

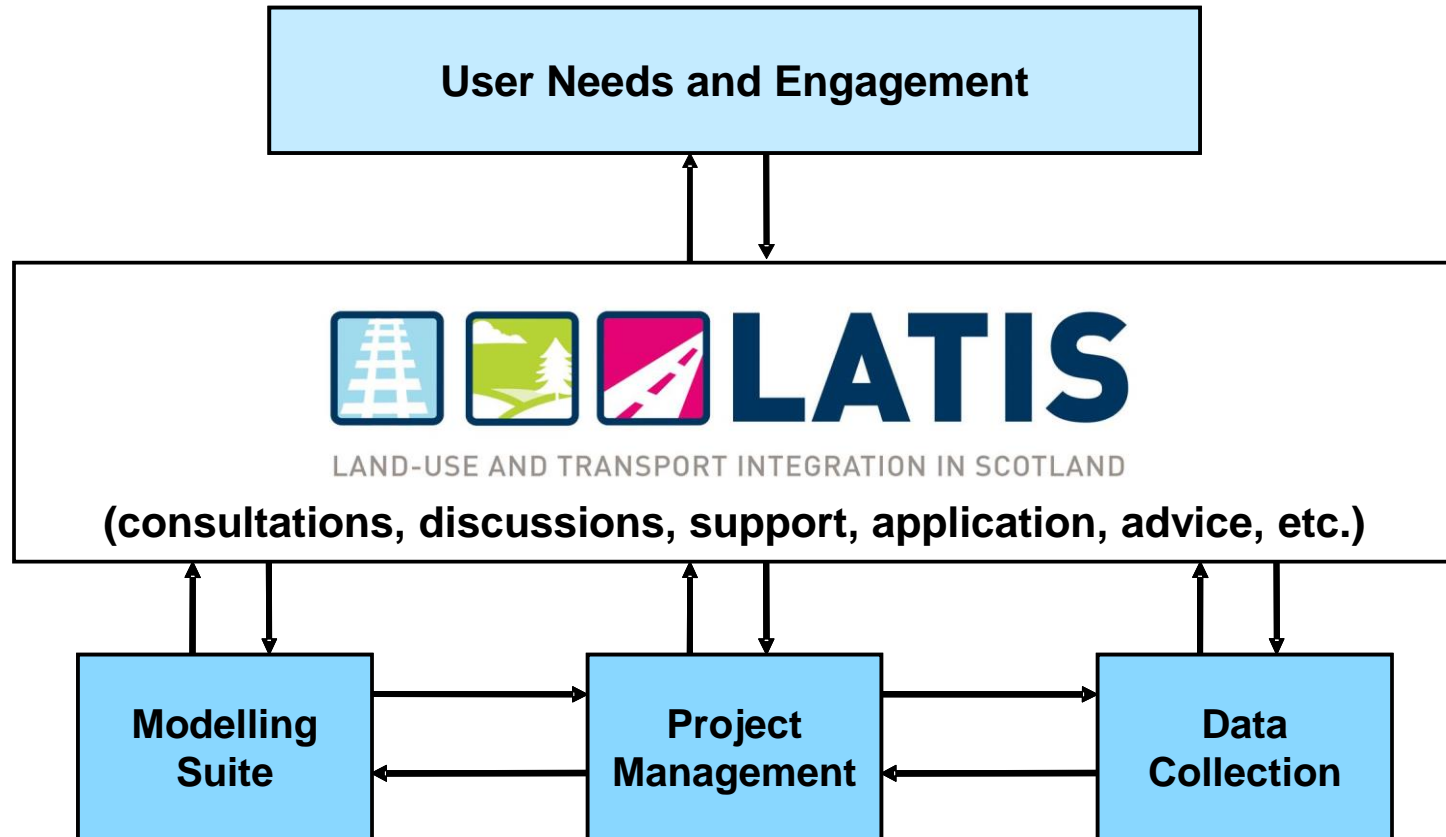
# Derivation of Annualisation Factors

Emma Schneider and Kevin  
Lumsden

29<sup>th</sup> March 2018



# Land Use and Transport Integration in Scotland



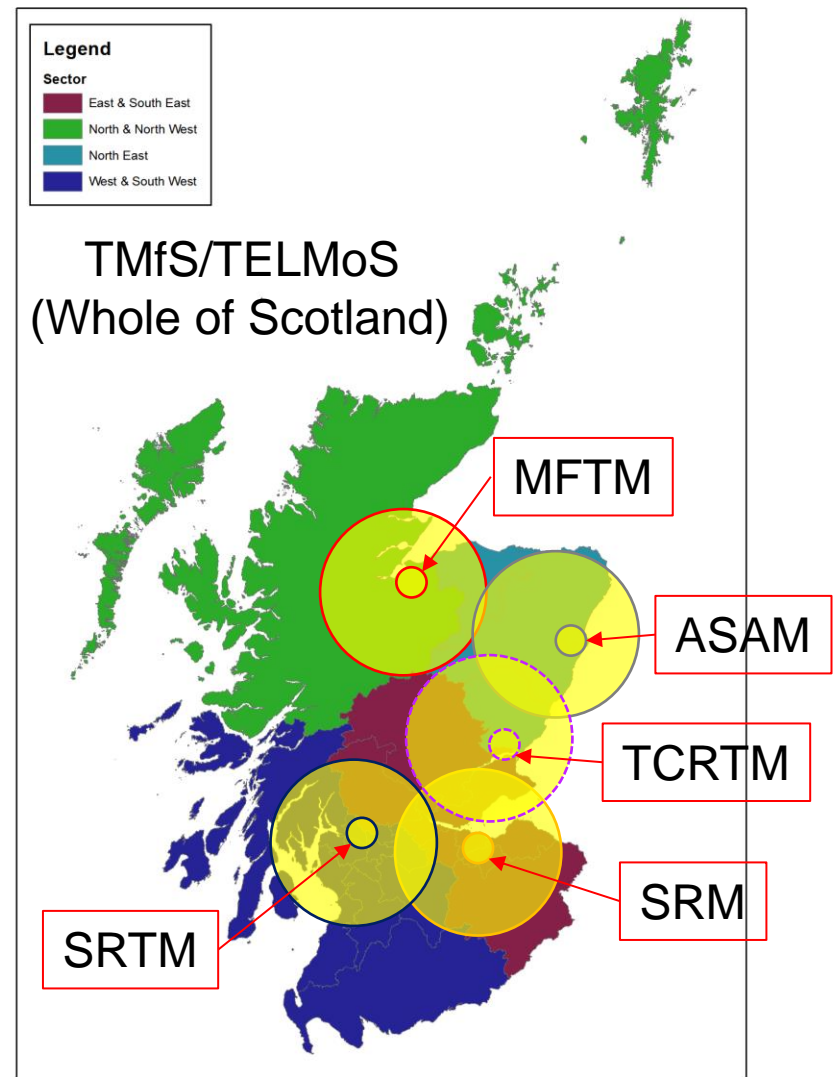
# Land Use and Transport Integration in Scotland

## The 'LATIS' service:

- Advice, transport data & land use & transport models
- Considers impact of transport investments & land use
- Operational, economic & environmental impacts
  - Modelled hours to annual for comparison/evaluation

Other SHS data Uses:

Ownership/availability
Trip Lengths by Purpose
Local Trip Rates
Return home proportions
Purpose splits
Time period of journeys
Car occupancy



# Annualisation Factor Outputs

## Factors for Use

- Relatively small sample sizes limit level of disaggregation.
- Factors recommended for use at Sector and national geographies, and for Car Driver and PT.

Sector	AM Peak Hour to Annual		Average Interpeak Hour to Annual		PM Peak Hour to Annual	
	Car Driver	Public Transport	Car Driver	Public Transport	Car Driver	Public Transport
East & South East	582	536	3,746	3,305	669	700
North & North West	529	476	3,191	2,516	624	762
North East	615	515	3,547	2,863	644	848
South & South West	549	561	3,898	3,100	654	634
<b>Scotland</b>	<b>572</b>	<b>542</b>	<b>3,736</b>	<b>3,144</b>	<b>656</b>	<b>680</b>

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# Calculation of Factors

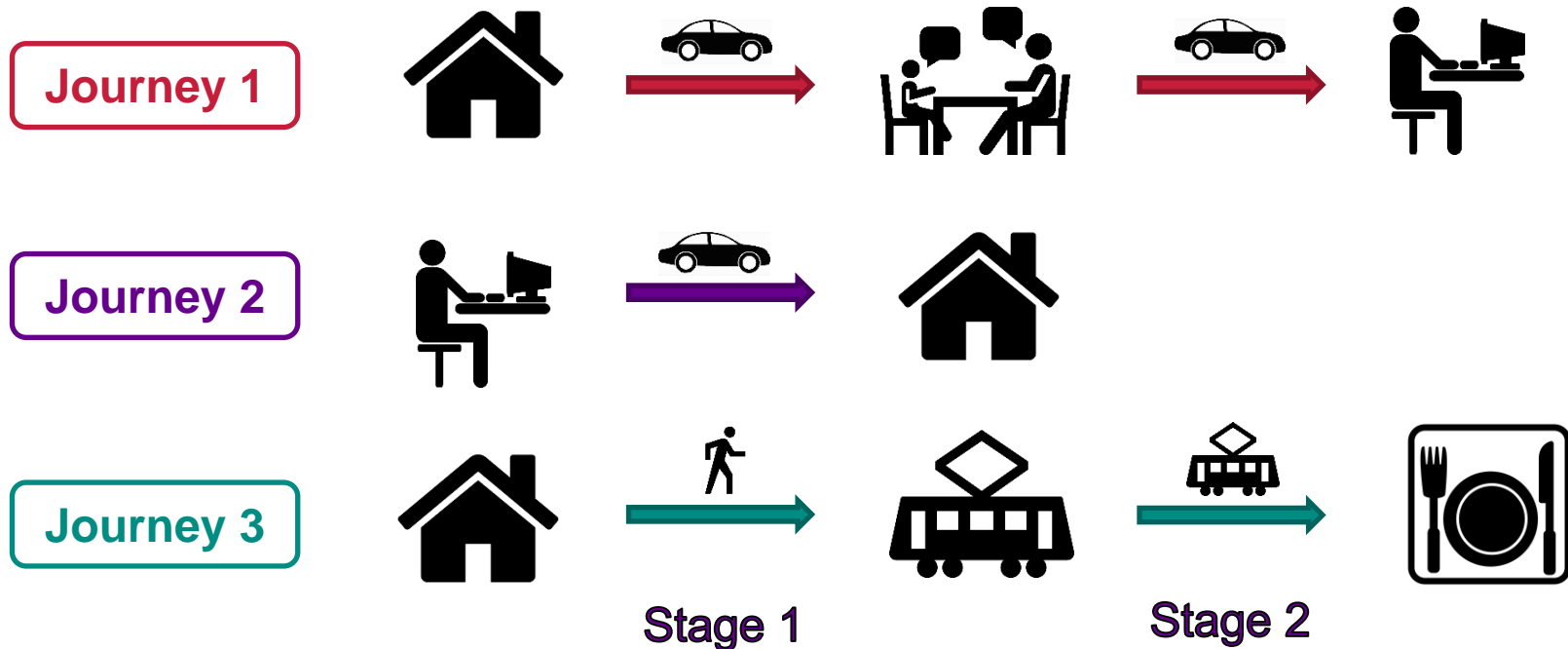
- Emma Schneider

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# Scottish Household Survey – Travel Diary

## Data requested

- SHS Travel Diary selected to provide basis for annualisation factors.
- The Travel Diary provides details of all the trips made by an independent adult on the day prior to the SHS survey being completed. This includes when, where and how they travelled.



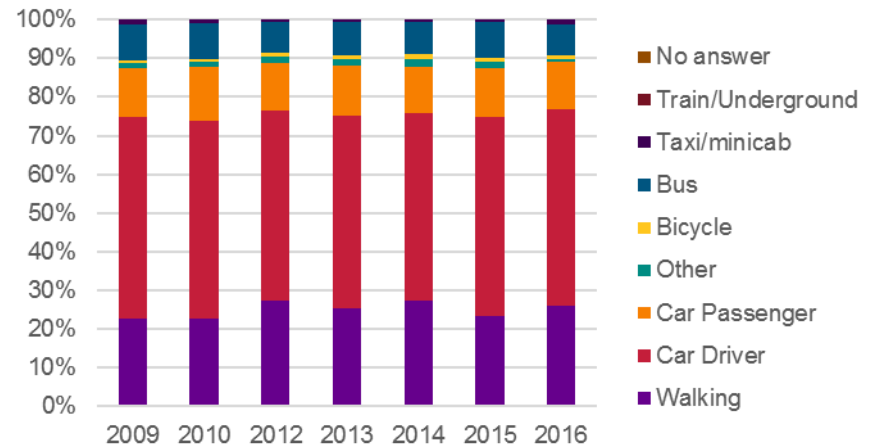
Example of Travel Diary Journey Stages (3 journeys and 5 stages)

# Scottish Household Survey – Travel Diary

## Data requested

- We requested Travel Diary outputs for 2009-2016 from the SHS Team.
- Seeking balance between sample size and timeliness.
- More than half of 2011 journey stages missing start and end LA => 2011 data excluded.
- Retained all other years.

Percentage of Stages by Mode



Year on year changes

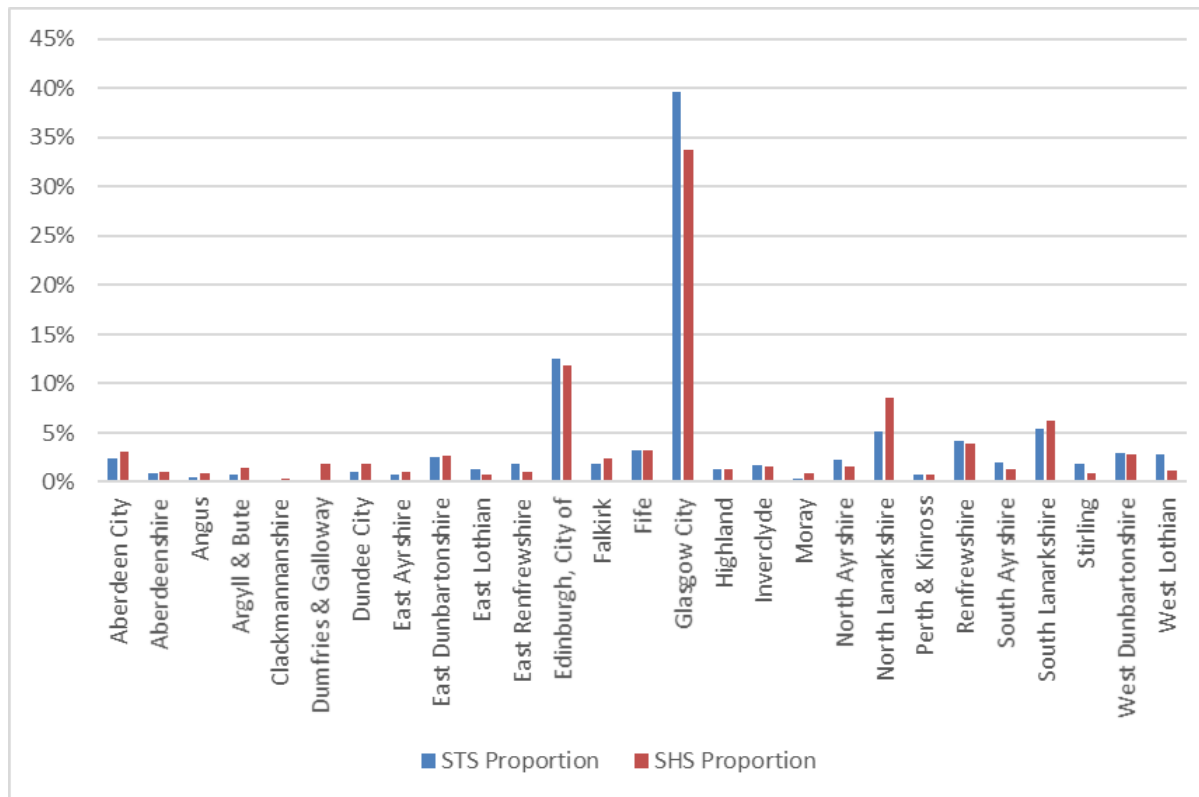
Year	No. SHS Households	No. Travel Diaries	No. Journey Stages
2016	10,470	7,044	19,719
2015	10,330	6,957	19,112
2014	10,630	7,291	20,513
2013	10,650	7,281	20,781
2012	10,640	7,060	20,314
2010	28,388	6,104	16,552
2009		6,804	18,934
<b>Total</b>	<b>70,458</b>	<b>41,481</b>	<b>135,925</b>

SHS sample size by year

# Scottish Household Survey – Travel Diary

## Representativeness of sample

- Consideration given to how representative SHS Travel Diary outputs are of reality.
- Difficult to estimate confidence as do not know population size.



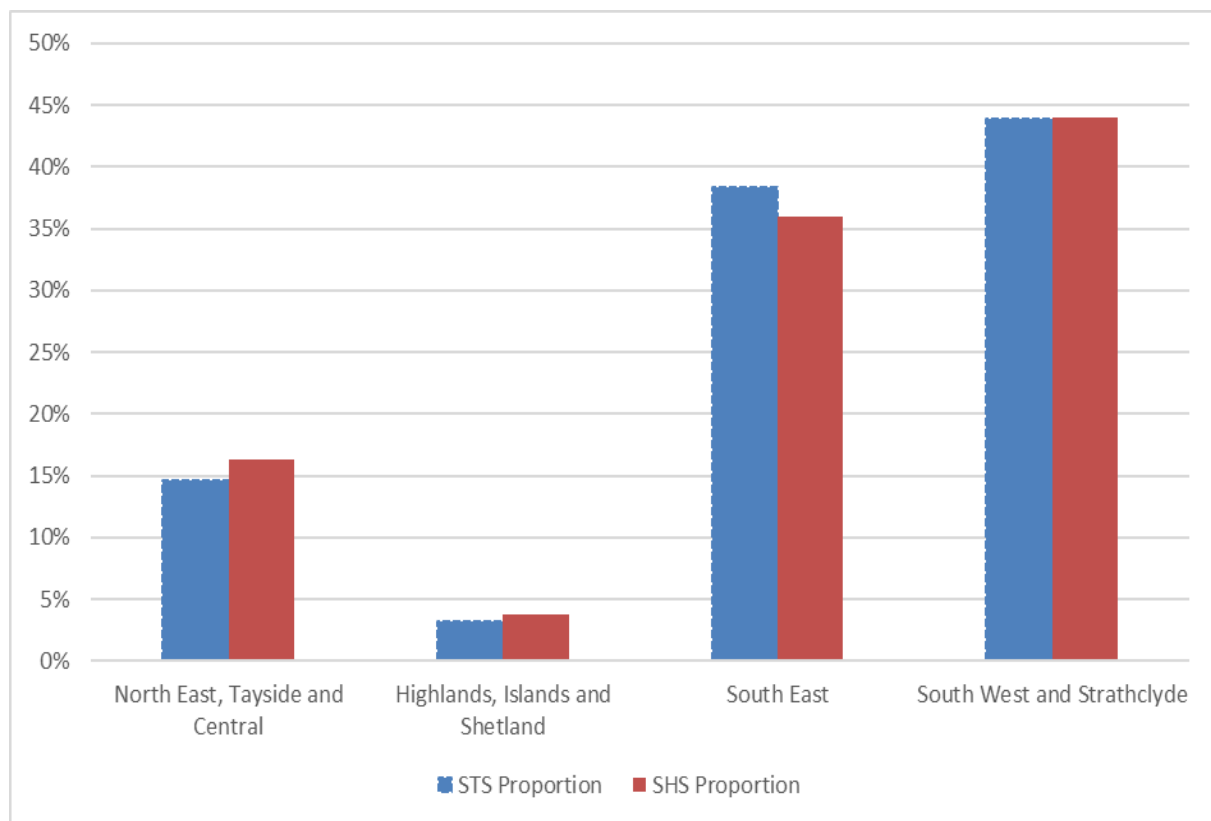
- Rail comparison with Scottish Transport Statistics (STS) annual rail passenger journeys by LA.
- Good match, but different 'rail' mode definitions between sources.

Proportion of rail trips by LA - STS vs SHS Travel Diary



# Scottish Household Survey – Travel Diary

## Representativeness of sample



Proportion of local bus trips by STS Region - STS vs SHS Travel Diary

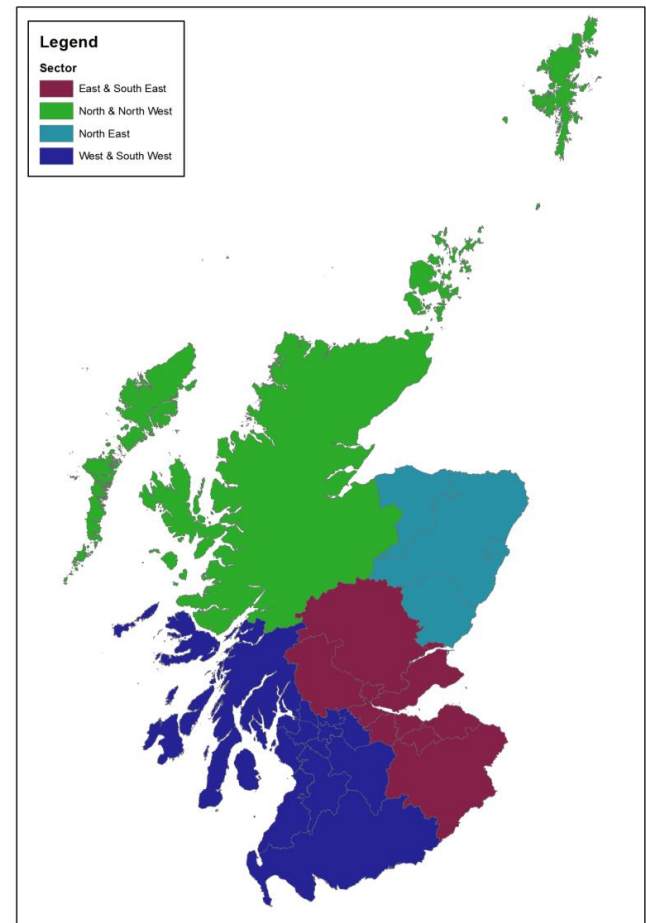
- Comparison of STS annual local bus passenger journeys by region, with those for the same areas from SHS.
- STS defined regions.
- Good match, but again slightly different mode definitions.

# Annualisation Factor Categories

Annualisation factors calculated for variety of...

- **Time periods:**
  - AM Peak Hour to annual
  - Average Interpeak (IP) Hour to annual
  - PM Peak Hour to annual
- **Geographies:**
  - Local authority (x 32).
  - Sector (x 4).
  - National.
- **Modes:**
  - Car driver
  - Car passenger
  - Bus (all types inc school bus and works bus)
  - Rail (train + tram + underground)
  - Walking
  - Bicycle
  - Car occupant (car driver + car passenger)
  - Public transport (bus + rail)
  - Active travel (walking + bicycle).

=> Total of 864 factors for LAs, 108 for sectors and 27 at national level.

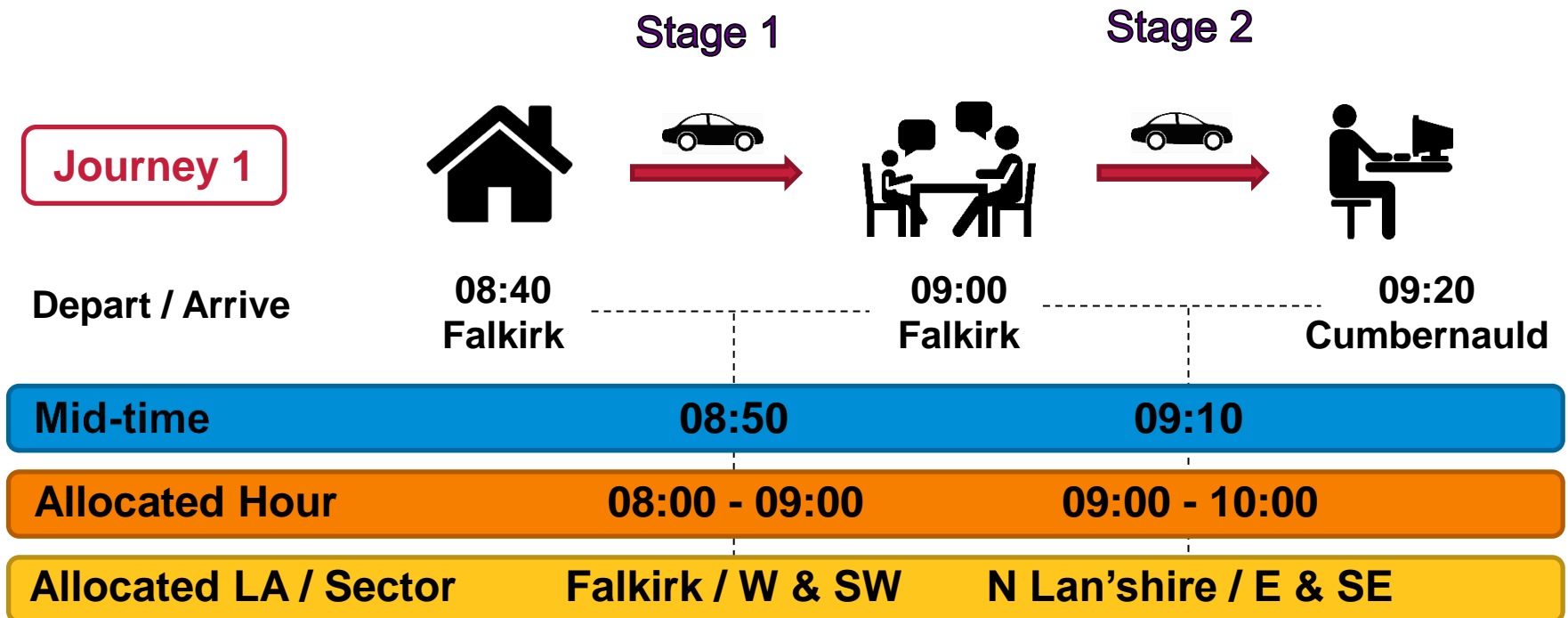


PBA defined sectors

# Annualisation Factor Categories

## Calculated fields based on Travel Diary

- Decision taken that annualisation factors would be calculated based on:
  - The mid-time of each stage.
  - The LA/sector in which the stage ended.



# Development of Annualisation Factors

## Method of calculation

### For AM/PM Peak Hour to Annual Factors:

1. Sum the number of stages falling within weekday peak hours (0800-0900/1700-1800) and peak periods (0700-1000/1600-1900) for each day, mode and geography combination.
2. Divide number of peak hour stages by the number of peak period stages recorded.
3. Multiply by no. standard weekdays per year, taking account of holidays, to generate AM/PM peak hour to annual factors.

### For Average Interpeak Hour to Annual Factors:

1. Similar approach taken to calculate Average Interpeak hour to annual factors for standard weekdays.
2. However Interpeak factors are calculated to demonstrate the relationship between Average Weekday IP Hour values and weekday interpeak, weekday offpeak, Saturday, Sunday and Public Holiday demand.
3. All IP factors then summed to produce the Average Weekday IP Hour to Annual factor.

# Development of Annualisation Factors

## North East AM Example – Sample Size

- After disaggregating data, we obtained the sample on which annualisation factors would be based.
- Sample sizes often small at LA level.
- Particular issue for rail and bicycle travel.

Local Authority	AM Peak Hour (0800-0900) Sample Size								
	Bicycle	Bus	Car Driver	Car Passenger	Rail	Walking	Bicycle + Walking	Bus + Rail	Car Driver + Passenger
Aberdeen City	9	51	326	26	0	142	151	51	352
Aberdeenshire	2	28	241	18	0	80	82	28	259
Angus	1	13	116	19	0	48	49	13	135
Moray	1	9	96	7	1	33	35	10	103
<b>North East</b>	<b>14</b>	<b>101</b>	<b>780</b>	<b>70</b>	<b>1</b>	<b>303</b>	<b>317</b>	<b>102</b>	<b>849</b>

No. SHS stages per category / annualisation factor – North East Sector, AM Peak Hour

# Development of Annualisation Factors

## North East AM Example - Factors

- Calculated annualisation factors for each category; however some extreme results were achieved where sample sizes were very small.
- Recommended that factors are primarily used at national level, and those at sector level are subject to case by case consideration.

Local Authority	AM Peak Hour to Annual Factors								
	Bicycle	Bus	Car Driver	Car Passenger	Rail	Walking	Bicycle + Walking	Bus + Rail	Car Driver + Passenger
Aberdeen City	400	562	588	685	n/a	473	468	606	595
Aberdeenshire	778	383	673	871	n/a	586	591	393	687
Angus	956	493	581	551	n/a	821	824	493	577
Moray	1,718	419	601	1,563	254	634	679	406	662
<b>North East</b>	<b>634</b>	<b>491</b>	<b>615</b>	<b>778</b>	<b>3,619</b>	<b>576</b>	<b>578</b>	<b>515</b>	<b>628</b>

Excerpt from Annualisation Factors Spreadsheet – North East Sector, AM Peak Hour to Annual Factors

# Annualisation Factor Outputs

## Comparison with Previous Studies – AM Results

### 2018 All Scotland Annualisation Factors

Area	AM Peak to Annual	
	Car Driver	PT
E & SE	582	536
N & NW	529	476
NE	615	515
<b>W &amp; SW</b>	<b>549</b>	<b>561</b>
<b>Scotland</b>	<b>572</b>	<b>542</b>

### 2009 All Scotland Annualisation Factors

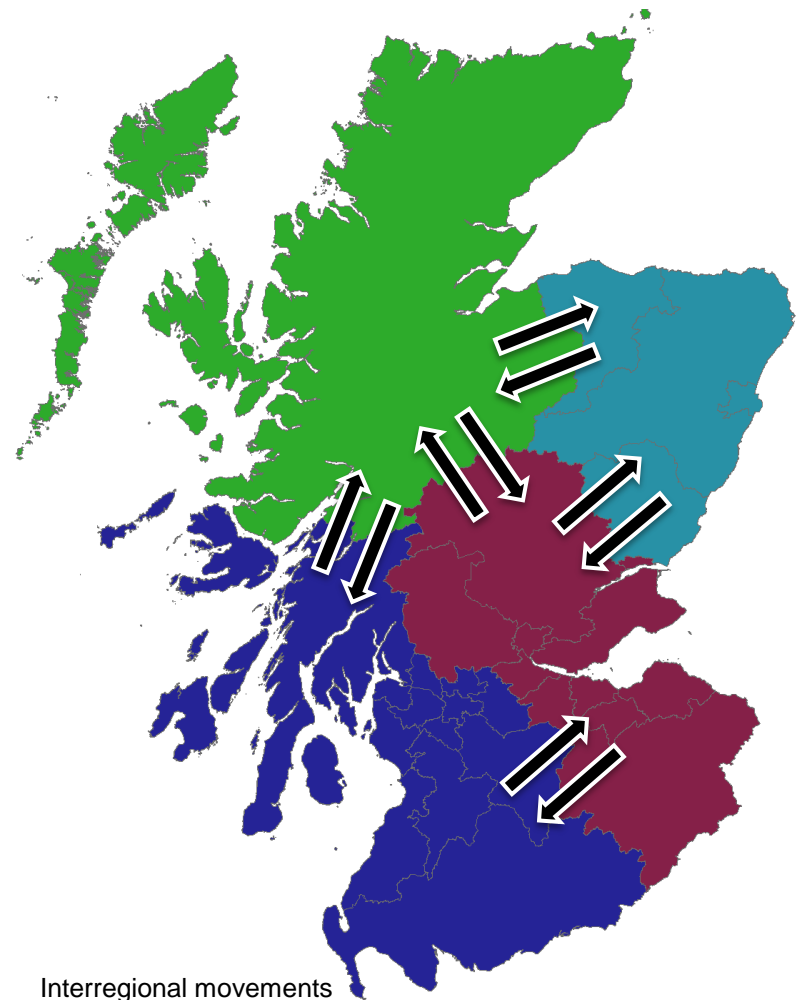
Area	AM Peak to Annual	
	Car Driver	PT
<b>SWESTRANS</b>	<b>570</b>	<b>551</b>
HITRANS	554	713
NESTRANS	622	756
SESTRAN	560	589
<b>SPT</b>	<b>541</b>	<b>576</b>
TACTRAN	542	627
ZETLAND	611	713
<b>Scotland</b>	<b>559</b>	<b>585</b>

### 2017 SRTM Annualisation Factors

Area	AM Peak to Annual	
	Car	PT
<b>SRTM</b>	<b>582</b>	<b>541</b>

# Summary and Recommendations

- Annualisation factors produced for 3 time periods, at 3 levels of geography and for 9 mode categories.
- Sample size restricts use of the most specific factors.
- Recommend use of national factors, and regional where sample sizes allow.
- Insufficient volume of interregional trips recorded to calculate meaningful interregional factors.
- Larger Travel Diary sample always useful, in addition to details of the season to which each travel diary relates.







**Thank you**

**Kevin Lumsden**

**Director of Transport Modelling**

**web: [www.peterbrett.com](http://www.peterbrett.com)**

**t: 0131 297 7010**

**e: [klumsden@peterbrett.com](mailto:klumsden@peterbrett.com)**

**a: 3rd Floor, Randolph House, 4 Charlotte Lane, Edinburgh, EH2 4QZ**

**m: 07930 554732**

# Annualisation Factor Outputs

## Comparison with Previous Studies - Approach

Two previous exercises undertaken using Travel Diary to calculate Annualisation Factors for Transport Scotland:

- In 2009, consultants produced factors at Region and Scotland level for Car Driver and Public Transport.
- In 2017, consultants produced factors for Car and Public Transport for Strathclyde Regional Transport Model (SRTM) area.

### 2009 Study

- 1999 to 2006 Travel Diaries.
- 8 public holidays per year

### 2017 Study

- 2014 Travel Diary only.
- Homes in SRTM area only.
- Trips allocated to geography by respondent home location.
- Car = Car Passenger + Car Driver + Taxi + Motorcycle / Moped.
- Public Transport = bus + train + ferry + underground + other