Estimating the cost of disruption to travel caused by severe winter weather

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1 INTRODUCTION

Karl Johnston

•Head of Road and Rail Economics, Transport Scotland

•Experience in Scottish Government and Whitehall (UK)

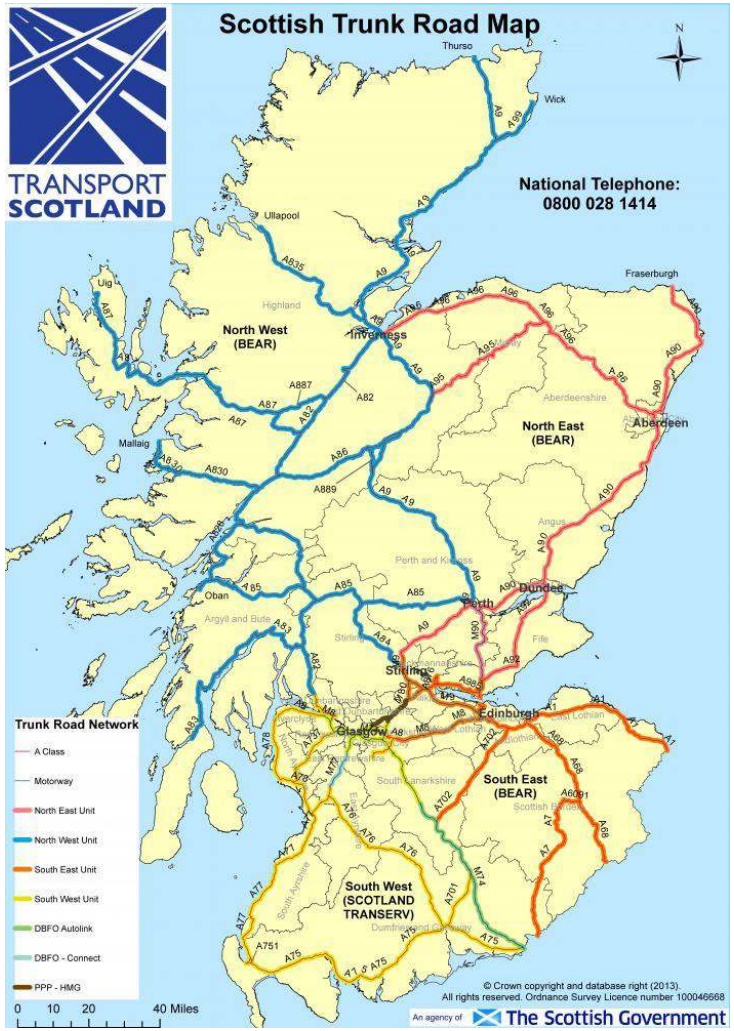
Transport Scotland

•Rail and trunk road networks

•Major public transport projects

•National concessionary travel schemes

•Transport policy



1. INTRODUCTION

- Weather in Scotland is very unpredictable – may be a lot of snow or no snow in any given year.
- Scotland has suffered some particularly severe winters in recent years – December 2010 coldest Scottish winter since records began.
- Exercise to examine social and economic costs of severe winter weather and *illustrate* benefits of increased investment.

2. EXPERIENCE OF THE 2010 WINTER

- Heaviest snowfall since 1960
- Coldest December on record
- Heavy snow in November
- Long periods of record low temperatures
- Salt shortages
- HGVs loosing traction on inclines
- M90 and A9 closed overnight
- M8 (motorway between Glasgow and Edinburgh) closed for 2 Days

2. EXPERIENCE OF THE 2010 WINTER

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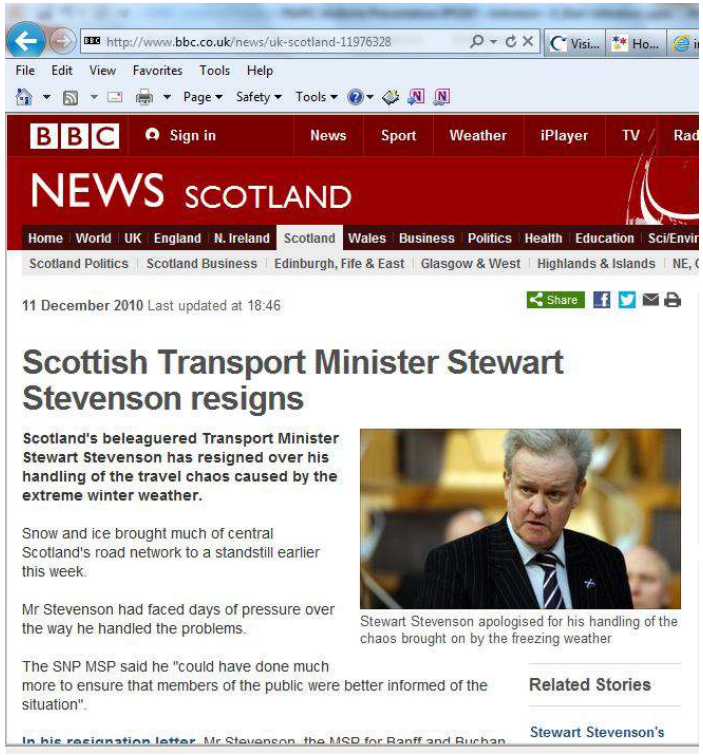
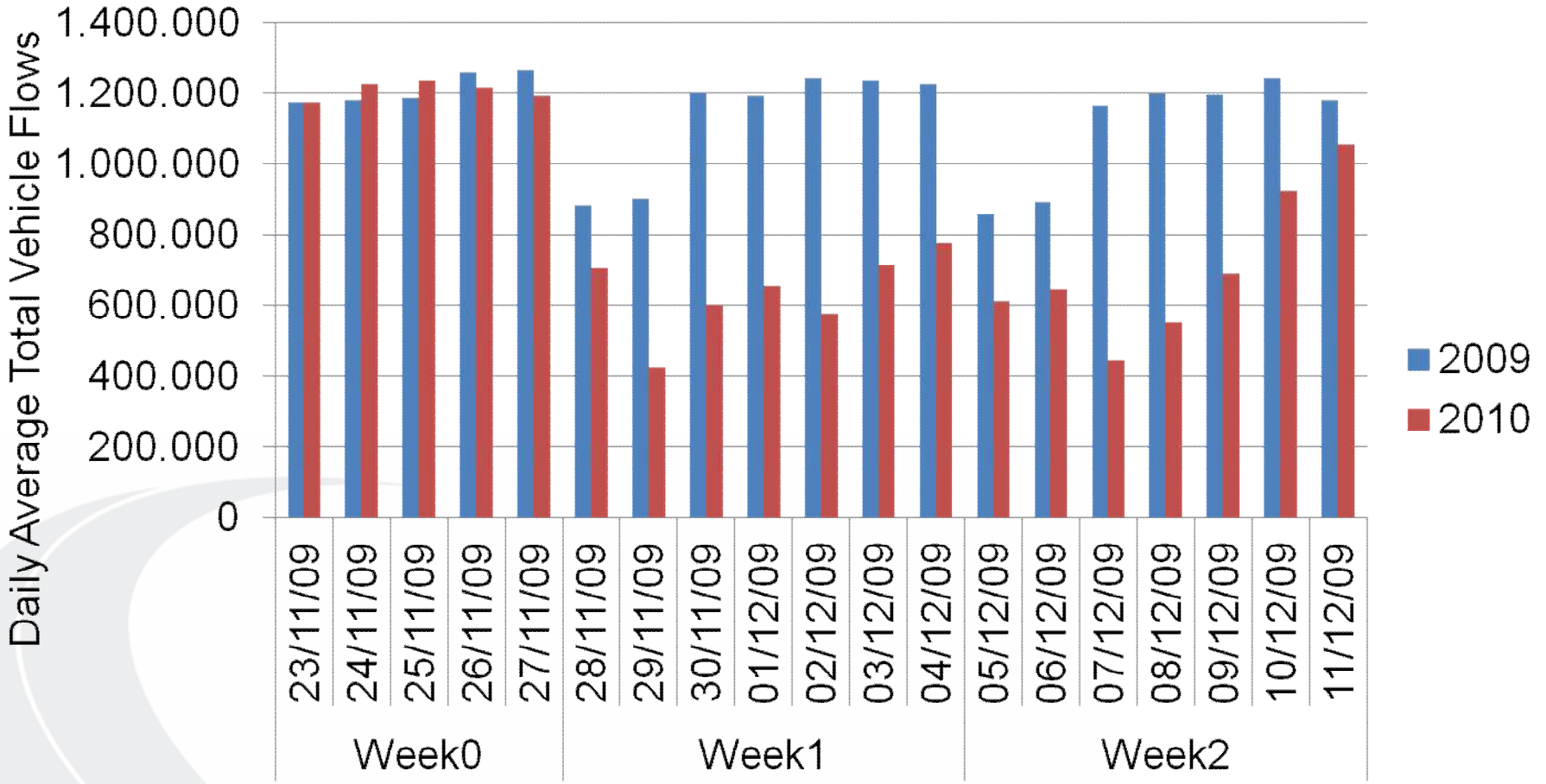
Impacts

- Low temperatures and significant snowfalls
- Schools closed, hospital admissions soared
- Flights suspended, bus and rail services disrupted
- Biggest impact was on the road network
- Transport Minister resigned in the political aftermath



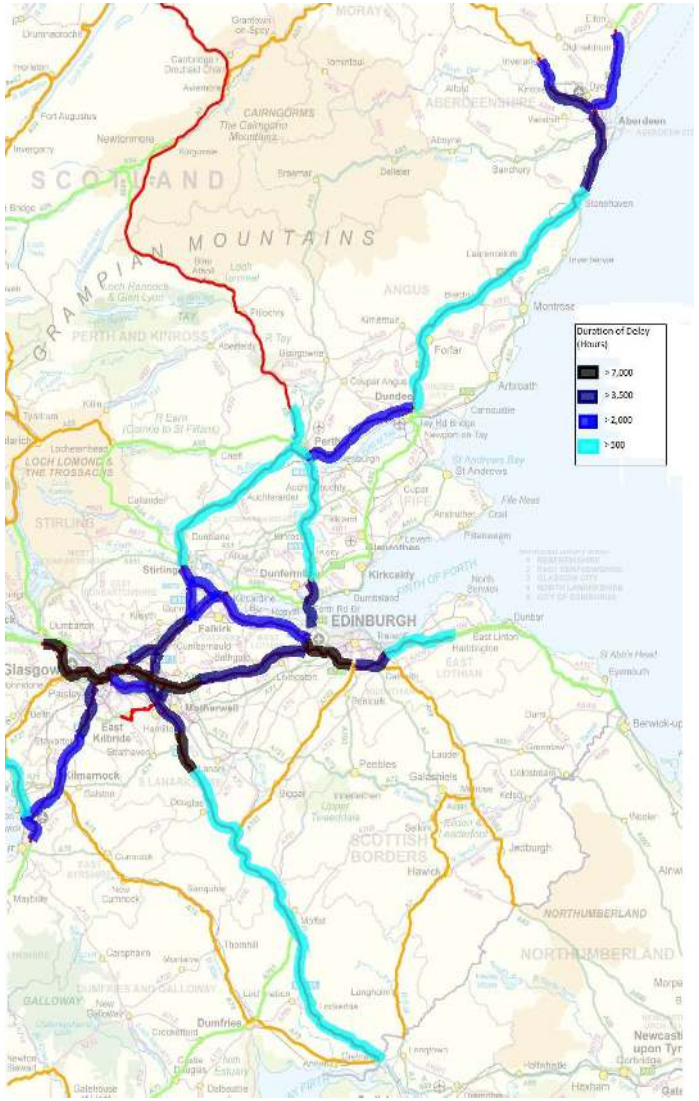
2. EXPERIENCE OF THE 2010 WINTER

Scottish Road Traffic Database (SRTDb) Daily Average Total Vehicle Flows



2. EXPERIENCE OF THE 2010 WINTER

Time impact on travellers of 1 hour delay in the morning peak



3. ECONOMIC AND SOCIAL COSTS OF WINTER DISRUPTION

- BIG data gaps. Judgement sometimes employed
- Used Winter Resilience Review (WRR) model
- Daily *welfare* cost of disruption caused by severe weather to be £30m (in 2010 prices)
- Daily *GDP* impact assumed to be £15m
- Met Office average number of snow days in Scotland 1968-2010:
  - 11 days of severe disruption per year
  - Annual welfare cost of c. £330m.

3. ECONOMIC AND SOCIAL COSTS OF WINTER DISRUPTION

Costs (daily, 2010 prices)	Welfare costs, £m
Reduced economic output from lost commuting and business/commuting journey time delays	13.0
Lost output from working parents with dependent children not at school	0.4
Lost hospital appointments	0.1
Goods vehicle delays	1.1
Wastage on food and perishables	0.2
Road vehicle collisions	0.0
Pedestrian accidents	2.4
Lost journeys - personal travel	4.6
Journey time delays - personal travel	3.2
Pedestrian delays	4.7
Total	29.7

3. ECONOMIC AND SOCIAL COSTS OF WINTER DISRUPTION

- Sensitivity analysis - ……..

		Average Annual Welfare Cost to Scotland	
Years Snow Data	Number of Snow Days	Range	Central Estimate
1968-2010	11.1	£115m - £633m	£330m
1981-2010	6.6	£65m - £374m	£195m
1991-2010	3.8	£35m - £217m	£112m

3. ECONOMIC AND SOCIAL COSTS OF WINTER DISRUPTION

GDP impact:

- £15m per day, range from £4m to £31m .
- Cost to commuters is considered a GDP cost in this analysis – it is assumed that commuting delays are a cost to the employer.

Other areas of potential cost (unquantified):

- Lost education
- Damage to highway/vehicles from potholes
- International trade and travel
- CO2 impact and operational cost of driving
- Changes in fuel use at home, work etc.
- Cost of additional breakdowns
- Any cost associated with investment – environmental impact of salt etc.

4. BENEFITS OF INCREASED EXPENDITURE ON WINTER RESILIENCE

Current annual spend:

- £110 from Local Authorities,
- £10m from Transport Scotland
- £120m total

Benefit of increase in spend of 50%, i.e. to £180m

	Range	Central Estimate
GDP benefit	£8m - £95m	£38m
Welfare benefit	£6m - £70m	£31m
Total benefit	£15m - £165m	£70m

NB Totals do not sum due to rounding.

4. BENEFITS OF INCREASED EXPENDITURE ON WINTER RESILIENCE

Analysis heavily dependent on assumptions:

•Proportion of disruption that can be avoided:

- 20%
- 25%
- 30%

•Length of delays caused by winter disruption (averaged across all trips)

- 2 minutes
- 4 minutes
- 6 minutes

5. TRANSPORT SCOTLAND'S RESPONSE

Winter treatment:

- 23 additional patrol gritters
- 30 minute maximum response time
- 2 hour target for completion
- New plant eg icebreakers, footway snow blowers, inverted V-ploughs
- Guidance on use of alternative de-icers
- Vulnerable locations identified for targeted interventions

5. TRANSPORT SCOTLAND'S RESPONSE

Enhanced decision making using better info, eg new weather stations:

- New weather stations
- Real time monitoring of location and temperature of each gritter

5. TRANSPORT SCOTLAND'S RESPONSE

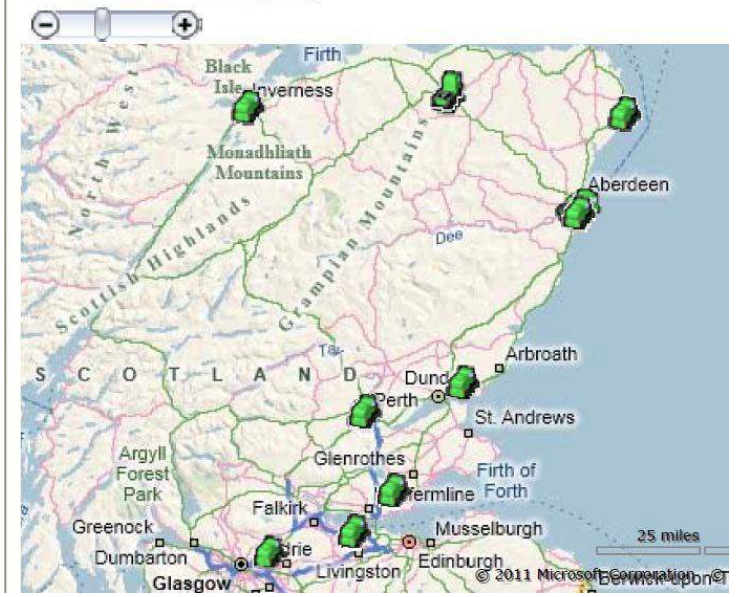
<u>Communication with road users improved – info "on the move"</u>

•Major lesson learnt

•Strengthened Traffic Scotland information service

- Information "on the move"
- Traffic Scotland Radio

•Ability to follow progress of the spreader fleet



6. WINTER PATROLS CASE STUDY

	Point 1 (high)	Point 2 (middling)	Point 3 (low)
Hours Saved by Avoiding 1 Hour Delay	18,000	6,000	3,000
Value of Time Benefit (2010 Prices)	£140,000	£50,000	£20,000

- Previously two hours on average to “complete”
- Now Winter Service Patrols designed to reach any part of the network in 30 mins.
- Assume average response time improvement of 1 hour

Cost of Additional Winter Patrols, 2012-13, South East Unit	Number of Patrols	Cost per Patrol	Number of Winter Patrol Incidents, South East Unit, 2012-13	Cost Per Incident
£800,000	7	£115,000	234	£3,500

7. CONCLUSIONS

- Economic and social costs of disruption caused by severe winter weather are high
- Analysis highlights the potential positive net benefits of increased spend on well targeted and managed measures to reduce disruption
- Improved winter patrols offer significant benefits
- Caution: data gaps mean that results highly dependent on assumptions
- Further evidence and analysis required

6. QUESTIONS?