TANK Wider Economy Impacts

Dr Garry McDonald & Dr Nicky Smith

June 2018

Overview

- Objective
- Scenarios
- Farm systems (AgFirst), discounted cashflows (Nimmo-Bell)
- Economy-wide impacts
  - Method
  - What’s in and out
  - Modelling caveats
- Results
- Next steps

Objectives of this Project

- Estimate regional economic impacts of policy options for managing water quality and quantity in the TANK catchments, and

- Compare against base case

Horticulture Scenarios

- Scenario 1 Base
  - 79% No ban, 21% Nga2400
- Scenario 2 Future B
  - 74% GW2013, 20% Nga3600, 6% Tut2500
  - Mitigation expenditures
- Scenario 3 Future C
  - 74% GW 9/10, 20% Nga3600, 6% Tut2500
  - Mitigation expenditures

Pastoral Scenarios

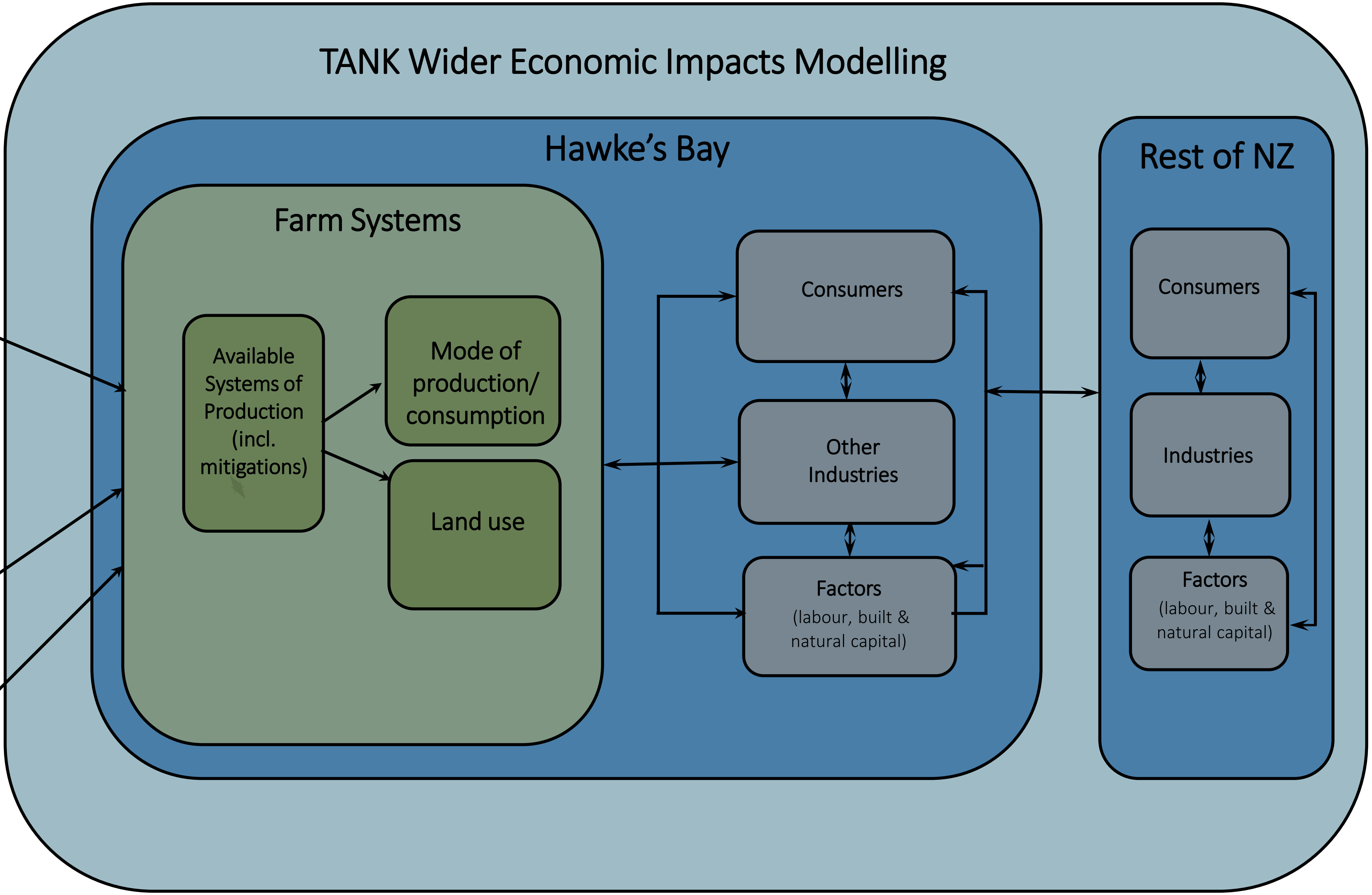
- Scenario 1 Base
  - Current practice
- Scenario 2 MS1
  - Sediment mitigation (30% reduction, over 10 yrs)
  - Land to forestry (retired and production)
- Scenario 3 MS2
  - Sediment plus nutrient reduction (10%, 10 yrs)
  - Land to forestry (retired and production)

Scenarios

Horticulture
Base
Future B
Future C

Pastoral (incl. Forestry)
Base
MS1
MS2

Combined Horticulture & Pastoral (incl. Forestry)
Future B + MS1
Future C + MS2



Discounted Cash Flows Analysis

For each scenario, Nimmo-Bell produced detailed Discounted Cashflows for 30 years covering:-

- *Revenue by item*
  - Aggregated by key commodity e.g. fresh produce, produce for processing, livestock, wool, wood
- *Expenditure by item*
  - Aggregated by key purchase item e.g. wages and salaries, fertiliser, electricity, transport, services
- *Operating Surplus (aka EBIT)*

Present Value ($m) Horticulture (Fast Start - Yr 3; 8% Discount Rate)

	Scenario 1 Base	Scenario 2 Future B	Scenario 3 Future C
Revenue	7,586	7,431	7,243
% change to base		-2.0%	-4.5%
Expenditure	5,478	5,505	5,505
% change to base		0.5%	0.5%
TANK Net Revenue	2,108	1,927	1,738
% change to base		-8.6%	-17.5%

Present Value ($m) Pastoral (Start Yr 1, 10 Yr Spread; 8% Discount Rate)

	Scenario 1 Base	Scenario 2 MS1	Scenario 3 MS2
Pastoral			
Revenue	1,840	1,809	1,776
Expenditure	1,367	1,357	1,339
Net Revenue	474	453	437
Net Revenue % change to base		-4.4%	-7.6%
Forestry			
Revenue		25	25
Expenditure		18	18
Net Revenue		7	7
TANK Net Cashflow	474	459	444
% change to base		-3.0%	-6.2%

Present Value ($m) of Horticulture (Fast Start - Yr 3) & Pastoral (Start Yr 1, 10 Yr Spread) Combined (8% Discount Rate)

	Base	Scenario 2 Future B + MS1	Scenario 3 Future C + MS2
Horticulture			
Revenue	7,586	7,431	7,243
Expenditure	5,478	5,505	5,505
Net Revenue	2,108	1,927	1,738
Net Revenue % change to base		-8.6%	-17.5%
Pastoral			
Revenue	1,840	1,809	1,776
Expenditure	1,367	1,357	1,339
Net Revenue	474	453	437
Net Revenue % change to base		-4.4%	-7.6%
Forestry			
Revenue		25	25
Expenditure		18	18
Net Revenue		7	7
TANK Net Cashflow	2,581	2,386	2,182
% change to base		-7.6%	-15.5%

Input-Output Analysis

Our tables are comprehensively documented and peer-reviewed:-

- Based on the (latest available) 2012 National Inter-industry Study from SNZ
- Updated to 2016, regionalised, using methods developed under the Resilience National Science Challenge (see Smith *et al*. 2015)

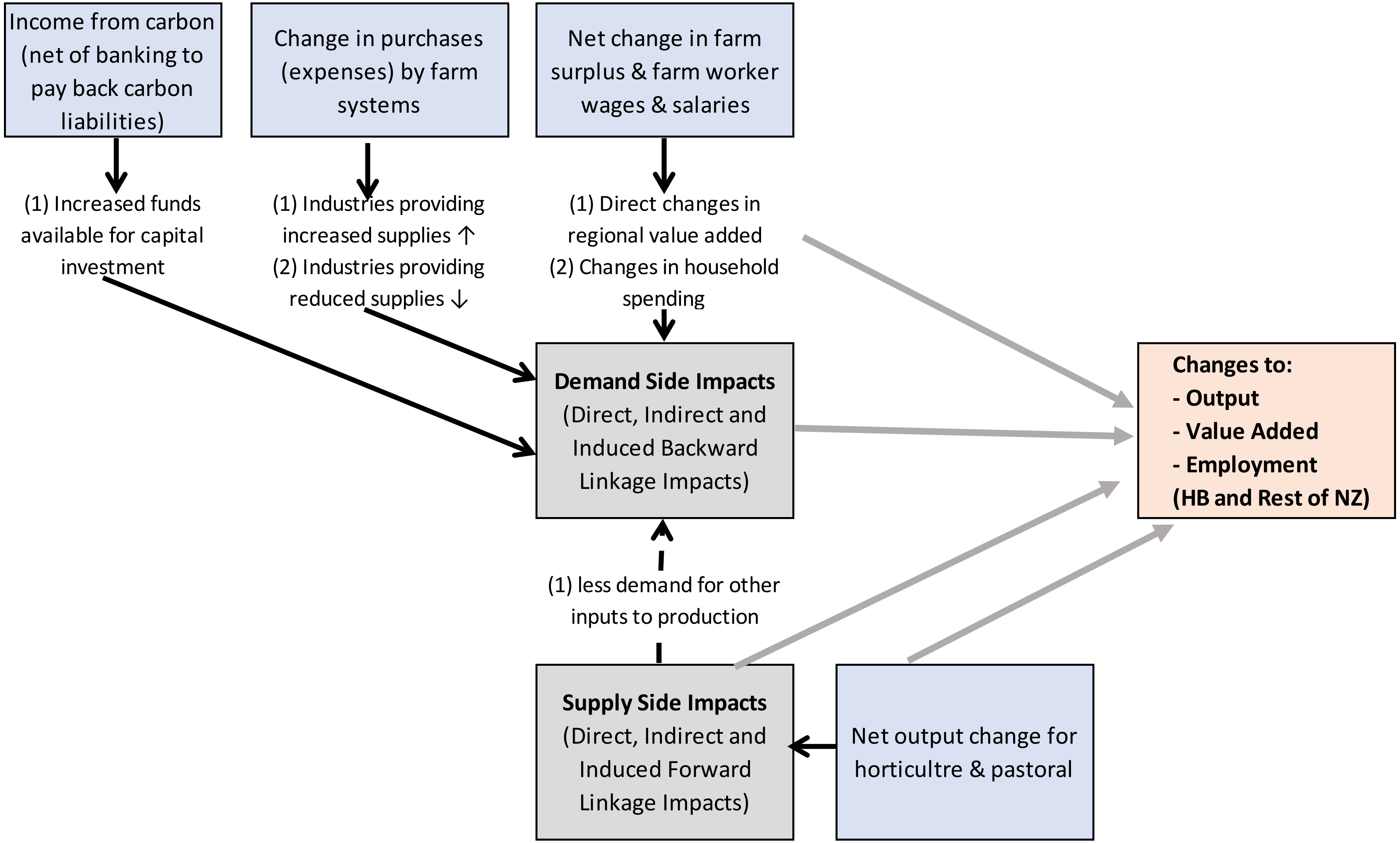
Covers:-

- 3 Regions - Hawke's Bay, Rest of North Island, Rest of NZ
- 106 Industries – aggregated to 17 for reporting
- 7 Primary inputs e.g. wages/salaries, taxes, imports
- 7 Final demands e.g. household/govt consumption, GFCF, exports

Wider Economic Impacts – What’s In

- Market-based economy-wide impacts focusing on structural interdependencies
  - *Indirect* effects - through supply chains backward and forward of an industry),
  - *Induced* effects - resulting from changes in income
- Both positive and negative impacts
  - Multiple regions, through time, for different stakeholder industries – comprehensive coverage
- <u>*Net*</u> impacts against a counterfactual or baseline scenario
- These impacts are assessed using Input-Output Analysis

Wider Economic Impacts – What's In



Reporting

- Gross output, value added, employment by 106 industries, aggregated to 17 industries here
- Multi-regional
    - Hawke’s Bay, Rest of North Island, Rest of NZ
- Sensitivity analysis
    - Fast, medium, slow start options for horticulture
    - 8%, 6% and 2% discount rates
- 30 year time horizon 2021 to 2051, can trace transition pathways

Average Gross Output, Value Added and Employment Impacts by Scenario, 2021-2051

	Average Net			Change from 2016		
	Gross Output $_{2016}m	Value Added $_{2016}m	Employment MECs	Gross Output	Value Added	Employment
Hawke's Bay Region						
Horticulture (Fast Start - Year 3)						
Future B	-106	-61	-363	-0.8%	-1.0%	-0.4%
Future C	-232	-132	-811	-1.7%	-2.1%	-1.0%
Pastoral (Start Year 1, 10 Year Spread)						
MS1	-2	1	0	0.0%	0.0%	0.0%
MS2	-22	-6	-60	-0.2%	-0.1%	-0.1%
Horticulture and Pastoral Combined						
Scenario 2 (Future B + MS1)	-108	-60	-363	-0.8%	-1.0%	-0.4%
Scenario 3 (Future C + MS2)	-254	-137	-871	-1.9%	-2.2%	-1.0%
New Zealand						
Horticulture (Fast Start - Year 3)						
Future B	-180	-97	-675	0.0%	0.0%	0.0%
Future C	-392	-208	-1,487	-0.1%	-0.1%	-0.1%
Pastoral (Start Year 1, 10 Year Spread)						
MS1	-9	-2	-29	0.0%	0.0%	0.0%
MS2	-50	-17	-175	0.0%	0.0%	0.0%
Horticulture and Pastoral Combined						
Scenario 2 (Future B + MS1)	-189	-98	-705	0.0%	0.0%	0.0%
Scenario 3 (Future C + MS2)	-443	-225	-1,662	-0.1%	-0.1%	-0.1%

NPV of Value Added Impacts by Scenario, 2021-2051 (8% Discount Rate)

	Value Added			Change from NPV 2016 Value Added		
	Direct $\$_{2016}$m	Direct & Indirect $\$_{2016}$m	Direct, Indirect & Induced $\$_{2016}$m	Direct	Direct & Indirect	Direct, Indirect & Induced
Hawke's Bay Region						
Horticulture (Fast Start - Year 3)						
Future B	-181	-559	-622	-0.3%	-0.8%	-0.9%
Future C	-370	-1,195	-1,336	-0.5%	-1.7%	-1.9%
Pastoral (Start Year 1, 10 Year Spread)						
MS1	-19	-33	-32	0.0%	0.0%	0.0%
MS2	-33	-86	-90	0.0%	-0.1%	-0.1%
Horticulture and Pastoral Combined						
Scenario 2 (Future B + MS1)	-200	-592	-653	-0.3%	-0.9%	-0.9%
Scenario 3 (Future C + MS2)	-402	-1,282	-1,426	-0.6%	-1.9%	-2.1%
New Zealand						
Horticulture (Fast Start - Year 3)						
Future B	-181	-776	-982	0.0%	0.0%	0.0%
Future C	-370	-1,662	-2,116	0.0%	-0.1%	-0.1%
Pastoral (Start Year 1, 10 Year Spread)						
MS1	-19	-67	-77	0.0%	0.0%	0.0%
MS2	-33	-173	-215	0.0%	0.0%	0.0%
Horticulture and Pastoral Combined						
Scenario 2 (Future B + MS1)	-200	-843	-1,060	0.0%	0.0%	0.0%
Scenario 3 (Future C + MS2)	-402	-1,835	-2,331	0.0%	-0.1%	-0.1%

Net Present Value of Value Added (Direct, Indirect and Induced) Impacts of Horticulture (Fast Start - Yr 3), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051 (8% Discount Rate)

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2 Future B + MS1		Scenario 3 Future C + MS2	
	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand
	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m
1 Horticulture and fruit growing	-184	-190	-376	-389	0	1	0	1	-184	-189	-376	-388
2 Sheep, beef, dairy and grain farming	-3	-11	-7	-24	-36	-46	-66	-87	-39	-57	-72	-111
3 Other farming	0	-1	0	-3	0	-1	-1	-2	0	-2	-1	-5
4 Forestry and logging	-1	-2	-2	-4	7	7	7	7	6	6	5	4
5 Other primary	0	-3	0	-7	0	0	0	-1	0	-4	0	-8
6 Agri., forestry and fish servs	9	5	2	-5	11	10	11	9	19	15	13	4
7 Meat manufacturing	0	-1	0	-1	-6	-12	-15	-28	-6	-12	-15	-29
8 Other food product manufacturing	-260	-315	-558	-676	0	-1	0	-2	-260	-316	-558	-678
9 Wood and paper manufacturing	0	0	0	0	3	4	3	4	3	4	3	4
10 Other manufacturing	-10	-38	-22	-82	-2	-5	-6	-16	-12	-43	-28	-98
11 Utilities	-9	-24	-19	-51	0	-1	-1	-6	-9	-25	-20	-57
12 Construction	-5	-11	-12	-24	1	1	1	-1	-4	-11	-11	-25
13 Wholesale and retail trade	-28	-67	-62	-145	-2	-6	-5	-19	-30	-73	-67	-164
14 Transport	-7	-28	-14	-62	-1	-3	-2	-9	-7	-31	-16	-71
15 Business services	-21	-65	-47	-142	0	-4	-2	-13	-22	-69	-49	-155
16 Local and central government	-5	-10	-10	-21	-1	-1	-1	-2	-6	-11	-11	-23
17 Other services	-97	-221	-209	-479	-6	-20	-14	-52	-103	-241	-223	-531
TOTAL	**-622**	**-982**	**-1,336**	**-2,116**	**-32**	**-77**	**-90**	**-215**	**-653**	**-1,060**	**-1,426**	**-2,331**
Change from NPV 2016 Value Added												
Primary	-1.8%	-0.1%	-3.9%	-0.3%	-0.2%	0.0%	-0.5%	0.0%	-2.0%	-0.1%	-4.4%	-0.3%
Secondary	-2.7%	-0.1%	-5.8%	-0.3%	0.0%	0.0%	-0.2%	0.0%	-2.7%	-0.1%	-5.9%	-0.3%
Tertiary	-0.4%	0.0%	-0.8%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.4%	0.0%	-0.8%	0.0%
Total	**-0.9%**	**0.0%**	**-1.9%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-0.9%**	**0.0%**	**-2.1%**	**-0.1%**

Average Net Employment (Direct, Indirect and Induced) Impacts of Horticulture (Fast Start - Yr 3), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2		Scenario 3	
	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand
	MECs	MECs	MECs	MECs	MECs	MECs	MECs	MECs	MECs	MECs	MECs	MECs
1 Horticulture and fruit growing	-9	-21	-19	-45	0	1	-1	2	-9	-20	-20	-43
2 Sheep, beef, dairy and grain farming	-3	-12	-6	-26	-21	-32	-38	-65	-23	-44	-44	-91
3 Other farming	0	-2	-1	-5	0	-2	-1	-5	-1	-4	-2	-9
4 Forestry and logging	0	-1	-1	-2	9	10	9	10	9	9	8	8
5 Other primary	0	0	0	-1	0	0	0	0	0	0	0	-1
6 Agri., forestry and fish servs	14	8	2	-11	7	6	8	4	21	14	10	-7
7 Meat manufacturing	0	-1	0	-2	-12	-20	-28	-48	-12	-21	-28	-50
8 Other food product manufacturing	-139	-165	-299	-353	0	0	0	-1	-139	-165	-299	-354
9 Wood and paper manufacturing	0	0	0	-1	12	17	12	17	12	17	12	17
10 Other manufacturing	-12	-34	-26	-73	-1	-3	-5	-13	-13	-37	-31	-86
11 Utilities	-2	-4	-4	-9	0	0	0	0	-1	-4	-4	-10
12 Construction	-9	-17	-20	-38	3	2	2	0	-6	-15	-18	-38
13 Wholesale and retail trade	-45	-94	-99	-204	0	-3	-5	-20	-45	-97	-104	-224
14 Transport	-7	-27	-16	-60	1	1	-1	-6	-6	-26	-17	-65
15 Business services	-50	-115	-109	-250	1	-2	-4	-18	-49	-117	-113	-268
16 Local and central government	-7	-12	-14	-25	0	0	-1	-2	-7	-12	-15	-27
17 Other services	-93	-178	-199	-383	0	-4	-9	-30	-93	-182	-208	-413
TOTAL	**-363**	**-675**	**-811**	**-1,487**	**0**	**-29**	**-60**	**-175**	**-363**	**-705**	**-871**	**-1,662**
Change from 2016 Employment												
Primary	0.0%	0.0%	-0.2%	-0.1%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.3%	-0.1%
Secondary	-1.4%	-0.1%	-3.1%	-0.2%	0.0%	0.0%	-0.2%	0.0%	-1.4%	-0.1%	-3.3%	-0.2%
Tertiary	-0.4%	0.0%	-0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	0.0%	-0.8%	-0.1%
Total	**-0.4%**	**0.0%**	**-1.0%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-0.4%**	**0.0%**	**-1.0%**	**-0.1%**

Wider Economic Impacts – What's Out

- Future growth
- Price changes, substitution & transformation effects and other dynamic feedbacks
  - Requires other forms of modelling
- Land use change for horticulture
- Technical change
- Behavioural adaptation

Wider Economic Impacts – What's Out

- Our land/ecosystem base provides for our well-being in many of ways, e.g.
  - Raw materials, waste assimilation, pollination
  - Recreation, aesthetic and cultural values
- Non-use values
  - Non market values difficult to measure and compare
  - Benefits/costs delivered from complex systems
  - Impacts are long-lasting and the future is uncertain

Modelling Caveats

- Models are simplifications of reality
  - Farm system models are representative, but each farm is unique – both in terms of land characteristics and management
  - It is the same for all other businesses in an economy
- All models are *wrong*, they are *useful* in that they reflect our best understand of how a system works
- No evaluation could ever fully predict all of the impacts and tradeoffs

Thank you!

Net Present Value of Value Added (Direct, Indirect and Induced) Impacts of Horticulture (Medium Start - Yr 5), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051 (8% Discount Rate)

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2 Future B + MS1		Scenario 3 Future C + MS2	
	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand
	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$	$\$_{2016}m$
1 Horticulture and fruit growing	-154	-121	-315	-326	0	1	0	1	-154	-121	-315	-325
2 Sheep, beef, dairy and grain farming	-2	-7	-5	-20	-36	-46	-66	-87	-39	-53	-71	-107
3 Other farming	0	-1	0	-2	0	-1	-1	-2	0	-2	-1	-5
4 Forestry and logging	-1	-1	-1	-3	7	7	7	7	6	6	6	4
5 Other primary	0	-2	0	-6	0	0	0	-1	0	-2	0	-7
6 Agri., forestry and fish servs	7	3	2	-4	11	10	11	9	18	13	13	5
7 Meat manufacturing	0	0	0	-1	-6	-12	-15	-28	-6	-12	-15	-29
8 Other food product manufacturing	-218	-201	-468	-567	0	-1	0	-2	-218	-202	-468	-569
9 Wood and paper manufacturing	0	0	0	0	3	4	3	4	3	4	3	4
10 Other manufacturing	-9	-24	-19	-69	-2	-5	-6	-16	-10	-29	-24	-85
11 Utilities	-8	-15	-16	-43	0	-1	-1	-6	-7	-17	-17	-49
12 Construction	-4	-7	-10	-20	1	1	1	-1	-3	-7	-9	-21
13 Wholesale and retail trade	-24	-43	-52	-122	-2	-6	-5	-19	-26	-49	-57	-141
14 Transport	-5	-18	-12	-52	-1	-3	-2	-9	-6	-21	-14	-61
15 Business services	-18	-42	-39	-119	0	-4	-2	-13	-18	-46	-41	-132
16 Local and central government	-4	-6	-9	-17	-1	-1	-1	-2	-5	-7	-10	-19
17 Other services	-81	-141	-175	-401	-6	-20	-14	-52	-87	-161	-190	-453
TOTAL	**-521**	**-627**	**-1,120**	**-1,775**	**-32**	**-77**	**-90**	**-215**	**-553**	**-705**	**-1,210**	**-1,990**
Change from NPV 2016 Value Added												
Primary	-1.5%	-0.1%	-3.3%	-0.2%	-0.2%	0.0%	-0.5%	0.0%	-1.7%	-0.1%	-3.8%	-0.3%
Secondary	-2.2%	-0.1%	-4.8%	-0.2%	0.0%	0.0%	-0.2%	0.0%	-2.3%	-0.1%	-5.0%	-0.2%
Tertiary	-0.3%	0.0%	-0.6%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.3%	0.0%	-0.7%	0.0%
Total	**-0.8%**	**0.0%**	**-1.6%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-0.8%**	**0.0%**	**-1.8%**	**-0.1%**

Net Present Value of Value Added (Direct, Indirect and Induced) Impacts of Horticulture (Slow Start - Yr 8), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051 (8% Discount Rate)

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2 Future B + MS1		Scenario 3 Future C + MS2	
	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand
	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	**$\$_{2016}$m**	**$\$_{2016}$m**	**$\$_{2016}$m**	**$\$_{2016}$m**
1 Horticulture and fruit growing	-118	-121	-240	-249	0	1	0	1	-117	-121	-240	-247
2 Sheep, beef, dairy and grain farming	-2	-7	-4	-16	-36	-46	-66	-87	-38	-53	-70	-102
3 Other farming	0	-1	0	-2	0	-1	-1	-2	0	-2	-1	-4
4 Forestry and logging	0	-1	-1	-2	7	7	7	7	7	6	6	5
5 Other primary	0	-2	0	-5	0	0	0	-1	0	-2	0	-5
6 Agri., forestry and fish servs	6	3	1	-3	11	10	11	9	16	13	13	6
7 Meat manufacturing	0	0	0	-1	-6	-12	-15	-28	-6	-12	-15	-28
8 Other food product manufacturing	-166	-201	-356	-432	0	-1	0	-2	-166	-202	-356	-434
9 Wood and paper manufacturing	0	0	0	0	3	4	3	4	3	4	3	4
10 Other manufacturing	-7	-24	-14	-53	-2	-5	-6	-16	-8	-29	-20	-68
11 Utilities	-6	-15	-12	-33	0	-1	-1	-6	-6	-17	-13	-38
12 Construction	-3	-7	-7	-15	1	1	1	-1	-2	-7	-7	-17
13 Wholesale and retail trade	-18	-43	-39	-93	-2	-6	-5	-19	-20	-49	-45	-112
14 Transport	-4	-18	-9	-39	-1	-3	-2	-9	-5	-21	-11	-49
15 Business services	-14	-42	-30	-91	0	-4	-2	-13	-14	-46	-32	-104
16 Local and central government	-3	-6	-7	-13	-1	-1	-1	-2	-4	-7	-8	-15
17 Other services	-62	-141	-134	-306	-6	-20	-14	-52	-68	-161	-148	-358
TOTAL	**-397**	**-627**	**-853**	**-1,352**	**-32**	**-77**	**-90**	**-215**	**-429**	**-705**	**-943**	**-1,567**
Change from NPV 2016 Value Added												
Primary	-1.2%	-0.1%	-2.5%	-0.2%	-0.2%	0.0%	-0.5%	0.0%	-1.4%	-0.1%	-3.0%	-0.2%
Secondary	-1.7%	-0.1%	-3.7%	-0.2%	0.0%	0.0%	-0.2%	0.0%	-1.8%	-0.1%	-3.8%	-0.2%
Tertiary	-0.2%	0.0%	-0.5%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.2%	0.0%	-0.5%	0.0%
Total	**-0.6%**	**0.0%**	**-1.2%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-0.6%**	**0.0%**	**-1.4%**	**-0.1%**

Average Net Employment (Direct, Indirect and Induced) Impacts of Horticulture (Slow Start - Yr 8), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2		Scenario 3	
	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs
1 Horticulture and fruit growing	-7	-17	-16	-37	0	1	-1	2	-8	-16	-17	-35
2 Sheep, beef, dairy and grain farming	-2	-10	-5	-22	-21	-32	-38	-65	-23	-42	-43	-87
3 Other farming	0	-2	-1	-4	0	-2	-1	-5	-1	-4	-2	-8
4 Forestry and logging	0	-1	-1	-2	9	10	9	10	9	9	8	8
5 Other primary	0	0	0	-1	0	0	0	0	0	0	0	-1
6 Agri., forestry and fish servs	12	7	2	-9	7	6	8	4	19	13	10	-5
7 Meat manufacturing	0	-1	0	-1	-12	-20	-28	-48	-12	-21	-28	-50
8 Other food product manufacturing	-114	-135	-246	-290	0	0	0	-1	-114	-136	-246	-291
9 Wood and paper manufacturing	0	0	0	0	12	17	12	17	12	17	12	17
10 Other manufacturing	-10	-28	-21	-60	-1	-3	-5	-13	-11	-31	-26	-73
11 Utilities	-2	-4	-3	-8	0	0	0	0	-1	-3	-3	-8
12 Construction	-7	-14	-16	-31	3	2	2	0	-5	-12	-14	-31
13 Wholesale and retail trade	-37	-77	-81	-167	0	-3	-5	-20	-37	-80	-86	-188
14 Transport	-6	-23	-13	-49	1	1	-1	-6	-5	-21	-14	-55
15 Business services	-41	-94	-90	-205	1	-2	-4	-18	-40	-97	-93	-224
16 Local and central government	-6	-10	-12	-21	0	0	-1	-2	-6	-10	-12	-22
17 Other services	-76	-146	-164	-315	0	-4	-9	-30	-76	-150	-172	-345
TOTAL	**-298**	**-555**	**-666**	**-1,221**	**0**	**-29**	**-60**	**-175**	**-298**	**-584**	**-726**	**-1,396**
Change from 2016 Employment												
Primary	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.3%	-0.1%
Secondary	-1.2%	-0.1%	-2.5%	-0.1%	0.0%	0.0%	-0.2%	0.0%	-1.2%	-0.1%	-2.7%	-0.2%
Tertiary	-0.3%	0.0%	-0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.3%	0.0%	-0.7%	0.0%
Total	**-0.4%**	**0.0%**	**-0.8%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-0.4%**	**0.0%**	**-0.9%**	**-0.1%**

Average Net Employment (Direct, Indirect and Induced) Impacts of Horticulture (Medium Start - Yr 5), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2		Scenario 3	
	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs	Hawke's Bay Region MECs	New Zealand MECs
1 Horticulture and fruit growing	-9	-21	-19	-45	0	1	-1	2	-9	-20	-20	-43
2 Sheep, beef, dairy and grain farming	-3	-12	-6	-26	-21	-32	-38	-65	-23	-44	-44	-91
3 Other farming	0	-2	-1	-5	0	-2	-1	-5	-1	-4	-2	-9
4 Forestry and logging	0	-1	-1	-2	9	10	9	10	9	9	8	8
5 Other primary	0	0	0	-1	0	0	0	0	0	0	0	-1
6 Agri., forestry and fish servs	14	8	2	-11	7	6	8	4	21	14	10	-7
7 Meat manufacturing	0	-1	0	-2	-12	-20	-28	-48	-12	-21	-28	-50
8 Other food product manufacturing	-139	-165	-299	-353	0	0	0	-1	-139	-165	-299	-354
9 Wood and paper manufacturing	0	0	0	-1	12	17	12	17	12	17	12	17
10 Other manufacturing	-12	-34	-26	-73	-1	-3	-5	-13	-13	-37	-31	-86
11 Utilities	-2	-4	-4	-9	0	0	0	0	-1	-4	-4	-10
12 Construction	-9	-17	-20	-38	3	2	2	0	-6	-15	-18	-38
13 Wholesale and retail trade	-45	-94	-99	-204	0	-3	-5	-20	-45	-97	-104	-224
14 Transport	-7	-27	-16	-60	1	1	-1	-6	-6	-26	-17	-65
15 Business services	-50	-115	-109	-250	1	-2	-4	-18	-49	-117	-113	-268
16 Local and central government	-7	-12	-14	-25	0	0	-1	-2	-7	-12	-15	-27
17 Other services	-93	-178	-199	-383	0	-4	-9	-30	-93	-182	-208	-413
TOTAL	**-363**	**-675**	**-811**	**-1,487**	**0**	**-29**	**-60**	**-175**	**-363**	**-705**	**-871**	**-1,662**
Change from 2016 Employment												
Primary	0.0%	0.0%	-0.2%	-0.1%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.3%	-0.1%
Secondary	-1.4%	-0.1%	-3.1%	-0.2%	0.0%	0.0%	-0.2%	0.0%	-1.4%	-0.1%	-3.3%	-0.2%
Tertiary	-0.4%	0.0%	-0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	0.0%	-0.8%	-0.1%
Total	**-0.4%**	**0.0%**	**-1.0%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-0.4%**	**0.0%**	**-1.0%**	**-0.1%**

Net Present Value of Value Added (Direct, Indirect and Induced) Impacts of Horticulture (Fast Start - Yr 3), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051 (6% Discount Rate)

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2 Future B + MS1		Scenario 3 Future C + MS2	
	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand
	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m
1 Horticulture and fruit growing	-231	-239	-473	-490	0	1	0	2	-231	-238	-473	-488
2 Sheep, beef, dairy and grain farming	-4	-14	-8	-31	-44	-56	-82	-109	-48	-70	-90	-140
3 Other farming	0	-1	-1	-3	0	-1	-1	-3	-1	-3	-1	-6
4 Forestry and logging	-1	-2	-2	-5	14	15	14	15	13	13	12	10
5 Other primary	0	-4	0	-9	0	0	0	-1	0	-5	0	-10
6 Agri., forestry and fish servs	11	6	2	-7	11	10	12	9	22	17	14	2
7 Meat manufacturing	0	-1	0	-2	-8	-15	-19	-36	-8	-16	-19	-37
8 Other food product manufacturing	-327	-397	-702	-852	0	-1	0	-2	-327	-398	-702	-854
9 Wood and paper manufacturing	0	0	0	0	5	7	5	7	5	7	5	7
10 Other manufacturing	-13	-48	-28	-104	-2	-6	-7	-20	-15	-53	-35	-124
11 Utilities	-11	-30	-25	-65	0	-1	-1	-7	-11	-31	-25	-71
12 Construction	-7	-14	-15	-30	2	1	1	-1	-5	-13	-14	-32
13 Wholesale and retail trade	-36	-84	-78	-183	-2	-7	-7	-23	-38	-92	-84	-206
14 Transport	-8	-36	-18	-78	0	-3	-2	-11	-9	-39	-20	-89
15 Business services	-27	-82	-59	-179	0	-5	-2	-16	-27	-87	-62	-195
16 Local and central government	-6	-12	-13	-26	-1	-1	-1	-3	-7	-14	-14	-28
17 Other services	-122	-279	-263	-603	-6	-22	-17	-63	-128	-301	-280	-666
TOTAL	**-782**	**-1,237**	**-1,682**	**-2,665**	**-31**	**-85**	**-106**	**-262**	**-813**	**-1,322**	**-1,788**	**-2,927**
Change from NPV 2016 Value Added												
Primary	-1.9%	-0.1%	-4.1%	-0.3%	-0.2%	0.0%	-0.5%	0.0%	-2.1%	-0.1%	-4.5%	-0.3%
Secondary	-2.8%	-0.1%	-5.9%	-0.3%	0.0%	0.0%	-0.2%	0.0%	-2.8%	-0.1%	-6.1%	-0.3%
Tertiary	-0.4%	0.0%	-0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	0.0%	-0.8%	-0.1%
Total	**-0.9%**	**0.0%**	**-2.0%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-1.0%**	**0.0%**	**-2.1%**	**-0.1%**

Net Present Value of Value Added (Direct, Indirect and Induced) Impacts of Horticulture (Fast Start - Yr 3), Pastoral (Start Yr 1, 10 Yr Spread) and Combined Scenarios, 2021-2051 (2% Discount Rate)

	Horticulture Scenarios				Pastoral Scenarios				Horticulture + Pastoral Scenarios			
	Future B		Future C		MS1		MS2		Scenario 2 Future B + MS1		Scenario 3 Future C + MS2	
	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand	Hawke's Bay Region	New Zealand
	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m	$\$_{2016}$m
1 Horticulture and fruit growing	-394	-408	-809	-838	0	1	0	3	-395	-407	-809	-835
2 Sheep, beef, dairy and grain farming	-6	-24	-14	-53	-70	-91	-138	-187	-76	-115	-152	-239
3 Other farming	0	-3	-1	-6	-1	-2	-2	-6	-1	-5	-3	-11
4 Forestry and logging	-1	-3	-3	-8	48	50	48	50	47	47	45	42
5 Other primary	0	-7	-1	-16	0	0	1	-1	0	-7	0	-17
6 Agri., forestry and fish servs	17	10	3	-13	12	11	13	8	29	21	16	-4
7 Meat manufacturing	0	-1	0	-3	-14	-27	-34	-64	-14	-28	-34	-67
8 Other food product manufacturing	-561	-680	-1,204	-1,460	0	-2	0	-4	-561	-682	-1,204	-1,464
9 Wood and paper manufacturing	0	0	0	-1	16	22	16	22	16	22	16	21
10 Other manufacturing	-22	-82	-48	-178	-3	-9	-12	-34	-25	-90	-60	-212
11 Utilities	-19	-51	-42	-111	2	0	0	-9	-18	-51	-42	-120
12 Construction	-11	-24	-25	-52	4	3	3	-1	-8	-21	-23	-53
13 Wholesale and retail trade	-61	-145	-133	-314	-1	-8	-10	-37	-63	-153	-143	-351
14 Transport	-14	-61	-31	-133	1	-1	-3	-16	-13	-63	-33	-150
15 Business services	-46	-141	-101	-306	1	-5	-3	-26	-46	-146	-105	-332
16 Local and central government	-11	-21	-22	-44	0	-1	-1	-3	-11	-22	-24	-48
17 Other services	-209	-478	-451	-1,033	-4	-23	-22	-98	-213	-501	-474	-1,131
TOTAL	**-1,341**	**-2,120**	**-2,882**	**-4,568**	**-10**	**-82**	**-146**	**-402**	**-1,351**	**-2,202**	**-3,028**	**-4,970**
Change from NPV 2016 Value Added												
Primary	-2.0%	-0.1%	-4.3%	-0.3%	-0.1%	0.0%	-0.4%	0.0%	-2.1%	-0.1%	-4.7%	-0.3%
Secondary	-2.9%	-0.1%	-6.2%	-0.3%	0.0%	0.0%	-0.2%	0.0%	-2.9%	-0.1%	-6.4%	-0.3%
Tertiary	-0.4%	0.0%	-0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%	0.0%	-0.9%	-0.1%
Total	**-1.0%**	**0.0%**	**-2.1%**	**-0.1%**	**0.0%**	**0.0%**	**-0.1%**	**0.0%**	**-1.0%**	**0.0%**	**-2.2%**	**-0.1%**