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Title

Giving cycling the green light: An overview of transportation in Ireland and the design of the National Cycle Network

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Author

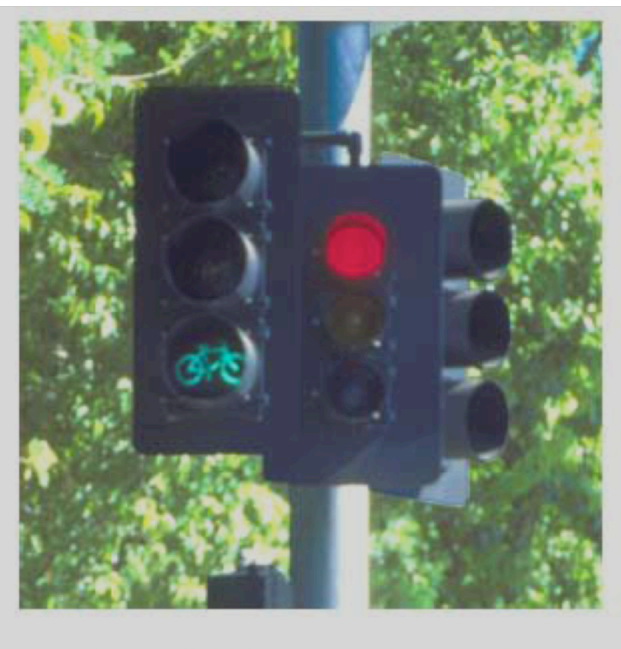
Manton, Richard

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Giving cycling the green light

An overview of transportation safety in Ireland and the design of the National Cycle Network



SafeTREC Seminar

Richard Manton

11th October 2013



OÉ Gaillimh
NUI Galway









An Roinn Iompair
Turasóireachta agus Spóirt
Department of Transport,
Tourism and Sport

Outline

Part One: Background to
Irish Transportation

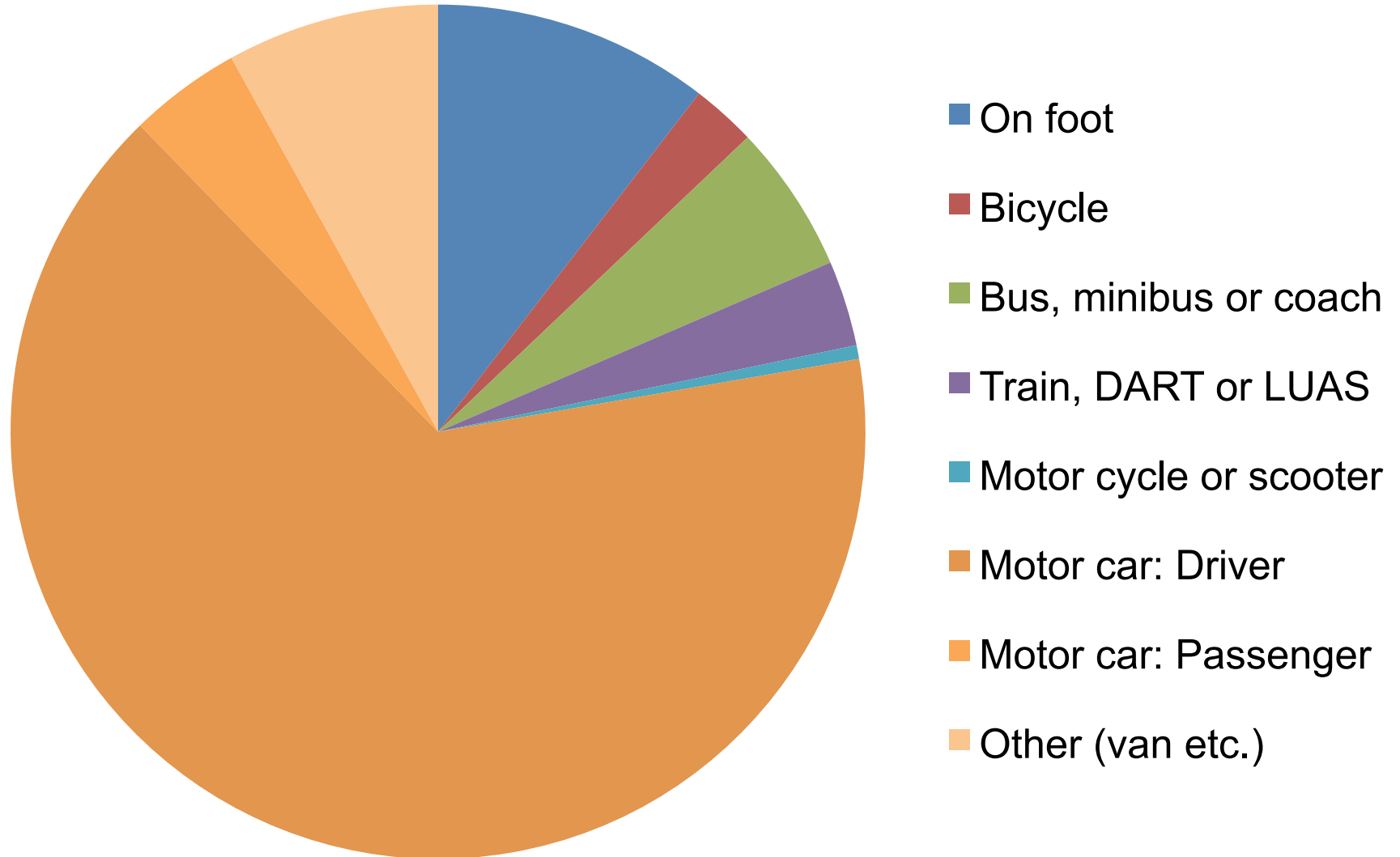
Part Two: Irish National Cycle Network
& Research at NUI Galway

Ireland

-  Western Europe
-  Member of EU (since 1973)
-  Land border with UK
-  Approx.
250 km x 500 km
(closest in size to Maine)
-  Population: 4.6 million (2011)
-  Commuters: 1.7 million (2011)



Commuting in 2011





Car driver: 65%



Passenger: 4%



Van driver: 8%

Passenger: 4%

**60% DOGS
(LIKE HUMANS)
ARE OVERWEIGHT
OR OBESE**

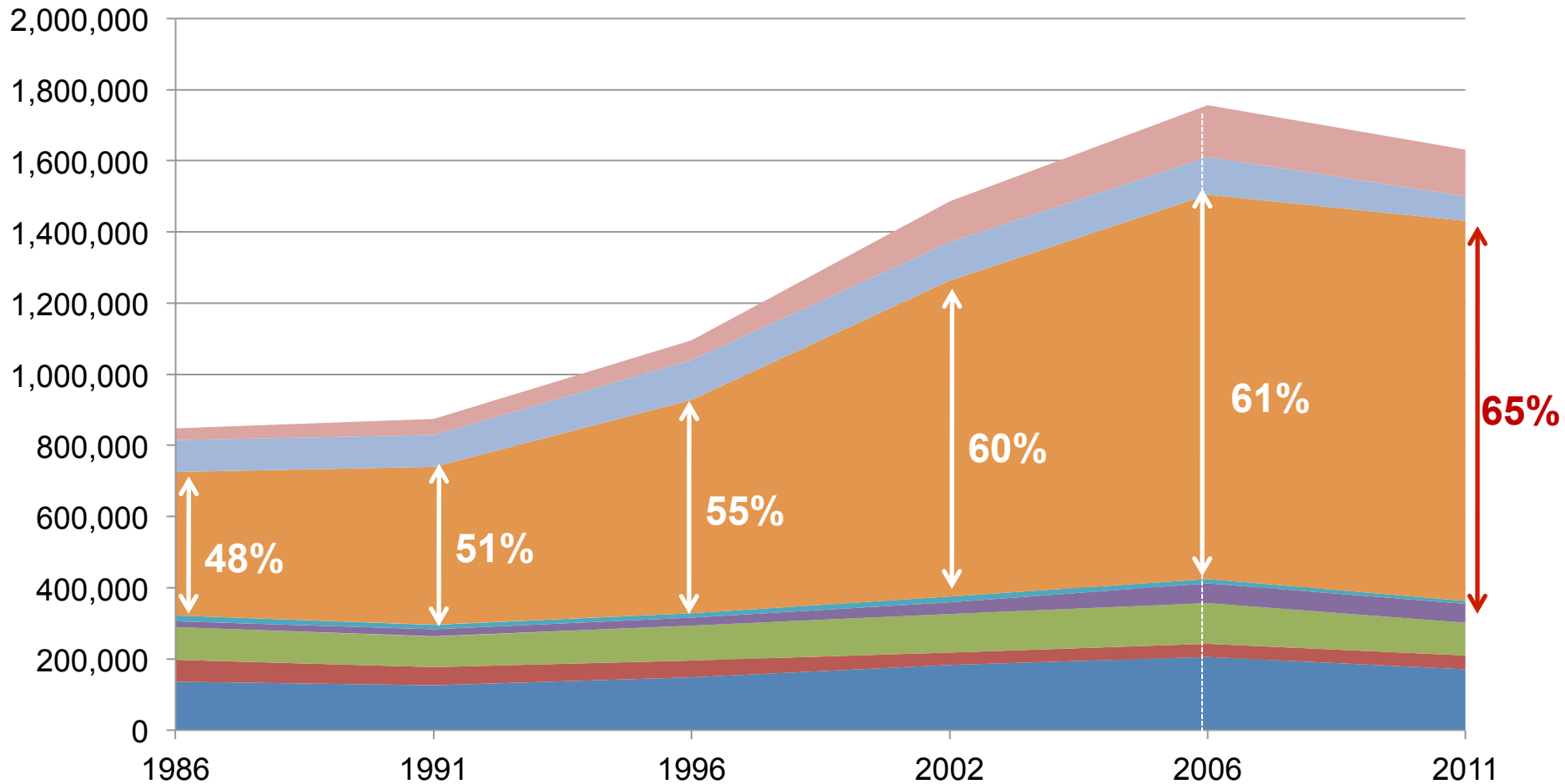
Car driver: 65%

Van driver: 8%

Commuting across a generation

(2011 modal share)

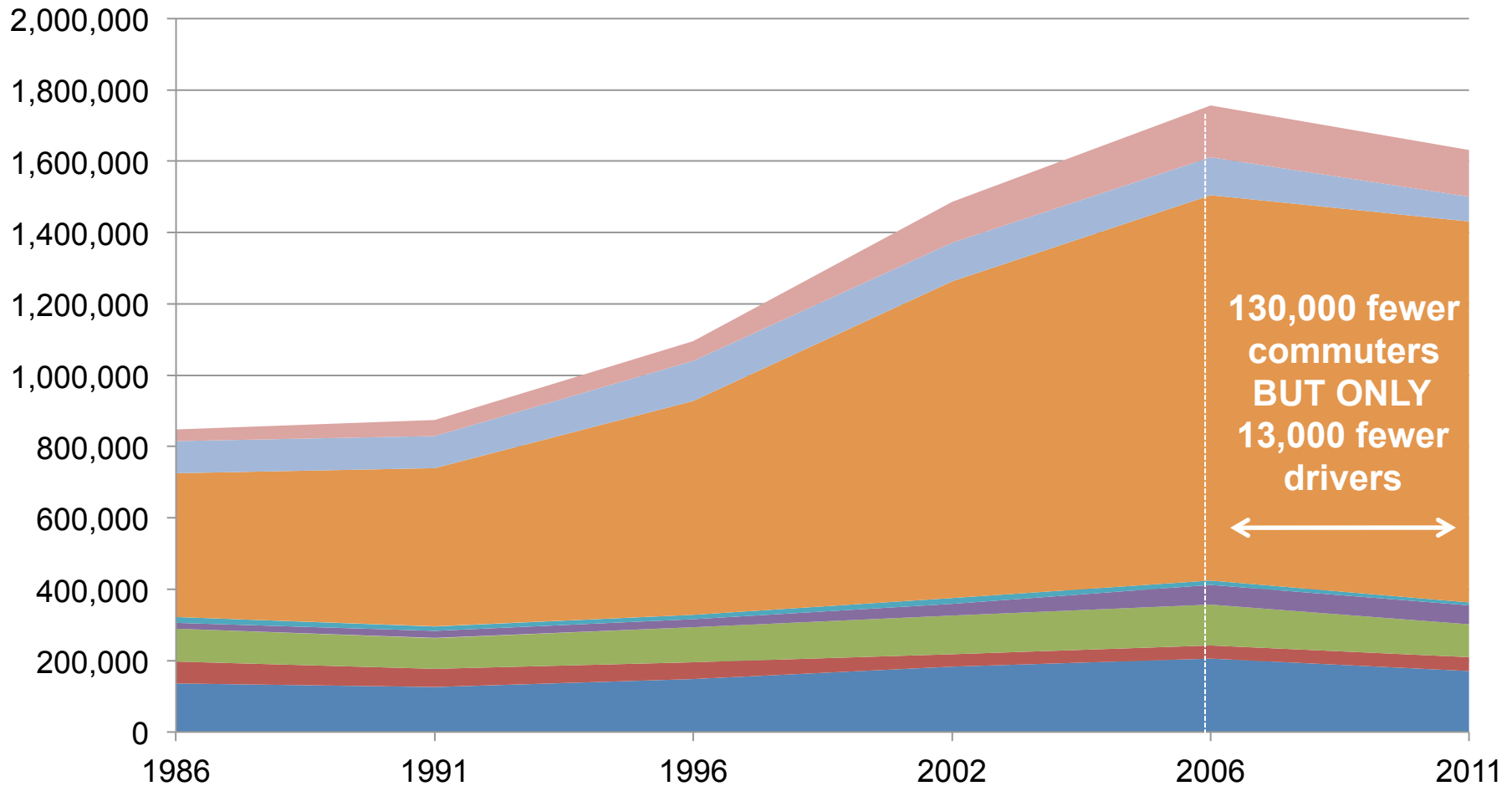
- On foot (10%)
- Train, DART or LUAS (3%)
- Motor car: Passenger (4%)
- Bicycle (2%)
- Motor cycle or scooter (1%)
- Other (8%)
- Bus, minibus or coach (6%)
- Motor car: Driver (65%)



Commuting across a generation

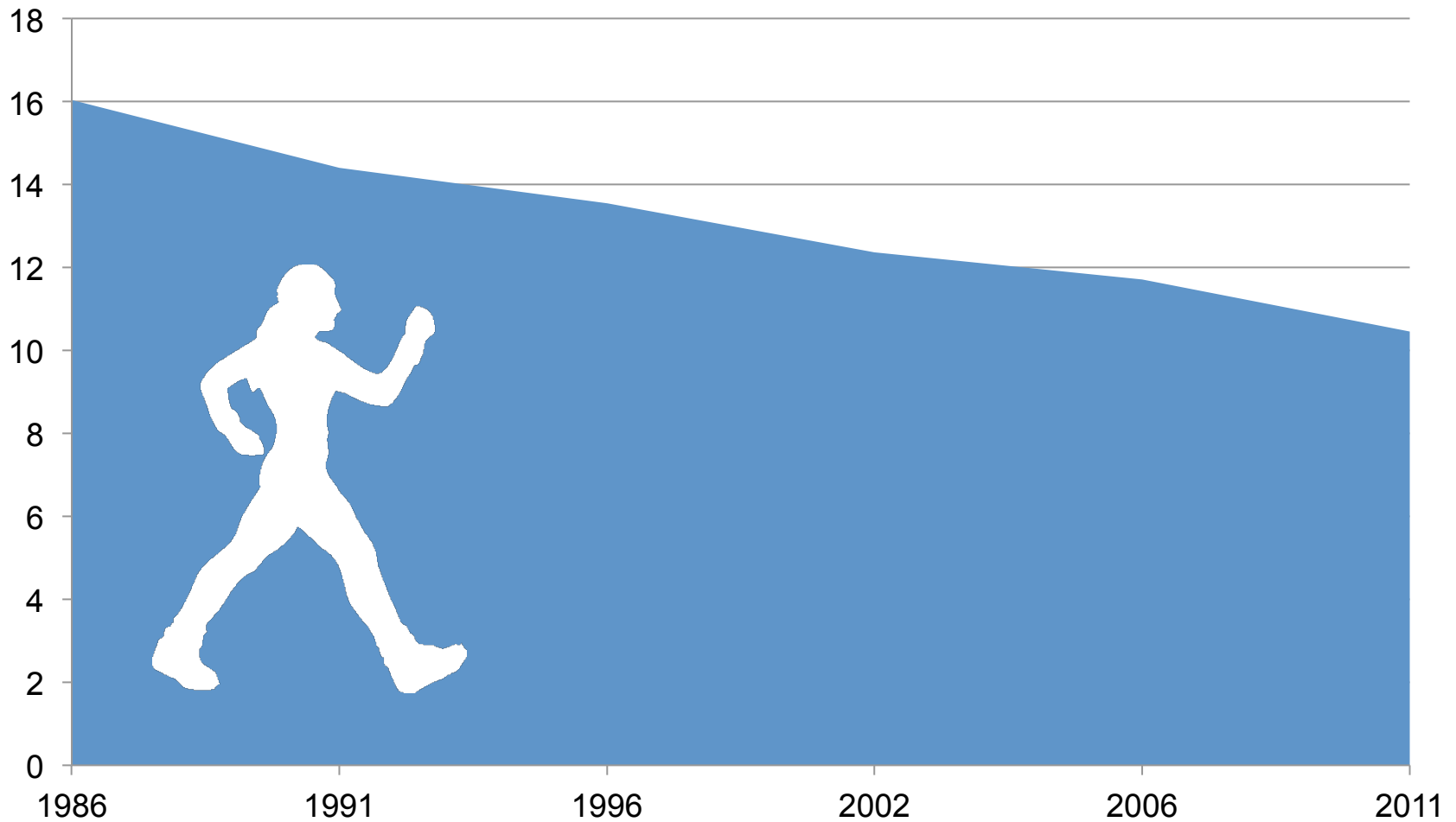
(2011 modal share)

- On foot (10%)
- Train, DART or LUAS (3%)
- Motor car: Passenger (4%)
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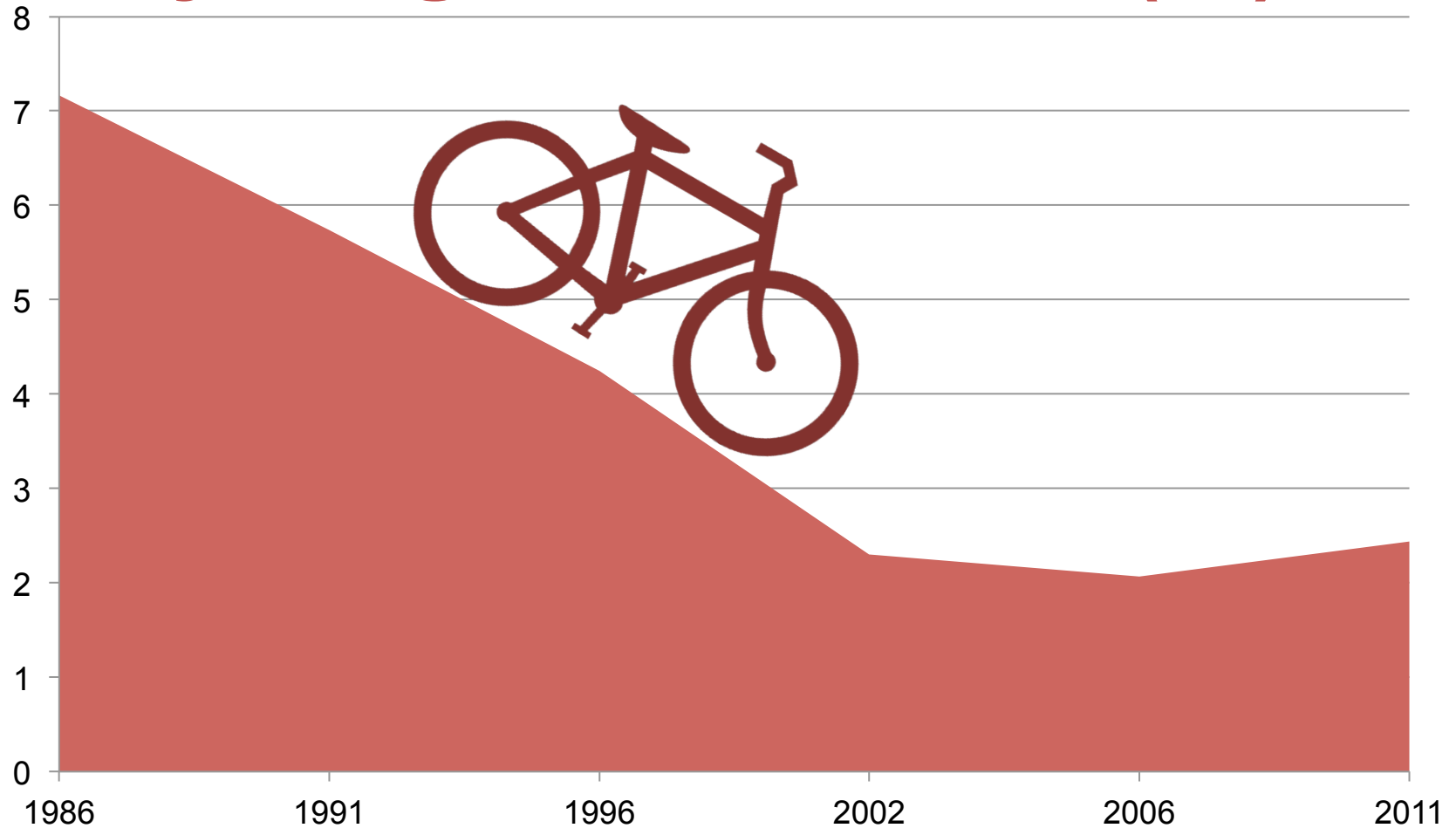
Commuting across a generation

Walking modal share (%)



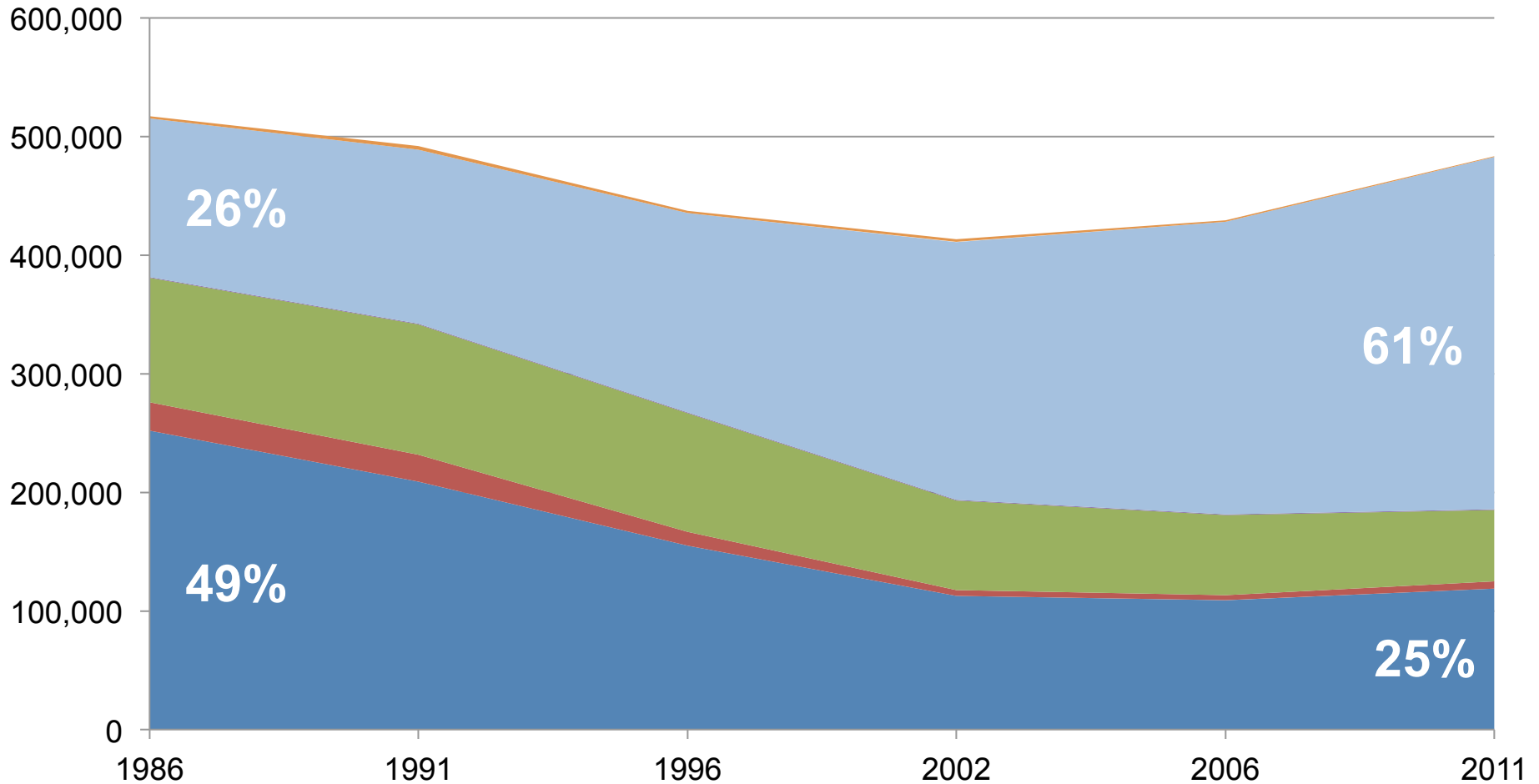
Commuting across a generation

Cycling modal share (%)

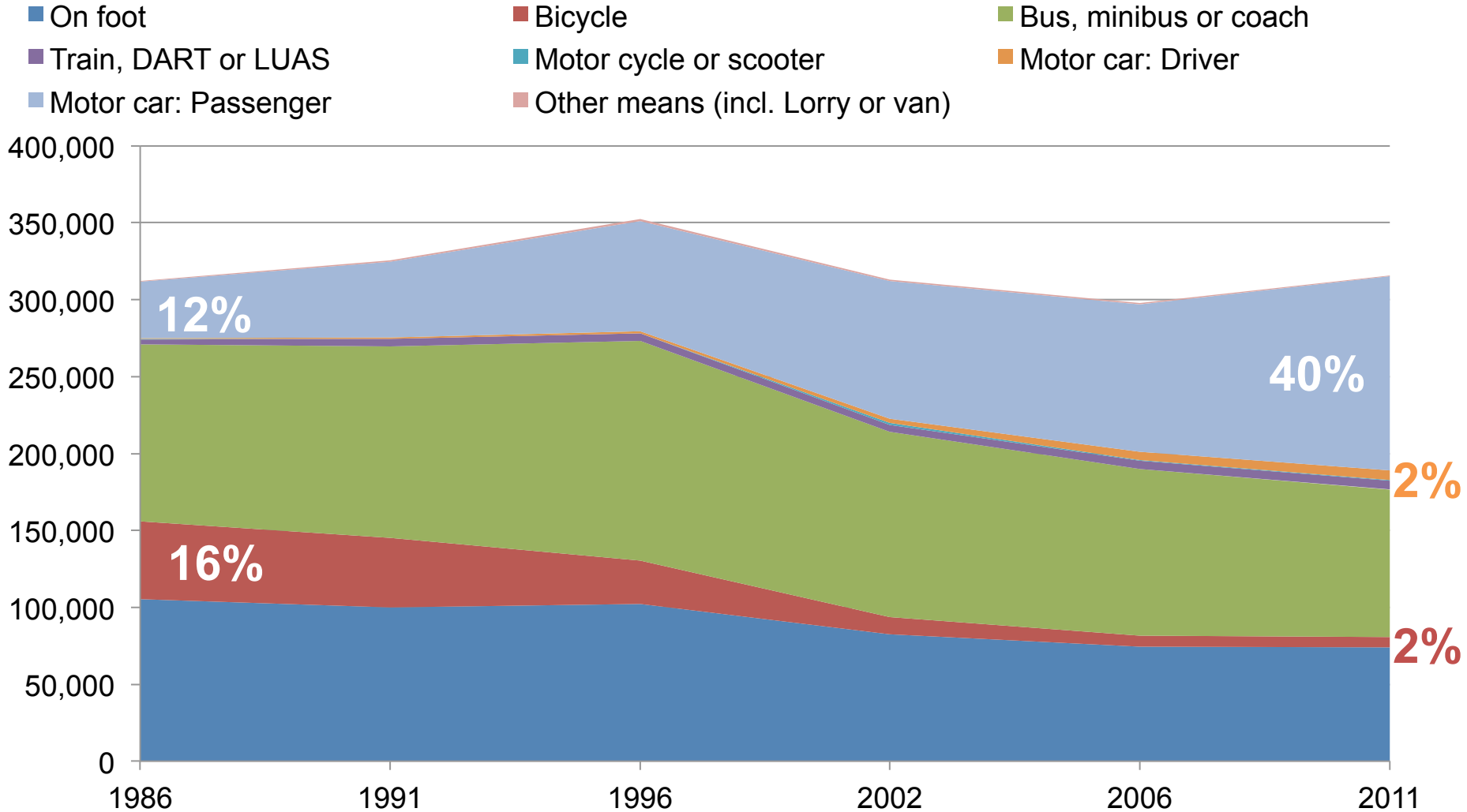


Travel to Primary School (4-12 years old)

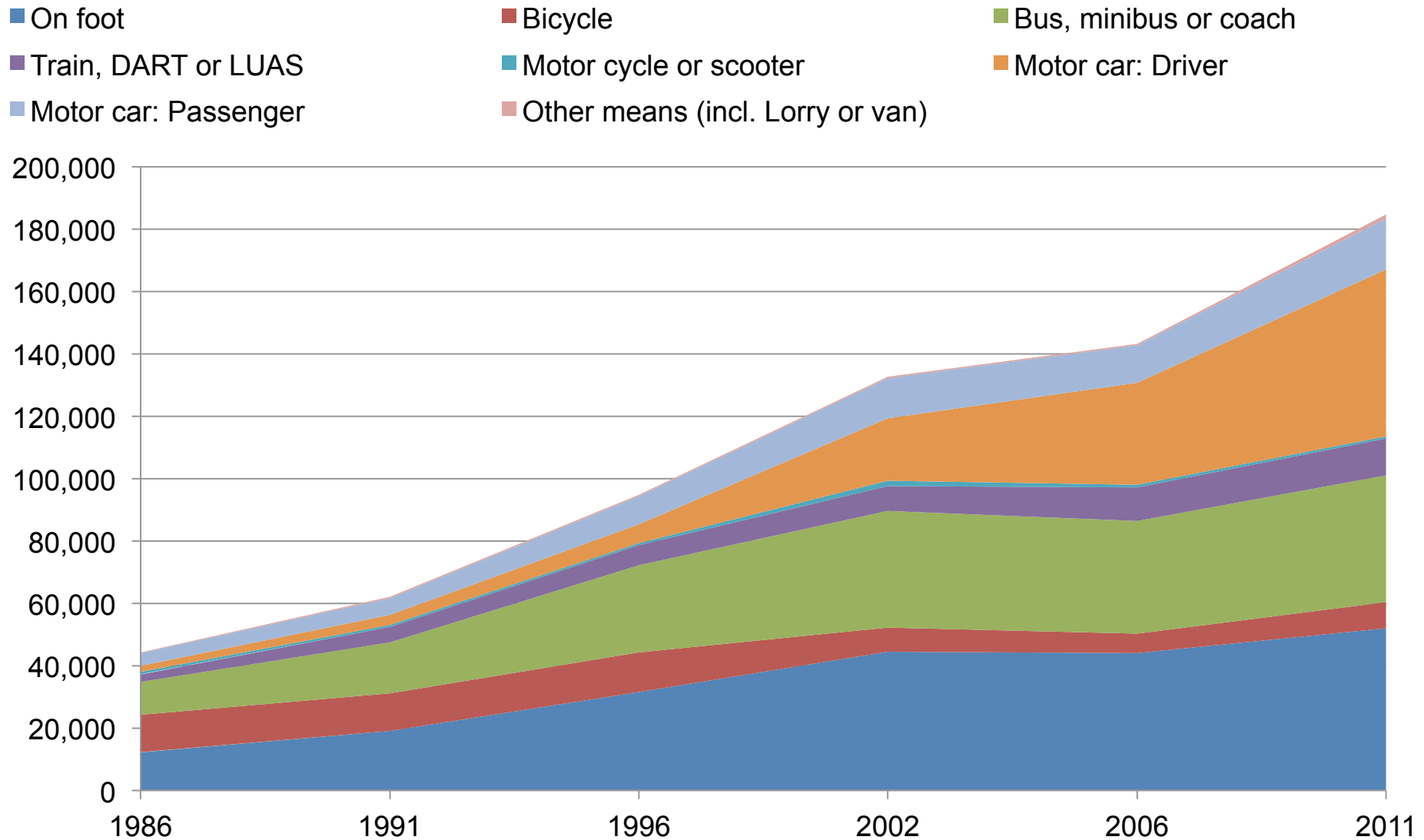
On foot Bicycle Bus, minibus or coach Train, DART or LUAS Motor car: Passenger



Travel to Secondary School (13-18 years old)

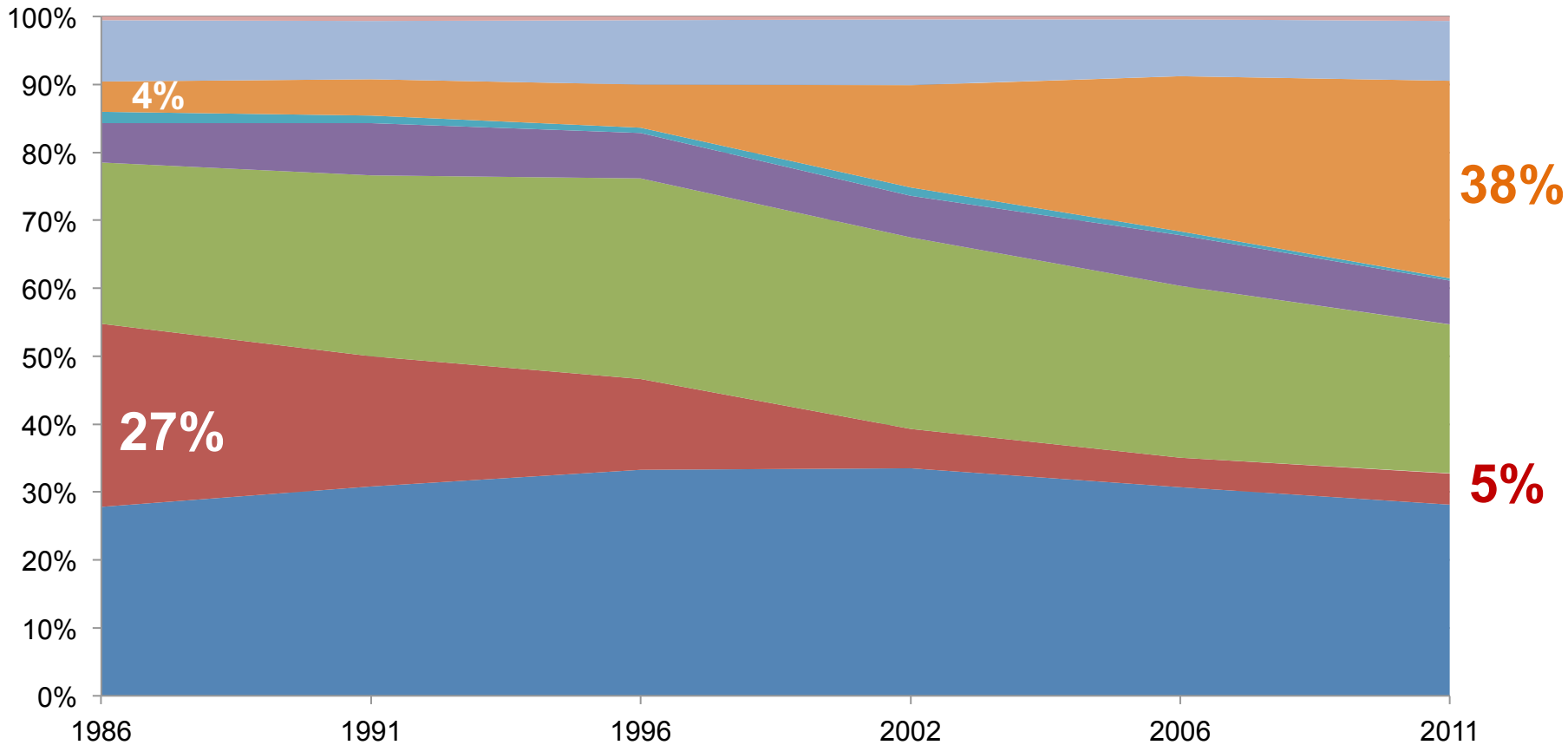


Travel to Higher Education

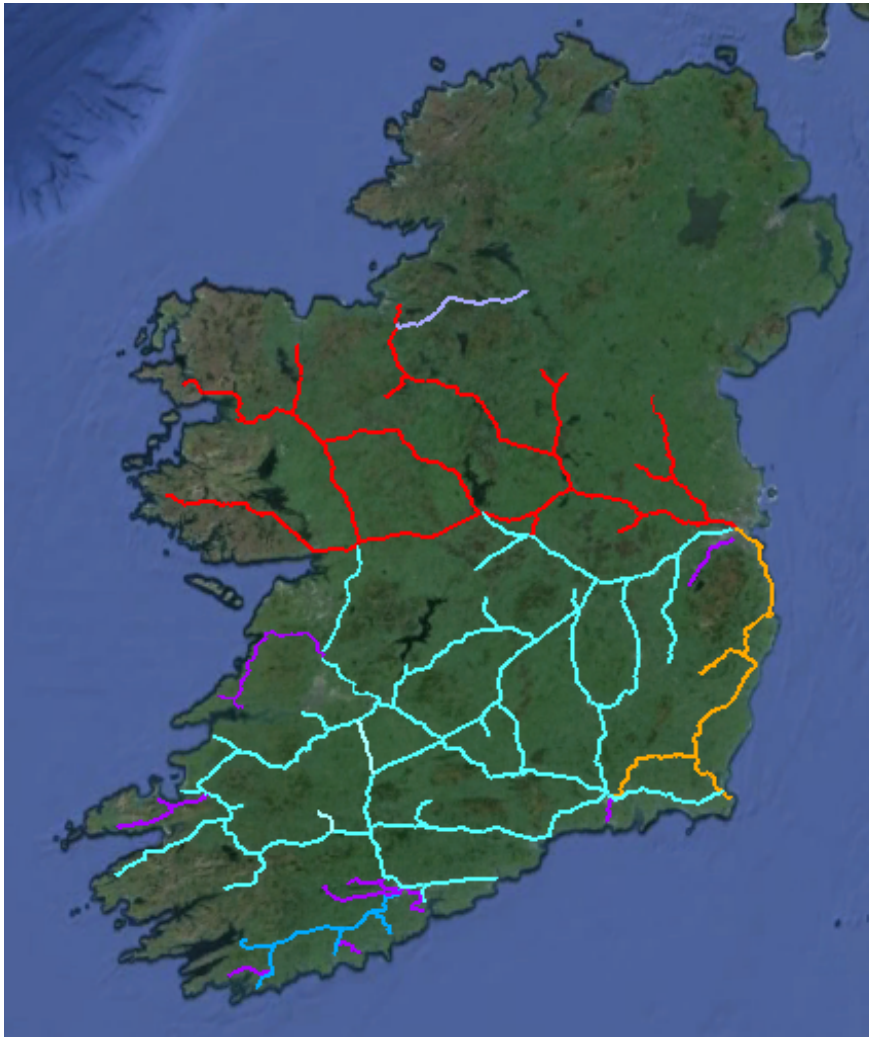


Travel to Higher Education

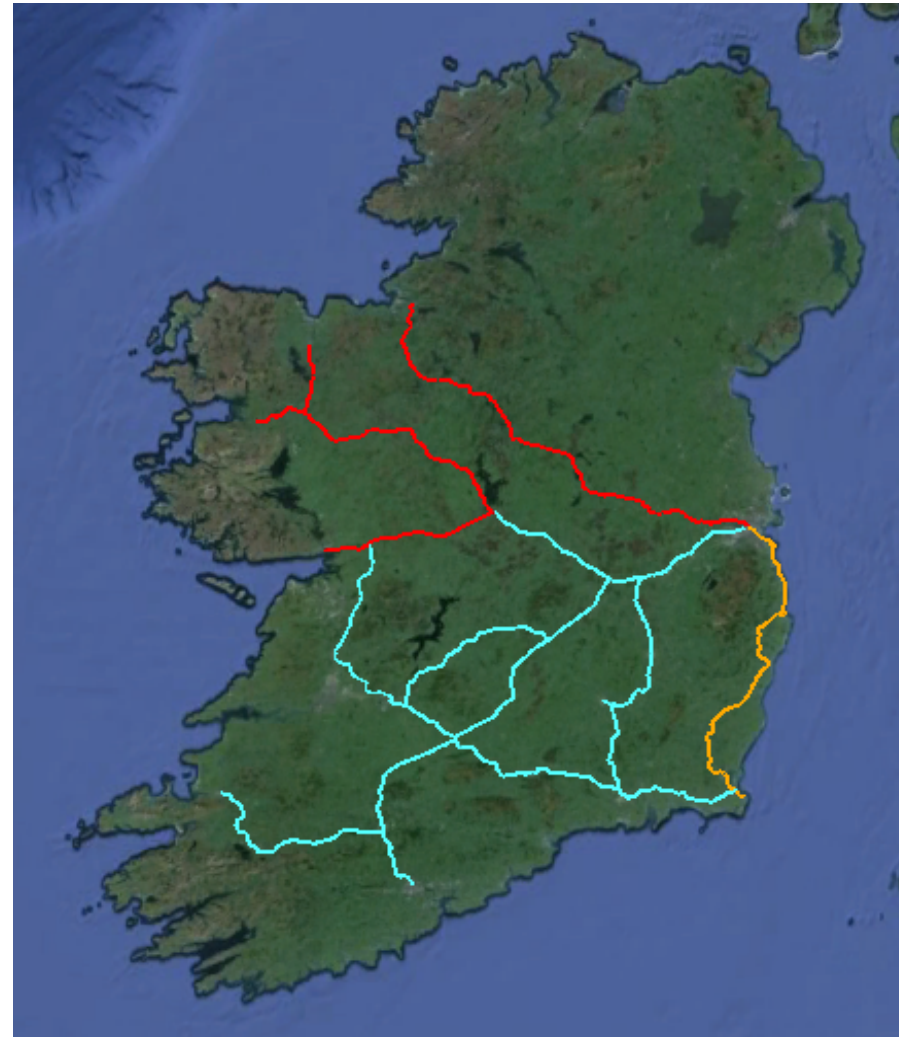
- On foot
- Train, DART or LUAS
- Motor car: Passenger
- Bicycle
- Motor cycle or scooter
- Other means (incl. Lorry or van)
- Bus, minibus or coach
- Motor car: Driver



Disappearing rail network



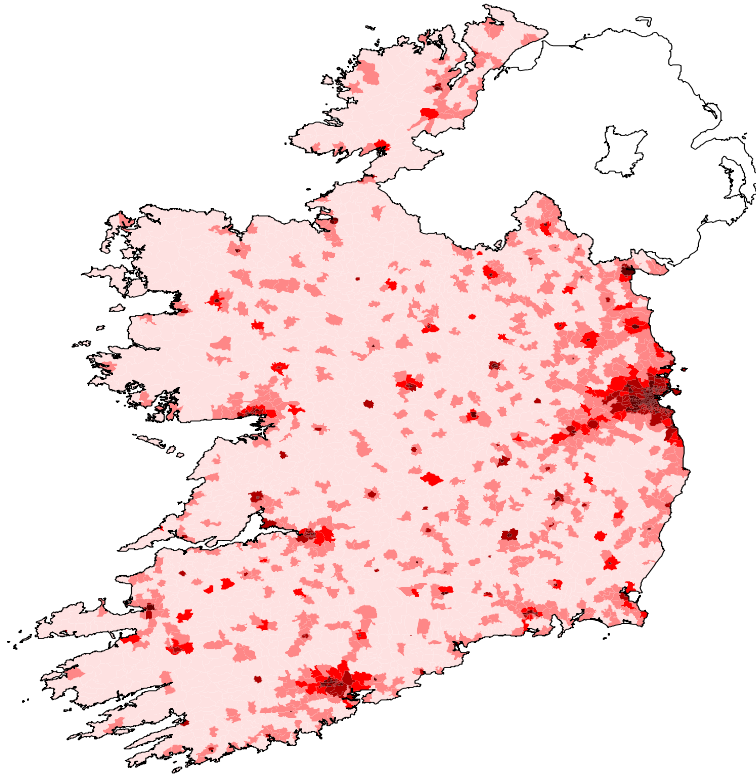
1911



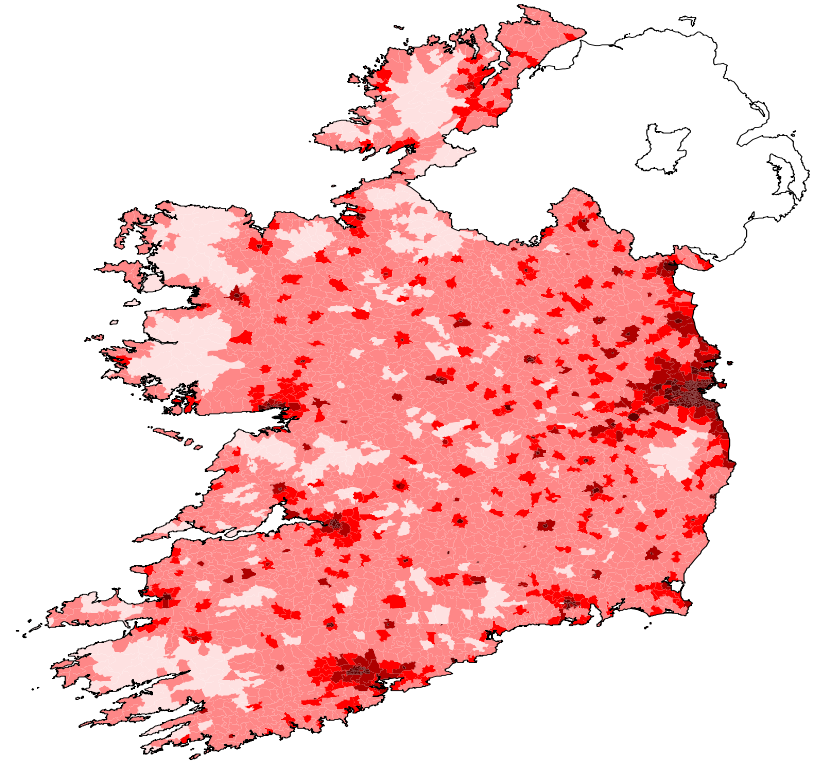
2011

Derived demand - spatial mismatch

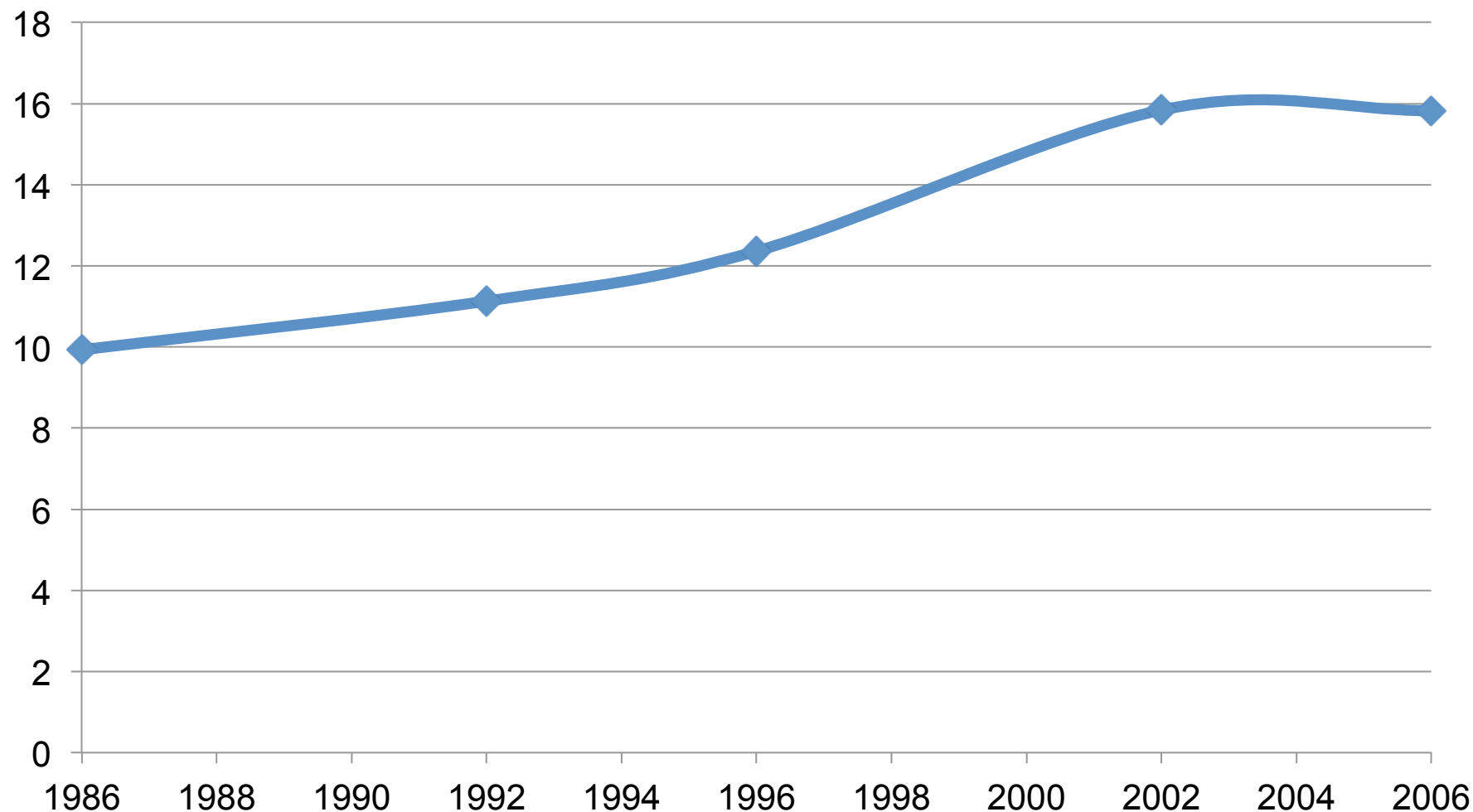
Employment



Residence

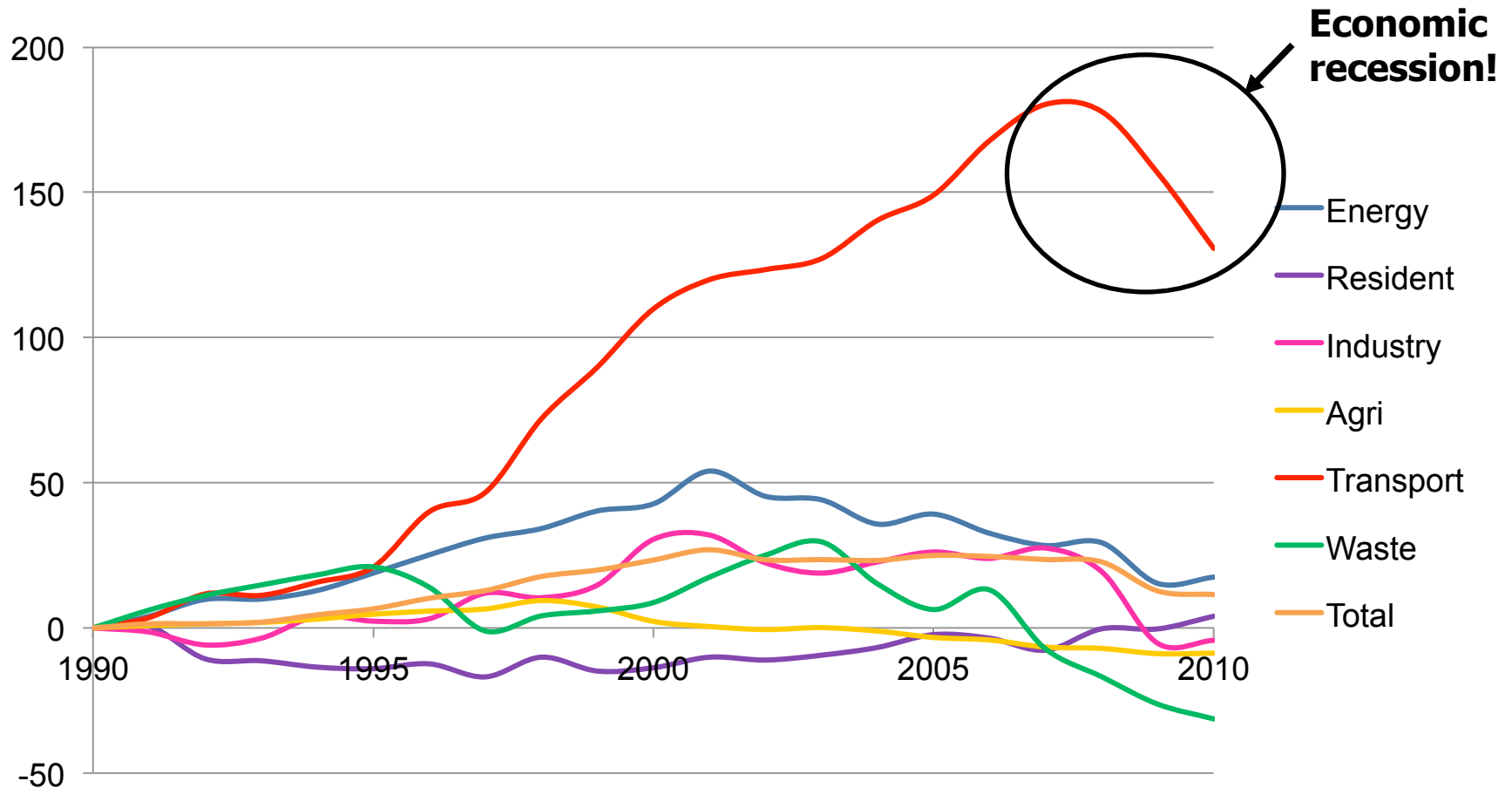


Average distance travelled to work (km)









Environmental effects

Percentage increase in carbon emissions by category on 1990



Some Positives

-  Policy: Smarter Travel, Cycle Policy, Urban Streets
-  National Cycling Network (next part)
-  Dublin Bikes share scheme (to be extended)
-  Smarter Travel areas (Westport, Limerick etc.)
-  Rail use doubled in 30 years (DART & Luas)
-  Road safety improvements

Road Safety

- Some good news!
- Irish roads now amongst safest in the world
- Fatalities down from 640 to 162 in 40 years
- Pedestrian and cyclist fatalities down 66%
- Must consider health, environmental, social and economic effects of driving

RSA



Road Safety Strategy
2013 — 2020

An tÚdarás Um Shábháilteacht Ar Bhóithre
Road Safety Authority

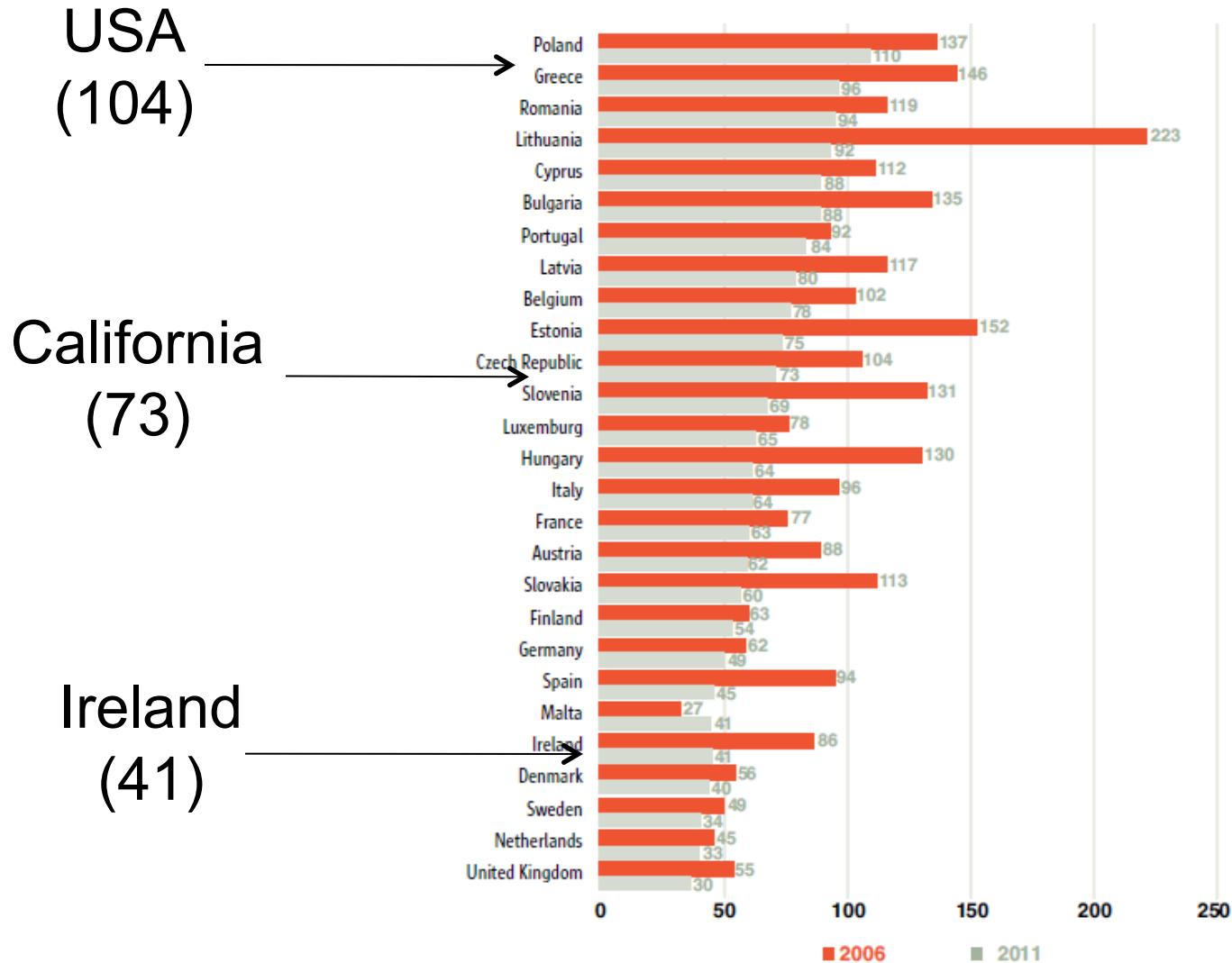
Fatalities



Fatalities per million population



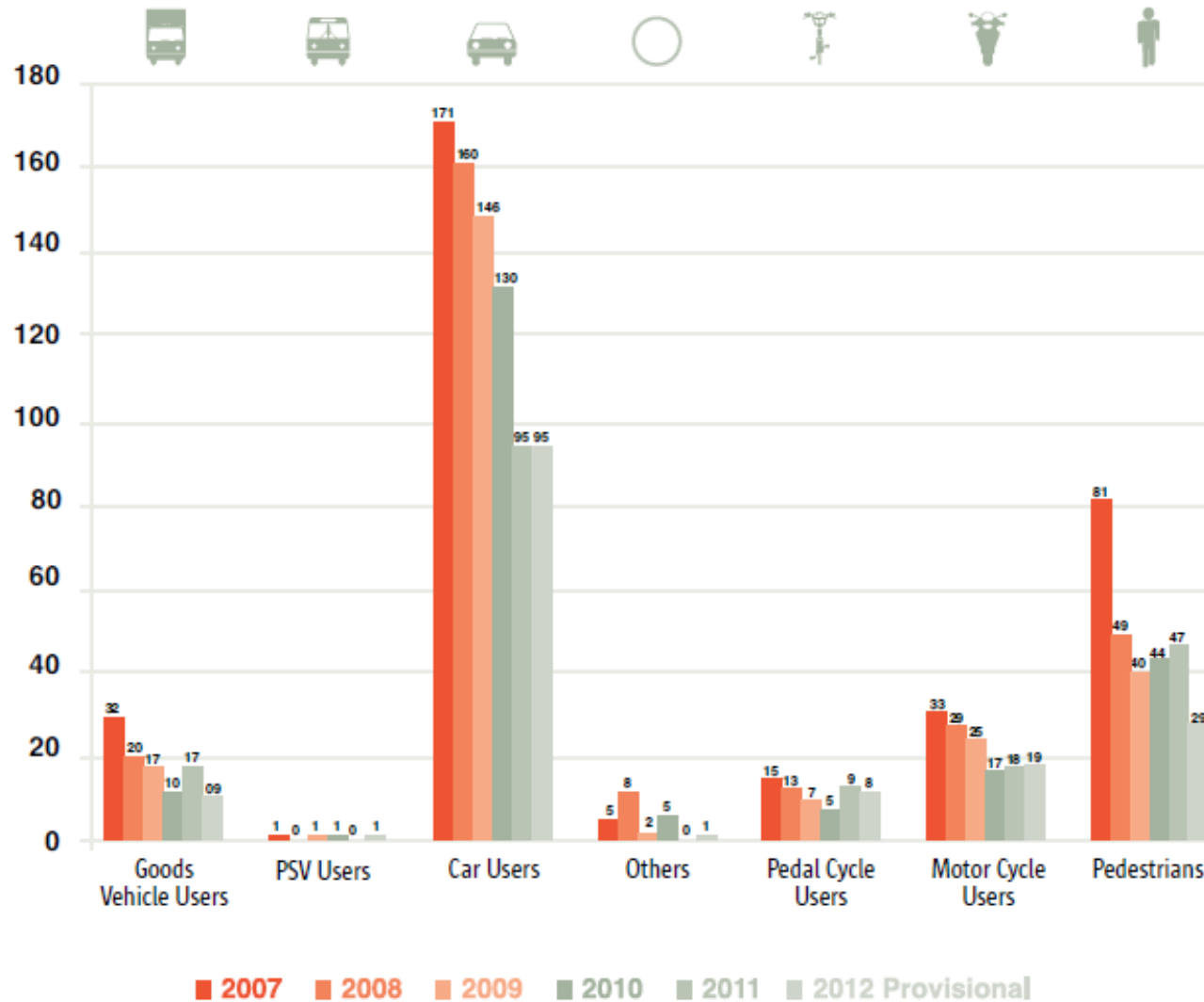
Fatalities per million population



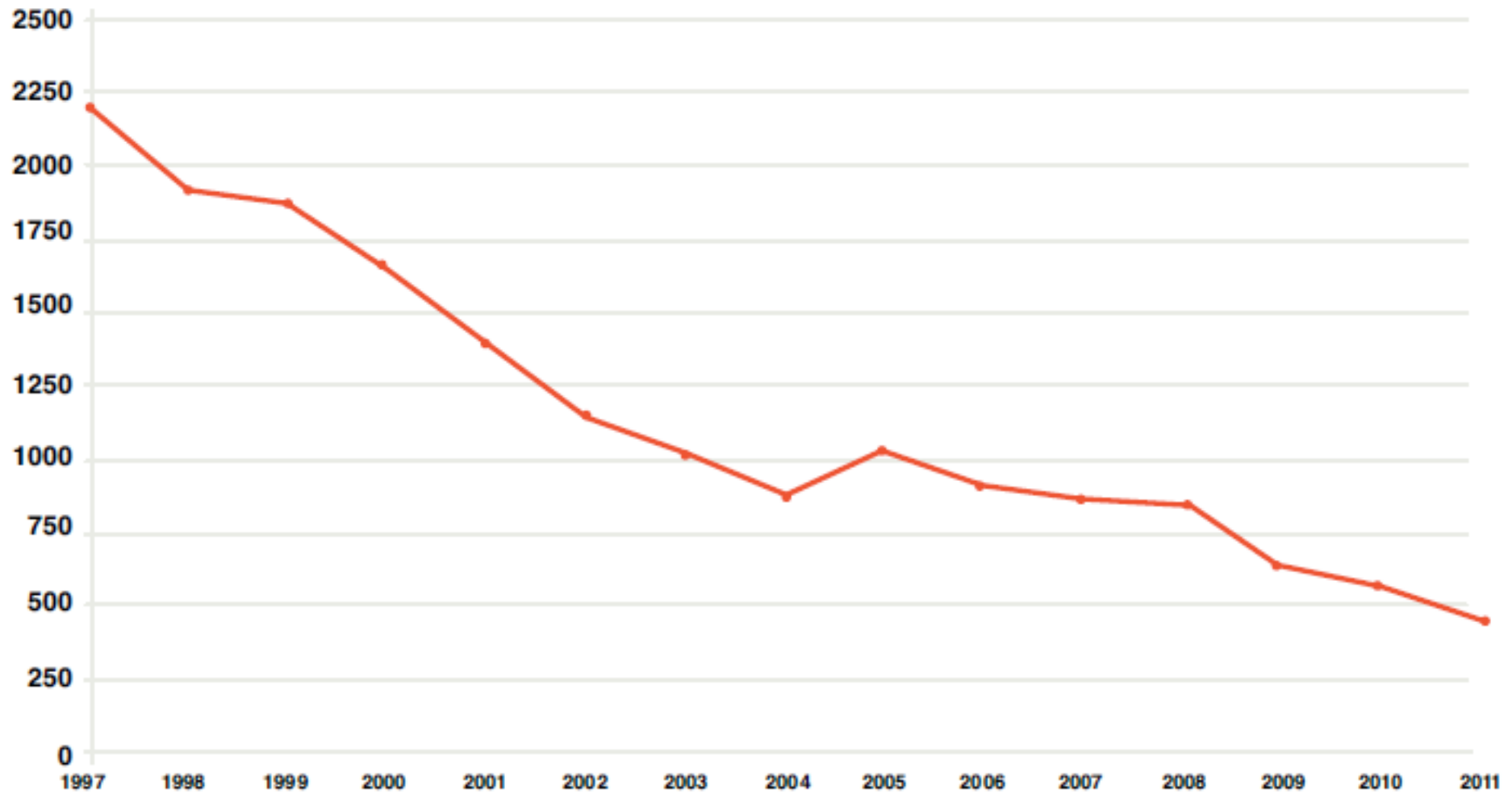
RSA (2013). *Road Safety Strategy 2013-2020*

NHTSA (2013). *Fatality analysis reporting system*

Fatalities by mode



Serious Injuries



Part Two

Irish National Cycle Network & Research at NUI Galway

National Cycling Network

13 corridors (≈ 2200 km in total)

Rural / Inter-urban basis

User groups:

1. Commuters
2. Cycle tourists
3. Leisure cyclists

Significant amount of cycling infrastructure planned in the coming years



EuroVelo









12 long distance routes
over 66,000 km
(45,000 km complete)

2 routes through Ireland:
'Atlantic Route' &
'Capitals Route'

Importance for
cycle tourism



Multi-criteria analysis

-  Evaluation of transport projects
-  Cost-Benefit Analysis most common evaluation
-  Not realistic to assign monetary values to all criteria
-  MCA considers combination of monetary and non-monetary impacts
-  Performance Matrix / Consequence Table
-  Need criteria
-  Need scores
-  Need weightings

Example: buying a toaster

Table 4.1 Performance matrix

Options	Price	Reheat setting	Warming rack	Adjustable slot width	Evenness of toasting	Number of drawbacks
Boots 2-slice	£18				☆	3
Kenwood TT350	£27	✓	✓	✓	☆	3
Marks & Spencer 2235	£25	✓	✓		★	3
Morphy Richards Coolstyle	£22				☆	2
Philips HD4807	£22	✓			★	2
Kenwood TT825	£30				☆	2
Tefal Thick'n'Thin 8780	£20	✓		✓	★	5

Table 6.4 Calculating overall scores

Criteria

Options

Options	Price	Reheat setting	Warming rack	Adjustable slot width	Evenness of toasting	Drawbacks	Total
Boots 2-slice	100	0	0	0	0	50	35
Kenwood TT350	25	100	100	100	0	80	61
Marks & Spencer 2235	42	100	100	0	100	50	53
Morphy Richards Coolstyle	67	0	0	0	0	100	30
Philips HD4807	67	100	0	0	100	90	49
Kenwood TT825	0	0	0	0	0	90	9
Tefal Thick'n'Thin 8780	84	100	0	100	100	0	70
Weights	30	5	15	25	15	10	

Scores

Weights

1st!

Multi-criteria analysis for the route selection of greenways



Adapting MCA for route selection

🚲 (Route) Options: determine from nature, infrastructure, policy, public consultation etc.

🚲 Criteria: literature review, surveys

🚲 Scores: this research

🚲 Weights: this research

🚲 Determine a preferred route and analyse

🚲 Test against case studies, role of public consultation



Great Western Greenway Co. Mayo



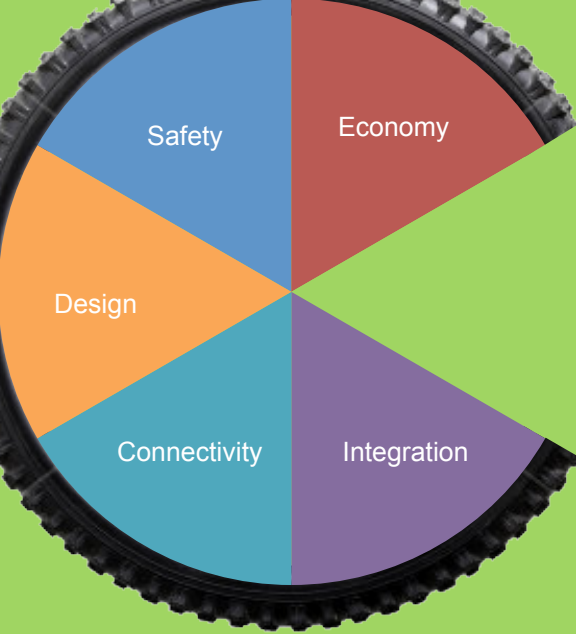











What went before:

**UK Dept. for Transport
Irish National Roads Authority
Research at Trinity College Dublin**



Environment

 A modal shift to cycling would reduce carbon emissions due to transport

-  A significant infrastructure required to encourage such a shift
-  Environmental impact of cycle route construction not previously considered
-  'carbon costs' of these routes may negate any 'carbon savings'
-  Creating a balance sheet for the carbon costs and savings

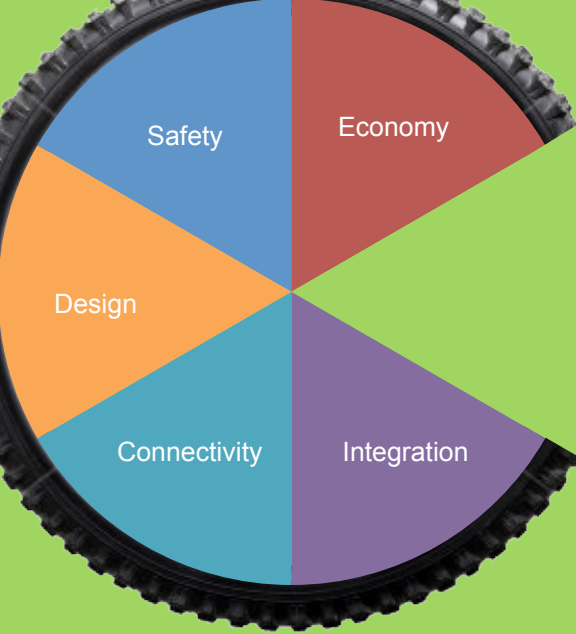


Environment

Using the Great Western Greenway as a case study...

Carbon footprint of a greenway (kgCO₂e/km)	58836
Length of the greenway (km)	10
Avoided carbon of each PKT shifted (kgCO ₂ e/km)	0.134
Commute distance (km)	5
Commutes per year	440
Life cycle of greenway (years)	20
Commuters required to shift for life of greenway	100

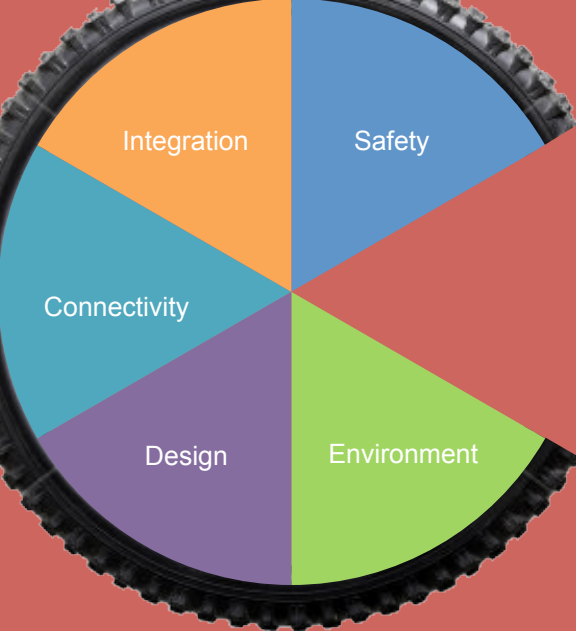
4.4 million passenger-kilometres must be shifted to offset the embodied carbon of the greenway
 This is a 5km commute for 100 people over 20 years!



Environment

Future work

- 🚲 Extension of boundary condition to cradle-to-grave
- 🚲 Mode of travel to greenways
- 🚲 Potential carbon savings of modal shift
- 🚲 Methods of reducing embodied carbon in greenways-
materials, network, public transport
- 🚲 Recommending methodologies for Environmental Impact



Economy



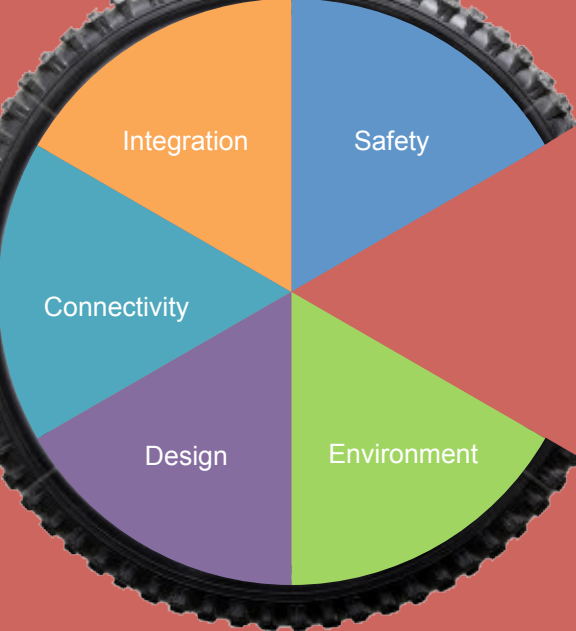
Importance of economic evaluation tools
in the current economic climate

Cycle tourism

- Value of €54 bn across Europe in 2009
- In Ireland in 2009, cycle tourists spent €97 million
- Ireland has major potential in this area
- Great Western Greenway: direct spend of €7.2m in 2011 –
supporting 55.5 jobs, creating 37.5 new jobs

Lumsdon et al (2012). *The European Cycle Route Network, EuroVelo*

Fáilte Ireland (2011). *Great Western Greenway – Economic Impact Study*



Economy

 **Health:** 3 hours cycling decreases risk of all-cause mortality by 72% (Anderson et al, 2000)

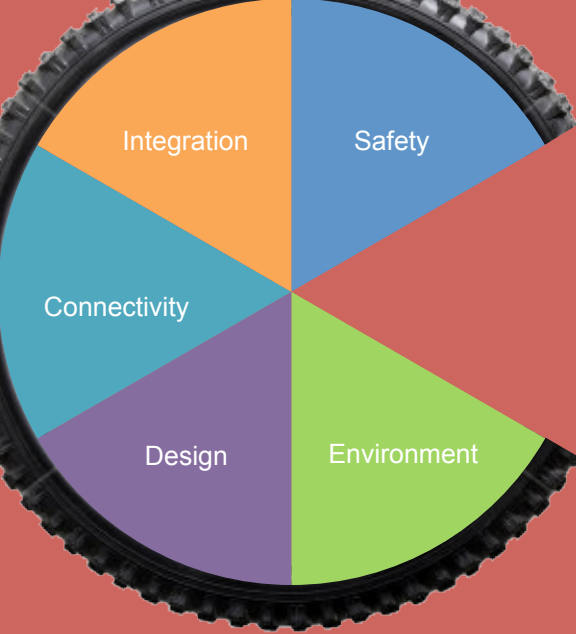
 **Absenteeism:** Physically active employees work 0.4 days more per year (NRA, 2011)

 **Journey Ambience:** Users willing to pay €0.17/min to cycle on a greenway (UK DfT, 2010)



Health
Absenteeism
Journey ambience

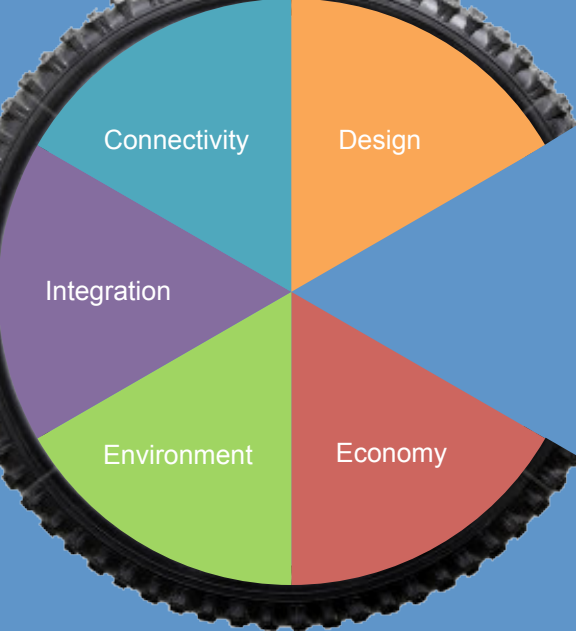
= €1.11
per km cycled



Economy

Future work

- 🚲 Survey spending on Great Western Greenway
- 🚲 Assemble costs involved in greenway construction
- 🚲 Use 'willingness to pay' to calculate value to public
- 🚲 Monetise safety improvements and carbon savings?
- 🚲 Construction of CBA for greenways



Safety

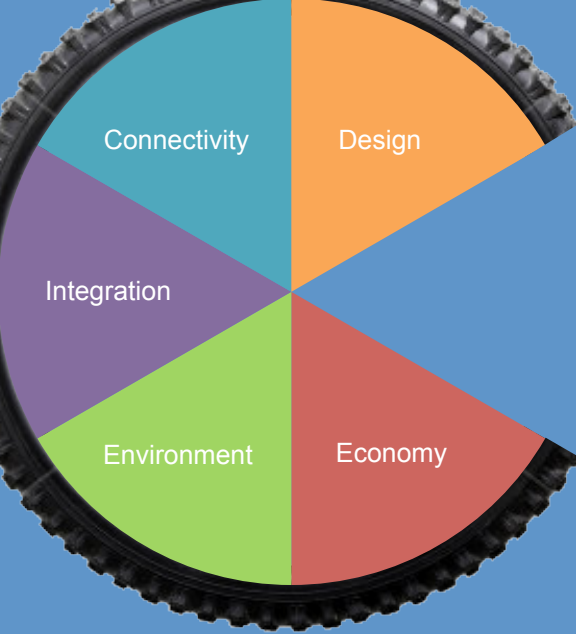
🚲 Safety concerns are the biggest impediment to the growth of cycling in Ireland

Statistics

- 🚲 In 15 years: 205 cyclists killed, 577 minor injuries, 5450 serious
- 🚲 3.5% of all road casualties
- 🚲 Though cyclists make up less than 2% of road users
- 🚲 85% of cyclist casualties occur in built-up areas
- 🚲 14% cyclists casualties are caused by HGVs

Road Safety Authority (2012). *Collisions data*




Fáilte Ireland (2007). *A strategy for the development of Irish cycle tourism*



Safety

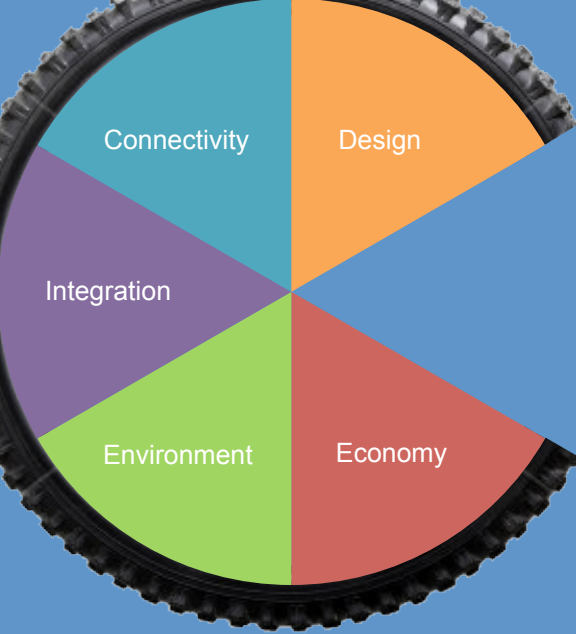
Two surveys underway to develop a quantitative Safety element

1. On-road safety

-  Mental mapping – draw route, rate sections
-  21 question survey about on-road cycling safety
-  Traffic volumes and other data for all Galway City roads

2. Greenway safety

-  29 question survey about greenway cycling safety
-  Conducted on Great Western Greenway



Safety

Future work

- 🚲 Unpack determinants of perceived cycling risk
- 🚲 Feed safety concerns into design guidance
- 🚲 Recommendations for road-greenway junctions
- 🚲 Safety Quality-of-Service measure and safety rating for potential routes



Design

Review of design guidance

Geometric design	Recommended Value
Width	2-3m
Design Speed	30 km/h
Gradient	0.5-5%
Crossfall	2%
Min. Radius of Curvature	25m
Min. Stopping Sight Distance	30m
Min. Lateral Clearance	Varies with topography
Min. Length of Crest Vertical Curve	Varies with topography

Recommended geometric design

Surface	20mm	HRA (10mm nominal aggregate size)
Base	40mm	Dense AC (20mm nominal aggregate size)
Sub-base	150mm	Type A granular material

Recommended cross-section



Design



Not sufficient to examine best practice alone



Based on the survey, user preferences will be established

Future work



Create a rating system based on user preferences and best practice



Create a Quality-of-Service tool for preferred design and rating for potential routes





Connectivity



Fundamental principle of cycling routes

Connectivity also includes: continuity, accessibility & permeability

Connection to origin (population) and destination (employment, shopping)

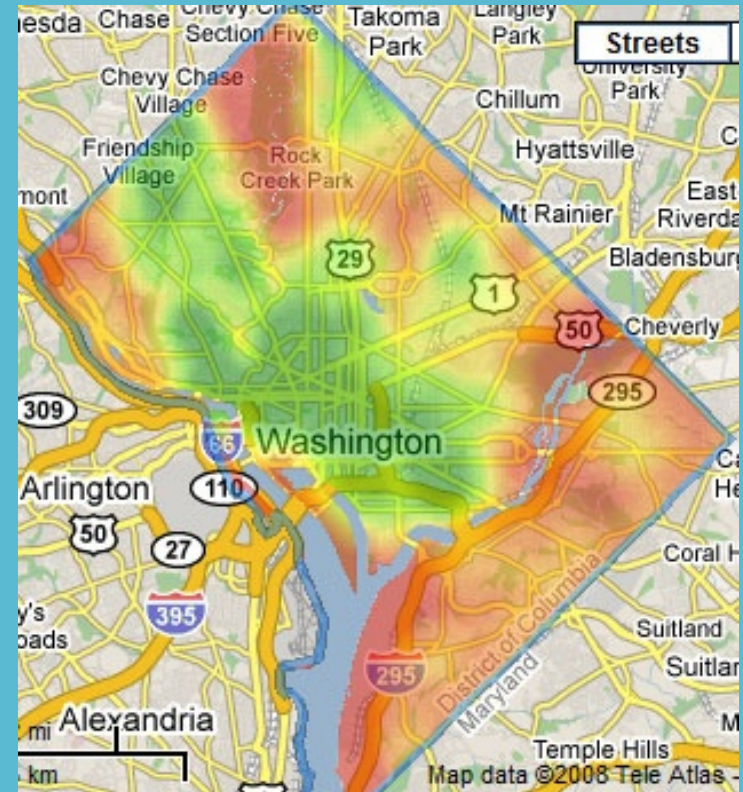
Connection to public transport

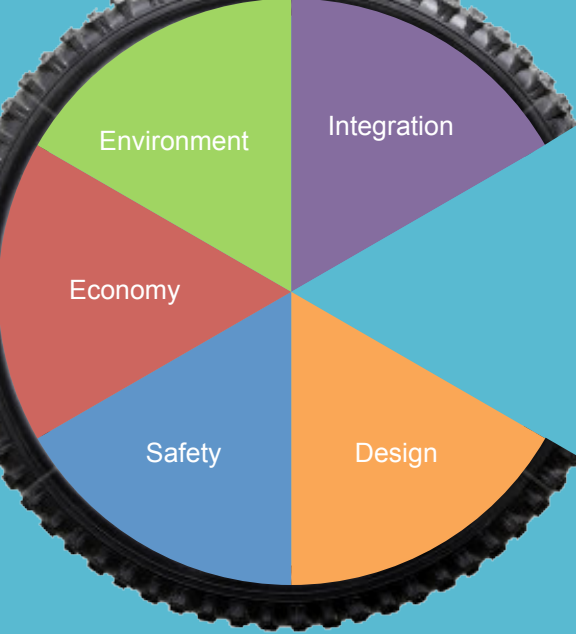
Connection to facilities, e.g. food & drink, toilets

Issues causing poor connectivity: walls, fences, steps etc.



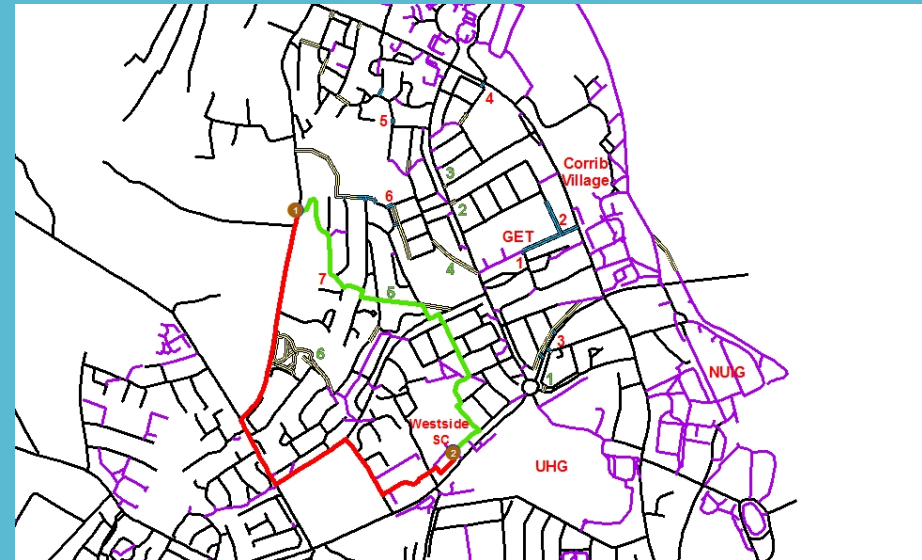
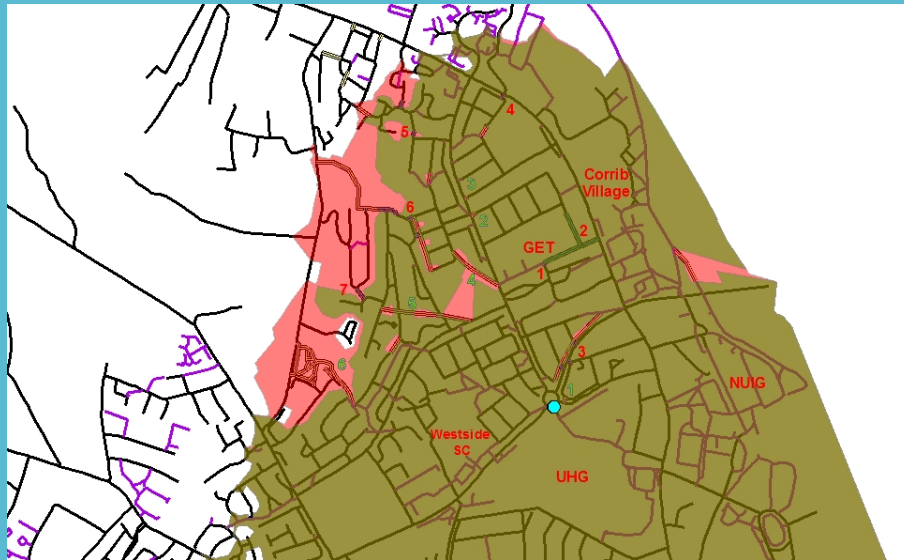
Connectivity





Connectivity

Study of Galway City West



Future work

Develop a rating system for the connectivity of greenways



Integration



Infrastructure must be shown to align with policy and plans



International/EU, national, regional, local



Smarter Travel & National Cycle Policy Framework



NSS, NDP, RDP, Trails Strategy etc.



City & County Development Plans, LAPs



Other policies, e.g. obesity, carbon savings



Integration with land use



Develop a rating system

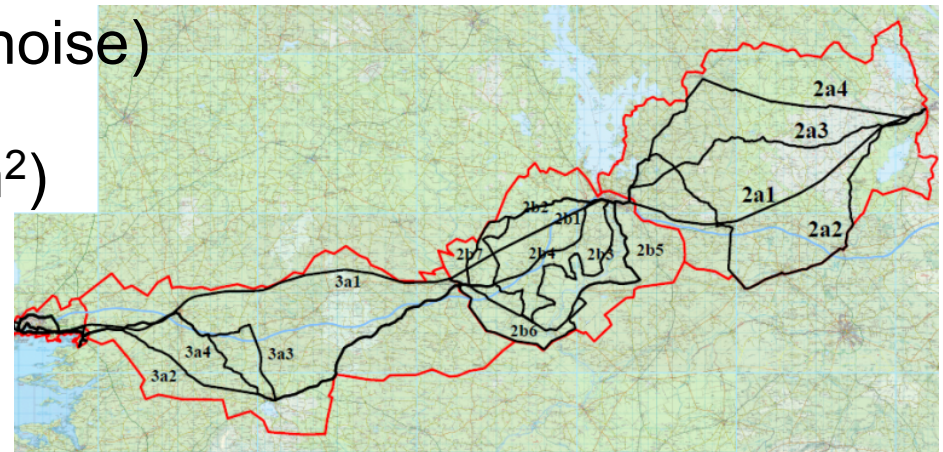
Case Study: Mullingar-Galway

Dublin-Clifden corridor
Coast-Coast
140 km long

Issues:

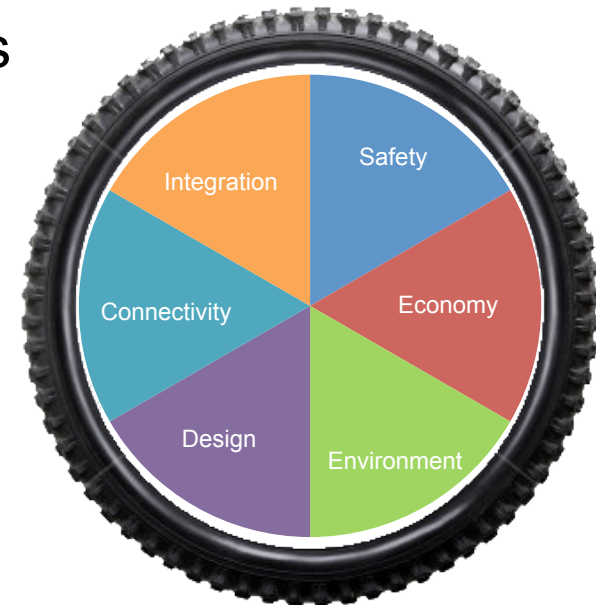
- Linking towns
- Low inter urban population density
- Facilitating all users
- Tourist attractions (Clonmacnoise)
- Ground conditions (bogs)
- Size of study area (2,023 km²)
- Constraints
- Number of route options

Ideal for testing analysis



Summary

- 🚲 A thorough greenway route selection process is required
- 🚲 This research will develop scores for: safety, value for money, environmental friendliness, quality of design, connectivity and integration with policy
- 🚲 Consider weightings as angle of the spokes
- 🚲 This could be an important tool for route design in Ireland and internationally



Contact

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