



**Irish Fiscal
Advisory Council**

Assessing fiscal impacts of climate change

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Path for the Public Finances 2020

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Own views; not those of Fiscal Council or others

“...the Quarterly Journal of Economics,
the most-cited journal in economics, has

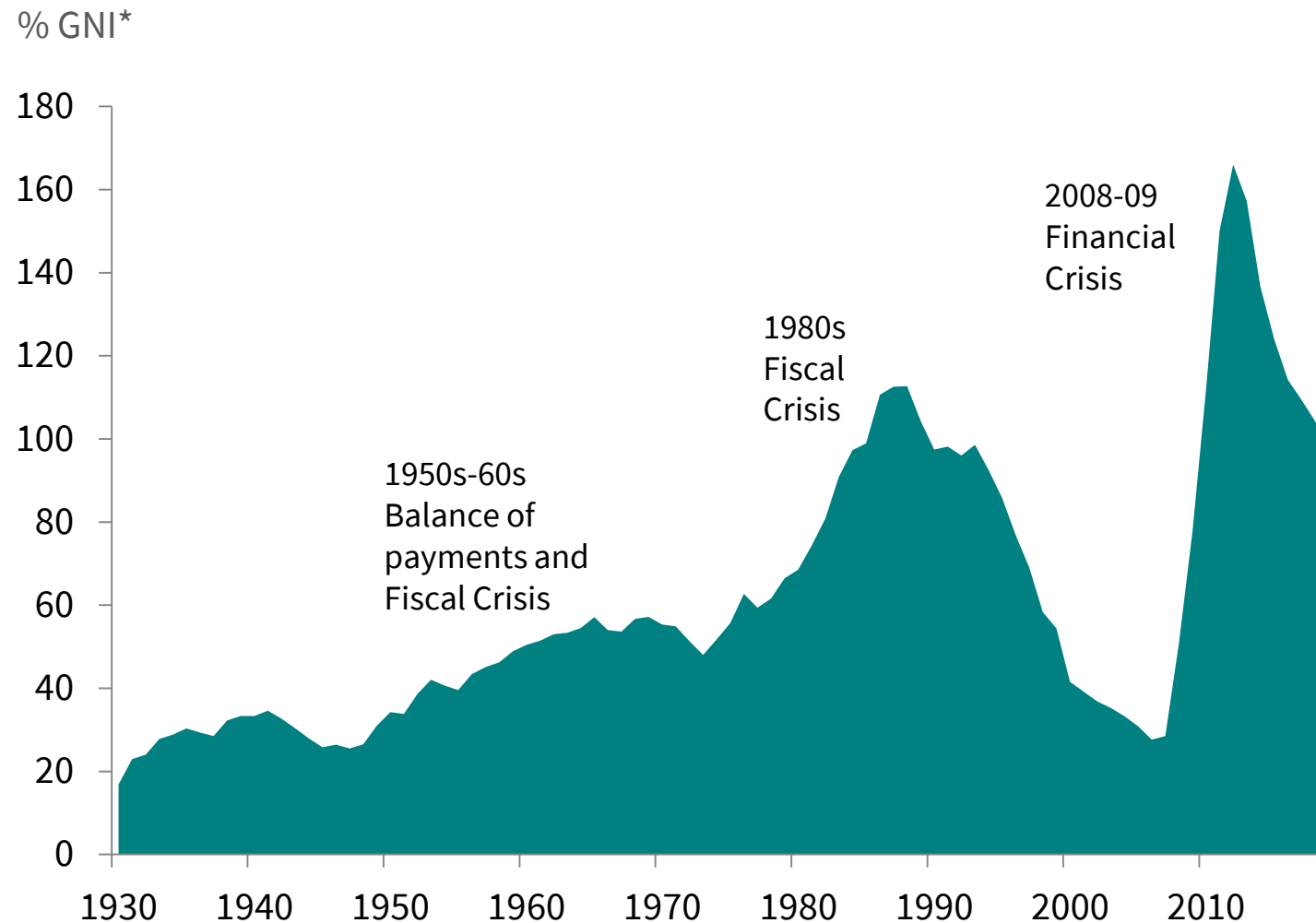
never published an article on
climate change.”

Oswald and Stern (2019)

[Why are economists letting down the world
on climate change?](#)

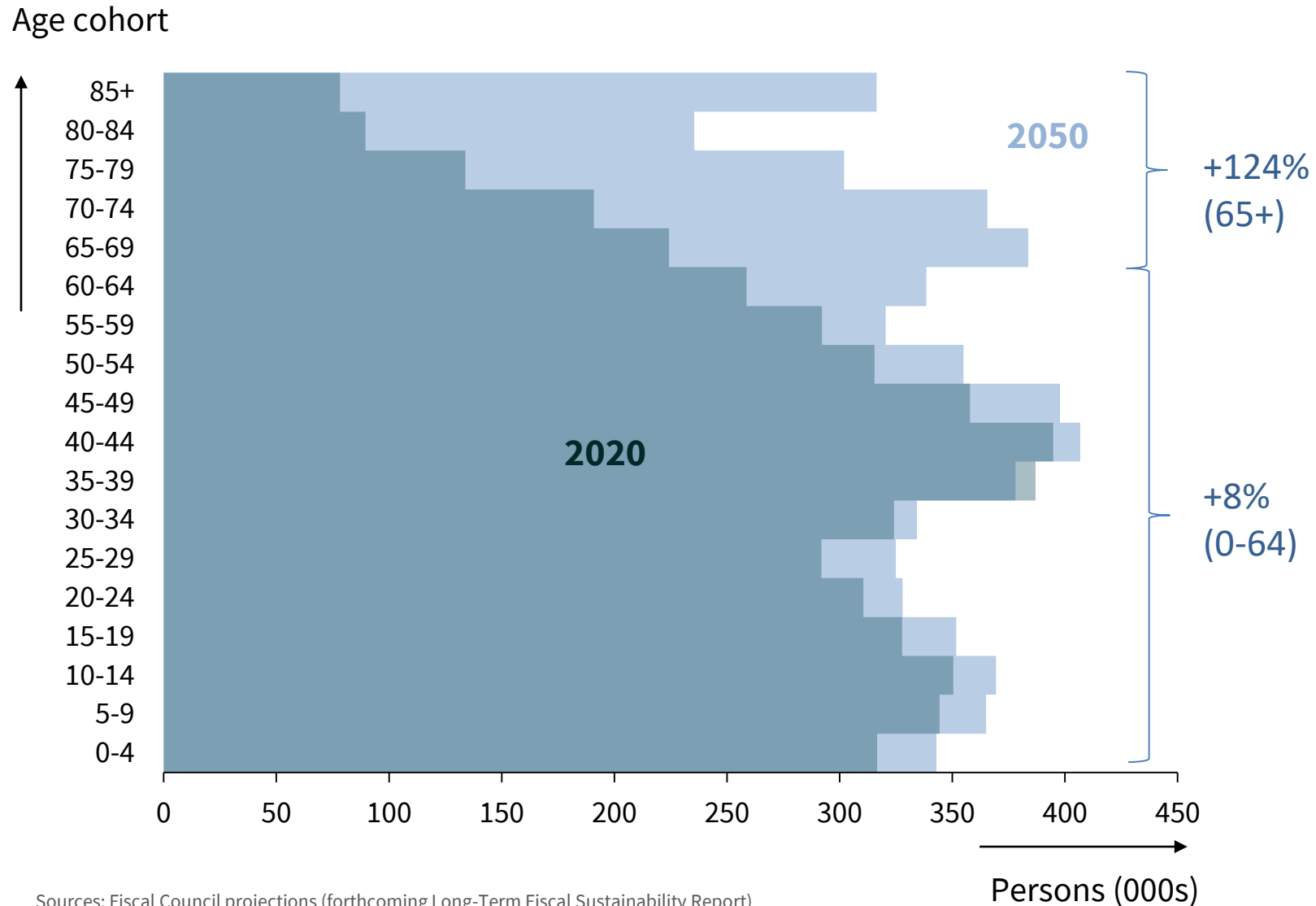
There are big fiscal challenges

There is a legacy of high debt

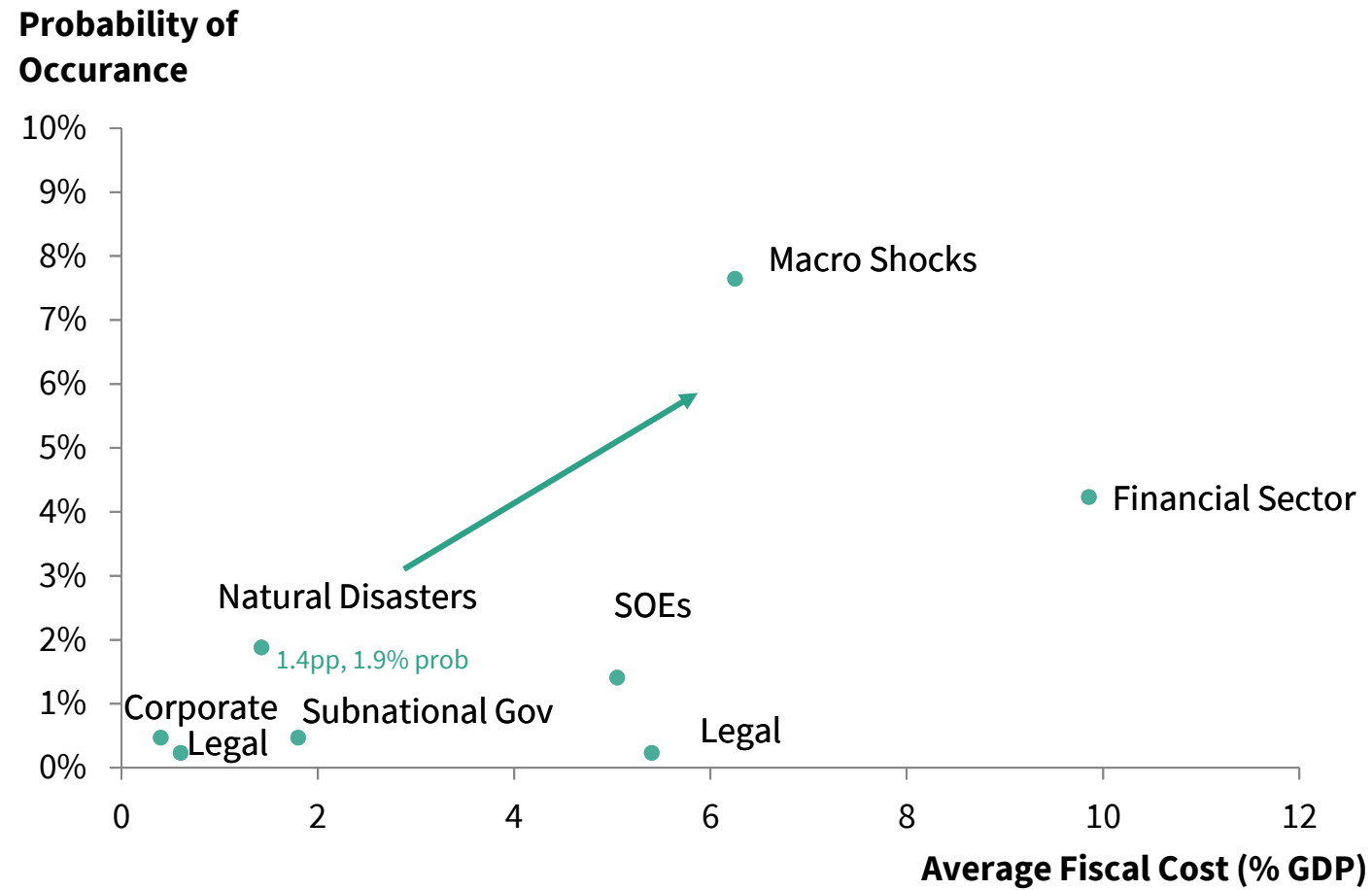


Sources: CSO; FitzGerald and Kenny (2018); and Department of Finance.
Note: Modified GNI* is linked to GNI for 1970-1995 and to GNP for 1926-1969.

Ongoing long-term challenges



And numerous risks

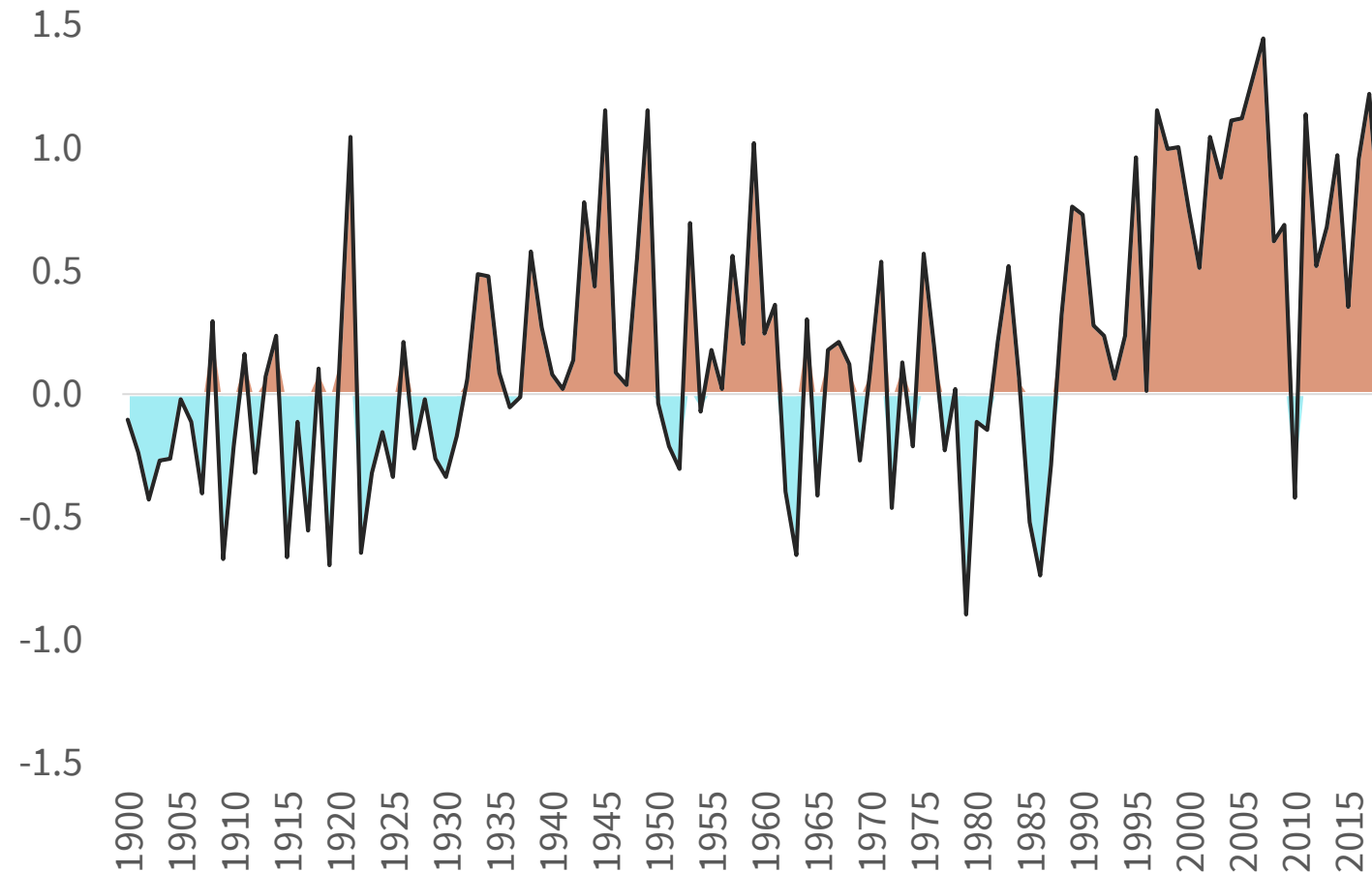


Sources: Bova et al. (2016); own workings.

The climate is changing

Irish surface temperatures are rising

Degree Celsius relative to long-run average (1961–1990)

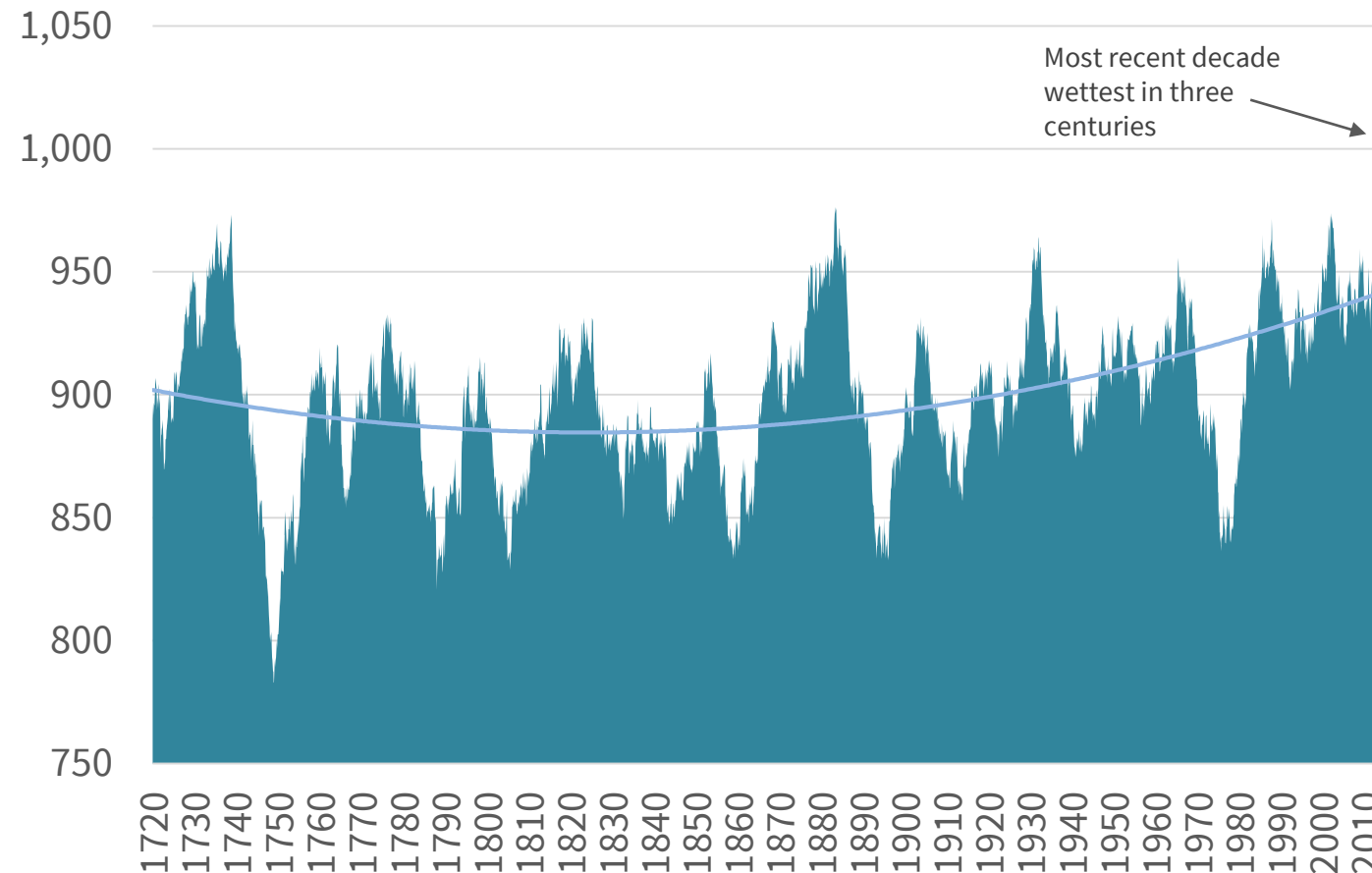


Sources: Met Éireann.

Note: Data show the difference in annual mean temperature, for 1900-2019, from its 1961-1990 long-term average. The Long-term average of 1961-1990 is a fixed reference period used for climate change studies. Data for 2018 and 2019 is provisional. Data is from five weather stations on the island of Ireland and was last updated as of January 2020.

Monthly rainfall is getting higher

Average annual rainfall in millimetres over ten years (moving ten-year averages)



Sources: Murphy et al. (2018); own workings.

Note: The trend line shows a second-order polynomial fitted to the decadal data.

Major weather events seem more common

No. of reported weather events (storms, cold spells, floods...)



Sources: Met Eireann; own workings.

Economic impacts

How to think through growth impacts (Supply-side channels)



Land

- Scarcity of land
- Shortages in water, food, energy



Labour

- Poorer health
- Higher mortality
- Migration



Capital

- Damages to infrastructure
- Faster depreciation
- Old tech vs new tech



Productivity

- Impaired health
- Temperature effects
- Old tech vs new tech (innovation)
- Reduced trade

“Green” investment has positive benefits

- Positives:
 - higher investment
 - jobs for people to retrofit houses, etc.
 - may be net negative in terms of GDP, but not necessarily welfare

Sectoral impacts

- Agriculture
- Pharma
- Aircraft leasing
- ICT (data centres)

Budgetary impacts

Assessing budgetary impacts

- We need to think of this in terms of:
 1. Getting the **Baseline** right
 - likely that current projections aren't fully accounting for all of the economic impacts that will arise from climate change and the impact of decarbonisation policies we will see
 2. The **Risks** around that baseline

Budgetary impacts: Baseline and Risks

	Decarbonisation (baseline)	Mitigation and managing risks
Tax	<ul style="list-style-type: none"> • Lower GDP • Tax incentives • Higher carbon taxes • Shrinking carbon tax base 	
Spending	<ul style="list-style-type: none"> • Cash Incentives • Public investment • Supports for transition sectors • Potential fines 	Natural disasters and flood defenses

Baseline

Tax with direct links

	2014 €bn	2018 €bn	2014 %	2018 %
Excise on heavy oils	1.2	1.6	3.0	2.8
Vehicle Reg Tax	0.5	0.9	1.3	1.6
Motor tax	0.9	0.8	2.2	1.4
Excise on light oils	0.8	0.6	1.9	1.1
Carbon tax		0.4	0.9	0.8
		4.1		6.1

(2% GNI*)

Tax with indirect links

- Reduced economic activity
- A shift from consumer spending towards investment would have impacts
 - Reduced VAT revenues
 - Investments at lower tax rates

Expenditure plans

- Some €36bn (31%) of National Development Plan allocated over 2018-2027 to broad areas (€3.6bn p.a. or **1.5% GNI***)

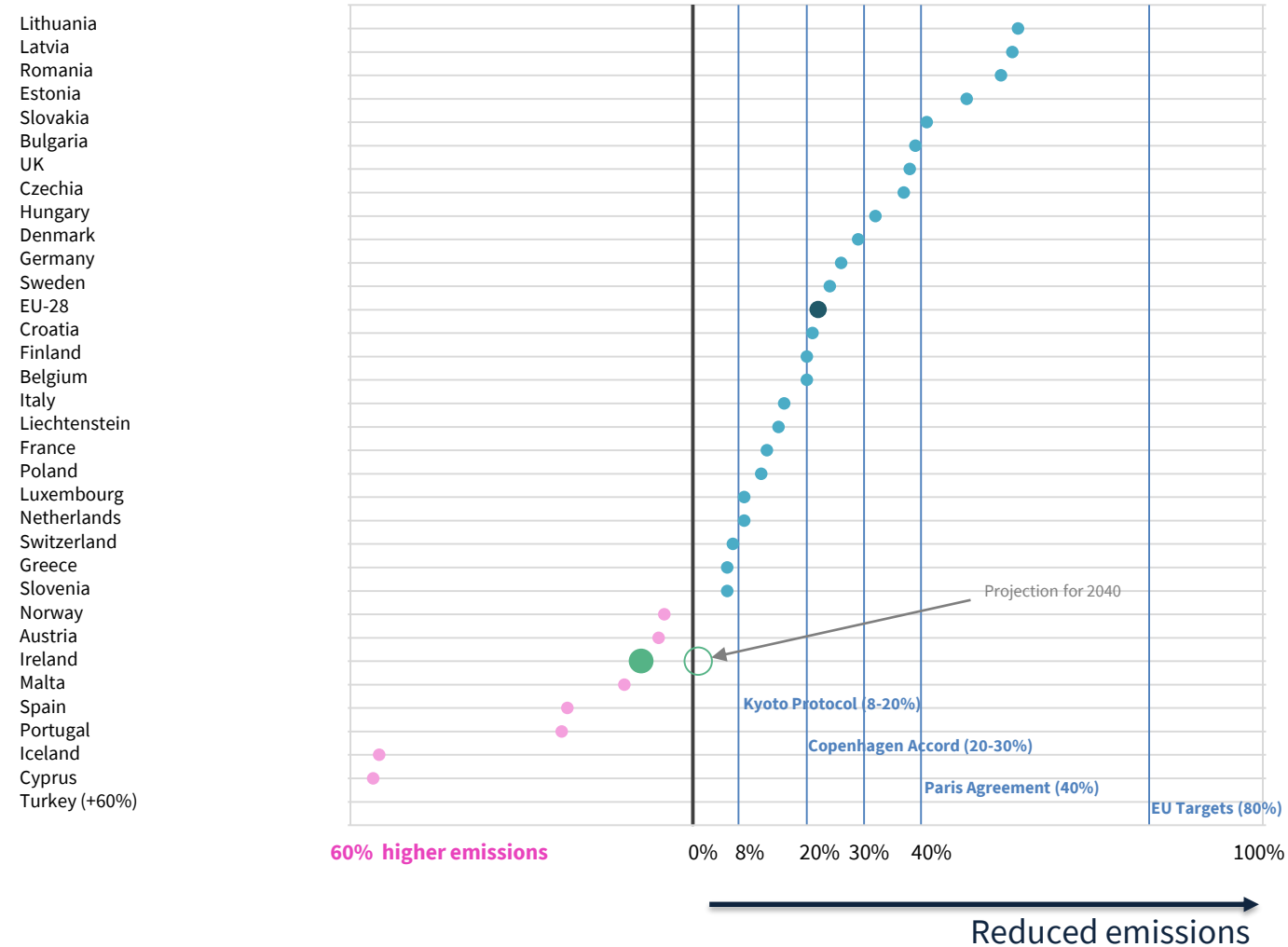
€bn	Exchequer	Non-Exchequer	Total	p.a.	p.a. (% GNI*)
Housing retrofit	3.0			0.30	0.12
Energy efficiency in public buildings	0.8			0.08	0.03
Boiler replacement	0.7			0.07	0.03
Support Scheme for Renewal Heat	0.3			0.03	0.01
Climate Action Fund		0.5		0.05	0.02
Electric vehicles	0.2			0.02	0.01
Flood Defences	1.0			0.10	0.04
Energy (renewables, interconnection, etc)		13.7		1.37	0.56
			20.2	2.02	0.82
Dart Expansion	2.0			0.20	0.1
Metro Link	3.0			0.30	0.1
BusConnects Programme	2.4			0.24	0.1
Irish Water	6.8	1.7		0.85	0.3
			15.9	1.59	0.65
	20.2	15.9	36.1	3.61	1.47

National Development Plan 2018-2027.

https://www.gov.ie/pdf/?file=https://assets.gov.ie/831/130718120306-5569359-NDP%20strategy%202018-2027_WEB.pdf#page=1

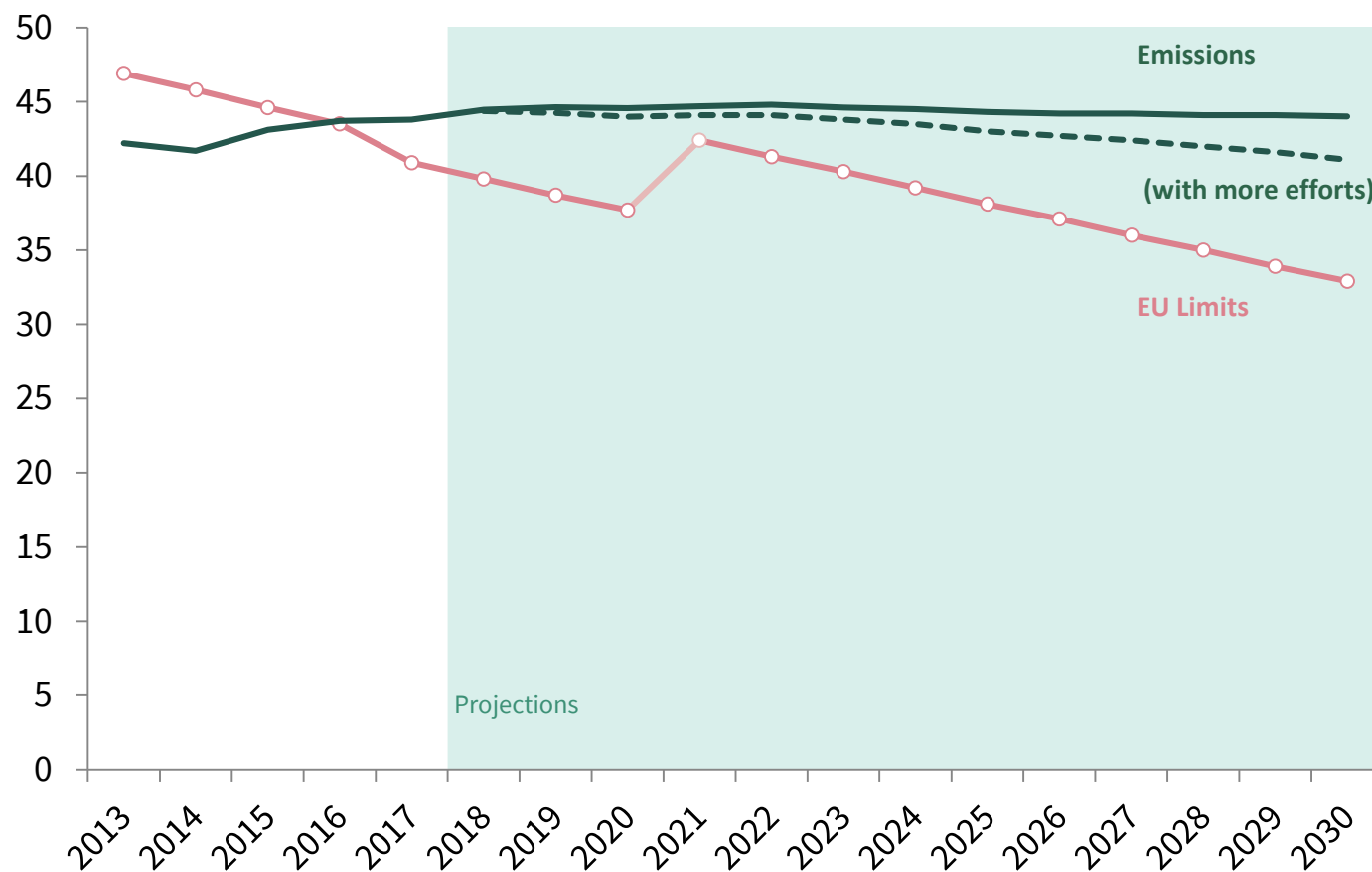
Ireland not meeting international targets

Greenhouse gas emissions and targets
(% change 2017 relative to 1990)



And expected to exceed EU limits

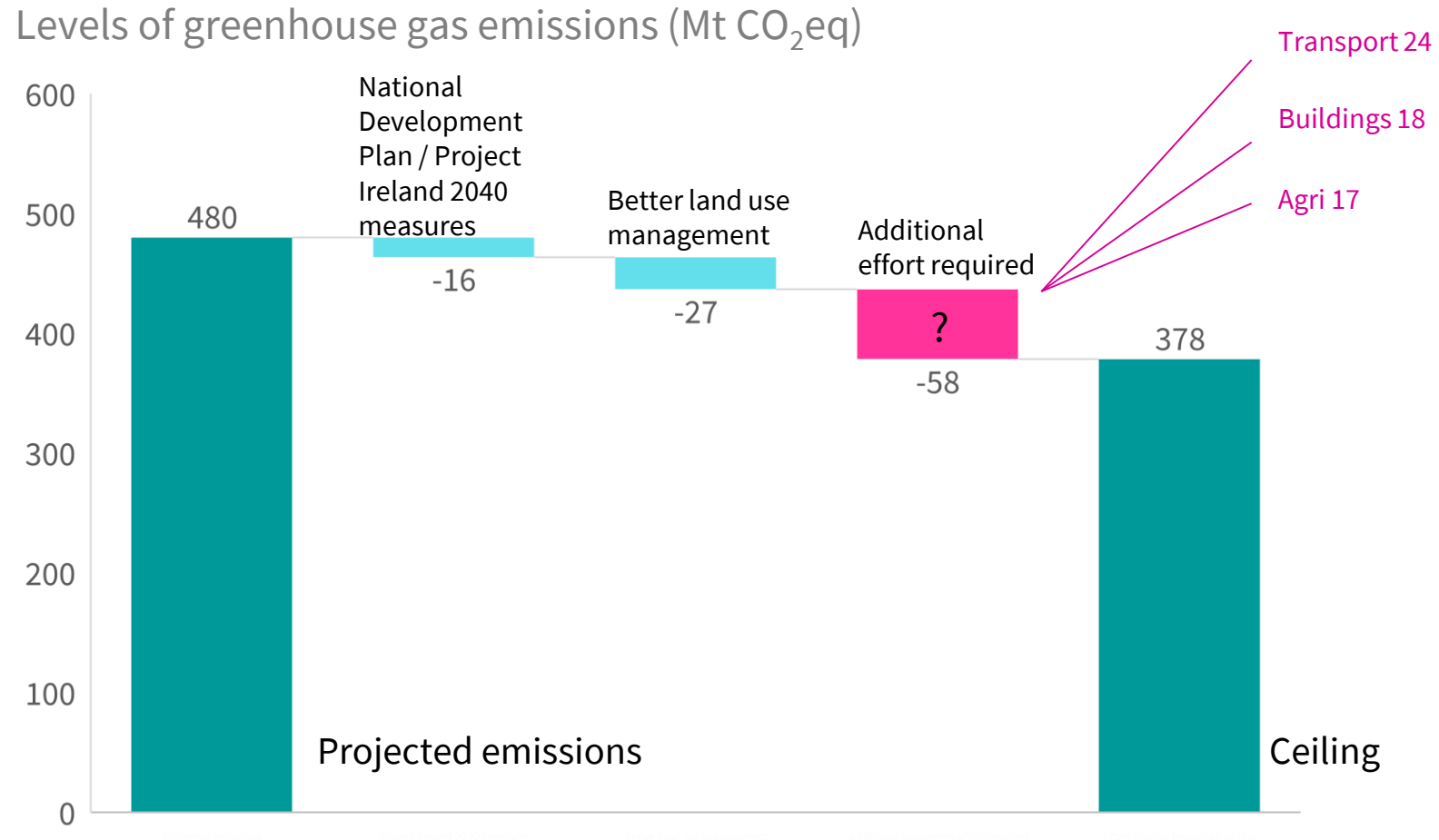
Levels of greenhouse gas emissions (Mt CO₂eq)



Sources: Climate Change Advisory Council (2019) drawing on EPA inventories and projections (2018-2040) and European Commission Decision (EU) 2017/1471 2017; and own workings.

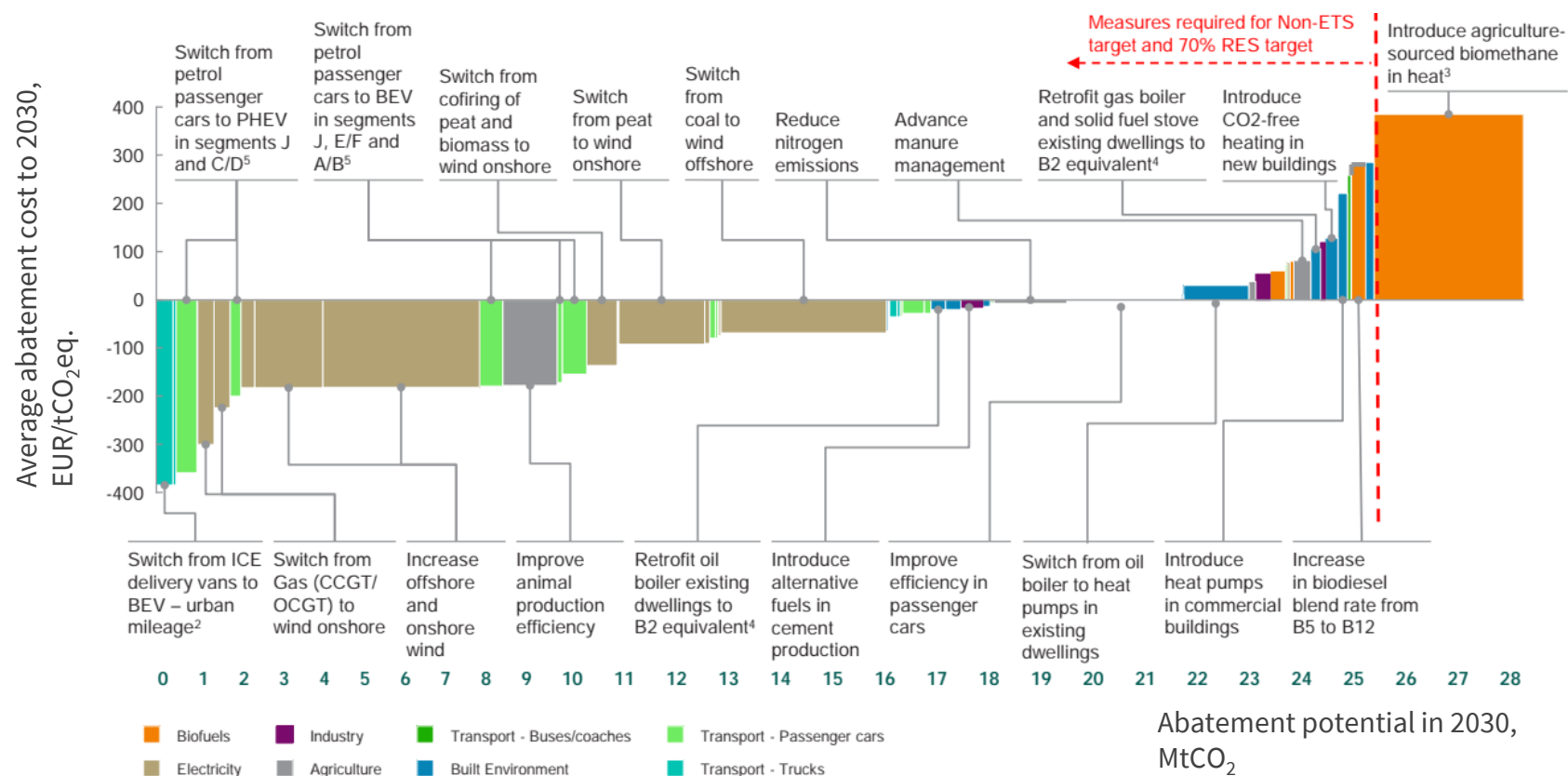
Note: Dashed line shows emissions with additional measures in the National Development Plan. Climate Action Plan measures are not included.

What are plans to reach the 2030 target?



Marginal Abatement Cost Curve for Ireland to 2030

Net lifetime costs and CO₂ impact of switches in technologies



Source: Climate Action Plan 2019

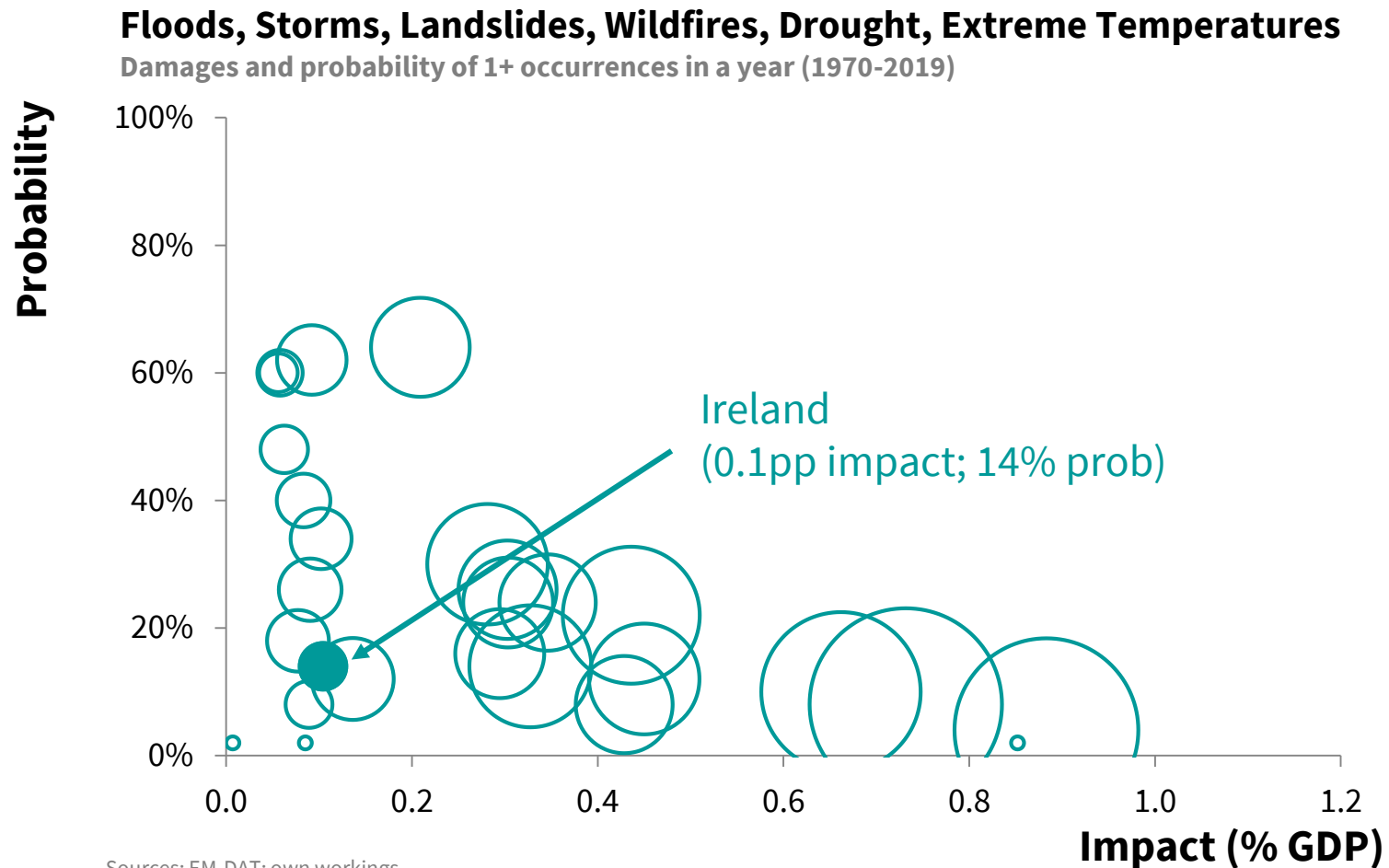
https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf#page=33

Have we got the baseline right?

- Are Climate Action Plan objectives properly costed?
- If not, how costly might additional efforts be?
- What are the costs of missing targets?
 - Ireland's 2020 emissions targets are unlikely to be met, implying costs of €148 million–€455 million per year (Deane, 2017).
 - Missing later (2030) targets could cost €2.7–€5.5 billion (Curtin, 2016).

Risks

Typical Damages by country (six disaster types)



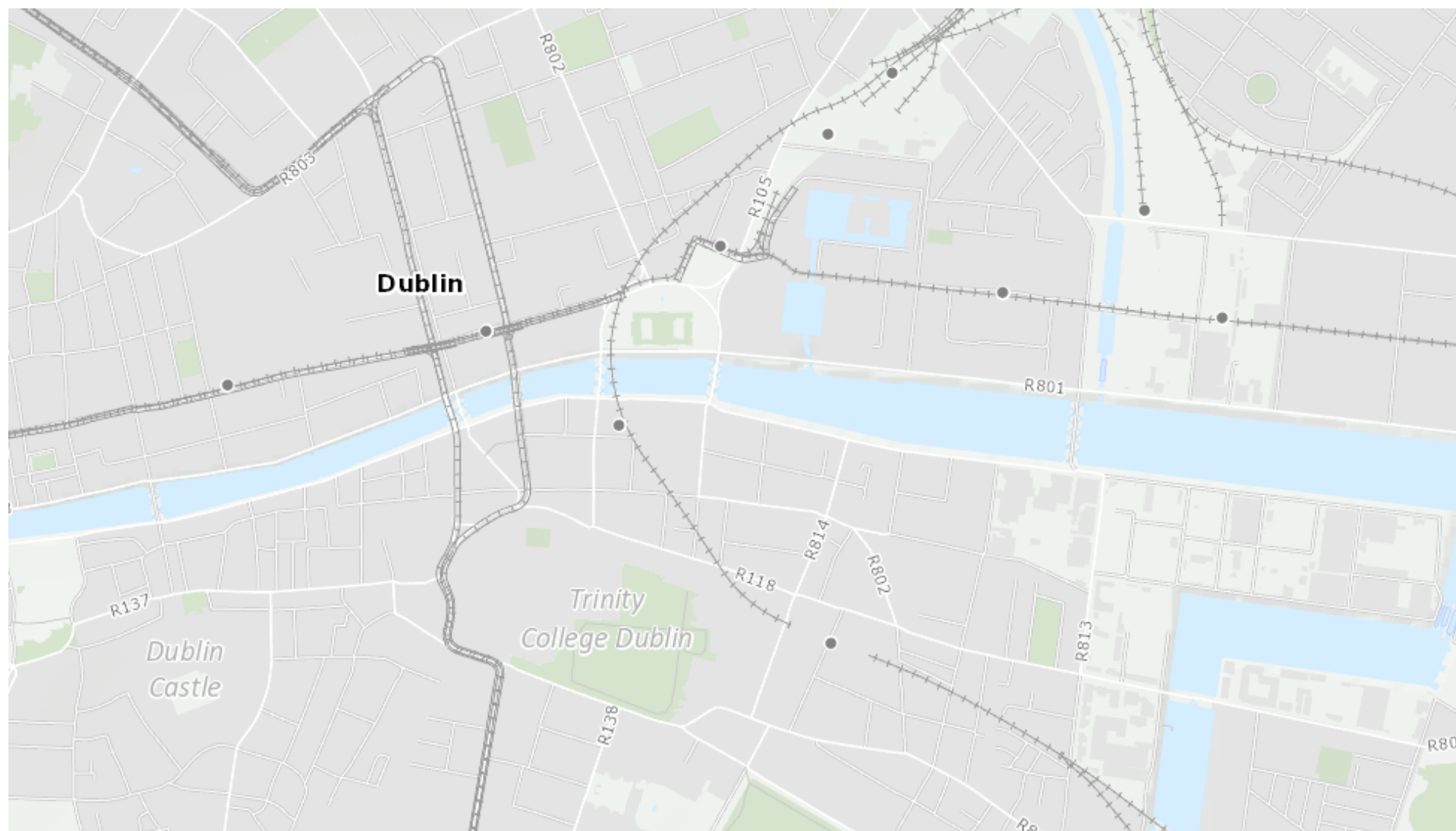
Sources: EM-DAT; own workings.

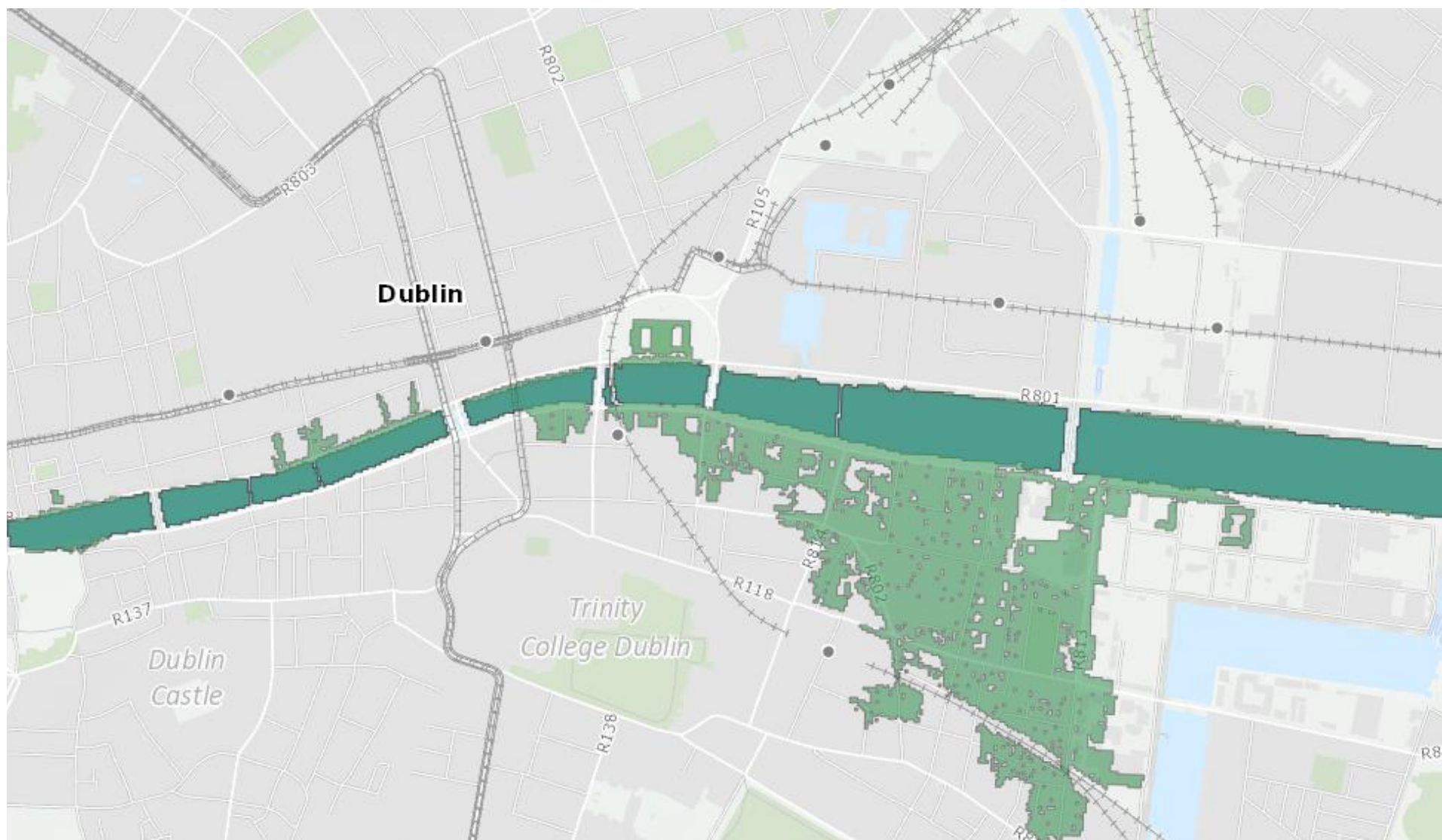
Note: Each bubble represents data for an individual country on annual event damage costs as % GDP (x-axis), unconditional probability of occurrence in a given year (y-axis), and (depending on size of bubble) the standard deviation of estimates (smaller bubbles represent lower standard deviations).

Costs: We have detailed assessments of flood risks/impacts from OPW's CFRAM

- Four main cities (~ 1/3 population) at risk
- CFRAM shows 10% flood risk probabilities (one-in-ten year events) for two scenarios:

Mid-Range Future Scenario	High-Range Future Scenario
+0.5 meter sea levels	+1 meter sea levels
+ 20% rainfall & peak flood flows	+ 30% rainfall & peak flood flows
-0.5mm land movement / year	-0.5mm land movement / year
1/6 Tp ² deforestation	1/3 Tp ² deforestation





Mid-Range Scenario

High probability river/coastal floods



High-Range Scenario

High probability river/coastal floods

Dublin City AFA Flood Risk Table

Type of Risk	Flood Risk for Design AEP (%) Event		
	10% AEP	1% AEP / 0.5% AEP	0.1% AEP
Current Scenario (Present Day)			
Event Damage (€)	11,862 Fluvial 4,854,778 Coastal 1 20,071,361 Coastal 2	1,130,231 Fluvial 130,651,297 Coastal 1 110,222,005 Coastal 2	5,763,238 Fluvial 518,386,518 Coastal 1 148,725,542 Coastal 2
No. Residential Properties at Risk	0 Fluvial 40 Coastal 1 303 Coastal 2	14 Fluvial 598 Coastal 1 1,339 Coastal 2	100 Fluvial 3,202 Coastal 1 1,562 Coastal 2
No. Business Properties at Risk	1 Fluvial 15 Coastal 1 7 Coastal 2	1 Fluvial 183 Coastal 1 69 Coastal 2	7 Fluvial 676 Coastal 1 82 Coastal 2
No. Utilities at Risk	1 Fluvial 0 Coastal	1 Fluvial 2 Coastal	1 Fluvial 2 Coastal
No. Major Transport Assets at Risk	10 Coastal	48 Coastal	148 Coastal
No. Highly Vulnerable Properties at Risk	0 Fluvial 0 Coastal 1 2 Coastal 2	0 Fluvial 4 Coastal 1 7 Coastal 2	0 Fluvial 21 Coastal 1 13 Coastal 2
No. of Social Infrastructure Assets at Risk	29 Fluvial 43 Coastal	38 Fluvial 91 Coastal	46 Fluvial 161 Coastal
No. Environmental Assets at Risk	5 Fluvial 11 Coastal	5 Fluvial 11 Coastal	5 Fluvial 11 Coastal
No. Potential Pollution Sources at Risk	0 Fluvial 0 Coastal	0 Fluvial 0 Coastal	0 Fluvial 0 Coastal

coastal 1 = tidal inundation
coastal 2 = wave overtopping

Source:

https://s3-eu-west-1.amazonaws.com/docs.floodinfo.opw/floodinfo_docs/Final_FRMPs_For_Publication/FRMP_Final2018_RiverBasin_09.pdf

High probability risks for Dublin City

(impacts of 10% probability or “1-in-10-year” events)

	Present day	Mid- Range Future Scenario	High-End Future Scenario
Event Damage (€m)	25	333	2,937
No. Residential Properties at Risk	343	18,962	14,514
No. Business Properties at Risk	23	3,809	2,947
No. Utilities at Risk	1	33	16
No. Major Transport Assets at Risk	10	50	392
No. Highly Vulnerable Properties at Risk	2	12	102
No. of Social Infrastructure Assets at Risk	72	169	410
No. Environmental Assets at Risk	16	17	17
No. Potential Pollution Sources at Risk	0	0	2

But strong flood risk management actions

- CFRAM programme
- Climate change sectoral adaptation plan
(<https://www.gov.ie/pdf/?file=https://assets.gov.ie/46534/3575554721374f7ab6840ee11b8b066a.pdf#page=1>)
- €1bn allocation in National Development Plan (€0.1bn per annum)
- Risks?
 - Higher than expected probabilities and impacts
 - Storm surges and river floods in urban areas

Good data resources are available

Dataset	Provider	Period	Reporting	Access/Detail
EM-DAT	CRED	Global (1900-)	Disasters, economic damage, insured loss, deaths...	Free Detailed info CSVs Good metadata
NatCat	MunichRe	Global (1980-)	Natural loss events, No. events, overall loss, fatalities	Some paywall Limited info Limited metadata
CFRAM	OPW	Ireland (mixed, mainly current)	Flood (river/coastal)	Free Highly detailed info CSVs Good metadata
Major Weather Events	Met Eireann	Ireland (1798-)	Extremes, temp, rainfall, winds, power/water/travel disruptions	Free Detailed info, but no costs Good metadata
Claims From Extreme Weather	Insurance Ireland	Ireland (2000-2012)	Cost of claims from extreme weather: Floods, Freeze	Limited info, high level

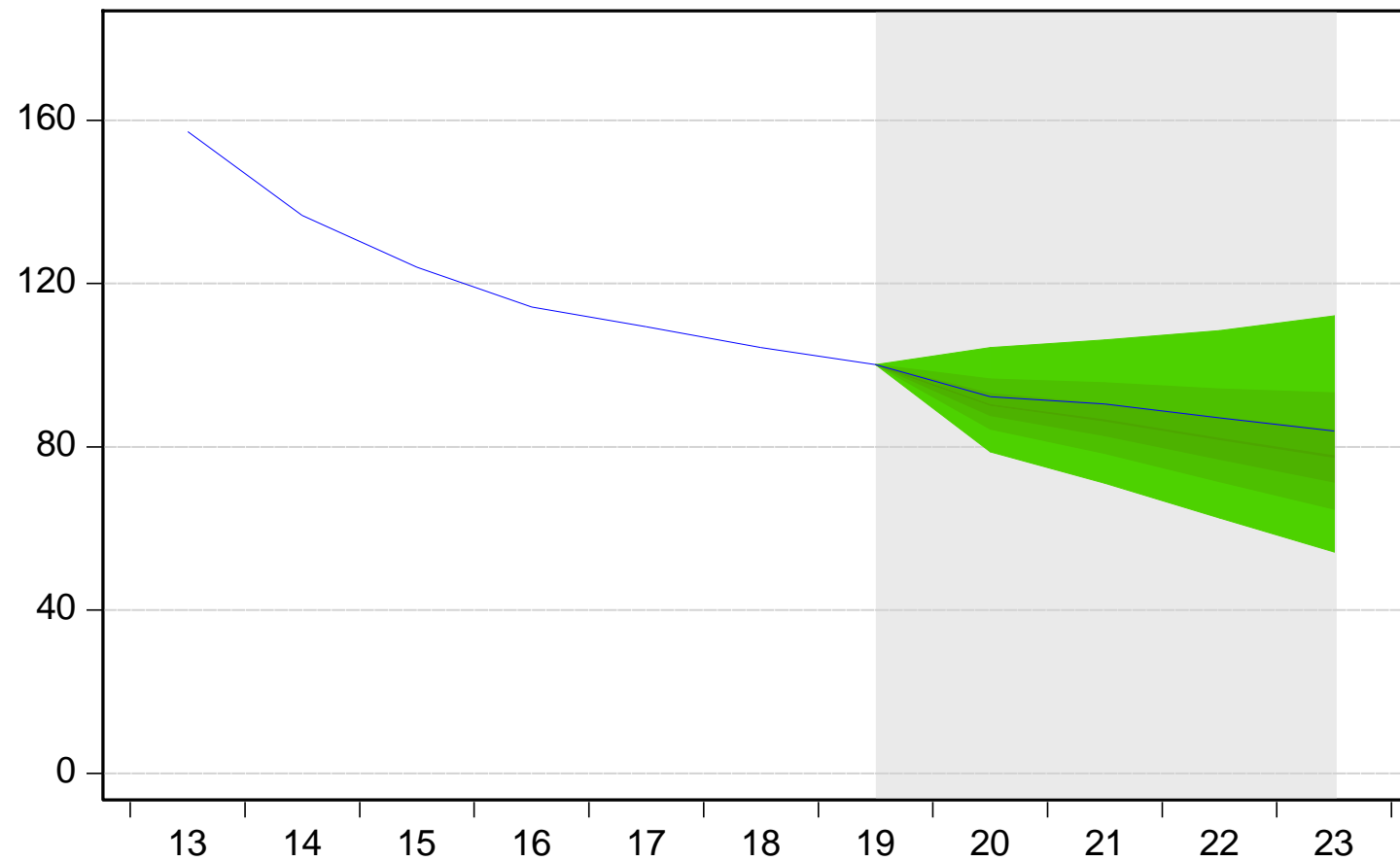
Putting it all together

Scenarios for Debt Sustainability Assessments (“Stress Tests”)

- **Ongoing impacts:** supply-side impacts captured through potential output growth rate economy converges to, expected adaptation costs, etc.
- **Discrete shocks:** demand-side impacts captured through a calibrated macro shock.
 - Additional budgetary costs:
 - 1) Typical shock (typical historical weather events)
 - 2) Tail risk shock (severe, but low probability)
 - Direct costs: damages to public assets...
 - Indirect costs: higher unemployment, reduced revenues due to lower consumption...
 - Contingent liabilities: insurance/bank sector...

Incorporate into probabilistic debt sustainability analyses

Gross Debt % GNI*



Fiscal risk management framework

(1) Identify & Quantify

(2) Mitigate?

- Direct controls (ceilings, guarantees)
- Regulation, incentives...(building/capital req's)
- Transfer/risk sharing (hurricane clauses)

(3) Provision for?

- Expense costs in budgets (AUS student loans)
- Budget contingencies (moderate impact, likely risks)
- Buffer funds (Rainy Day Fund)

(4) Residual risks?

- Debt targets

Conclusions

Conclusions

- **Huge wide-ranging challenges:** Baseline & Risks around it. Demand-side, supply-side, direct, indirect, contingent, legal.
- **Need to be clear** on policies to meet targets and need proper costings.
- **Few looking at debt sustainability risks** to date:
 - Big knowledge gaps: *impact* and *likelihood* of events, recognising uncertainties

Thanks