although congestion and congestion pricing has been of research/appraisal interest for around 50 years. As understanding of the linkages between transport and other elements of wellbeing has broadened, and transport external benefits and costs become more important community concerns, so the scope of appraisal has been extended and the supportive research base on which it draws has widened. Thus, a range of environmental outcomes, wider economic benefits

[1] https://www.gov.uk/guidance/transport-analysis-guidance-webtag

and, to a lesser extent, recognition of the role transport can play in promoting social inclusion have become more important priorities for policy, appraisal and related research. However, this broadening of interest has often been more about adding to the appraisal toolkit rather than using the knowledge so gained to help generate better ideas from the front-end of the policy cycle: more about better impact assessment than better needs identification. This capacity to absorb a growing range of outcomes of value to society and decision-makers has been important for the continuing relevance of appraisal and will remain critical for on-going relevance. The chapter argues that this, in turn, is dependent on successful development and implementation of need identification within integrated policy and planning frameworks, of which appraisal is a core part.

Figure 1: The policy cycle



Source: Adapted from Stopher and Stanley (2014).

An illustration of the broader perspective that is increasingly common in transport is provided by the new Scottish National Transport Strategy (Transport Scotland 2020), which was based on an extensive collaboration process. The strategy's vision is as follows (Transport Scotland 2020, p. 5):

> *We will have a sustainable, inclusive, safe and accessible transport system, helping deliver a healthier, fairer and more prosperous Scotland for communities, businesses and visitors*.

Elaborating on this vision, in terms of what are essentially societal sustainability goals, key intended outcomes are about

- reducing inequality
- taking climate action

- helping deliver inclusive economic growth and
- improving health and wellbeing.[2]

The goals of the Scottish Strategy are typical of those set out in integrated urban land use transport plans (Stanley, Stanley and Hansen 2017). This should be no surprise, given that the demand for transport is mainly a derived demand, valued for what it enables rather than for itself. As leading land use transport planning expert Professor Rob Cervero has reminded us, major transport projects have such large city-shaping potential that you need to first be clear about the kind of city (or region) you want and then plan your transport networks to help achieve that city (or region) (Cervero 2014).

In terms of relative priorities, the Scottish Strategy suggests that all outcome areas are equally important, as is common of strategic plans. However, it emphasizes that action in the transport arena to reduce climate change and reduce inequality has climbed the priority ladder (Transport Scotland 2020). A key role that good appraisal can play is to inform the decision-making process about the best ways to contribute to achievement of identified high-level goals and to illuminate associated trade-offs that will need to be confronted along the pathway to achievement.

Much of the focus of this book has been on detailed examination of elements of an appraisal toolkit, such as measurement of the value of time, and on different appraisal techniques. There are important research priorities for appraisal in all such areas and individual chapters have highlighted some relevant examples. In contrast, the research priorities that are expressed in the current chapter unapologetically reflect a personal bias towards achieving closer alignment, within integrated strategic policy and planning frameworks, between societal goal setting/need identification and supportive transport appraisal methodologies. This then requires a solid evidence-based understanding of connections between transport and such societal outcomes, which helps to shape appraisal methodologies. In taking this approach, the chapter also seeks to retain a focus on the value basis of appraisal techniques, a research area that is typically neglected but is important in terms of shaping the why and how of appraisal.

The chapter illustrates research priorities throughout the policy cycle that are important for appraisal methodology development. It is encouraging, in terms of content, to see similar strategic and institutional issues raised by authors such as Worsley and Mackie (2015) and Marsden and Docherty (2019). Urban land transport examples are often used in the chapter to illustrate points being explored, recognizing that this is where over half the world's people spend most of their time, and more so in developed economies.

Section 2 of the chapter explores some of the value judgments that underpin appraisal. Much of the discussion is about individual preferences and the role these should play in appraisal (recognizing that this involves personal value judgments from the author, which are hopefully exposed!). The section includes brief consideration of cost-benefit analysis (CBA) and multi-criteria appraisal techniques. Section 3 contrasts appraisal that is essentially impact assessment with appraisal that is grounded in need identification. Section 4 looks in more detail at appraisal research priorities related to mobility-related social inclusion, wider economic benefits and greenhouse gas emissions, three key societal outcomes. Chapter 5 summarizes the chapter's conclusions.

[2] A detailed implementation plan now needs to accompany that progressive new Strategy, to show how goal achievement will be accomplished.

2. Some issues of preferences

2.1 Judging if society is better off

In market economies, most resource allocation is the outcome of decisions made by large numbers of consumers and producers, based on their needs and preferences. Adam Smith, for example, talked about the efficiency of the 'invisible hand' of the market (Smith 1770). While markets might be efficient ways to allocate resources in large numbers of situations, there are well recognized situations where markets fail. Stopher and Stanley (2014) identify the following sources of market failure: public goods; merit goods; externalities; natural monopoly; limited extent of markets; lack of information; and distributional considerations. In the transport sector, all these issues are relevant, with externalities (e.g. agglomeration economies, congestion, air pollution, greenhouse gas emissions) and distributional considerations (e.g. mobility related social exclusion) perhaps the most common concerns.

Market failures such as these are the main reasons why governments become involved in transport policy, the (usually implicit) presumption being that some form of intervention to rectify identified market failure will deliver better outcomes for society than a failing market. This presumption raises a fundamental, question for research in transport appraisal: How can we know that some course of action will make *society* better off, when it will typically involve

- a range of potential consequences or impacts (benefits/costs)
- on different groups of people and nature (other species)
- over time?

All these areas involve value judgments and practical challenges in measurement. Nash, Pearce and Stanley (1975a, b) argue that thought is required about what value judgments should underpin choice of an appraisal methodology. This is an area where there are ultimately no right answers, albeit that alternative value judgments can be proposed, debated and their underlying moral notions and associated appraisal implications discussed.

Arrow's famous Impossibility Theorem (Arrow 1963) showed that there is no way to add together individual *ranked preferences* to identify one unique social preference ranking that meets five reasonable conditions that a democratic decision rule should possess. However, if measures of *strength of preference* can be used then it might be possible to conclude that situation A is better for society than situation B. Appraisal is essentially about seeking measures of strength of preference, to help identify whether some course of action is likely to make a 'society' better off. As Nash et al. (1975a, b) point out, this requires consideration of matters such as:

- What is to be valued?
- How is it to be valued?
- How are trade-offs to be made between valued items?
- How should different (groups of) people be treated?

The most widely used method of transport project appraisal that seeks to handle such complexities is CBA.[3] CBAs seek to quantify in *money terms* the expected benefits and costs of a course of action (e.g. policy, program or project) under consideration, using *willingness to pay* as its indicator for measurement of a benefit (or *willingness to accept compensation* for a cost). In broad terms, following the Hicks (1939) - Kaldor (1939) test, a course of action is regarded as worthwhile (an

[3] Cost effectiveness analysis is also common, where the focus is essentially on appraising alternative ways of achieving a given outcome. CBA involves multiple valued outcomes.

improvement for society as a whole) provided that its benefits, to whomsoever they accrue, exceed its costs. Nash, Pearce and Stanley (1975a, p. 122) point out that this approach contains two implicit value judgements:

1. The decision criterion shall reflect individuals' preferences.
2. These preferences shall be weighted by market power.

In terms of the key societal outcomes that are increasingly being sought from transport, these value judgments raise many challenges, some of which are illustrated below.

Equity

As indicated by the second value judgment, the standard CBA decision rule includes both *efficiency* and *equity* elements. This cannot be avoided, since use of market prices implicitly accepts the existing distribution of income and wealth, from which those prices derive, as being of normative significance for societal resource allocation questions.

For analysts/stakeholders/decision-makers concerned about the market power implications of the existing distribution of income and wealth, benefit/cost weighting techniques have been developed to support different ways of aggregating monetary measures of benefits and costs across different income groups. This is important since, after all, it is the expected value (or utility) arising from a course of action that is ultimately being assessed, to form a view on whether or not society will be better off, rather than money per se. Money is simply a measuring rod with which to estimate expected value of utility gains and it is widely acknowledged that a dollar is not of equal value to all. The UK Treasury Greenbook outlines the logic behind distributional weights based on expected diminishing marginal utility of income as income levels increase (HM Treasury 2018a). Sources of disadvantage or social inequity other than income are also often important and need consideration in appraisal.

Further developing appraisal techniques that reflect both efficiency and equity perspectives is important, extending progress that has been made with income-based equity weighting. A starting point is disaggregated assessment of benefits and costs by stakeholder groups, particularly for large projects, which is discussed further in Section 2.3. The issue of equity/disadvantage is further explored in sections 2.3, 3 and 4.2 below.

The Environment

An important point about the first value judgment (individual preferences) is that it is anthropocentric: it says that things only have value when they are valued by individuals (people), which brings in questions like the rights of species other than our own. Biodiversity loss and species extinction is happening at an increasing rate, compounded by climate change, notwithstanding the establishment of international conventions and national/state legislative and policy frameworks intended to protect the natural world (e.g. Biodiversity Protection legislation and associated lists of rare and threatened species). For example, the current extinction rate is up to 1000 times faster than the natural or background loss rate, and increasing, with threshold levels for survival little understood (Berger 2004). As well as loss of species, the abundance of species is down by 60% since 1970 (World Economic Forum 2019). Due to climate change alone, about one third of species will be lost by mid-century, if extinctions continue at the same pace (IPCC 2007). To put these numbers in some context, very little is known about an estimated 8.7 million species (Sweetlove 2011). The risk is that species are being lost before they are even really known! These outcomes should be a wake-up call for the strategic phase of the policy cycle and the way appraisal takes place in that cycle.

How to handle this matter in CBA has been an area of discussion for decades. Pearce and Turner (1990) point out that environmental literature identifies three types of value relationships underlying the policy and ethics adopted in society:

- values expressed through individual preferences - what the individual preferences value judgment in CBA is concerned with
- public preference value which finds expression via social norms – e.g. which underlie matters such as public provision of health care and education (what economists call merit goods)
- functional physical ecosystem value – where the intrinsic, non-preference related, value of ecosystems is recognized.

The distinction between the three is not necessarily clear-cut, since people may include intrinsic values within their individual preferences, sometimes known as *existence values*. To illustrate this in an Australian context, when asked, people oppose extinction (Garnett 2012): 75% of surveyed people said they would become upset if a bird became extinct (only 7% disagreed) and 74% said there was a moral obligation to protect threatened birds (5% disagreed).

Environmental economists like Pearce and Turner (1990) use the idea of protecting the stock of natural capital as one way of approaching biodiversity loss, which focuses on the third type of values, through ecosystem protection. This, in effect, imposes an environmental system constraint against which CBA takes place. Implementation requires tightening of relevant international and national/state legislative and regulatory frameworks, and allied compliance and enforcement measures, to deliver more effective biodiversity conservation (protecting natural capital). Sectoral strategic planning processes then need to ensure that a multiplicity of individual project appraisals do not push the sector in the wrong direction. Sections 2.2 and 4.3 include further consideration of possible environmental constraints and appraisal.

Implications

Questions of preferences related to equity and the environment, as illustrated, are core challenges for appraisal. How do you ensure that your appraisal tool is not (unintentionally) reinforcing social disadvantage and/or compounding biodiversity loss? The author proposes that strategic solutions are required at the goal setting/need identification stages in the policy cycle to deal with such high-level concerns, rather than dealing with them as incidental outcomes of initiatives that have their origins in some other purpose.

2.2 Which preferences?

Saying that the appraisal tool to assess initiative desirability should generally reflect individual preferences poses many questions for analysts, decision-makers and those interested in the appraisal process and/or its findings (Nash et al. 1975a,b), some examples of which follow

Whose preferences should count – in line with the individual preferences value judgment, prima facie the preferences of anyone whose wellbeing is affected by, or has an interest in, a project/initiative that is to be the subject of appraisal should be included within the scope of the appraisal, even if that effect is indirect (e.g. people concerned about possible species loss associated with a transport construction project). A difficult question is how appraisal should deal with preferences of future generations? Building on the argument in Section 2.1, the view of Pearce et al. (1989) is that future generations interests should be protected by ensuring that they have access to a stock of natural capital no less than the current stock and have the opportunity to make decisions about the use of that stock to enhance their welfare in their own time.

Are there any groups whose preferences should not be included, for moral reasons – which need to be spelt out? For example, children's preferences are rarely included within appraisals. Why not? The Scottish National Transport Strategy (Transport Scotland 2020), for example, is notable for its emphasis on tackling child poverty, through appropriate transport initiatives. How should children be involved in need identification and assessment of alternatives? Stanley et al. (2017), for example, include a chapter on what makes a good city for children.

When should individual preferences not count – some people argue that a lack of knowledge about the potential benefits/costs of a course of action justifies ignoring the preferences of the 'uninformed'. In other words, leave it to the experts and/or those who understand these things! The present author's view is that it is better to provide people with good information and then let them express a preference. However, as noted in Section 2.1, there may be some issues, such as existential issues relating to biodiversity loss/climate change, that warrant governmental policy or legislation being used to set thresholds, which effectively form binding target conditions that constrain potential courses of action in sectors such as transport, over-riding the individual preferences that have led to the crisis. Identification of such matters should be argued by the government(s) in question, especially given the low and declining levels of trust in many governments (Edelman 2020), and thresholds set in a context of stakeholder engagement.

Section 4.3 considers the issue of thresholds in relation of climate change and Section 4.2 includes discussion about mobility-related social exclusion, arguing that this is another outcome area where over-riding individual preferences is defensible, essentially on merit goods (public preference) grounds.

2.3 What about the non-monetary bits – how should preferences be aggregated?

The holy grail for many analysts undertaking appraisal is the production of a single number as an indicator of the merit of a course of action, such as a benefit/cost ratio (or variant, such as Net Present Value). National level appraisals usually tend to focus at this level. Deriving such a measure requires aggregation across different types of impacts (including on nature), different stakeholders and time, where measurement of any impact might be in either money terms, physical impact units, intangible or some combination thereof. Any useful project appraisal methodology needs to be able to span these complexities.

Difficulties of valuing all initiative benefits and costs in monetary terms, so that (for example) they can be added up and traded-off, often leads analysts to use a tool such as some form of Multi-Criteria Analysis (MCA) (Department for Communities and Local Government 2009). This form of analysis extends back to work such as Hill's Goals Achievement Matrix (Hill 1968). MCA essentially uses a rating mechanism of some form to aggregate monetary, physical and intangible impacts into a single measure of project or initiative merit.[4] A resulting challenge, for those who are believers in the individual preferences value judgment, is that rating across the various types of impact is often performed by an expert or group of experts, which is fundamentally at odds with this value judgment. However, groups of affected/interested stakeholders can be asked to rate the

[4] A serious concern with much MCA is that weighting of the relative importance of individual impacts, by type, is often undertaken *before* detailed assessment of potential project impacts have been identified. Nash et al. (1975b) point out that, for resulting assessments to be meaningful in terms of relative option performance, this requires highly restrictive assumptions about the nature of preference trade-offs. Weighting of types of impacts should emerge *during* an appraisal process, rather than be an input to that process.

consequences of initiatives across monetary, physical and intangible effects, to form a view of overall initiative value from their perspectives, as they can in an extended CBA.

If a single measure of initiative/project merit is being sought through an appraisal, some key issues for the present author are: (1) the extent to which the resulting appraisal reflects preferences of affected/interested stakeholders for particular impacts, expressed in a setting of knowledge and understanding, rather than reflecting opinions/values of 'experts' – where informed individual preferences is preferred by the author; (2) whether weighting of different valued outcome areas is evolved during the appraisal by affected/interested stakeholders, or imposed on it as an input (e.g. from experts) – development by stakeholders during the appraisal is preferred; and (3) how resulting stakeholder assessments are combined to form an overall view of initiative merit. The ultimate decision-maker(s) will eventually specify the relative weights for different valued outcome types and the importance to be attached to the preferences of particular stakeholders groups but that is not inconsistent with the appraisal process informing the decision-maker on how affected/interested stakeholders see such weighting.

Multi-Actor-Multi-Criteria-Analysis (MAMCA) as a means to elucidate the preferences of different groups of stakeholders across monetary, physical and intangible effects, assessed in terms of particular economic, environmental and social outcomes that a project is intended to achieve or might impact, shows promise (Keseru et al. 2016). It is consistent with the individual preferences value judgment and can be used to develop criteria weights for different stakeholder groups as part of an evolving appraisal process. It is easy to be critical of the way impact areas (or types of valued outcomes) are specified in such an approach but the same challenge confronts all appraisal tools that look to derive overall measures of initiative value across a range of outcome areas.

Given the complexities involved, it is arguable that the loss of important decision-making information in the production of a single indicator of initiative merit will lead to a loss of transparency and accountability of the appraisal process. It may also mean a loss of relevance of appraisal. For example, city decision-makers are commonly interested in specific desired project/initiative outcomes, such as what it might mean for job growth, productivity, road safety outcomes, the public transport mode share, air pollution levels, social inclusion (of particular groups, for example) or such like. The national level origin, and economic efficiency focus, of most appraisal methodology development is often blind to the colour and movement that arises in the places where people live and carry out their daily lives. For appraisals to be of most value to decision-makers, the outputs from the appraisal need to (among other things) inform key concerns that confront those decision-makers, introduce them to other concerns and to new opportunities (Worsley and Mackie 2015).

The significance of this point has been well demonstrated by several interesting papers on the use of CBA in Swedish public transport. For example, Ljungberg (2003) and Vigren and Ljungberg (2017) have found that most regional public transport authorities do not rely on CBA to inform key resource allocation decisions, since CBA outputs are not what matters to those decision-makers. Swedish national transport policy has economic efficiency as its primary goal and uses CBA to inform national project selection but this does not carry through to regional PT service planning. These two authors, and Johansson et al. (2017), found that regional PT planners' two main objectives are increasing the market share of PT, relative to car, and providing a social service. In Stockholm, Johansson et al. (2017) suggest that making Stockholm Europe's most attractive metropolitan area is also a key purpose of PT. More broadly, Johansson et al. suggest that PT is increasingly being judged in terms of environmental issues, land use, and labour market effects. These are the purposes which integrated strategic land use transport plans are increasingly targeting. Well-structured appraisals can help to provide information on the best way of meeting such purposes, provided outcome reporting is sufficiently comprehensive.

Reporting outputs primarily in terms of benefit-cost ratios, net present values or other comparable measures is not information-rich and does not provide much enlightenment to the decision-maker concerned about a number of valued outcomes. The UK Treasury Greenbook (HM Treasury 2018a) uses an Appraisal Summary Table to bring together disparate initiative impacts, with supporting tables providing further detail. Non-monetised benefits and costs are to be recorded, presented as part of the appraisal and, where possible, 'assessed in another way, providing an understanding of their magnitude' (HM Treasury 2018a p. 74). Multi-Criteria Decision Analysis (MCDA), using swing weighting (essentially a way of identifying how significant an impact needs to be to change the ranking of alternatives) is noted as one way of approaching such challenges. This seems a transparent and accountable way of managing the complexity involved in appraisal.

3. Needs identification or impact assessment?

Too often project or initiative appraisal is separated from the process that led to project need identification in the first place. For example, someone higher up in an agency asks its evaluation team to undertake a CBA on a project whose inception has not involved that evaluation team. In this case, project appraisal is essentially a form of *impact assessment.* The preferred approach is for appraisal to be firmly rooted in a policy cycle process, with societal objectives and need identification as the starting point and option appraisal a stage in the process, informed by the starting points of goals and needs.

The increasing use of a 'business case' discipline, within which appraisal is located, should serve to strengthen a needs focus. For example, the UK Treasury Business Case guidelines indicate a requirement for 5 reports (HM Treasury 2018b): the strategic case; the economic case; the commercial case; the financial case; and the management case. The strategic case should provide solid evidence of need, to ground subsequent appraisal. Evidence of relevant societal values that are defining the key needs to be tackled should figure strongly in shaping in the Strategic Case and in subsequent detailed appraisal.

For urban/regional land transport appraisal, integrated strategic land use transport policy and planning processes should be the starting point, founded on societal values and reflected in vision and goal/outcome statements and associated need identification, which form the primary high-level direction setting anchors. This process needs to be driven at city/region level. Cities such as Vancouver (Canada) and Freiburg im Breisgau (Germany) are leaders here, with community consultation programs providing the glue for stable long-term integrated strategies.

Stanley, Stanley and Hansen (2017) point out that strategic land use transport plans are becoming increasingly broad, since they impinge on so many outcomes that are valued by citizens. For example, shaping a city or region to benefit from emerging structural economic changes, requires supportive land use and transport initiatives. Similarly, affordable housing is increasingly seen as an integral part of land use transport planning, including planning of Transit Oriented Development (where gentrification is often a concern, implying a need to include affordable housing in the development). Transport appraisal must be alert to the need to take this increasingly broader perspective.

Vertical fiscal imbalance will inevitably mean that the goals /needs identified at urban (regional) level, and resulting transport priorities, will need some negotiation with higher government as part of a planning and funding cycle, if funding assistance is being sought from higher government. Local government will also need to be engaged if it exists at sub-city/sub-region level. Goals and relative priorities can be expected to differ across layers of government to some extent. Worsley and Mackie (2015), noting the relative weakness of the strategic focus in UK national appraisal, suggest that this funding context will lead to what they call a two-fence approach to project generation and appraisal,

where projects seeking financial support from higher government will need to meet appraisal expectations at that level as well as locally. Initiatives such as City Deals and Sub-national Transport Bodies (STBs) may help to bridge the gaps in the UK between vertical layers. In an Australian setting, Stanley et al. (2017) have argued for federal government involvement in urban land use transport strategy formulation at the goal setting/need identification stage, where this is a state government responsibility, to smooth the processes of such inter-governmental negotiations, and for the major cities to have a city-level entity that speaks for the city, like the Mayor of London The next few years should demonstrate whether emerging institutional arrangements in the UK are improving policy line-of-sight and supporting more integrated pursuit of outcomes across governmental layers.

4. Some specific appraisal priorities

4.1 Purpose

The intent of this section is to illustrate some more specific research priorities for the development of an appraisal process that is more closely attuned to integrated thinking about how transport can further high-level societal goals. Space requirements mean that only a few examples are possible.

4.2 Social inclusion

Merit goods

The specification of social goals in integrated strategic land use transport planning is not nearly as well developed as it is for economic or environmental goals. For example, Stanley et al. (2017) identify almost twenty different ways of elaborating social goals across various urban plans, suggesting that the goal area is still at a relatively undeveloped state. This often leads to plans focussing narrowly on some aspect of spatial disadvantage, such as relative accessibility to jobs between different parts of a city or region, with little appreciation of the knowledge base for improving social outcomes.

Building on the innovative work of the UK Social Exclusion Unit (SEU 2003), the present author favours a focus on social inclusion as a useful way to shape social goal setting in land use transport plans, as a precursor to improved individual and societal wellbeing (Stanley et al. 2011a, b). Transport is an important input into accessing friends, goods and various activities, with poor transport opportunities often a source of social exclusion – defined as lacking the capacity to participate in mainstream society. In the SEU work, links were drawn between the exclusion of people who do not have access to a car, and their needs for education, employment, access to health and other services and to food shops, as well as to sporting, leisure and cultural activities. Findings from the SEU's transport study were organized into five groups of barriers that need to be addressed in order to improve transport-based accessibility to key services considered by the SEU authors to be central to social inclusion. Subsequent research has broadened the scope of the SEU work to examine connections between transport, social capital, community connectedness and well-being (see, for example, Mollenkopf et al. 2007; Currie (Ed) 2011; Stanley et al. 2011a, b).

Most people in an industrialized society have the capabilities and access to resources to facilitate their inclusion. However, some groups remain at risk of social exclusion, such as those with limited education and on a low income, those in poor health and/or with a disability, people who are geographically isolated, some disadvantaged youth, some older people and single parent households. Social exclusion tends to become self-reinforcing when the only affordable living locations are those with the poorest infrastructure, services and job opportunities. Thus, social exclusion is in large part an issue of public policy and planning for the availability of the means for

people to be included, through the provision of relevant infrastructure and services, including the transport/mobility required to access opportunities.

UK webtag tools provide useful ways to identify many groups likely to be at risk of mobility-related social exclusion and identify some of their accessibility challenges (DfT 2019). Such data could provide a basis for the political process to debate provision of publicly funded transport/mobility as an issue of social justice (or merit good[5]), aimed (for example) at developing minimum service standards for supporting inclusion. This requires spelling out the kinds of activities to which people ought to have access (e.g. schools, shops, medical care, recreation opportunities, nature, etc) and then ensuring that the means of providing such access are available, whether by provision of suitable mobility opportunities (e.g. local bus services) and/or by the location of those activities.

A concern with this approach, however, is that Stanley et al. (2011a, b; 2019a) suggest that when provided with improved mobility opportunities, those at risk of mobility-related social exclusion tend to first increase travel that builds their social capital (e.g. visiting friends, recreation). Stanley et al. (2011a, 2019) show that building social capital has a high value to these people and provides them with a pathway to access other resources (e.g. jobs). That research concluded that it is better, therefore, to not specify those activities to which excluded people should have access but to provide them with the means to access those opportunities that improve their wellbeing *as they see it*.

CBAs typically seek monetary measures of benefit/cost. If social inclusion is seen as a matter of social justice, then perhaps such monetary values are not required: politically determined (public preferences) minimum accessibility levels as of right, for example, might suffice. However, given the pressure on funding of local public transport services in many jurisdictions, and the role such services play in supporting mobility-related social inclusion, the case for supporting public transport (and active travel) to promote inclusion may benefit from evidence of monetization. There is only one body of research of which the author is aware that pursues such monetization in terms of reducing risks of mobility-related social exclusion.

Building on UK research (Burchardt et al. 2002), Stanley et al. (2011a, b) measured social exclusion risk using five dimensions (income, employment status, political activity, social support and participation) then sought to identify associations between exclusion risk, personal wellbeing (self-assessed) and a number of explanatory variables, including trip making, personality, psychological wellbeing, social capital, age and household income. The research then estimated the value of an additional trip by a person at risk of mobility-related exclusion in both Melbourne and regional Victoria (Australia), finding it to be of high value and of increasing value as household income reduces. Stanley and Hensher (2011) conclude that the resulting social inclusion benefits are the largest single benefit from Melbourne's urban route bus services, being considerably larger than the cost of service provision. They suggest that a boarding rate of 10-11 per hour is enough for a Melbourne urban route bus service to break-even in terms of social inclusion benefits plus congestion cost savings. Stanley et al. (2019a) undertake similar analyses for regional Victorian urban route bus services, finding that a boarding rate of 6-7 persons/hour would suffice for the service to break-even on social inclusion benefits alone.

[5] Stopher and Stanley (2014, p 24) describe a merit good as: '... one which society, through its political processes, has decided should be provided on the basis of considerations of need rather than ability and willingness to pay. The good is provided in the private market place, but there is a social decision to ensure some base level is available, irrespective of individual preferences or circumstances.'

A focus on enhancing mobility-related social inclusion underlines the importance of the goal setting and need identification stages in the policy cycle coming to grips with concepts such as transport disadvantage and mobility-related risk of social exclusion, building awareness of key causalities (e.g. social capital, community connectedness, personality, trip making, household incomes, etc) and identifying how transport opportunities affect such outcomes. These should be research priorities for improved appraisal, as should exploring the social justice case for decent minimum public and active travel opportunities being supported through the public purse, together with further studies on the monetary value of improved mobility for those at risk of mobility-related social exclusion.

The research on the social inclusion benefits of improved mobility opportunities summarized above is mainly about benefits to the at-risk person. This research needs to be extended to incorporate potential *external benefits* flowing from reduced social exclusion. Thus, for example, exclusion is expected to be associated with higher unemployment, increased crime and poorer health. Reducing exclusion should imply associated benefits flowing in such areas. The present author is not aware of studies that have systematically measured such flow-on benefits in a way that would permit their application in transport cost benefit analysis. However, research on the benefits of bus services undertaken for the UK's Urban Transport Group recognizes the probability of such flow-on benefits and elaborates specific examples of public agencies (e.g., health, education) whose activities and budgets can be expected to benefit from well targeted bus services (see, for example, Fuller 2019; Abrantes et al. 2013). The investigation of such externalities should also be a priority for improved transport appraisal. They are likely to strengthen the public policy case for government(s) supporting local public and active travel opportunities.

4.3 Wider economic benefits

An extensive body of research has emerged on transport and economic development, much of it with a focus on cities and productivity growth, parts looking at the transport influence therein. Research on agglomeration economies, arising from economic density has been central. The origins of such productivity gains have been understood for some time, summarized by Puga (2010) as sharing, matching and learning.

In urban settings, productivity increases (agglomeration externalities) of 3-8 per cent from doubling city size (Rosenthal and Strange 2004) and 4.5-6 percent from doubling employment density in a city (Ciccone and Hall 1996; Ciccone 2002) are widely cited. The meta-analysis by Melo et al. (2009) suggests a mean elasticity value of 3 per cent across all its reviewed studies, with considerable variation between studies. Graham and Gibbons (2019), in a more recent study, find an unweighted elasticity value across 47 international studies of 4.6 per cent. More recent research has tended to strengthen support for the lower end of the elasticity range, as issues such as firm selection and sorting have been recognized (see, for example, Behrens et al. 2014). Relative output increases in service industries, particularly knowledge-intensive industries, many of which tend to concentrate in CBDs and other urban hubs, are typically at the high end of the elasticity range. Melo et al. (2009) for example, report an elasticity of urban agglomeration for service industries of about 8 per cent.

Evidence of the existence of agglomeration economies is then suggestive of opportunities for external benefits from transport initiatives that can enhance the effective economic density on which such agglomeration economies depend, such as by extending catchment scale, with resulting benefits being additional to direct transport user benefits (subject to measurement approach). Significant contributions to incorporating agglomeration benefits in transport appraisal have been made by authors such as (for example): Venables (2007), who developed a graphical demonstration of the opportunity for, and additionality of, agglomeration benefits; Graham (2007) for early estimates of relevant elasticities in the UK; Venables, Laird and Overman (2014), who reviewed the subject area and highlighted strengths and gaps; Graham and Gibbons (2019), who have presented a

forensic assessment of the identification and measurement of agglomeration and associated benefits; and DfT (2018) for its guidelines on concepts and estimation.

Estimation of potential agglomeration benefits in transport appraisal requires three steps, as outlined by Graham and Gibbons (2019):

1. calculate a connectivity metric to represent agglomeration (or effective density)
2. estimate elasticities of productivity with respect to agglomeration
3. quantify the agglomeration impacts arising from transport schemes using the values derived from steps 1 and 2.

Graham and Gibbons outline research priorities through these three steps, to which the interested reader is referred. They include, for example, testing for the additionality of agglomeration benefits and using alternative specifications for economic mass and for the decay function in the economic density equation. However, in terms of the subject matter of this chapter, with its interest in land use transport integration, the present author highlights two key research questions requiring attention.

First, given the widespread interest in poly-centric urban and regional land use development patterns, a key question is how far the concept of agglomeration economies might extend to poly-centric cities or regions. This subject seems to have a relatively small research base. An important question, for example, is whether individual cities within a polycentric region might 'borrow' from each other's sizes to capture some scale benefits, sometimes described as network economies or network externalities (Boix and Trullén 2007). Agglomeration economies are generally thought to decay with distance whereas network externalities are thought to be dependent on the strength of functional relationships and less distance dependent. Meijers and Burger (2010) examined this question in a US setting and found that, other things being equal, polycentricity seems to be beneficial for productivity, particularly in smaller metropolitan areas, but a collection of cities does not provide a substitute for the urbanization externalities of a single large city, even though the size of the population in both may be similar. A stronger knowledge base in this area would be extremely helpful for jurisdictions seeking to spread the benefits of productivity gains more broadly across a city or region through transport improvements (e.g. Melbourne and Sydney in Australia; Skåne in Sweden, extending across to Copenhagen).

The second priority area is estimation of mode-specific agglomeration effects. The scarcity of such estimates is a major concern in terms of quantifying agglomeration benefits, since it is usually major rail initiatives that are added to support a stronger mono-centric city. Graham and Gibbons (2019) suggest that mode-specific estimation is fraught with econometric difficulties and recommend against deriving such estimates. This does little to remove unease about using modally agnostic agglomeration benefit estimates, since transport initiatives are inherently mode specific. Further research on how to resolve the relevant estimation problems is encouraged, so that the results are a better reflection for decision-makers and planners of the expected outcomes of the actual transport interventions that are the subject of appraisal, rather than something more generic.

In terms of appraisal methodology more broadly, there are many important research questions concerning the transport-economic development connection. These include the following, many of which are inter-related and go to the heart of the need for integrated land use transport thinking and planning, especially in an urban/regional setting.

- In what circumstances does transport appraisal need to go beyond traditional user benefit measures to reflect total economic benefits (and costs)?

- How does transport, and transport improvement, impact the location decisions of people and businesses (Hensher et al. 2019; Ho et al. 2017) and on what evidence base can we rely for answers to such questions? For example, will travel time savings from transport improvements get taken out as longer travel times, a common occurrence in sprawling Australian cities? How should the economic effects of the relevant transport changes that lead to such behaviour changes be assessed, particularly given the external costs of sprawl? Agglomeration measurement is usually static, assuming away such relocation effects. In what circumstances might this produce misleading conclusions for appraisal?
- To what extent is the economic change (e.g. jobs, productivity, value added) flowing from transport improvement a net improvement (sometimes called additionality), as compared to redistribution between areas/people? It should be noted that both possible outcomes are relevant in appraisal if costs and benefits to *whomsoever they accrue* is used as the criterion for benefit/cost inclusion, as the present author believes is appropriate.
- How can transport improvements be used to help drive beneficial structural economic change? Melbourne and London are examples of good practice here, in different spatial settings (Stanley et al. 2017).
- What can land value tell us about the impact of transport on economic performance? To what extent would including land value gain in project benefits constitute double counting of user benefits? If used as benefit indicators, should land valued be amended to recognize differences between market and social discount rates?
- How can/should local and regional outcomes be identified and reconciled with national outcomes? This goes to the argument in section 3 about retaining disaggregated appraisal results through the appraisal process. Spatial Computable General Equilibrium models are being used for this purpose in some settings. What is best practice here?

Answers to research questions such as these will help to ensure that transport appraisal can continue to provide well-founded evidence-based advice to the decision-making process and, in a broader sense, help shape more sustainable cities, regions and countries.

4.3 The environment: Greenhouse gas emissions

Section 2.2 raised the issue of whether governments should over-ride individual preferences in some situations, using biodiversity loss as an example. Climate change is also a key example here, where current emissions trajectories and policy settings are inconsistent with achievement of the Intergovernmantal Panel on Climate Change target of temperatures rising no more than 1.5 degrees Celsius above pre-industrial levels. Transport sector emissions are a significant part of the problem. Climate change adds to biodiversity loss, as noted in Section 2.1, but also has a much wider range of economic, social and environmental impacts. The Scottish National Transport Strategy, for example, sees this area as a high priority for action in Scotland, transport sector emissions accounting for 37% of Scottish GHG emissions in 2017 (Transport Scotland 2020).

Transport project appraisals often claim an environmental benefit for a project because it is forecast that it will marginally reduce greenhouse gas emissions. Project appraisal guidelines reinforce this when they suggest a shadow price for carbon, such values converting marginal CO2 emissions reductions into a project benefit. For example, UK webtag advisory material indicates transport appraisal should use a central carbon price of £60.3/tCO2e in 2020, with a range from £30.6 (low) to £92.6 (high).[6] However, if a country is well off track for meeting its emissions targets, this apparent 'benefit' is a seriously misleading indicator of performance. Sector level strategic planning and

[6] https://www.gov.uk/government/publications/tag-environmental-impacts-worksheets.

demonstration of benefits is needed to reconcile the way individual projects are treated with the sectoral picture.

Because of the global consequences of climate change and the transport sector contribution thereto, national greenhouse gas emission targets should play a crucial role in transport policy and program/project development, starting at the goal setting/need identification stages, with national targets sourced from relevant IPCC agreements and national stakeholder collaborations relating thereto (which provide an opportunity for public preferences to be discussed). Some countries have chosen to establish a national commission, or similar body, to lead the process of national target setting and monitor/report on achievement, akin to the role played by central banks in monetary policy. Hopkinson and Sloman (2019) argue, in a UK context, that linked sectoral targets (carbon budgets) should be set for major emissions sectors, including the transport sector, since this is both a large emitting sector in most jurisdictions and regularly underperforming in terms of emissions reductions.

The current author agrees that global warming has reached the climate emergency stage and binding transport sector emission targets are now appropriate within a country, consistent with that country's overall carbon budget and targets (his national government would not agree!). Such an approach imposes a carbon constraint within the sector's goal setting process, which should condition subsequent policy, program and project development. Stanley et al. (2011c, 2019b), have shown what a carbon budget for Australian road transport might look like and explored the behavioural and technological requirements likely to be needed for target achievement.

Sector governance arrangements then need to ensure that initiatives/projects that are the subject of appraisal are consistent with the carbon threshold, which becomes a constraint on the bundles of initiatives that are assembled. A major area for research then becomes the management of the way GHG emissions are handled through appraisal. The review of transport governance arrangements in the UK by Marsden and Docherty (2019) demonstrates the complexity of current arrangements, which suggests that establishing and implementing workable sectoral carbon budgets will provide the subject-matter for multiple PhDs.

5. Conclusions

While recognizing that appraisal is not only used in a policy cycle, this paper has purposefully looked at appraisal as an integral part of a well-functioning policy cycle. Moving through the steps in the policy cycle, the author proposes that transparent and accountable transport appraisal should

- begin with, and be clear about, needs identification, grounded in vision/societal values and shaped through integrated strategic planning processes (strategic focus). Both at a spatial level (e.g. a city or region), and nationally, this requires open community/stakeholder engagement from the start, initially around vision/societal goals, key strategic issues (opportunities and challenges) and need identification. This stage is where any threshold issues/constraints should be flagged, such as setting GHG emission thresholds/carbon budgets or targets for minimum public transport service standards and active travel opportunities for social inclusion, since this will have a critical influence on how such matters are managed in appraisal. It is also where the research base on wider economic benefits should be used to help shape strategic land use development directions to enhance productivity performance. In the current author's view, the strategic goal setting/need identification stages are the most important, but least developed, in the policy cycle. Strengthening this part of the policy cycle will have important ramifications for appraisal, the detail of which will depending on the directions that are set

- recognize that the strategic focus in transport will usually need to span multiple layers of government. Vertical integration should be approached with the intent to achieve policy line-of-sight on critical matters through the participating governmental layers, with the driving force coming from the responsible layer of government. A sub-text here is the growing importance attached to localism, and the need for better access to own-source revenues at lower levels of government. Appraisals need to be relevant across the layers involved
- clearly identify value judgments implied in choice of appraisal technique and test appraisal results for sensitivity to value judgments (values focus)
- identify and assess alternative possible ways of meeting identified needs (option identification), again in an open and transparent way, with on-going stakeholder engagement. Rapid appraisal techniques, such as the UK Early Assessment Sifting Tool[7] and the MetroScan model (Hensher et al. 2019) can be helpful in sorting outliers from options that are worthy of more detailed examination
- measure impacts of alternative courses of action at the highest level possible, without stretching the credibility of the quantification involved, either across types of impact or stakeholders (technical assessment)
- engage different stakeholder groups in undertaking initial values/goals and needs identification, subsequent development of possible options and assessment of what such options might mean for them. This includes deriving preference indicators for impact scales and relevant importance weights across various valued outcome categories that reflect the values and preferences of different stakeholder groups. Establishing linkages between such analysis and potential funding models provides an opportunity for considering how initiative funding might be structured
- ensure open discussion about, and retain full information on, the range of impacts and trade-offs involved, and stakeholder views thereon, to support the decision-making process (transparency and accountability), rather than placing undue reliance on a single indicator of initiative performance.

Improving the performance of each of these steps should be research priorities for enhancing appraisal methodologies, with identifying key strategic threshold constraints (particularly social and environmental) and engaging affected stakeholders as personal priorities, including enabling/supporting them to engage fully throughout the process. Major initiatives, and programs of smaller initiatives, should emerge from this strategic integrated process, rather than being imposed on it one-by-one in response to apparent planning/transport problems (such as traffic congestion).

[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/4475/east-guidance.pdf

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