OPTIMISING POST-DISASTER RECOVERY INTERVENTIONS IN AUSTRALIA

UTILISING CENSUS DATA TO INFORM PUBLIC POLICY:
THE QUEENSLAND FLOODS 2010-11
THE BLACK SATURDAY BUSHFIRES 2009

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Research Team

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End-User representatives

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Mr Aaron Verlin   Emergency Management Australia, Attorney General's Department

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POTENTIAL END USERS:

- *Queensland Reconstruction Authority*

- *Department of Treasury and Finance Victoria*

- *Queensland Treasury*

PRESENTATION OVERVIEW

1 THE PROJECT

2 OBJECTIVES & METHODOLOGY

3 FINDINGS: QUEENSLAND FLOODS 2010-11

4 BLACK SATURDAY BUSHFIRES 2009

5 PROGRESS TO DATE

6 THE WAY FORWARD
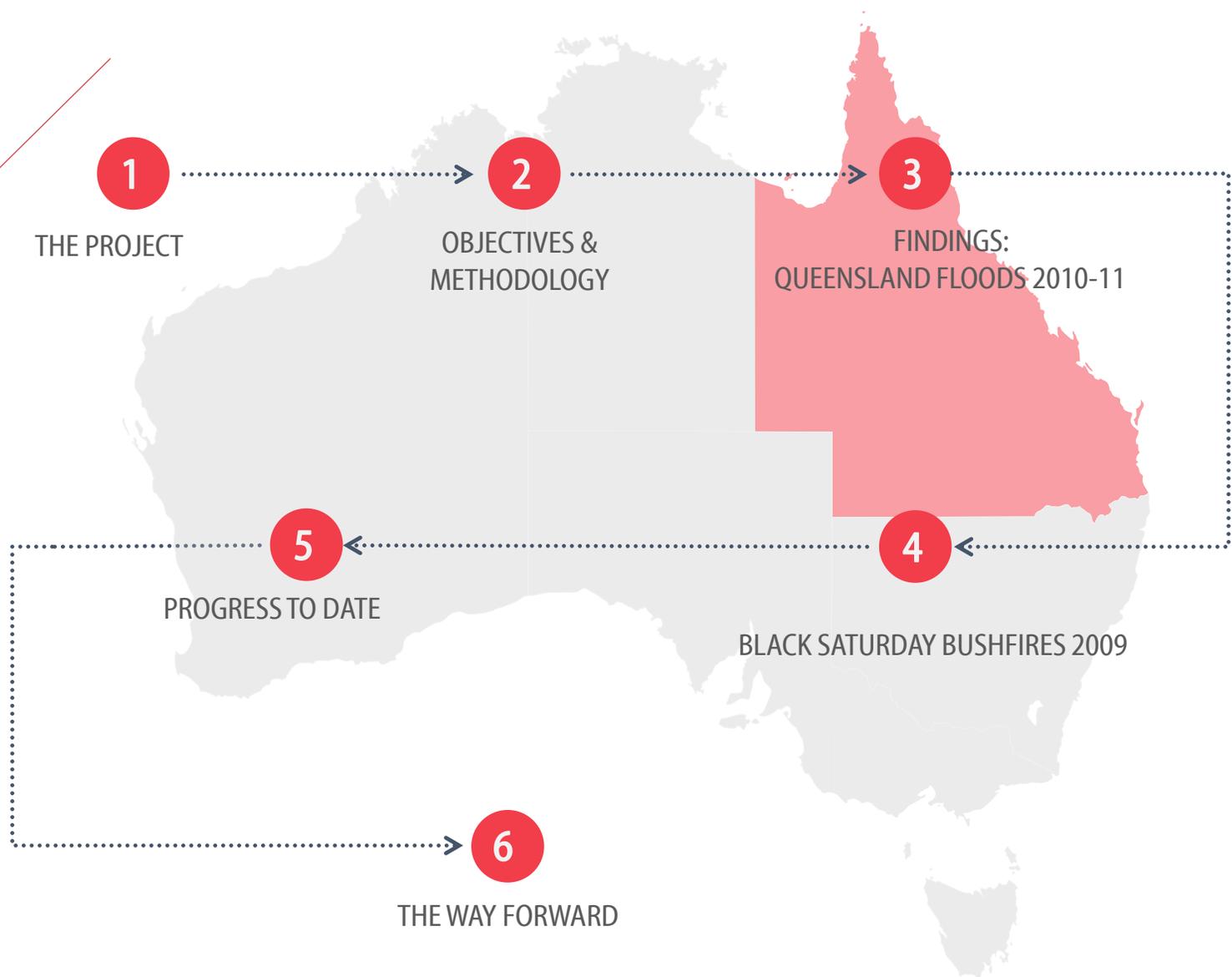
1. OBJECTIVES OF THE PROJECT

OBJECTIVES OF THE PROJECT

IDENTIFYING INCOME EFFECTS OF NATURAL DISASTERS

To estimate the effects of severe natural disasters on individuals' income by sector:

- Identify the economic sectors that are 'vulnerable' to bushfires
- Identify the economic sectors that are 'beneficiaries' of bushfires
- Identify the economic sectors that are 'unlikely to be affected' by bushfires

TRANSLATING RESEARCH INTO PRODUCT

Develop a ranked list of the economic sectors that seek more attention for policy intervention to minimise potential adverse effects of bushfires

UTILISATION OF RESEARCH OUTPUT

To guide budget allocation across economic sectors in post-disaster recovery phase

2 CASE STUDIES
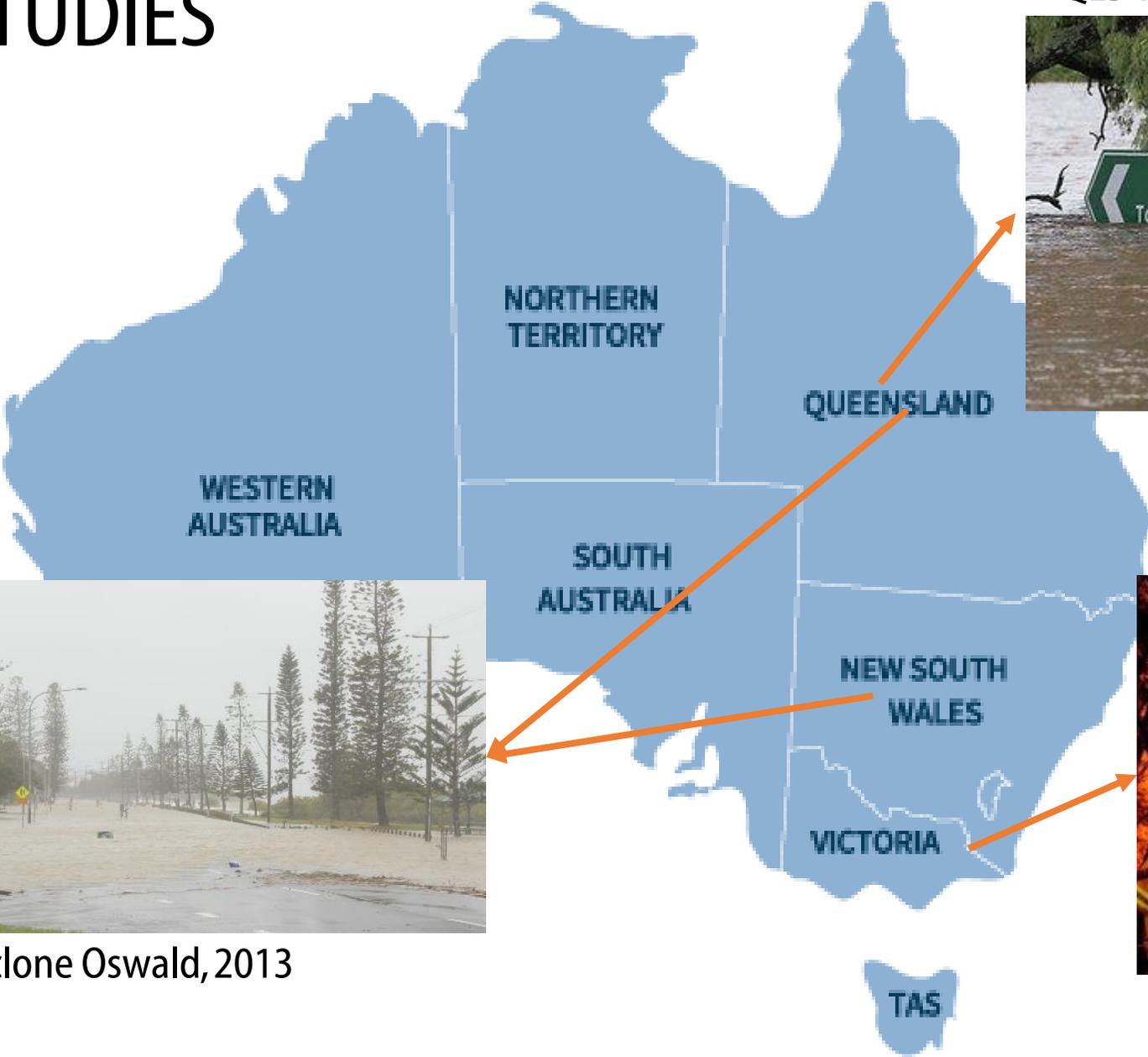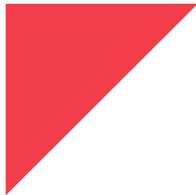
QLD Floods 2010-11

Black Saturday Bushfires 09

Cyclone Oswald, 2013

NORTHERN TERRITORY

WESTERN AUSTRALIA

SOUTH AUSTRALIA

QUEENSLAND

NEW SOUTH WALES

VICTORIA

TAS
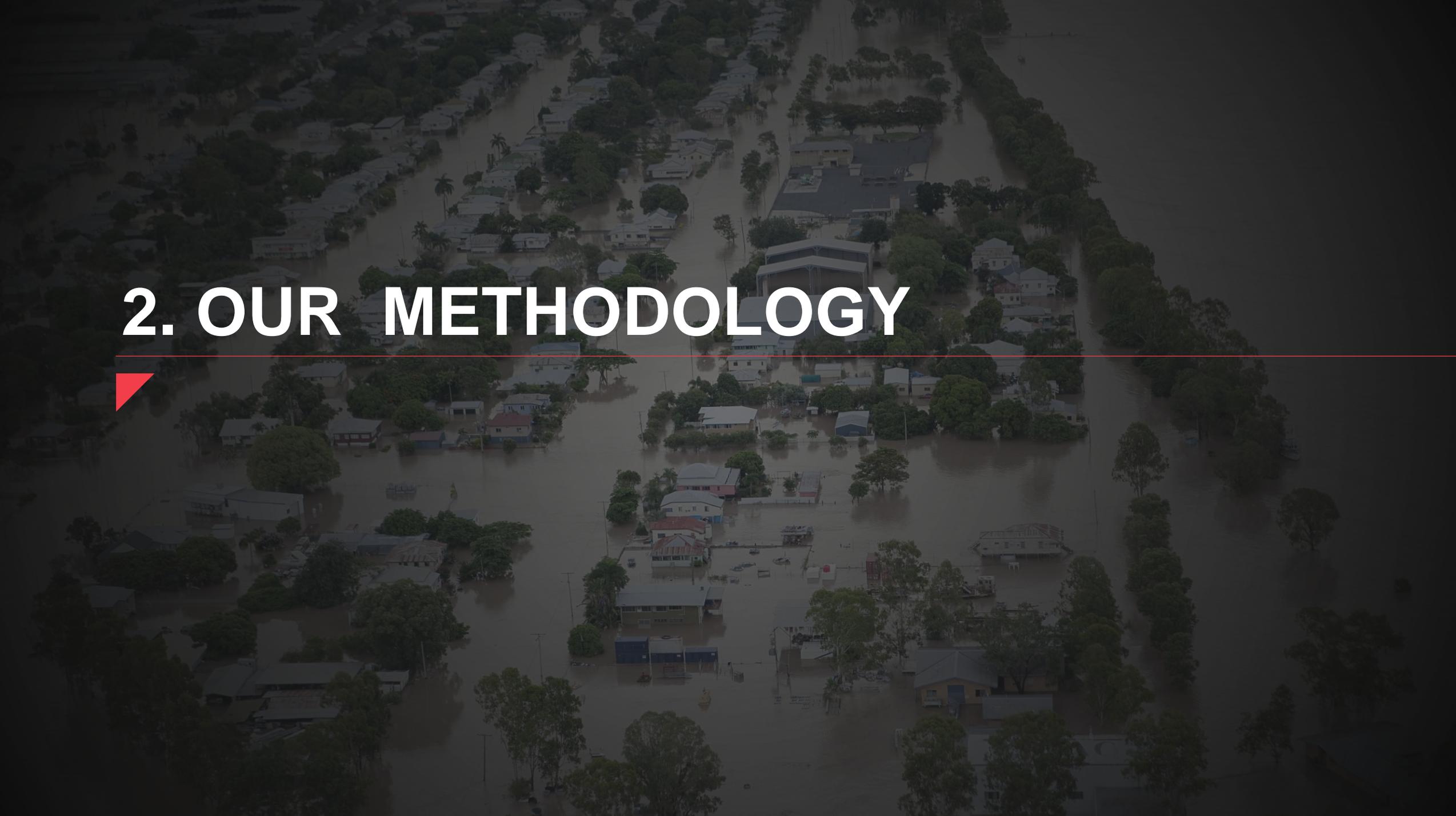
2. OUR METHODOLOGY

CIRCULAR FLOW DIAGRAM OF THE ECONOMY
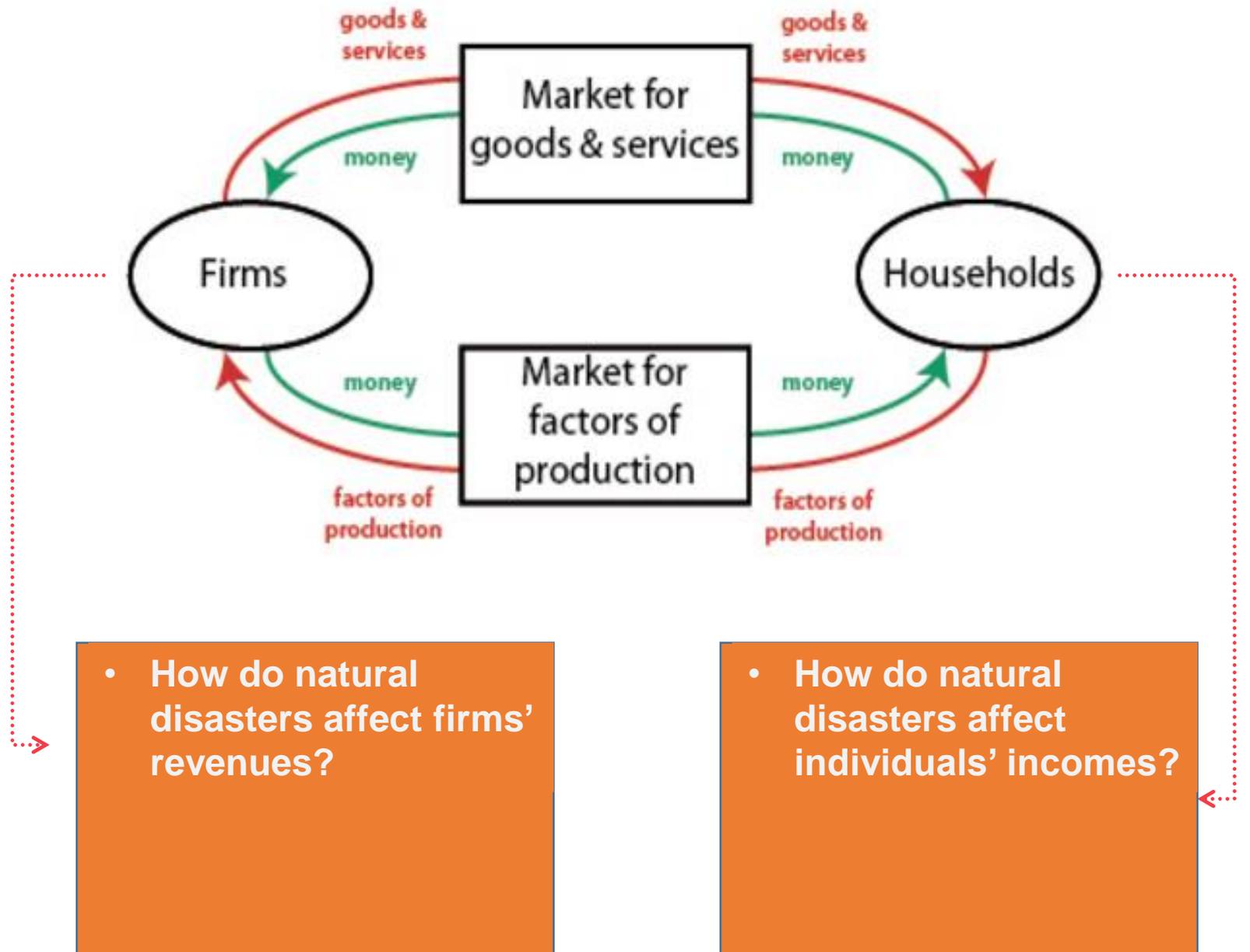
- **How do natural disasters affect firms' revenues?**

- **How do natural disasters affect individuals' incomes?**

THE DATA
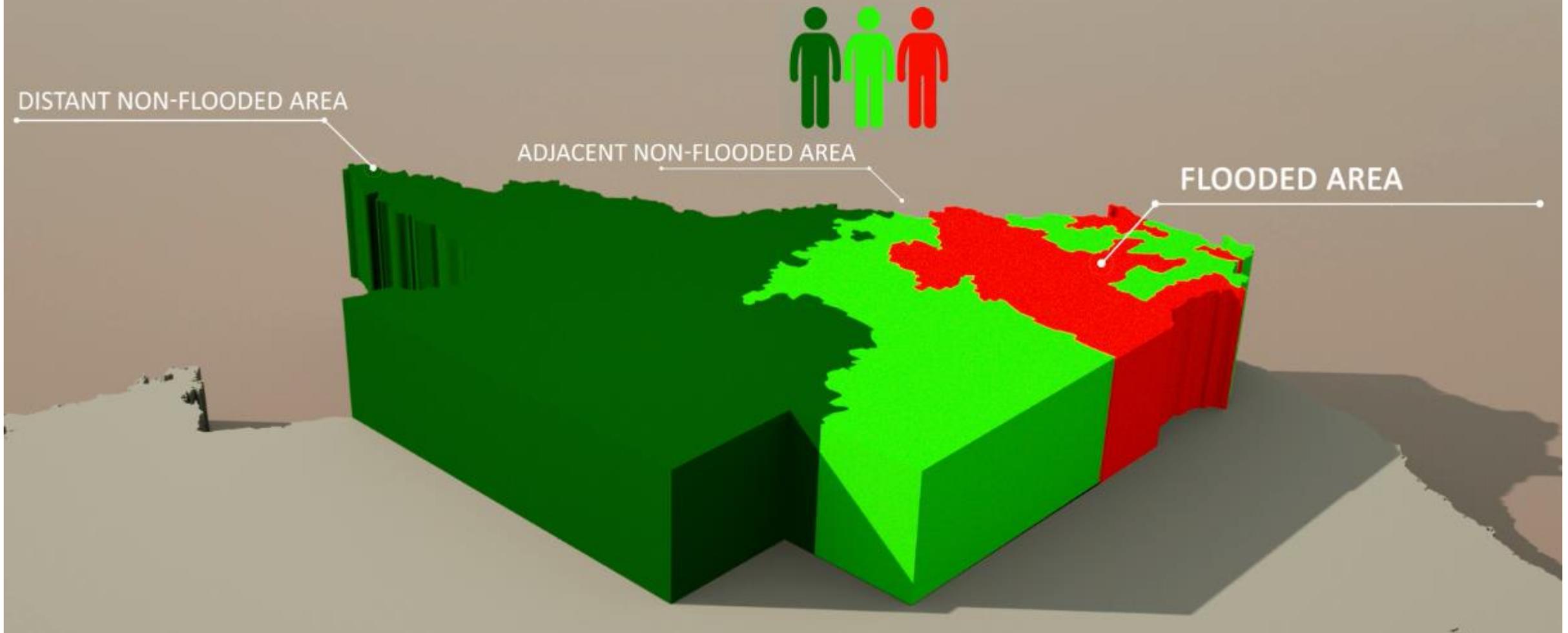
Brisbane and SE QLD flood map: Dec 2010 - Jan 2011

Bureau of Meteorology (BoM), Govt. of Australia

We calculate "flood-water height" at SA2 level overlaying:

➢ Flooded-area map
➢ Digital elevation map

Map: Flooded Areas in Queensland, January 2011
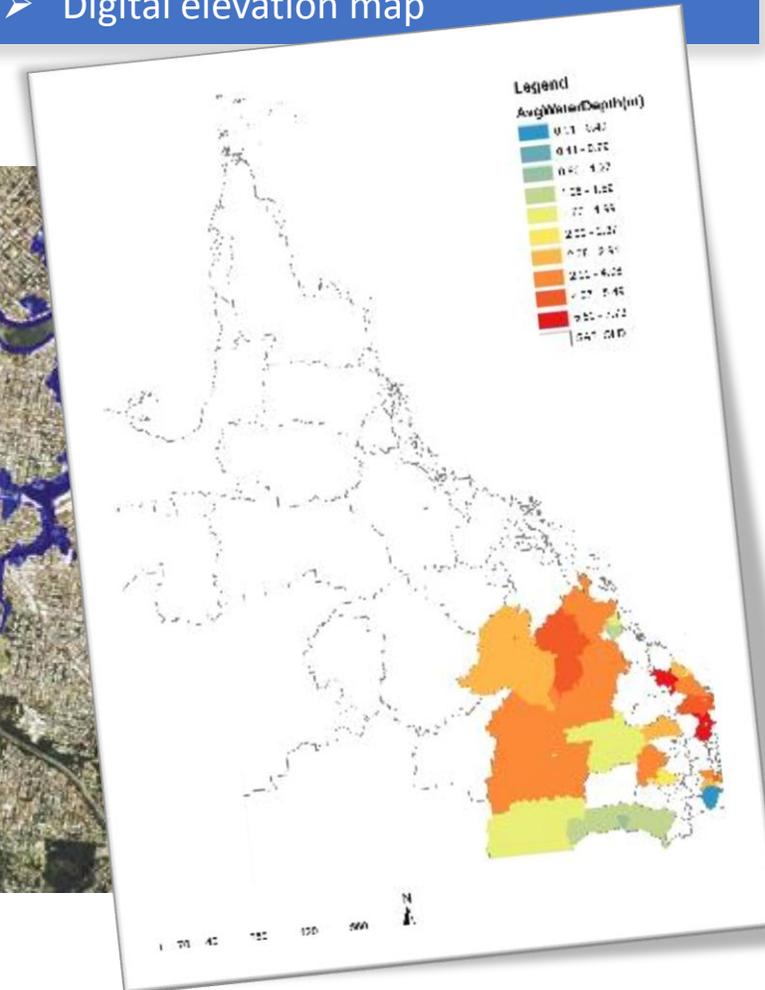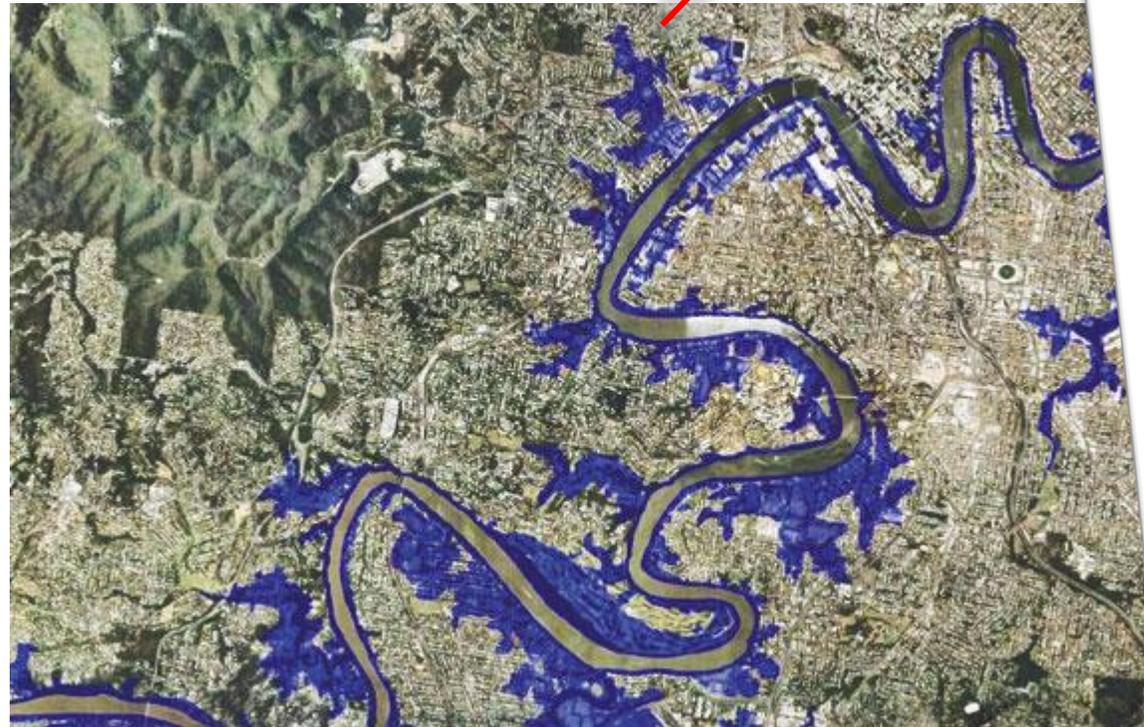
AUSTRALIA

524 Statistical Area 2 units in Queensland
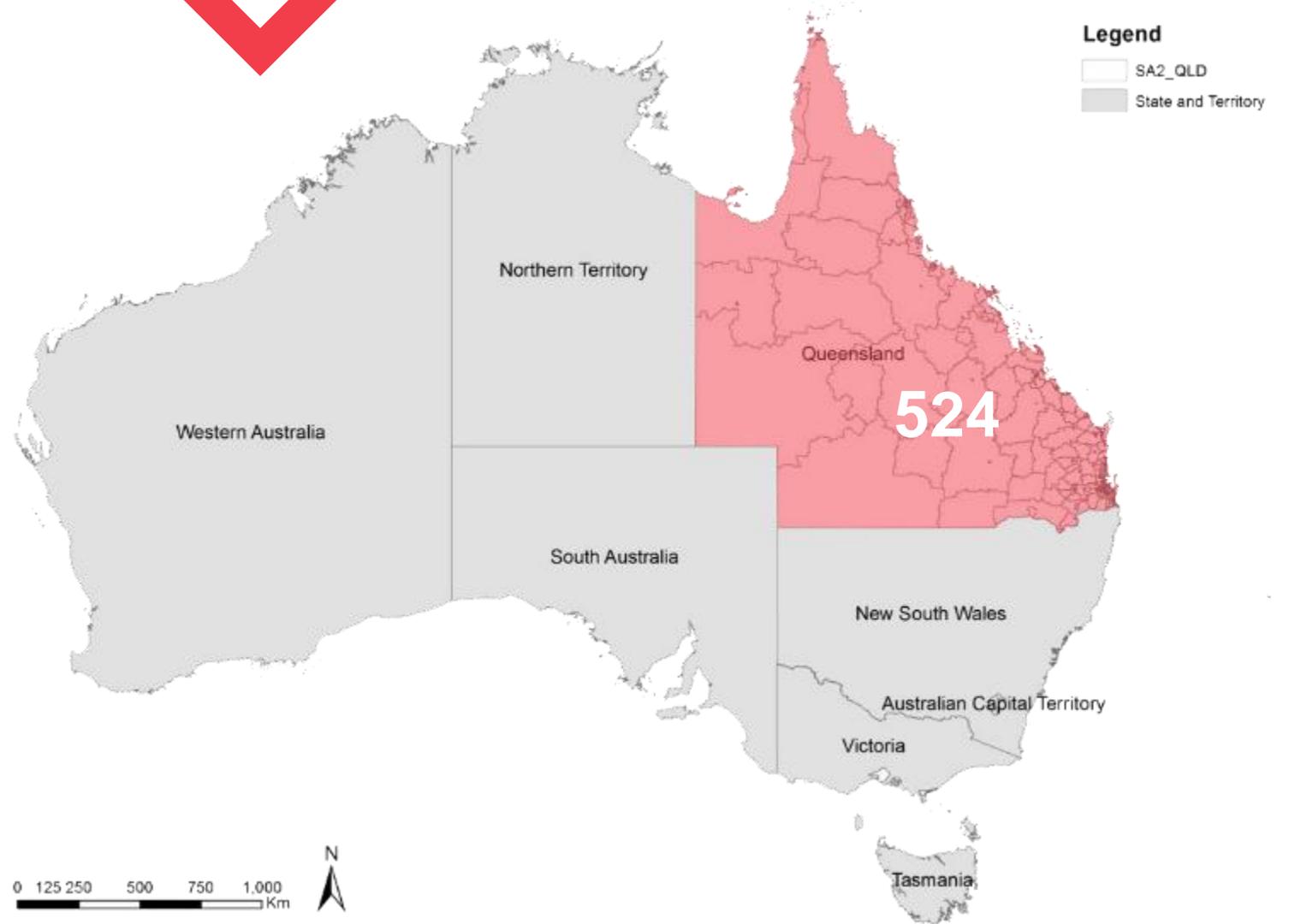
QUEENSLAND FLOODS IN 2010-11

SA2

140

374

Flooded SA2 Non-flooded SA2
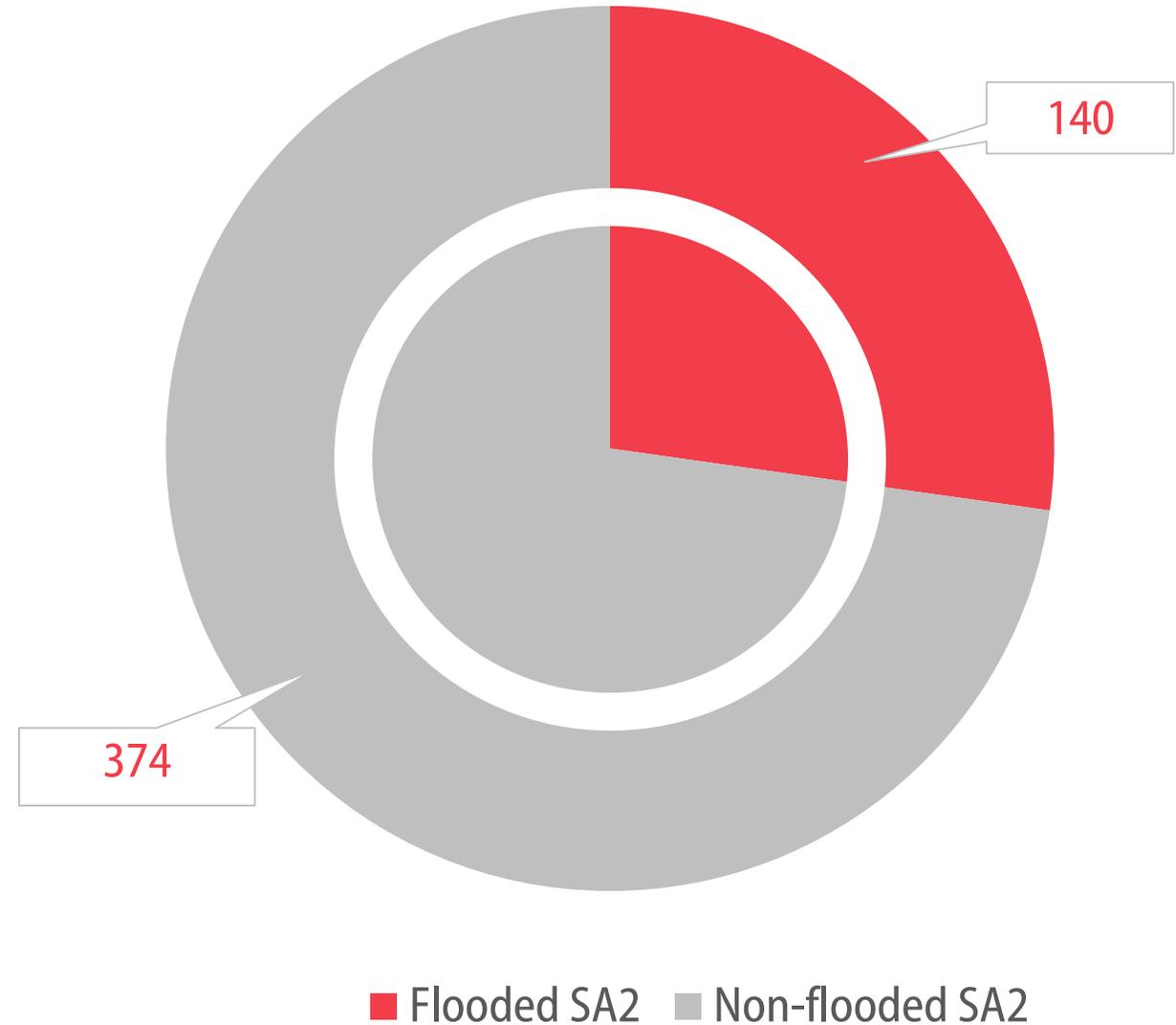
THE DATA

+ DATA ON ECONOMIC VARIABLES:

Australian Census Longitudinal Dataset, 2006 and 2011.

Conducted in August 2006 and August 2011, respectively.

- **The ACLD is a random 5% sample of persons enumerated in Australia on Census Nights, 8 August 2006 and 9 August 2011**

- **Two censuses linked by the ABS to generate a longitudinal dataset**

- **Anonymised**

ESTIMATION MODEL

● We use a Difference-in-differences design:

$$Y_{ict} = cons + \alpha_i + \beta_1 Treat_{it} + \beta_2 PostDisaster_{ct} + \beta_3 Treat_{it} \times PostDisaster_{ct} + \varepsilon_{ict}$$

Income

**Coefficient
of interest**

where,

α	= Individual fixed effect
i	= Individuals
c	= Cluster/SA2
t	= 2006, 2011
ε	= Disturbance Term

• We also include the following covariates in the model:

➢ Length of shared boundary between treated and comparison SA2s

➢ Distance from the nearest disaster affected SA2

3. KEY FINDINGS: QUEENSLAND FLOOD 2010-11

3. KEY FINDINGS: SECTOR-SPECIFIC INCOME CHANGES OF INDIVIDUALS DUE TO THE QLD FLOODS 2010-11

Sectors	Change in Income (% / AU$)
Transport, Postal and Warehousing	+2.3% (AUD 1,150)
Rental, Hiring and Real Estate Services	+8.8% (AUD 4,400)
Mining	-2.5% (AUD -1,250)

Sectors that experienced NO income difference:

- Agriculture, Forestry and Fishing
- Manufacturing
- Electricity, Gas, Water and Waste Services
- Construction
- Wholesale Trade
- Retail Trade
- Accommodation and food services
- Information Media and Telecommunications
- Financial and Insurance Services
- Professional, Scientific and Technical Services
- Administrative and Support Services
- Public Administration and Safety
- Education and Training
- Health Care and Social Assistance
- Arts and Recreation Services
- Other Services

THE QUEENSLAND FLOODS 2010-11

By Income Group:

- *Low Income Group*   : Increase in income by 5.4% (i.e., AUD 1,234)

- *Middle Income Group* : No Change in income

- *High Income Group*   : No Change in income

By Gender:

- *Males:* Decrease in income by 2.7% (i.e., AUD 1,350)

By Employment:

- *Unemployment:* Decreased *by 0.15% (*3,257 persons) compared to the nonflooded areas

- *Part-time Employed to Full-time Employed: 0.20% (4,342 persons) increased compared to the nonflooded areas*

By Work-Leisure Tradeoff:

- *Weekly Working Hours:* +9 minutes per person

4. THE BLACK SATURDAY BUSHFIRES 2009

BLACK SATURDAY BUSHFIRES: 07 FEB 2009

The most devastating Bushfires in Australian history

BLACK SATURDAY BUSHFIRES:
07 FEB 2009

Forest FDI: 172

- **Max. Temperature: 46° c**
- **Min. Relative Humidity: 4%**
- **Max. Wind Speed: 69 km/h**
- **Grassland FDI: 241**
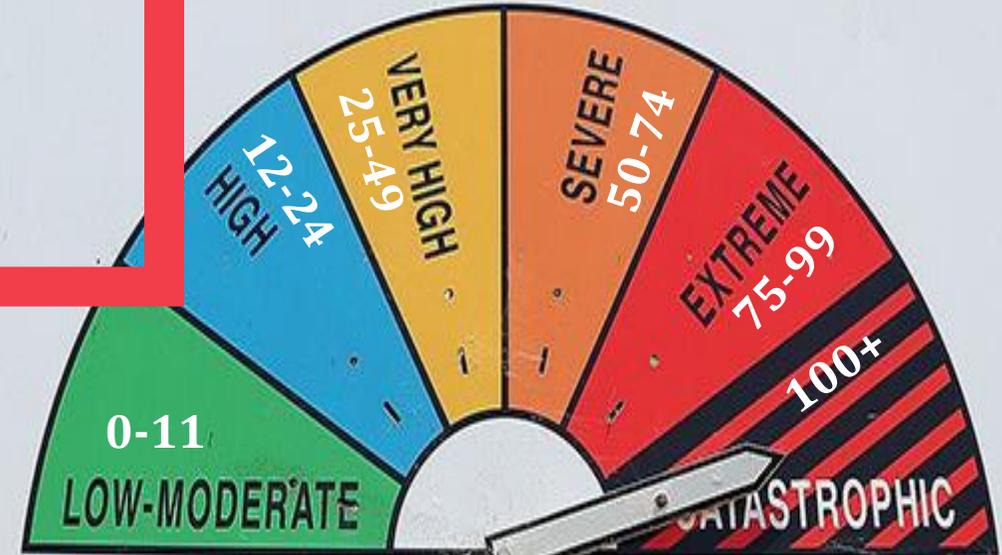
BLACK SATURDAY BUSHFIRES: 07 FEB 2009
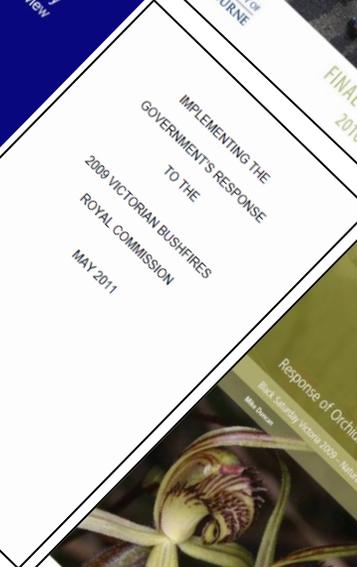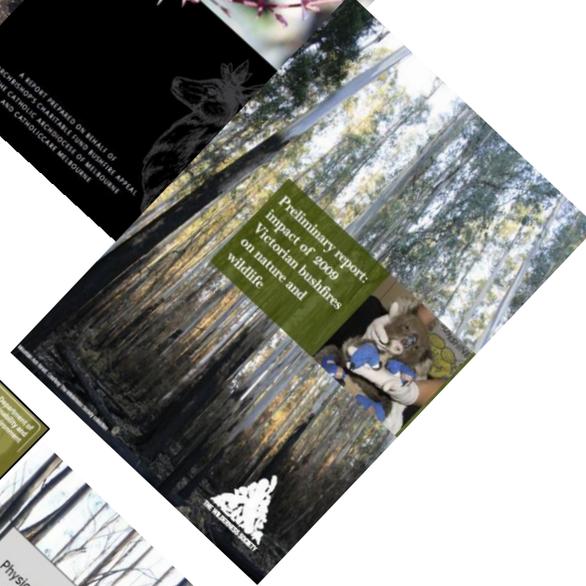
EXISTING ASSESSMENT REPORTS

Cost of Black Saturday bushfires

TANGIBLE $3.1 bn

INTANGIBLE $3.9 bn

$7bn

BLACK SATURDAY BUSHFIRES: 07 FEB 2009

•$3.9 billion in Losses (Deloitte Access Economics, 2016)

FOR COMPARABILITY:

BUSHFIRE ZONES

AFFECTED ON BLACK

SATURDAY 2009

Versus

BUSHFIRE ZONES NOT

AFFECTED ON BLACK

SATURDAY 2009

2009 AUSTRALIAN BUSHFIRES

FIRE INCIDENT NAME	START DATE	TOTAL AREA BURNED (ha)	FATALITIES
DELBURN	28-Jan-09	6,440	
BRANXHOLME	29-Jan-09	475	
BUNYIP	04-Feb-09	26,300	
DARGO	06-Feb-09	13,640	
BEECHWORTH / MUDGEGONGA	07-Feb-09	32,300	2
KILMORE EAST / MURRINDINDI	07-Feb-09	255,300	159
HORSHAM	07-Feb-09	2,200	
COLERAINE	07-Feb-09	775	
POMBORNEIT/WEERITE	07-Feb-09	1,300	
CHURCHILL	07-Feb-09	24,500	11
REDESDALE	07-Feb-09	9,500	
BENDIGO	07-Feb-09	330	1
WILSONS PROMONTORY	09-Feb-09	25,200	
MUSKVALE	23-Feb-09	2,813	

1 hectare (ha) = 2.47 acres

AUSTRALIA

435 Statistical Area 2 units in Victoria

435
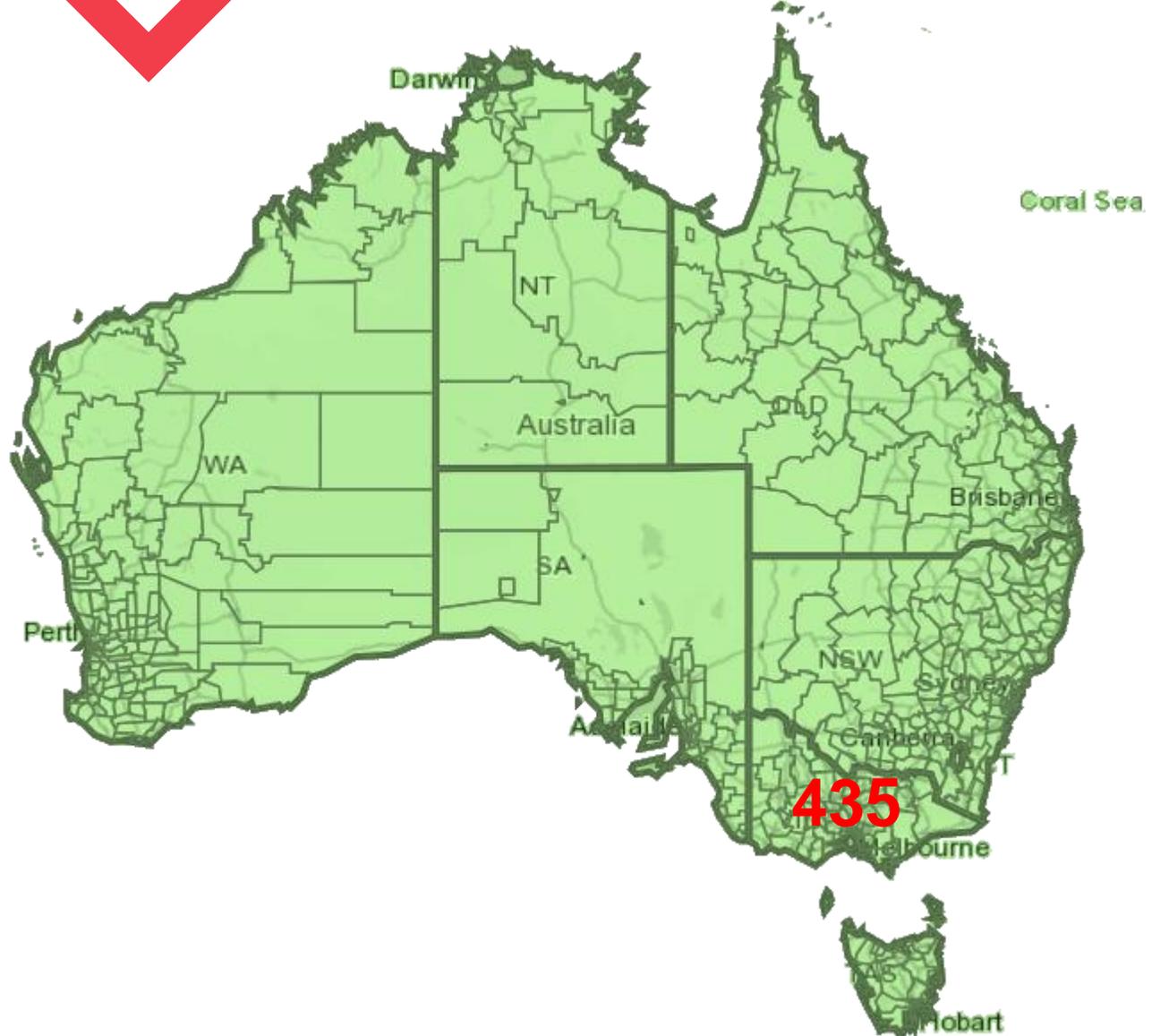
BLACK SATURDAY BUSHFIRES IN 2009

SA2

Affected

Unaffected

- Affected SA2
- Non-flooded SA2

THE DATA
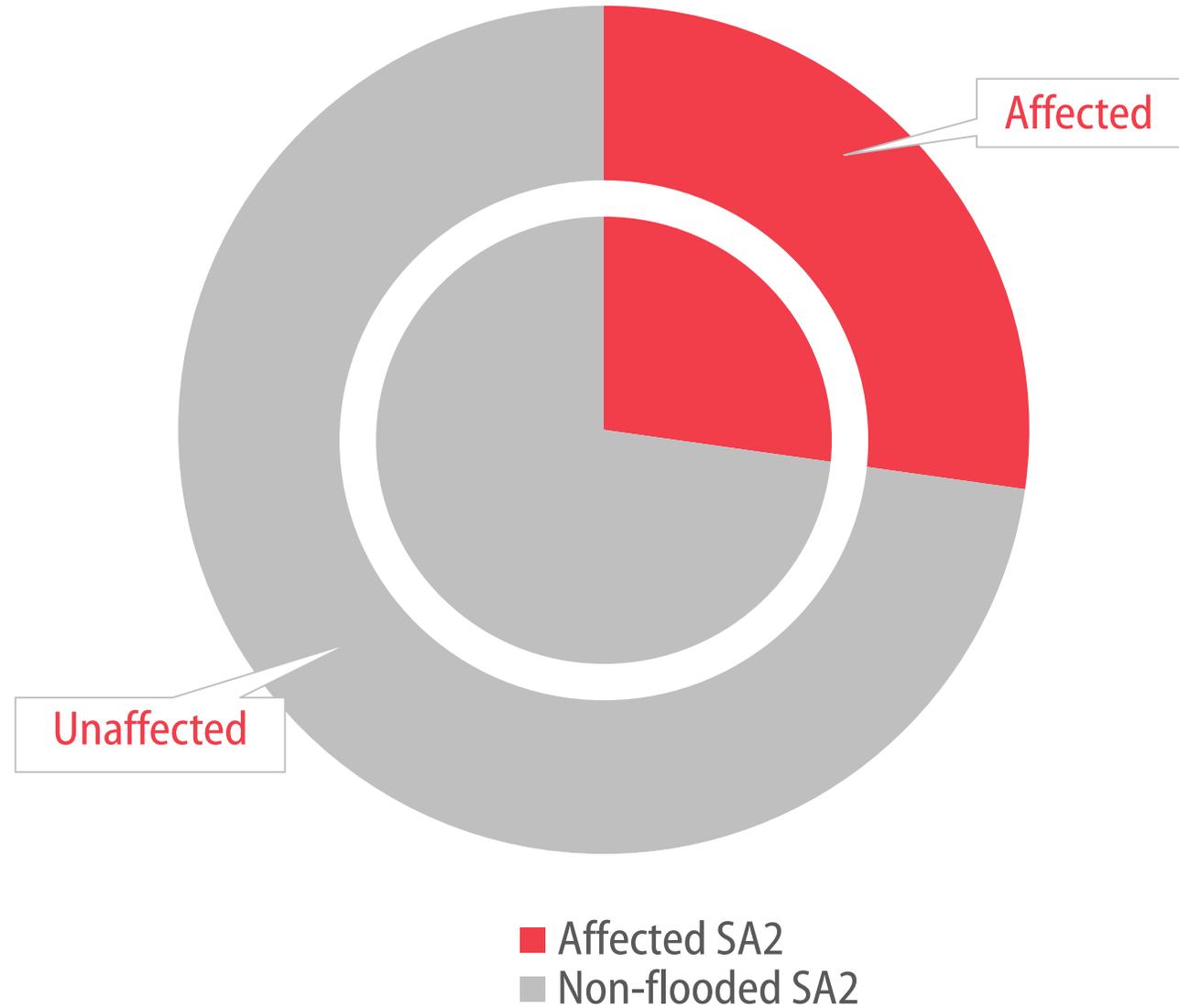
2009 Victorian Bushfires Royal Commission

Government of Australia

Map: The Churchill Fire, 2009

Source: Exhibit 904 – Churchill Fire – Fire Spread Map.[19]

Maximum temperature	The maximum temperature recorded was 46.1°C at Latrobe Valley automatic weather station at 16:02.[1]
Minimum relative humidity	The minimum relative humidity recorded on 7 February was 8 per cent at Latrobe Valley AWS at 15:43.[2]
Wind	The maximum winds recorded before the wind change were north-north-westerly at 44 kilometres an hour at Latrobe Valley AWS at 15:43.[3]
	The south-westerly wind change was recorded by the Latrobe Valley AWS at 18:18.[4]
	The maximum winds recorded after the wind change were 46 kilometres an hour at Latrobe Valley AWS at 18:20.[5]
Fire danger index	The maximum Forest Fire Danger Index was 103 at Latrobe Valley AWS at 16:00.[6]
Cause	Suspicious.[7]
Fatalities	Eleven fatalities.[8]
Casualties	Thirty-five casualties.[9]
Houses destroyed	One hundred and forty-five houses.[10]
Overall area burnt	25,861 hectares.[11]
Firefighting resources	On 7 February 409 CFA and 167 NEO personnel attended the fire. They were supported by 76 CFA appliances, 29 NEO appliances and 4 aircraft. 33 HVP firefighters also provided support.[12]

THE DATA

Household, Income and Labour Dynamics in Australia (HILDA) Survey

HILDA

Funded by the Australian Government Department of Social Services

MELBOURNE INSTITUTE®
of Applied Economic and Social Research

+ The HILDA Data

The Household, Income and Labour Dynamics in Australia (HILDA) Survey is a **household–based panel study** which began in 2001. It has the following key features:

- It collects information about **economic and subjective well–being, labour market dynamics and family dynamics**.

- **Special questionnaire modules** are included each wave.

- Hundreds of questions in each wave

- Wave 1 panel consisted of 7682 households and 19,914 individuals.

- Interviews are conducted annually with all adult members of each household.

- **Panel members are followed over time**.

- Data releases usually occur in January.

  - Wave 1:   2001
  - Wave 2:   2002
  - Wave 3:   2003
  - Wave 4:   2004
  - Wave 5:   2005
  - Wave 6:   2006
  - **Wave 15 is now available**

ESTIMATION MODEL

● We use a Difference-in-differences design:

$$Y_{ict} = cons + \alpha_i + \beta_1 Treat_{it} + \beta_2 PostBushfire_{ct} + \beta_3 Treat_{it} \times PostBushfire_{ct} + \varepsilon_{ict}$$

Income

Coefficient of interest

where,

α = Individual fixed effect

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SOME SOCIOECONOMIC ASPECTS

- *Labour-leisure tradeoff*: Bushfire-affected individuals who used to work A hours in a day had to work around B hours in the aftermath of the floods such that $B > A$

What happened to economically vulnerable groups?

These aspects are currently under scrutiny:

- *Gender sensitiveness:* income effects of floods on male and female labor force

- *Employment status:* full-employment, part-time employment, and unemployment

- *Employment structure:* wage- vs. self employed, incorporated vs. unincorporated employees

- *Income gaps:* Low- vs. high-income earners

- *Social impact:* family violence, health and wellbeing, and crime (with HILDA dataset)

5. PROGRESS 2016-17

END USER ENGAGEMENT

Key Utilisation Activities Since the Last RAF, May 2016

- **A Meeting with the Attorney General's Department (AGD) on 13 OCT 2016:**
  - ✓ **Understanding the effectiveness of the federal government recovery intervention schemes**
  - ✓ **Cyclone Oswald needs to be examined**

- **A Meeting with the Department of Environment, Land, Water and Planning, Victoria on 28 Mar 2017:**
  - ✓ **Long-term impacts of the Black Saturday Bushfires 2009**
  - ✓ **The Cascading effect of bushfires on economic sectors**
  - ✓ **Impact assessment by different geographic areas**
  - ✓ **Both physical and mental health implications**

SOME KEY RESEARCH OUTPUTS

Key Research Outputs Since the Last RAF, May 2016

- **A Paper presented at AFAC 2016, Brisbane**

- **A Paper has been accepted for presentation at AFAC 2017, Sydney**

- **A research report on "The Heterogeneous Impact of Natural Disasters in an Advanced Economy: Evidence from Australia" has been completed**

- **Fine-tuning a Case Study on the "Sectoral Economic Impact of the Queensland Floods 2010-11"**

6. THE WAY FORWARD

6. THE WAY FORWARD

- **Data To Be Collected:**

  ➢ The Black Saturday Bushfires 2009 Severity Map at SA2 Level

  ➢ Victoria Land Use/Bushfires Zonal Map

  ➢ Victoria Vegetation/Forest Density Map

- **Comparing Affected Cohorts with Unaffected Ones:**

  ➢ Matching affected individuals with identical unaffected individuals in terms of:

    ✓ Geographic setting

    ✓ Economic Indicators

    ✓ Social Status

- **Firm-Level Analyses:**

  ➢ The Queensland Floods 2010-11

  ➢ The Black Saturday Bushfires 2009

- **A Meeting with AGD in June 2017**

FIRM LEVEL ANALYSIS, 2018-2020

goods & services

Market for goods & services

goods & services

money

money

Firms

Households

money

Market for factors of production

money

factors of production

factors of production
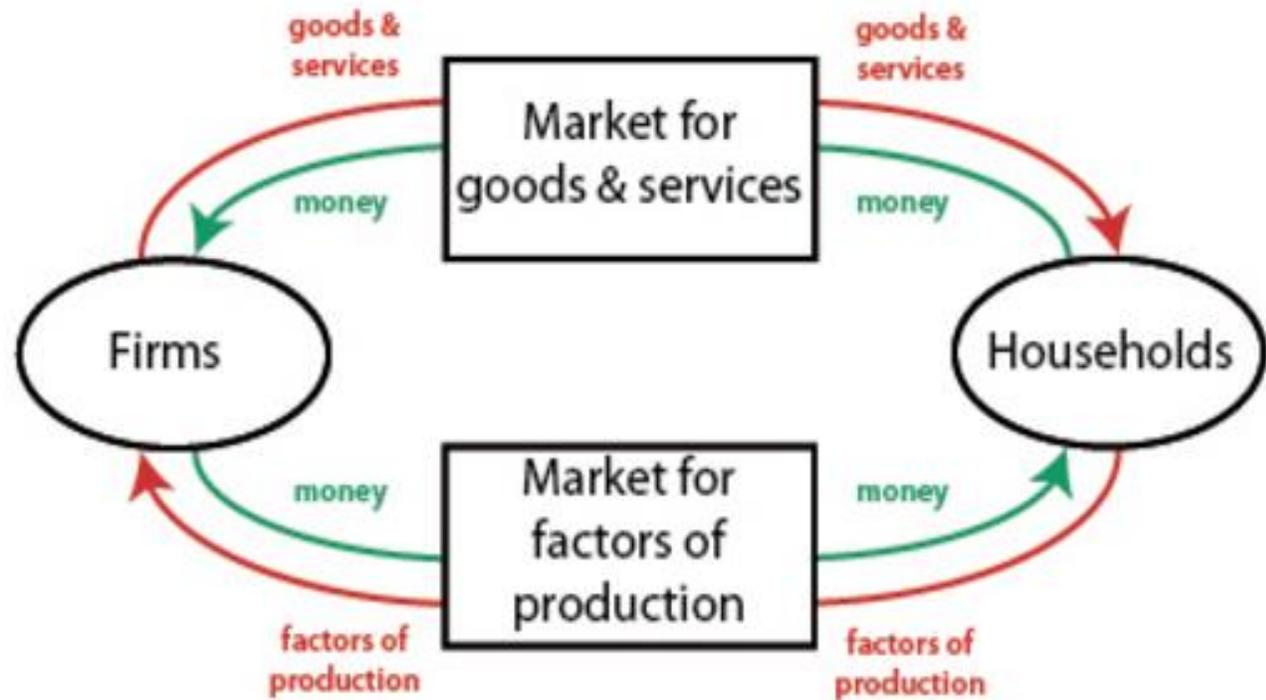
- **How do natural disasters affect firms' revenues?**

Business Longitudinal Dataset (BLD), ABS

Period: 2009-10 to 2013-14

Q&A SESSION

THANK YOU