

---

## Complexity in transport policies: a Local Government review

Noemi Giupponi and Mic Ralph, Glasgow City Council

### 1 Introducing transport complexity

#### 1.1 Transport components

Urban transport components are numerous and, as an assemblage of people, processes, services, techniques and tools, are made by both animate and inanimate objects (Rydin, 2014; Beaurigard, 2015). The system as a whole comprises: 1) physical infrastructures (roads, footways, footpaths, pavements, tunnels, bridges, bus stands, signage etc.), 2) the owners and the operators of these infrastructures, 3) the services provided, 4) the service providers, 5) the technical interfaces used by service providers to ensure the system run efficiently, 6) the vehicles running on the infrastructures, 7) the citizens using and/or affected by the physical infrastructure, 8) the system of incentives promoting specific transport modes, and many more. To summarise, physical infrastructures, infrastructure services and stakeholders are identified as the three main system components in which 'efficiency' and 'attractiveness' measures are used to determine the overall system performance.

#### 1.2 Multiple Stakeholders

Focusing on its stakeholders, the transport system is characterised by multi-level governance with agencies and actors having the statutory duty to deliver targets set at national and/or international levels. The main agent making national policies tackling transport issues at a national level in Scotland is Transport Scotland, the Executive Agency of the Scottish Government, which was formed in 2006 and, since 2010, merged with the Directorate of Transport. In the context of Glasgow, the other important transport government body is The Strathclyde Partnership for Transport (SPT), which is the passenger transport authority responsible to manage public transport provision across different administrative boundaries covering the same metropolitan region. In addition to the executive agency of Transport Scotland and the passenger transport authority SPT, multiple stakeholders (from the public and the private sector) collaborate in partnership to address complex transport related challenges. Examples of these are the Glasgow and the Clyde Valley Strategic Development Planning Authority (responsible for making the strategic Development Plan for the Glasgow and Clyde Valley city region) and the Glasgow City Region City Deal (looking at how to boost economic growth at a regional level). National transport policies are implemented locally through a City Development Plan, a Local Transport Strategy or other strategies (City Centre Transport Strategy, Cycling Strategy etc.); Local Authority Departments, Consultancy firms, the third sector and Academia are the different stakeholders which, at a local level, have an interest in and/or are affected by both local and national transport policies.

#### 1.3 Transport Governance modes

Transport stakeholders are expected to manage transport governance as a "function by which efficiency and attractiveness are created", making use of efficiency measures (e.g. time and energy cost) and attractiveness measures (e.g. accessibility, affordability, convenience, etc.). Governance styles vary between different transport modes: walking, cycling or rail strategies have their own management logic with their unique networks of stakeholders in which coordination 'styles' may vary between competition, tendering and monopoly. As a result of an increasing privatisation of public services, there is a tendency for transport services to be powered by competition which may lead to system inefficiencies; different transport governance regimes also relate to different risk 'cultures', themselves contextualised by the level at which transport is enacted (e.g. operations; maintenance and planning; delivery).

---

#### **1.4 Sustainable transportation challenges**

According to Reducing Emissions in Scotland (Climate Change Committee, 2016), between 2009 and 2013, CO<sub>2</sub> reductions from the transport sector in Glasgow were four times lower than reductions in the domestic and industry sectors with transport accounting for 22% of total CO<sub>2</sub> emissions (34% domestic; 43 % industry). The report also suggests that little progress has been made in Scotland in reducing emissions from transport, with low sales of electric vehicles and stagnant emissions. Although annual carbon emission reductions for 2014 were met, progress was mainly due to the power sector, its reduced coal production and increased renewable energy resources.

In addition to carbon emissions reduction, four other challenges relating to urban sprawl, mobility needs, climate change and innovations in Information and Communication Technologies, characterise sustainable transportation in contemporary cities; increasing the share of public transport, introducing cleaner transport modes and utilizing ICT for discouraging car use or making public transport more attractive, are just some of the actions being taken to address such challenges. As a response to these challenges, common objectives for sustainable transportation are summarised in Pollaris (2016) as: 1) reduce unnecessary trips, 2) reduce length and occurrence of passenger and freight trips, 3) prioritize non-motorized and low-energy intensity modes, 4) improve functionality of infrastructure, 5) Improve user behaviour and 6) improve efficiency of vehicles.

#### **1.5 Barriers to sustainable transportation implementation**

Significant research has been carried out discussing the challenges around the implementation of sustainable transport policies through the direct involvement of different communities either influencing or having an interest in transport. For example, the DISTILLATE programme, whose “principal objective was to develop ways of overcoming the barriers to effective development and delivery of sustainable urban transport”, involved fifteen local authority members (providing 35 case studies) and identified political, legal, financial, technical, organisational and cultural barriers to sustainable urban transport (Hull, 2009). Similarly, In Bache et al. (2015) behavioural change, institutional structures, the primacy of the economy, problematic carbon policies, little control of buses, funding cuts, lack of ambition/leadership and little positive vision, were identified as the main implementation barriers by stakeholders involved in the implementation of local transport strategies in the Strathclyde region. From a different angle, a review of the Scottish Government Active Travel strategy (Transport Scotland, 2016a), identified another set of barriers to policy implementation as being: inadequate data, car-oriented evaluation frameworks, limited research, lack of technical expertise, difficulty in cross-government coordination, resourcing, invisibility in public domain, perceptions of public acceptance, lack of political support, unsupportive funding structures etc.

These studies as a whole reveal the multi dimensionality of transport challenges and emissions reduction is the perfect example demonstrating how hard it is to demarcate boundaries of transport related problems: introducing new cycle lanes, increasing engines efficiency, controlling public transport, improving the road network, introducing new technologies, etc., are all actions requiring multiple actors (who may also be competing actors) to act collectively while reflecting on how specific actions could contribute to the achievement of non-transport related targets (e.g. health). This is the reason why it was decided to use decarbonisation as a point of departure to think about and address transport complexity.

---

## 2 Research overall aim: getting the beat of the system

By presenting the multiplicity of its components, governance modes and challenges, this research put light on the complexity of the transport system and provided the necessary background for realising the different levels at which complexity influences agenda setting, policy making and implementation (Rittel et al. 1973). Meadows's seminal work on system thinking was used to draw the layout of this preliminary research: Meadows (2008) explains that, dealing with complexity and, using her words "learn how to dance with complexity", requires "watching how the complex system behaves before disturbing it". She adds: "if (the complex system) is a piece of music or a whitewater rapid or a fluctuation in commodity price, study its beat. If it's a social system, watch it work. Learn its history. Ask people who've been around a long time to tell you what's happened." (Meadows, 2008)

By applying Meadow's methodological approach to studying complexity in the context of transport, challenges around transport policies design and implementation are discussed with Local Government Officials working for the same Local Authority. In doing so, this works attempts to piece together a picture of transport as seen by the people who have been working with it for quite a long time in order to inform future strategies and actions.

## 3 Research outline

In the context of policy making, Howlett (2011) identifies four different sets of communities (core actors, public sector insiders, private sector insiders and outsiders), each of which has a different mix of attitudes to risk influencing the way "things are seen, done and justified" (Underwood et al. 2014). Information is gathered from key public sector insiders working for Glasgow City Council, discussing barriers and challenges in relation to transport policy design and implementation. From these discussions, normative, analytic and governance related issues are identified and presented in Section 5 following Ramani's conceptual framework on sustainable transportation which associates the normative, analytic and governance elements, to definitions, measurements and implementation aspects of sustainable transport<sup>1</sup>(Ramani et al. 2016).

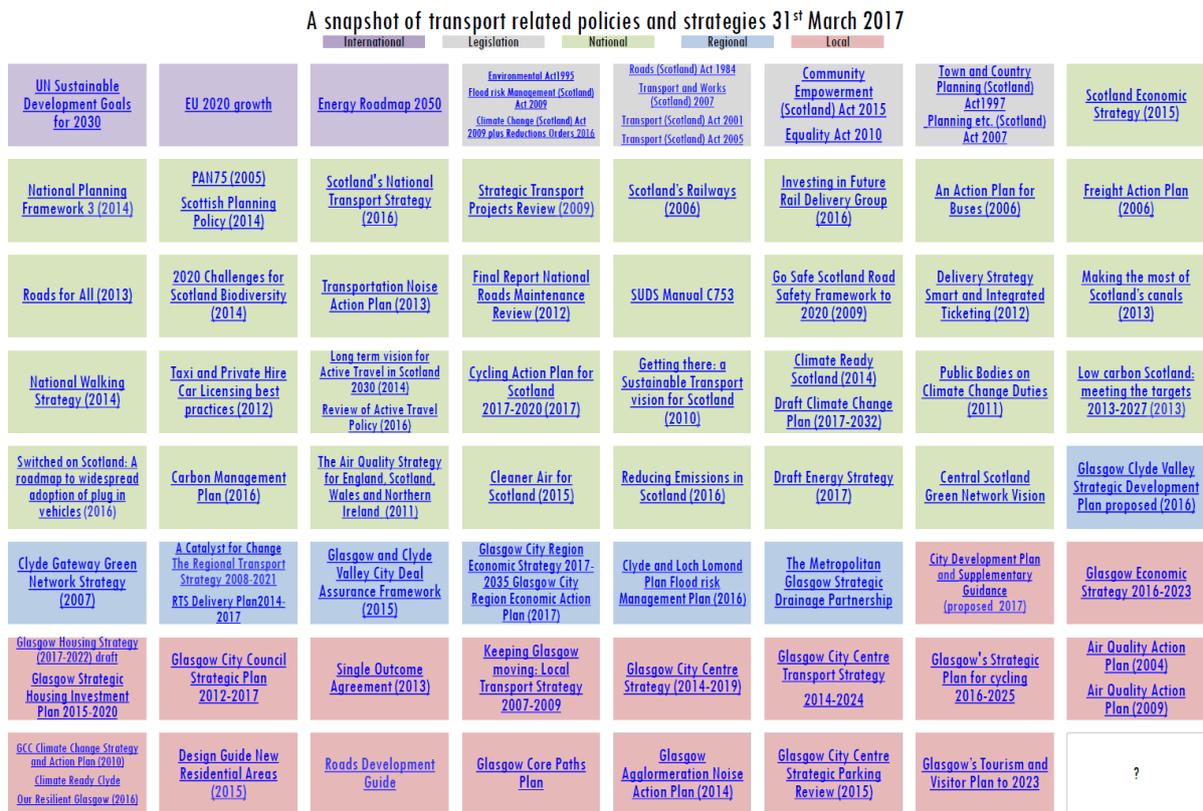
Conclusions are made adopting the framework of adaptive governance, originally developed for the analysis of socio-ecological systems by Wilkinson (2011), Kaufman (2012), Thompson et al. (2014) and Coaffe et al (2016) and found to be suitable for addressing complexity. Coaffe et al. (2016) explains that "adaptive governance highlights the need to engage in coproductive efforts and decision making, with different networks of formal and informal institutions, and which, through approaches that are collaborative, flexible and learning based, rely on network of people and organisations at different levels".

By putting emphasis on the collaborative and learning related aspects of adaptive governance, findings from the data collected throughout the interviews are used to suggest that Glasgow should increase its adaptability levels across all transport related departments. The paper finally proposes that adaptability, a core property (along resilience and transformability) of socio ecological systems (Kaufman, 2012), should be triggered by reviewing existing efforts enhancing collaboration, monitoring and evaluation and learning activities in the complex system of transport.

---

<sup>1</sup> Although Ramani's framework makes explicit reference to sustainable transport, sustainability was a term which was used inconsistently throughout the interviews and its utilization should then be taken critically.

#### 4 Research Methods



**Fig.1** Elicitation material used during the interviews to initiate discussion

Before illustrating the methods adopted for this research, it is noted that, originally, the research focus was to investigate the barriers and challenges relating to the decarbonisation of the transport sector. This original focus evolved throughout the process of detailing the research strategy as it was felt important to let respondents focus on what they themselves thought were the challenges and barriers, rather than directing them to the specific theme of decarbonisation.

In February and March 2017, fifteen face to face Interviews were carried out to gather different perspectives over transport related issues from Local Government Officials working in different teams and services for the same Local Authority. Both the interviewers were employees at Glasgow City Council and the interviewees were selected for their role in contributing to the delivery of different transport related objectives across the wider Council Family. Based on expert judgement, the final sample selection included actors with expertise in resilience, decarbonisation, air quality, policy making, housing and regeneration, economic development, transport planning and environmental health. The representativeness of the final sample is recognised to be limited by the expert's own social network as well as the respondents' availability to participate to this study. A meeting agenda was drawn including two guiding questions and replaced the traditional interview sheet. The interviews were semi-structured and discussion was facilitated by elicitation material: the meeting agenda and a sheet listing different transport policies, which the researcher developed in an exploratory desktop-based research (Figure 1), were handed to the interviewee during the interview. Interviewers would then introduce themselves and the purpose of the meeting and ask the interviewees to carefully look at the list of policies identified and discussions on whether they thought any key policies and/or strategies were missing were initiated. Interviewees were then told the list would be updated and forwarded to them with live hyperlinks to the online documents. Using this snowballing style, a comprehensive list of policies around transport was generated with the input of every interviewee and forwarded to every interviewee at the end of the research.

By adopting a conversational-style approach, barriers and challenges to policy design and implementation were explored. Each interview lasted between 30 and 60 minutes and pen and paper were used to record the responses. Two interviewers (the researcher and the Senior Transport Officer) attended every meeting except of two meetings attended by the researcher only.

The notes were then digitized and categorised in themes reflecting the guiding questions used in the interview (missing policies, policy design and implementation barriers and challenges), which were then interpreted following Ramani’s conceptual framework on sustainable transportation (Ramani et al., 2016). Findings are narrated in Chapter 5 making use of anonymous quotes extracted from the primary data and, partially, revisited.

It is acknowledged that the quality of conceptual consistency, sampling and analysis was affected by the following methodological issues: a) the lack of clarity provided in the discussion of sustainability, sustainable transportation and transport as both the interviewees and the interviewers would switch between the different terms generating poor conceptual consistency, b) the conflict of interest caused by one of the interviewees having an established role in Glasgow City Council, which represented a minimal threat to the internal validity of the research and c) the inability –due to time constraints- to contextualise the issues raised during the interviews in relation to the interviewee’s job role which would have allowed for a comparative analysis .

## 5 Findings

### 5.1 Definition of what sustainable transportation is: multiple perspectives and synergies

3	Lower carbon emissions	v	New development
1	Placemaking desire to reduced the dominance of the car	v	Reality - with developments being built where public needs or desires one car or more
7	Modal shift	v	Public transport provision
5 & 6	Transport Scotland Officials need to respond to Ministers	v	Local Authorities Officials responding to Councillors
4	Carfree development policy	v	On street car parking - reducing quality of place for existing residents
2	Public transport provision	v	Air quality

Table 1 Emerging transport conflicts as identified by respondents (non exhaustive) ; the numbers are used to relate to specific spatial challenges identified in Table 2

The interviews revealed there is a shared recognition of transport being “different from what it used to be in the past”, expressing itself in the discussion of themes like ‘active travel’, ‘modal shift’, ‘health’, ‘social inequality’ etc. *111* stated that “most of the recent policies (National Walking Strategy, Cycling Strategy, Climate Ready Scotland, Low Carbon emissions, Clean Air for Scotland etc.) distance themselves from ‘hard transport’ objectives” (intended as rail, roads, airports, bridges etc), and other

interviewees explained how: “transport has changed from being seen (only) as an infrastructure, to being seen as a service” and: “...in the past, transport would solely focus on spatial land use while now (transport) is not a roads only business” (*i13, i7*); the role of transport in enhancing the quality of development was acknowledged by *i13* who suggested that: “transport should be at the heart of development”. Depending on their remit, respondents would focus on different elements of transport: transport is “how you move people around” in the context of housing (*i10*), it is air quality in relation to environmental health (*i13*) and it is about fuel consumption in the context of climate change (*i3*).

Transport priorities and definitions presented above clearly depend on the professional goals which, following organisational theory, could be associated to different perceptions of risk of the interviewees. These generate conflict in the identification of priorities (Table 1), often justified by other existing policies (e.g. housing, environmental health etc.). Nonetheless, the existence of multiple definitions and goals was not necessarily interpreted by respondents as a negative trait of sustainable transport but, instead, it was recognised that it could be a place for building up synergies via collaboration and learning activities. Just to make an example, *i12* explained how: “although flooding management priorities are, at times, in conflict with transport priorities, a modal shift would reduce the n. of parking spaces allowing for extra water storage”.

Looking beyond the diverging perspectives on transport related priorities, interviewees seemed to strongly agree on one specific aspect of transport, sharing the idea that buses should be regulated. Having control of buses seemed to be, for most of the respondents, a mean to achieve objectives across different departments, with some respondents concentrating on the impracticality of gaining control because of financial viability and competition regulations (*i20*), as well as the “problematic engagement with local bus companies” (*i3*). Comments were also made over the variation of approaches to transport, more specifically between local Authorities, the Strathclyde Transport Partnership and other –both existing and emerging- regional bodies with an interest in transport, like the Glasgow and the Clyde Valley Strategic Development Planning Authority or the Glasgow City Region City Deal (*i20, i14*).

Ramani (2016) explains that, in order to shift towards a sustainable transportation paradigm, a clear vision and consensus around its definition is required. From the interviews with the different Local Governmental Officials, it appears that, in the context of a single Local Authority, transport and sustainable transport meant different things to different people, with transport planning “lacking focus and an overall strategy which results in high levels of fragmentation” (*i14*).

## **5.2 Measurement of progress towards sustainability in a consistent manner: right data at the right time**

Measurements are key elements to progress towards sustainability and are usually carried out through the use of indicators in a consistent manner (Ramani et al. 2016). Measurements of progress towards sustainability have been hardly mentioned throughout the interviews and this could be partly due to the inability of the interviewee to address these issues. However, it can be stated that, in between the many issues which were mentioned in relation to policy design and implementation, only a minority related to “measurement” with the exception of ‘transport assessment and modelling’, which were instead seen as fundamental decision aiding tools from more than one respondent (*i2, i20, i30*).

A comment was made in relation to carbon emissions and the difficulty of measuring transport emissions at a city level in comparison to other sectors (e.g. commercial and residential) (*i3*). The general need for better measurements was also identified in the context of the open space strategy where, for example, the update of the ‘core paths plan’ was seen as a priority, although it was understood that, according *i7*, there are difficulties in ensuring everyone gets consulted because of many complexities around land ownership.

The need for improving data quality was addressed by many with the clear example of *i30*, who expressed the need for an accessibility map able to visualise accessibility as connectivity to multiple areas rather than mere distances to buses and train stations. A better understanding of how people use spaces was seen by *i4* as: “relating to the whole idea of smart cities where decisions are informed by data made available by new technologies”. *i4* explained that information should deal with the ‘granularity of space’ recognising that the new City Development Plan is moving towards a better use of mapping and this will help “achieving a better perspective since the spatiality of planning priorities is better considered” (*i4*), linking the availability of different spatial datasets to better decision making. The embryonic state of this ‘spatialization process’, was again iterated by *i4* stating that: “...this is just a start for efficiencies to be generated by providing the right information at the right time”.

At the light of this, it is anticipated that the introduction of new measurements -and new definitions- for future policies will unavoidably require the innovation of current technologies used for the measurement of progress. Partial awareness at this front was demonstrated by *i13*'s comment: “new policies should be able to understand the relationship between intervention and monitoring and new data and other partners like universities, can help in doing so.”

### 5.3 Implementation of appropriate policies and programmes to achieve the goals of transportation: collaboration, commitment, restructuring, clear strategy and conflicts

1	Outer urban redevelopment - Desire to minimise car parking led to discussion on marketability and consequential displaced parking in adjacent residential areas
2	Discussion on possible Low Emission Zones for City centre identified risk of reduction in public transport provision and older buses being displaced to other areas
3	Greenfield residential development with lack of new bus service will bring new car trips onto the network increasing carbon emissions
4	New large flatted development cannot provide appropriate car parking and deliver a good non car development redeveloped without displacing parking problem
5	Major motorway upgrade delivering on new pedestrian bridge where Local Authorities want to link two new residential developments with a road bridge to allow potential public transport route
6	Desire to connect link road of new Transport Scotland delivered junction to allow potential public transport connection for new large residential areas. This was not granted due to contract from which precludes potential bus penetration
7	Major cycling infrastructure in city centre opposed by bus operators because of speed reducing measures

Table 2 Spatially expressed conflicts as a result of diverging priorities between different stakeholders (non exhaustive); the numbers are used to establish a relationship with the policy conflicts identified in Table 1

Ramani et al. (2016) explains that: “in cases where sustainability has been a driving force behind certain plans and initiatives, questions still remain as to whether outcomes have been meaningfully affected.” In relation to outcomes, some of the interviewees believed that existing policies were in fact

---

sufficient in directing actions relating instead existing transport problems to poor collaboration and commitment levels both from agencies as well as individuals.

*I6* explained how: “teams are ready to apply for funding and do research to demonstrate interventions are efficient but doors of delivery partners are often closed”; from *I9*’s perspectives, “clear policies for improving walking and cycling already exist,” and everyone “agrees on their face-value” (*I9*) but the problem lies in the fact that people do not accept the implications of new policies on design and planning practices. For instance, the idea of designing for people and not for cars creates different constraints for different actors generating conflicts during actual decision making which could translate in a lack of collaboration; in the case of the Avenue project, the regional transport partnership, disagreeing with the Local Authority, submitted an objection to the project although being involved and consulted from inception. Other examples in which conflicts arose while delivering development were extracted from the interviews and summarised in Table 2; it is possible to notice how, ‘on the ground’ conflicts, relate to the more abstract priority conflicts as defined in 5.1, Table 1.

In terms of commitment levels, *I9* stated: “there is a disconnect between new strategies and existing practices as it all depends on people’s commitment.” Besides, implementation depended on the levels of aspiration of singular individuals, which itself depended from the ability of “cascading the information down from the top and then back up again” (*I6*; *I11*) and from the ability of “staff to accept required changes” (*I9*). Such organisational inertia was rationalised by *I11*: “people tend to go with the last path of resistance –whether a developer or a politician-”

In addition to the lack of collaboration and commitment, organisational re-structuring was mentioned as another factor affecting implementation. *I11* recounted that “although sustainability was introduced in local policies in 2001, many organisational changes have shifted the responsibility for sustainable transport with a considerable loss of knowledge from one phase to another”. Similarly, in the context of the recently agreed developer contributions in relation to accessibility, “it is under consideration who will deal with developer contributions in relation to accessibility” (*I7*) suggesting the presence of a gap between policy design and policy implementation which may derive from existing organisational structure. Organisational restructuring, along its political and financial dimensions, is then understood to have an impact on the implementation of sustainable transport strategies as well as their definition.

Opposing to the interviewees who thought that existing policies could satisfactorily direct transport actions, *I1*, *I13* and *I14* saw the creation of a new local transport strategy as a necessary step to implement objectives from policies at a higher level: “the challenge is to have a local transport strategy which is coherent to what is done at a regional level by different partnerships (*I13*). *I1* added: “we need a strong policy which allows us to back up actions such as further restrictions on private parking”; and again: “a local transport strategy should be at centre and all other strategies should be sub strategies”; “we need a clear sustainable transport strategy; local development framework is ok but it only sets a framework and cannot replace a clear transport strategy” (*I13*).

## **6 Summary of findings: Learning and adaptive governance**

Among the different factors identified as barriers to sustainable transportation definition, measurements and implementation, focus is put on one particular aspect which was not explicitly mentioned by the interviewees but is found to cross through the three concepts used to present the findings: the need for better organisational learning. As one of the interviewees underlined: “the organisation prevent learning from happening as different groups often re-invent the wheel as they are unaware of existing strategies and do not refer back to existing policies”. Moreover, the rationale for better learning is framed by *I9* and *I7* comments on accountability and reliability: “we work with public money and when we make a mistake we should be working on it to get it fixed” (*I9*), and: “there is a reliance on development managers and the skills of individual looking at public movement during application”(*I7*).

---

Lack of learning is also linked to the lack of awareness of the intention of policies influencing aspects outside individual's silos (a term repeatedly used by respondents during the interviews) recognised by i2. Although it was recognised that: "things are better than they were in the past from the perspective of cross departmental communication", "there is a need for joined up thinking across Land and Environmental Services and Development and Regeneration Services", emphasising that "there will be no return to the times where transport planning had its own department but there is a need to have a core team providing focus and a clear strategy" and, again "there should be a clear transport planning group who will be responsible for the delivery of strategic transport planning" (i14).

By gathering different perspectives on the complexity of transport it is iterated that there is no single panacea or single fixer for transport problems but actors having an interest in or being affected by transport strategies, will need to come forward with their best approach ready to engage with their community of practice and having the capability to compromise and learn during decision making processes. Although there is a large body of literature highlighting the difficulties of 'policy transfer' and 'policy translation' that could lead to different interpretations of the presented findings, this research uses adaptive governance theory, originally generated in the field of environmental resource management, to summarise the results from the interviews.

The concept of adaptive cycles is useful to explain why the capability to compromise and learn and, if required, switch to a different mode of governance, is key to address complex organisational change (Thompson et al. 2014); as for the cycles of conservation, destruction and regeneration, required for the survival of an ecological community, the ability to switch from one mode of governance to another increases adaptability. Stating that adaptability levels should be increased in transport policy design and implementation, equals to state that future transport policies should be able to set the grounds for reviewing the effects of existing policies and strategies, promoting cross departmental learning while ensuring that unlearning occurs whenever necessary.

## 7 Conclusions and recommendations

According to Thompson et al. (2014), adaptive governance is enhanced when 1) excluded actors are included in decision making processes, 2) different information sources, generated by actors with different worldviews, are easily accessible and 3) when actors are open to absorb new information (transformability). When these three different variables co-exist in decision making, the system will exhibit high levels of adaptability leading to the generation of 'clumsy' rather than 'elegant' solutions, in which consensus building is replaced by compromise.

Looking at the findings from the interviews, it is possible to understand that low levels of adaptability exist, suggesting that 'clumsy' transport solutions will only emerge when: 1) different priorities for different actors are made explicit during the strategic phase and compromises on what can be achieved are agreed at front ; 2) challenges around the measurement of progress are overcome and clear and accurate indicators are developed for the different aspects of transport as generated by the different priorities and 3) 'inter' and 'intra' organisational learning activities are enacted.

This research also suggests that the presence of a shared vision around one specific aspect of transport could represent leverage in the system and agreement between different interviewees over a specific aspect of transport, should be exploited to facilitate the required shift towards a more adaptive style of governance. At the light of this, it is recognised that most respondents felt that the lack of control of buses created inefficiencies; talks on public transport coordination could therefore represent a trigger for establishing a common sense of purpose across different departments and establish positive relationships which could then be exploited in more contested territories.

To conclude, this research understands that the ability of future strategies to meet sustainable transport targets will coincide with the ability to work with different definitions of sustainable transport, improve their measurability and promote organisational learning. Likewise, the capability to address

---

these three different aspects is found to be determined by the capability to move towards a more adaptive mode of governance and a better management of resilience within the Local Authority itself; as *i14* noted: “If we want to get things done better, we should first look at what we can do in our own house” This raises issue around the need of better coordination and orchestration of cross-departmental activities which is identified as a potential focus for the future way forward.

## 8 References

Bache, I., Bartle, I., Flinders, M. and Marsden, G (2015) *Multi-level Governance and Climate Change: Insights from Transport Policy*, Lanham (US) and London: Rowman and Littlefield

Beaurigard R.A. (2016) *Planning matter: acting with things* Chicago, University of Chicago Press, ISBN 9780226297392

Coaffe J. & Lee P. (2016) *Urban Resilience Planning for Risk, Crisis and Uncertainty* Palgrave ISBN 978-1-137-28883

Committee on Climate Change (2016) *Reducing Emissions in Scotland 2016 progress report* Available at <https://www.theccc.org.uk/wp-content/uploads/2016/09/Reducing-emissions-in-Scotland-2016-Progress-Report-Committee-on-Climate-Change.pdf> [31st March 2017]

Howlett, M., (2011) “*Revisiting Policy Design: The Rise and Fall (and Rebirth?) of Policy Design Studies*”, Paper presented at ECPR Conference, Iceland.

Hull, A. (2009). Implementing innovatory transport measures: What local authorities in the UK say about their problems and requirements. *European Journal of Transport and Infrastructure Research*, 9(3), 202-218.

Kaufman S. (2012) Complex Systems, Anticipation, and Collaborative Planning for Resilience in *Collaborative Resilience* edited by Goldstein B. E. Massachusetts Institute of Technology ISBN 978-0-262-01653-7

May A.D. (2013) Urban transport and sustainability: The key challenges. *International Journal of Sustainable Transportation* 7(3):170–185

Meadows D.H. (2008) *Thinking in Systems: a primer* Edited by Diana Wright Sustainability Institute ISBN 978-1-60358-055-7

McEvoy D , Hartmut Fünfgeld & Karyn Bosomworth (2013) Resilience and Climate Change Adaptation: The Importance of Framing, *Planning Practice & Research*, 28:3, 280-293

Pollaris S. N. (2016) *Planning Sustainable Cities* Zofnass Programme for sustainable Infrastructure, Harvard University Graduate School of Design, Routledge ISBN 9781138188426

Ramani T. L. & Zietsman J. (2016) Sustainable transportation – alternative perspectives and enduring challenges, *International Journal of Urban Sciences*, 20:3, 318-333

Rittel, H. W. J., and Webber, M. W. (1973). “Dilemmas in a general theory of planning.” *Policy Sci.*, 4(2), 155–169.

---

Rydin Y (2014) The challenges of the “material turn” for planning studies, *Planning Theory & Practice*, 15:4, 590-595

Sørensen, C. H., Gudmundsson, H., & Leleur, S. (2013). National transport planning – sustainability, institutions, tools. Technical University of Denmark.

Thompson, M and Beck, B (2014) ‘*Coping with change: urban resilience, sustainability, adaptability and path dependence*’, Government Foresight Future of Cities: working paper, Available at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/396355/15-1-future-of-cities-copingwith-change.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/396355/15-1-future-of-cities-copingwith-change.pdf)

Underwood A, Thompson M, & Ingram D (2014). All on the same train, but heading in different directions. *Intelligent Risk* 09:44-53.

Wilkinson C. (2012) Social-ecological resilience: Insights and issues for planning theory, *Planning Theory* Vol 1, Issue 2

### **Disclaimer**

The opinions expressed in this paper are those of the authors and contributors and do not necessarily reflect those of Glasgow City Council.

### **Acknowledgements**

We thank Dr Graham Martin for comments that greatly improved the manuscript and all the interviewees who dedicated some of their time to contribute to this work.