A Pathway to Sustainable Transport

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1. Introduction

In recent decades, there has been a growing awareness of the relationship between human existence and the geophysical limits of the Earth. Through such issues as climate change, water availability, air pollution, and the impacts of economic and social development, there is an increasing understanding that our society is facing significant change if we are to effectively address the limits of our geophysical location and its social consequences.

In these circumstances, making significant progress towards sustainability – in the general sense of an "ability to last" - seems to be increasingly important, but few developed economies have yet reached a general level of social, political or philosophical agreement on the way forward or even the nature of the most desirable outcome.

Yet, even if we cannot reach immediate agreement on the path or the goal, we still need to make progress. This paper proposes an intermediate and pragmatic approach to sustainable transport policy. It is based within the broad perspectives of sustainability, while developing the Swedish Vision Zero approach to strategic goal setting and reviewing the institutional consequences. It is not the definitive answer to achieving sustainability across the whole of society, but it offers substantial potential for pragmatic progress by integrating international current best practice with high priorities for action, while seeking to deliver specific benefits to individuals and society.

This paper:

- Reviews the broad context of approaches to the concept of sustainability and its implementation

- Identifies an intermediate strategic approach to transport sustainability, building on the Vision Zero approach and international best practice

- Reviews the implications for institutional and organisational development in transport

- Identifies research issues that arise from this approach, including institutional structures and systems and the possible future role of government

2. Sustainability

For much of human history, attitudes to human development have been implicitly driven by a vision of an Earth with apparently endless resources. In the last two hundred years – and especially in the last thirty years - this concept is changing into a perception of humanity's future on the Earth being increasingly limited by geophysical bounds, requiring a new sustainable relationship between the human and natural worlds.

The literature of sustainability is immense, still developing, and can be presented in many different ways (Francheschi and Kahn, 2003; Hopwood et al., 2005). As a high level overview, Table 1, derived in part from Baker (2006), groups the development of perspectives on the economic, environmental and social dimensions of sustainability into five steps along an implied "ladder".

Negative sustainability

At the foot of this "ladder", it is important to remember that opposition to the overall concept of sustainability remains significant. This approach was originally grounded in optimism over the scale of the Earth's resources and the ability of technology to overcome temporary resource shortages (Simon and Kahn, 1984). More recent criticism sees overall sustainability as a lower priority than wealth generation or disease reduction (Lomborg, 2001), while Van Houtan and Pimm (2007 (forthcoming)) note that the complex relationship between religion and science does not necessarily support progress towards sustainability.

Superficial sustainability

Most jurisdictions have yet to consider the basic social, economic or environmental relationships that might underpin sustainability, and have made only tentative steps towards tackling component issues such as pollution or accessibility. Yet this has not prevented the adoption of much of the *language* of sustainability. In many public policy documents, terms such as "sustainability", "sustainable development" and "liveability" are invested with meaning that the associated policy initiatives struggle to justify. Meadowcroft (2000) sees this superficiality as evidence of widespread government policy failure, though Bartelmus (2000), perhaps more realistically, recognises the problems of major change in public and political perceptions. Adopting the language of sustainability may not *of itself* represent change – though it may, perhaps, be a preparation for future change.

Weak sustainability

The concept of "weak" sustainability as the next step on the "ladder" is essentially founded on the reform of traditional classical economics, with the aim of improving resource efficiency in the management of environmental, social and economic systems, without necessarily requiring major social

Table 1   Perspectives on sustainability: the ladder?

Model of sustainability	Economic perspective	Environmental perspective	Social perspective
Ideal sustainability?	Economy based on meeting needs and sufficiency, not growth; economic policy driven by ethical principles; non-renewable natural capital held; renewable natural capital grown.	Natural world has intrinsic value; must be protected in its own right; sustainable biodiversity becomes the main goal; all activity based on ecocentric approach to natural environment	Local participatory democracy; goal of equity between all groups in society, including gender and race; access policies; decentralised structures; management of demographic issues a key question
Strong sustainability	Improved capitalism with wider range of costs included in market structures; non-renewable natural capital protected; renewable natural capital enlarged; ethical based strategies	Full "ecological modernisation"; "natural capitalism" with full cost accounting, extended property rights & internalised externalities; lifecycle management; biodiversity protected; ecocentrism grows	Liberal democracy, with enhanced consultation processes; financial and other support for disadvantaged socio-economic groups; physical access rights laws; some assistance with wider access issues through system subsidies
Weak sustainability	All forms of capital interchangeable; human capital can replace natural capital; resources still seen as sufficient with better economic management needed.	Partial "ecological modernisation"; decoupling of impacts from activity; recycling; start of lifecycle management; "end of pipe" pollution management; market led pollution agreements; bidiversity harvesting; anthropocentric	Top down decision-making in centralised states; limited local control; welfare states provide some assistance to disadvantaged socio-economic groups; limited support for access issues
Superficial sustainability (also known as pollution control)	Slight changes to economic systems; deals with major sustainable issues as they arise; all foms of capital interchangeable; economy still has externalities outside decision-making system	Environmental problems addressed on ad hoc basis; "end of pipe" solutions to pollution rather than system management; intensive anthropocentric view; language of sustainability rather than reality	Major economic interests involved in government; some support for disadvantaged groups; highly centralised government and decision-making systems
Negative sustainability: denial of need for sustainable initiatives	Economic system seen as functioning efficiently; the "invisible hand"; all capital interchangeable; denial of pressure on geophysical resources; economic growth as driving force of human development	Environmental improvements will come with economic growth and greater personal wealth as a matter of course; intensive anthropocentric approach; no need for precautionary principle; religious input in some cases	No particular link seen between social issues and geophysical limits; supports or accepts population growth; existing centralised government systems seen as working satisfactorily

Source: Modified from Baker (2006)

change. The concept was initially linked to the early development of what has become known as 'ecological modernisation", though this approach is now more closely allied to "strong" sustainability (Mol and Spaargaren, 2000).

While it attempts to move towards sustainable outcomes, "weak" sustainability essentially retains the traditional economic principle of the full interchangeability of the basic economic building blocks of human, social, industrial and natural capital (air, water, land and all associated minerals and biosystems) (Hartwick, 1977).

Critics cite the frequent irreversibility of such interchangeability, noting that there are no tradeable substitutes for such components of natural capital such as photosynthesis (Dietz and Neumayer, 2006). Perhaps the most fundamental criticism of weak sustainability is offered by Spangenberg (2005) in his study that evaluates the inability of economics to develop accurate and truly comparable measures of the different types of capital that are necessary to even *consider* interchangeability.

Strong sustainability

"Strong" sustainability still seeks to reform existing economic, environmental and social systems within a broadly liberal welfare democratic framework of decision-making, but holds that human ethics require a decision that natural capital is not interchangeable with other forms of capital; must not be depleted in the case of non-renewable resources; and must be increased in the case of renewable natural resources (Daly, 1994; Partridge, 2003). Essentially this approach sets capitalism within a new normative framework (Bartelmus, 2000; Hawken, 1993; Porritt, 2005), that leads to such fundamental changes within the ambit of ecological modernisation as the internalisation of externality costs, full cost accounting, increased property rights and lifecycle management of resources.

Ideal sustainability

At the head of the sustainability "ladder", sits an ideal future vision that remains under extensive development – and which may well imply further intermediate steps up the ladder from "strong" sustainability. "Ideal" sustainability envisages a society based on the ethics of economic sufficiency; sustainable biodiversity; equality within society groups; and decentralised participatory decision-making. It is a body of thought which continues to grow in scope and influence and generate debate. Components of this approach include ecological evolution (Bookchin, 1990); the abandonment of anthropomorphism (Buchdahl and Raper, 1998); advocacy for nature (Eckersley, 2004); the deep ecological restructuring of society (Naess, 1983); the size of the world's population (Optimum Population Trust, 2007); the case for ecosocialism (Kovel, 2002); the need to address social equality (Plumwood, 1998); and the role of ecofeminism (Warren, 2000).

3. Delivering sustainability

The "ladder" is a useful device for demonstrating a directional relationship between different perspectives on sustainability, but the processes of change will be untidy and will proceed at different paces in different places over time. It is at best a broad direction sign rather than a detailed road map.

The real question is how to make progress in a social and political environment where most participants recognise that there are problems that need to be addressed; where some are opposed to change; many are reluctant to change; a few are deeply enthusiastic for a new future; and there is often division over the particular path to follow.

The problems of managing sustainability into a developed society - or into the transport sector in particular - are pressing, but if sustainability is to be turned into an accepted reality, then the path seems more likely to be one of evolution rather than revolution.

In this context, the likely path forward seems to be one of long-sighted incrementalism, tackling current problems where support can be generated; maintaining an ethical long term direction towards sustainability; yet retaining flexibility both in the short and long term. The pursuit of sustainability is an ongoing process, rather than a journey towards a fixed and final point. Indeed, recent research into system measurement sees the monitoring of sustainability as the measuring of system *values* rather than the definition of a final set of targets (Bagheri and Hjorth, 2005).

4. Vision Zero

If the path towards sustainable transport is to combine a long term vision with shorter term operational flexibility, then there is already a policy approach that could provide a model to follow.

In 1997, the Swedish Parliament passed legislation which stated that it is ethically unacceptable for people to die or be seriously injured in the road system – a concept that became known as Vision Zero. This initial law was followed by a second that set a specific upper limit for deaths and injuries to be attained by 2007 (Global Road Safety Steering Committee, 2004), while leaving open the timing of the achievement of the ultimate goal of zero deaths and injuries.

Equally importantly, the Vision Zero approach included a fundamental change to overall responsibility for road safety, formally dividing accountability between road users and "system designers" – a definition that covers designers and maintainers of roads, vehicles and services; as well as those agencies responsible for rules, regulations, surveillance, rescue, care and rehabilitation.

Vision Zero has been variously criticised for its idealistic approach; for placing ethical targets (the protection of human life) above cost benefit analysis; for its intrusion into the life of "risk taking" citizens; and for its initially limited achievement in meeting its intermediate targets (Rosencrantz et al., 2007).

Yet Vision Zero continues to enjoy community support as a desirable long term target; has forced a major re-evaluation of road safety policy and available technology towards the new goal; retains operational flexibility for future initiatives within a clear legal outcome; and is making progress towards the determined outcome. Ultimately, Vision Zero draws much of its influence from its approach to rational outcome setting, recognising that:

- The outcome must be precise and free from vagueness
- The outcome must be able to be measured
- The outcome must be approachable in the sense that a knowledge of current best practice allows for the possibility of achieving the outcome at some foreseeable point
- The outcome must motivate participants to make progress (Edvardsson and Hansson, 2005).

Finally, its most radical impact seems likely to be that it has begun a fundamental refocussing of accountability for road safety responsibilities across the relevant institutions and organisations (Nihlen Fahlquist, 2006).

While only Norway and Denmark have so far additionally adopted Vision Zero as a road safety target, a similar ethical concept seemed initially to have driven the *Americans with Disabilities Act 1990*, though here the approach has struggled with conflicts in the associated administrative systems (Switzer, 2001).

5. A Vision Zero Network?

The Vision Zero approach will not miraculously produce a sustainable transport system, but it does seem to have significant potential to make pragmatic progress up the sustainability "ladder". By seeking public support for a specific overall outcome, implementation mechanisms and accountability in primary legislation, Vision Zero has begun to refocus elements of the transport system in a way that inherently has greater force than any plethora of non statutory documents, rules or strategies.

Could this approach be extended to make progress on some of the key issues in sustainable transport? Could there be a Vision Zero Network of targets?

Widening the Vision Zero approach in this way implies three broad factors that would need to be taken into account:

- First of all, the Vision Zero concept is fundamentally about seeking public support for putting clear direction in legislation. This will not be easy, but it may be less difficult than sometimes supposed. Promoting safety, noise and emissions reduction, and cleaning water runoff in the

transport system are specific ideas that are capable of gathering public support to set a broad direction using primary legislation on the Vision Zero model. Even the growing experience of congestion pricing in cities such as London, Stockholm and New York or user charging on main roads in many countries suggests that public support can be built for ideas that at first sight seem significantly unattractive.

- It follows that, to be effective, such targets must meet the requirements of rationality noted earlier.

- Thirdly, we need to make a pragmatic distinction between those issues that are largely distinctive to the transport sector and those that relate to the whole of society. This is *not* to say that issues such as equity, disabled persons' access, recycling of resources, land use or security are less important than transport emissions to air or safety – simply that the latter can be best and most effectively addressed on a sectoral basis, while the former inherently address a much wider range of issues across the whole of society. Figure 1 sets out this relationship, showing the transport sector focussing on a range of specific outcomes, while closely reflecting wider social concerns.
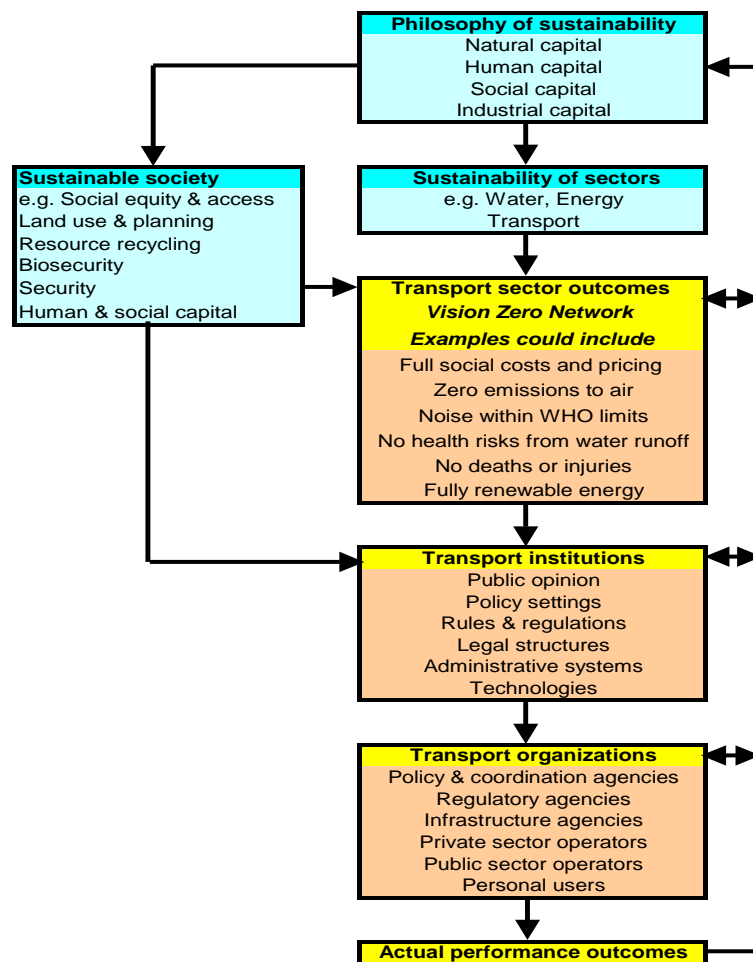
Philosophy of sustainability
Natural capital
Human capital
Social capital
Industrial capital

Sustainable society
e.g. Social equity & access
Land use & planning
Resource recycling
Biosecurity
Security
Human & social capital

Sustainability of sectors
e.g. Water, Energy
Transport

Transport sector outcomes
Vision Zero Network
Examples could include
Full social costs and pricing
Zero emissions to air
Noise within WHO limits
No health risks from water runoff
No deaths or injuries
Fully renewable energy

Transport institutions
Public opinion
Policy settings
Rules & regulations
Legal structures
Administrative systems
Technologies

Transport organizations
Policy & coordination agencies
Regulatory agencies
Infrastructure agencies
Private sector operators
Public sector operators
Personal users

Actual performance outcomes

Figure 1 Transport outcomes, institutions and organisations

6. The Vision Zero approach: developing the process

Developing a range of transport outcomes within the Vision Zero model would – and should - clearly involve significant public debate and legislative development. While this is not the place to cover the detailed processes leading to such legislatively mandated outcomes and processes covering safety, noise, emissions, water runoff, costing and pricing systems or even a transition to renewable fuels, it may be useful to briefly scope two examples as different examples of possible paths towards greater sustainability.

Transport emissions

This element of the Vision Zero Network could start from the current Danish approach to road traffic, which seeks to move to an outcome whereby "traffic causes no hazard to human health" (Government of Denmark, 2002) though the principle should logically be extended across the whole transport sector.

It seems at least possible that setting a long term Vision Zero that "the transport sector will not generate any emissions to air that are harmful to human health or the ecosystem" would command substantial public support. A Vision Zero approach of this sort could also enable the incorporation – and legislative strengthening - of many existing nominal reduction targets for emissions and carbon dioxide, and would certainly generate consideration of the future of the "system designers" in order to ensure that accountability for results was properly attributed. While far from simple, it is an area where existing knowledge, public attitudes and available technology would enable relatively rapid progress.

Transport costs

Major studies in Britain (Sansom, 2001) and New Zealand (Booz Allen Hamilton & Institute for Transport Studies University of Leeds, 2005) have already identified that many, if not all, road users are directly paying significantly less than the costs that they impose on society, and are consequentially distorting demand for roads and other transport modes. Waterways in Europe seem to be in a similar situation (Ecorys Transport & Mettle, 2005), while aviation costs are becoming a matter of increasing debate. Some writers have attempted to measure the global economic and environmental impacts of such externality costs – or "perverse subsidies" (Myers and Kent, 2001). Schade and Rothengatter (2004) have taken this approach further by calculating the impacts of restructuring the German road system to include full social costs, identifying the substantial economic and environmental benefits to be received from eliminating externalities – seen by some as the biggest single step towards sustainable transport (Black, 2004).

Developing the Vision Zero approach of legislative outcome; measures and accountabilities in this case would be a lengthy and complex process. Research and public understanding of transport costs lies far behind

understanding of such issues as emissions or safety. As a recent catalogue of social cost studies shows, there is still a basic need to reach an generally agreed methodology (Litman, 2007), before developing an outcome that could precisely focus on the need for the transport sector and its users to directly bear the whole of the costs imposed on society. The subsequent complexities of reforming existing transport financing and subsidies; managing changes in pricing technology; attributing organisational and individual accountabilities; and potentially dealing with modal shift on the scale that Schade and Rothengatter identify: these do not suggest an easy or a swift process that would be free from controversy. Yet, if moving to sustainability is to command genuine public support, then this development process becomes a crucial step up the "ladder".

7. Institutions and organizations: research and change

Implementing change

Public interest in the Vision Zero approach has focussed mostly on the nature of the legislatively mandated outcome and intermediate goals, as well as on specific initiatives to progress such goals. Far less attention has been focussed on the equally important issue of accountabilities and the resulting institutional and organisational structure and performance.

Recent literature on transport sustainability has demonstrated a growing realization that successful moves towards sustainable outcomes will need a clearer understanding of the institutions of human society, and the way that these progress or obstruct change (Meadowcroft et al., 2005; Nilsson, 1999; Pfahl, 2005; Rietveld and Stough, 2005; Teisman, 1999). In this context, the term "institutions" covers the range of social structures from individual or public beliefs and opinions, through to formal legal structures, politics and governmental and regulatory systems; as well as the full range of public and private organizations and their behaviour (Banister, 2005). Institutions, in this developing approach, are the result of historical or contemporary processes and interactions that form the basis for current performance and simultaneously set out the potential for future change.

The Vision Zero approach, as a step towards sustainability, inherently highlights questions of institutional and organisational change in the transport sector. If, for example, each mode potentially takes financial and managerial responsibility for current externalities and costs, institutional and organisational forms are likely to change. While sectors such as maritime, rail and aviation are already broadly structured as corporate entities, road infrastructure management across the world is currently scattered among a wide range of local, state and central government departments, statutory public agencies, and private sector franchisees and owners (Axhausen, 1999). The pressure to incorporate external costs; to invest; to manage traffic access issues as demand shifts; technological change as current charges such as fuel taxes become increasingly ineffective with new propulsion systems; the need for greater accountability: all of these existing trends will place the management systems of roads under increasing attention. If the

outcome tends towards greater use of corporate structures for road management, then further issues such as the management of access rights and performance accountability will be on the policy agenda.

The key issue here is that institutions and organisations matter when change is in prospect. Institutions and organisations can promote or obstruct change in often unexpected ways (Parsons, 1995). Understanding how existing institutions and organisations might contribute to sustainability now and in the future; their potential for change; and the possible creation of new institutions and organizations; all of these become important areas for research.

The role of government

The Vision Zero approach will materially affect governments at every level. The outcome, target setting and timescale process; financial management; operational co-ordination; setting and regulating sector standards; managing wider social issues such as equity; all of these seem likely to remain the primary responsibility of governments. While some of the trends noted earlier may suggest a smaller role for public agencies in operational activities, the public role in sector co-ordination seems likely to grow (Viegas, 2003).

As already noted, change in sectors such as transport through a Vision Zero approach will also require ongoing co-ordination in that sector and across the whole of society. Changing transport pricing, for example, is likely to raise a range of issues such as social equity and the management of change in inter-modal transport tasks that will need to be addressed on an ongoing basis. Conversely, wider social changes such as access policy or materials recycling will, in turn, require responses from the transport sector.

Again, it is an area of institutional behaviour in a complex world about which we know remarkably little – and need to know more (May and Crass, 2006). Many jurisdictions do not even treat transport as a single sector; attempt to operate through inappropriate command and control approaches (Scott, 1998); deal with modal issues in isolation; and, most fundamentally, act without a basic understanding of human behaviour – the failure of Mexico City's attempt to manage car emissions being a case in point (Davis, 2006). Organisational models such as Transport for London or even the short-lived coordination of Sydney's transport during the Olympic Games in 2000 may offer pointers for the future, but also emphasise the need for much greater research into and understanding of governmental roles in managing a sustainable future.

8. Conclusion

The Vision Zero approach, as outlined in this paper, ultimately relies for its strength on the development of public support, which in turn is reflected in legislated outcomes; intermediate flexible targets; and formal delineation of administrative responsibilities. It is a potentially complex and difficult process for debate, guidance and direction setting within a democracy in an uncertain world. Ultimately it seeks to be a rational goal setting approach that can

provide direction within a climate of change and uncertainty along the path towards a sustainable transport system within a sustainable society.

A Vision Zero Network approach may initially raise as many questions as it will answer. Recent research into policy implementation makes it increasingly clear that the key to successful change also lies in the accountability and behaviour of the institutions of society – from the role of public opinion through the formal rules, structures and operations of government to the organisational structure of the transport sector. In taking steps on the long journey towards sustainability, we need to have a greatly enhanced understanding of how these institutions work; how they influence current processes; and what changes would be necessary to support future development.

The broad problem of sustainability – that the world has geophysical limits that humans are in danger of exceeding – is increasingly understood, if not universally accepted. The issue now is increasingly what practical steps can be taken to address this issue. The Vision Zero Network approach does not provide a miracle cure to these problems as they exist in the transport sector, or in society as a whole. What Vision Zero can offer – by involving public opinion, setting formal goals and attributing accountabilities for delivery - is a practical process that begins to address these problems.

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