



ECONOMIC IMPACTS OF PROPOSED ENERGY FROM
WASTE PLANT - UPDATE
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AUSTRALIAN PAPER ENERGY FROM WASTE PLANT UPDATE

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INTRODUCTION

Australian Paper is a vertically integrated manufacturer of pulp and paper. The company strives to achieve sustainable practices throughout its operations in a way that aims to minimise its impact on the environment and improve its social and economic contribution to its employees and the communities in which it operates.

Australian Paper has indicated its vision to deliver an Energy from Waste (EfW) plant to be situated at its Maryvale Mill site, within the Latrobe Valley region of Victoria. To realise Australian Paper's vision of a sustainable and reliable energy source, the company has indicated the need for a high level economic impact analysis to be conducted to support the initial stages of funding.

In 2017, Australian Paper commissioned WRI to prepare an economic impact analysis for the pre-feasibility stage of the proposed EfW plant. Australian Paper has also engaged WRI in past projects to measure the organisation's economic impacts in 2012, 2013 and 2016. This report is for the feasibility stage of the EfW plant and is an update of the 2017 pre-feasibility study. The scope of the work undertaken in this study specifically covers the economic impacts on the Victorian State economy and the Latrobe Valley regional economy associated with the proposed EfW plant construction and future operation.

Energy from Waste plant

Over the past few years there has been an increasing interest in Energy from Waste (EfW) facilities across Australia. EfW plants have the potential to contribute to Australia's renewable energy targets, reduce carbon emissions and divert waste away from landfill. They also have the potential to improve the energy mix in Australia by supplementing wind and solar production through base load generation¹.

The proposed EfW plant at Maryvale will assist Australian Paper in its commitment to managing waste responsibly and ensure future sustainability and reliability in energy production. The EfW plant will promote low carbon network emissions, economic development and employment growth in the Latrobe Valley region of Victoria.

¹ PricewaterhouseCoopers Australia, Energy from Waste in Australia, April 2017.
<https://www.pwc.com.au/publications/pdf/energy-from-waste-april-2017.pdf>. Accessed 4 October 2018.

Reporting

The economic impact of the proposed EfW construction and operation has been reported as the sum of:

- **Initial impacts:** defined as the value of the immediate changes in the respective region resulting from the proposed EfW operations
- **Flow-on impacts:** defined as the value of changes in the regional economy resulting from an additional round of spending after the initial impact occurred.

The economic impact of the proposed EfW plant on each of the study areas have been estimated in terms of:

- **Gross Regional Product (GRP):** is the local equivalent of Gross Domestic Product (GDP) and is the amount the value of an article is increased at each step of its production exclusive of its initial cost. Also known as value added, the Australian Bureau of Statistics (ABS) defines GDP as *“the total market value of goods and services produced in Australia within a given period after deducting the cost of goods and services used up in the process of production, but before deducting allowances for the consumption of fixed capital”*.² At the state level the relevant term is **Gross State Product (GSP)**.
- **Household Income:** Household income consists of all current receipts, whether monetary or in kind, that are received by the household or by individual members of the household, and which are available for, or intended to support, current consumption.³ Examples include employee wages and salaries, salary sacrificed income, non-cash benefits, bonuses and termination payments, government pensions and allowances, profit/loss from own unincorporated business, investment income, superannuation, workers' compensation, income from annuities, child support, etc.⁴
- **Full-time equivalent employment (FTE):** a measure of the workload of an employed person in a location that makes workloads comparable across different types of employment (part-time and full time) by measuring hours worked and equating to how many full time positions the hours make up.

² ABS [Release No. 1345.0, Key Economic Indicators, 2018](#).

³ ABS [Release No. 6523.0 - Household Income and Wealth, Australia, 2015-16](#).

⁴ *ibid.*

CONSTRUCTION PHASE

Victorian impacts

When flow on effects are taken into account it is estimated that the proposed EfW plant to be constructed at Australian Paper's Maryvale site will contribute approximately \$483 million in total to Victorian GSP and approximately \$228 million in total to Victorian Household Income during the 3 year construction phase. This represents an average of 1,046 FTE jobs per annum in the Victorian economy over 3 years.

Table 1 illustrates the project impacts over the projected 3 years modelled that underpin the averages listed above.

Table 1: Economic Impact of proposed EfW plant construction on Victoria

EfW plant construction impacts Victoria	GSP (\$m)	Household Income (\$m)	Employment (FTE Jobs)
Construction Phase Year 1			
Victoria (including Flow-on)	\$140.2	\$66.7	895
Construction Phase Year 2			
Victoria (including Flow-on)	\$190.7	\$89.9	1,247
Construction Phase Year 3			
Victoria (including Flow-on)	\$152.3	\$71.8	996
Construction Phase Overall Year 1 to 3	\$483.2 total	\$228.4 total	1,046 average jobs per annum over 3 years

The main industry sectors likely to be impacted by the flow-on from the EfW plant construction in terms of FTE employment in the Victorian economy are:

- Construction
- Machinery and Equipment Manufacturing
- Professional, Scientific and Technical Services
- Retail Trade
- Chemical and Non-metallic Mineral Product Manufacturing
- Finance and Insurance Services

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Latrobe Valley regional impacts

The construction impacts of the proposed EfW plant are estimated to contribute over \$203 million to Latrobe Valley GRP and just under \$89 million in household income in total to Latrobe Valley regional Household Income during the 3 year construction phase. This represents an average of 454 FTE jobs per annum in the Latrobe Valley regional economy over 3 years.

Table 2 illustrates the project impacts over the projected 3 years modelled that underpin the averages listed above.

Table 2: Economic impact of proposed EfW plant construction on the Latrobe Valley Region

EfW plant construction impacts Latrobe Valley	GRP (\$m)	Household Income (\$m)	Employment (FTE Jobs)
Construction Phase Year 1			
Latrobe Valley (including Flow-on)	\$54.6	\$23.4	360
Construction Phase Year 2			
Latrobe Valley (including Flow-on)	\$83.5	\$36.6	561
Construction Phase Year 3			
Latrobe Valley (including Flow-on)	\$65.4	\$28.8	442
Construction Phase Overall Year 1 to 3	\$203.5 total	\$88.8 total	454 average jobs per annum over 3 years

The main industry sectors likely to be impacted by the flow-on from the EfW plant construction, in terms of FTE employment in the Latrobe Valley region economy, are:

- Construction
- Retail Trade
- Machinery and Equipment Manufacturing
- Chemical and Non-metallic Mineral Product Manufacturing
- Electricity Generation
- Professional, Scientific and Technical Services
- Metal and Metal Product Manufacturing

OPERATIONAL PHASE

Victorian impacts

The operational impacts based on the cost data provided of the proposed EfW plant are estimated to contribute annual impacts of just under \$199 million in Victorian GSP, approximately \$76 million in household income and 911 FTE jobs when flow-on effects are considered.

Table 3: Economic impact of proposed EfW plant operations on Victoria

EfW plant operational impacts Victoria	GSP \$m	Household Income \$m	Employment FTE Jobs
Victoria (including Flow-on)	\$198.7	\$76.1	911

The main industry sectors likely to be impacted by the flow-on from the EfW plant operations, in terms of FTE employment in the Victorian economy, are:

- Waste Collection, Treatment and Disposal Services
- Professional, Scientific and Technical Services
- Repair and Maintenance Services
- Retail Trade
- Transport, Postal and Warehousing

Latrobe Valley regional impacts

The operational impacts based on the cost data of the proposed EfW plant are estimated to contribute annual impacts close to \$96 million in Latrobe Valley GRP, \$20 million in household income and 265 FTE jobs when flow-on effects are considered.

Table 4: Economic impact of proposed EfW plant operations on the Latrobe Valley Region

EfW plant operational impacts Latrobe Valley	GRP (\$m)	Household Income (\$m)	Employment (FTE Jobs)
Latrobe Valley (including Flow-on)	\$95.8	\$20.2	265

The main industry sectors likely to be impacted by the flow-on from the EfW plant operations, in terms of FTE employment in the Latrobe Valley regional economy, are:

- Repair and Maintenance Services
- Waste Collection, Treatment and Disposal Services
- Transport, Postal and Warehousing

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- Machinery and Equipment Manufacturing
- Retail Trade

CONCLUSION

The combined EfW plant operations and construction are estimated to make significant contributions to both the Victorian and Latrobe Valley economies and help Australian Paper improve its social and economic contribution to its employees and the communities in which it operates.

In Victoria, the contribution is estimated to be:

- **Gross State Product** – an estimated \$483.2 million in total from construction impacts and \$198.7 million per annum added from operational impacts.
- **Household income** – an estimated \$228.4 million in total from construction impacts and \$76.1 million in per annum from operational impacts in household income
- **Employment** – an average of 1,046 full-time equivalent jobs per annum for each of the 3 years of construction and 911 full time equivalent jobs thereafter.

In the Latrobe Valley region, the combined contribution is estimated to be:

- **Gross Regional Product** – an estimated \$203.5 million in total from construction impacts and \$95.8 million per annum added from operational impacts.
- **Household income** – an estimated \$88.8 million in total from construction impacts and \$20.2 million in per annum from operational impacts in household income
- **Employment** – an average of 454 full-time equivalent jobs per annum for each of the 3 years of construction and 265 full time equivalent jobs thereafter.

The proposed EfW plant has the potential to provide other social, economic and environmental benefits alongside those discussed in this report, including wider benefits to the Australian economy.

It is recommended that a full business case be developed to gain greater insight into the full impact of the EfW plant.

METHODOLOGY

The economic impacts were assessed at state and Latrobe Valley regional levels. Modelling was undertaken through input-output analysis, which provides a detailed picture of the structure of an economy at a point in time and can be used to estimate the contribution or impact of a sector of the economy or an individual organisation including flow-on or multiplier effects. The impacts are measured in terms of GSP, GRP, household income and full-time equivalent jobs. All impacts are expressed in either dollar terms or full-time equivalent (FTE) employment terms and as a percentage of the national, state or regional economy.

Constructing the tables

The input-output table for this project was extracted from the Australian Bureau of Statistics (ABS) 2015-16 national input-output table (released 15/6/2018) using the Generation of Regional Input-Output Tables (GRIT) technique. The national table was adjusted to represent Victoria using detailed ABS data from the State Accounts (ABS cat no. 5220.0) and Labour Force, Australia, Detailed Quarterly (ABS cat. no. 6291.0.55.003) publications. Subsequently a regional table was built for the Latrobe Valley region (aggregation of Statistical Area level 3 (SA3 regions as defined in the Geographical scope section below) using total employment data, ratio of full-time and part-time employment and income levels sourced from the 2016 ABS Census and growth rates calculated from the ABS Labour Force Release No. 6291.0.55.003, Employed Persons by Region, Gender and Industry, using the most appropriate Labour Force Region data (ABS Cat.).

The GRIT technique derives regional input-output tables from the national input-output table using location quotients and superior data, such as primary source data (in this case, information regarding the proposed construction and operation of the EfW plant as well as regional employment and income data) at various stages in the construction of the tables. Appendix 1 provides a detailed description of the input-output methodology utilised in this analysis.

It should be noted that in the construction of economic tables for modelling, the Australian Bureau of Statistics applies a confidentiality technique to its Census data tables. The technique involves small random adjustments to the data which help prevent the disclosure of any identifiable data. Whilst unavoidable, these random adjustments can be expected to have a small impact on modelled outcomes.

Geographical scope

The economic impacts from the proposed EfW operations and construction were assessed at the Victorian state level and at the Latrobe Valley regional level, where the EfW plant is to be located. For this report the Latrobe Valley region is the aggregation of SA3 regions from the Australian Statistical Geographical Standard. Table 5 outlines the regions included in this report that make up the Latrobe Valley region.

Table 5: Broader Region Definitions

Broader regions	Statistical Area Level	State within which the Latrobe Valley region is located
Latrobe Valley	Baw Baw (SA3)	Victoria
	Latrobe Valley (SA3)	
	Wellington (SA3)	

Data collection

To estimate the economic contribution of the EfW construction and operations, WRI was supplied with high level information about Australian Paper’s proposed expenditure, location of expenditure, employment, and revenues. This information was used to construct a new sector in the input-output table representing the operations of the EfW.

Revenue

Revenue data was supplied by Australian Paper and was allocated to the region from which it is likely to be paid within the relevant state or statistical area or from outside the local area. Any income made within the area of interest is considered local and revenue received outside of the local area is deemed to be an export to the region.

Wages and Salaries

Estimated human resource information including number of FTE and associated wages and salaries was supplied by Australian Paper.

Other Expenditure

Australian Paper supplied high level information regarding other estimated expenditure by type and location where the purchase is likely to be made. Any expenditure made within the region being modelled is considered local and anything made outside of this area is deemed to be an import to the region.

Capital Expenditure

Australian Paper has supplied information regarding construction costs for the proposed EfW plant by type of expenditure and the location where the purchase is likely to be made. This one-off capital expenditure was treated as a final demand impact in the relevant tables.

Impact Analysis

Final Demand Impacts

The final demand impact analysis calculates the impacts (measured by GRP, GSP, household income and employment) across all sectors in response to changes in industry final demands. Construction related expenditure was allocated to the relevant sectors to give the estimated impacts of this expenditure including both initial and flow-on effects.

Industry Shutdown Impacts

The impacts from operational expenditure were measured by creating a new sector in the relevant Input-Output tables reflecting the operations of the EfW plant. The economic impacts are measured by shutting down the sector by comparing the economy with and without the industry in question in terms of both direct and flow-on impacts.

APPENDIX 1: INPUT-OUTPUT ANALYSIS

Input-output tables are part of the Australian national accounts. An input-output model provides a detailed picture of the structure of an economy at a particular point in time. It includes all the transactions that occur during a specific period, usually one year.

The rows of an input-output table show the disposal of the output of an industry to itself and to other industries as well as final demand categories (e.g. exports and household consumption).

The columns show the origin of inputs into production, whether they are intermediate inputs (i.e. intra- and inter-industry purchases) or primary inputs (e.g. labour and capital).

The main use of input-output tables is economic impact analysis where the tables are used to estimate the benefits generated by new initiatives on each sector of an economy. For example, if there is a change in the purchasing or sales pattern of any industry, the flow on, or multiplier effects on upstream industries can be calculated. An input-output table is also very useful for estimating the direct and indirect contribution of final demand as with the proposed construction expenditure associated with the EfW plant operations.

One of the main attractions of input-output models is their relative ease of use and the level of detail obtained concerning the structure of the economy. The Australian Bureau of Statistics (ABS) notes the usefulness of input-output tables:

“Input-output tables provide detailed information about the supply and disposition of commodities in the Australian economy and about the structure of, and inter-relationships between, Australian industries. Detailed data on supply and use of commodities, inter-industry flows and a range of derived data, such as input-output multipliers, are provided for economic planning and analysis, and construction of models for forecasting purposes.” (ABS Introduction to Input-Output Multipliers, Cat. 5246.0)

The application of input-output analysis to estimate the economic impact of the proposed EfW plant operations and construction on Victoria and the Latrobe Valley region involves five basic steps:

- Construction of appropriate state and regional input-output tables
- Analysis of the value of expenditure by type and origin (local, imported and total)
- As it will be a new plant, data has been added to expand the economies reflected in the regional and state economies
- Assessment of final demand impacts (construction) and shut down impacts (operations)
- Using marginal coefficients to overcome the problem of over-estimation associated with linear coefficients.

The input-output table for this project was extracted from the Australian Bureau of Statistics (ABS) 2015-16 national input-output table using GRIT technique.

The national table was adjusted to represent Victoria using detailed ABS data from the State Accounts (ABS cat no. 5220.0) and Labour Force, Australia, Detailed Quarterly (ABS cat. no. 6291.0.55.003) publications. Subsequently a regional table was built for the Latrobe Valley region) using total employment data, ratio of FTE and income levels sourced from the 2016 ABS Census and the proportional FTE and growth rates calculated from the ABS Labour Force Catalogue, Employed Persons by Region, Gender and Industry, using the most appropriate Labour Force Region data (ABS Cat. No. 6291.0.55.003).

The GRIT technique derives regional input-output tables from the national input-output table using location quotients and superior data, such as primary survey data, at various stages in the construction of the tables. The GRIT procedure was developed by Associate Professor Guy West and Professor Rod Jensen of the University of Queensland and is a widely used method of constructing regional input-output tables in Australia.

GRIT uses a series of non-survey steps to produce a prototype regional table from the national table but provides the opportunity at various stages for the insertion of superior data, in this case data on proposed expenditure obtained from Australian Paper for the EfW plant. The system is variable interference in that the analyst can determine the extent to which they interfere with the mechanical processes by introducing primary or other superior data.

The GRIT system is designed to produce regional tables that are:

- Consistent in accounting terms with each other and with the national table
- Capable of calculations to a reasonable degree of holistic accuracy
- Capable of being updated with a minimum effort as new data becomes available.

The final input-output tables were balanced using the RAS technique. The RAS technique is a bi-proportional iterative adjustment method designed to modify a base input-output matrix to fit new row and column totals. The rows and columns are simply adjusted proportionally to the new row and column totals in turn and the cycle repeated until the actual row and column totals converge to the specified values. After the tables are balanced they are checked to ensure that the final tables are consistent and to identify any large discrepancies.

Marginal Coefficients Model

One of the main limitations of input-output tables is the assumption of linear coefficients. To address this problem and the associated problem of overestimation, the input-output analysis undertaken for the proposed EfW plant operations and construction incorporates the marginal coefficients model which attempts to overcome the limitations of traditional input-output analysis by removing the assumption of linear coefficients for the household sector.

The household sector is the dominant component of multiplier effects in an input-output table so using marginal, rather than average income coefficients for the household sector only, provides a more accurate estimate of the multiplier effects and provides results closer to those of a computable general equilibrium (CGE) model. This provides more accurate estimates of the significance of impacts associated with the proposed EfW plant operations and construction than would be possible with traditional input-output analysis.

The impacts are measured in terms of GRP, household income and FTE. All impacts are measured in either dollar terms or FTE terms and as a percentage of the regional economy.

Final Demand

The impact of one-off capital expenditure was estimated as a final demand impact. Specifically, expenditure was allocated to the relevant sectors to give the estimated impacts of this expenditure including both initial and flow-on effects.

Industry Shutdown

The impact of operational expenditure was estimated as a shutdown impact measuring the difference in economic activity with and without the EfW plant. This measures the flow of direct expenditure by the EfW plant across the supply chain including the resultant flow-on impacts from industrial support and consumption-induced expenditure.

WESTERN RESEARCH INSTITUTE

WRI is a regional development research organisation located in Bathurst, New South Wales. WRI holds a wealth of knowledge on employment, business development and investment issues affecting regional Australia. Over the past 19 years WRI has worked with Commonwealth, State and Local Governments and industry groups on numerous investment and development programs in regional areas.

Ms Kathy Woolley – Chief Executive Officer

GAICD, MIIA, Change Management Qualification (AGSM), Public Participation Certification (IAP2) BComm (Economics-with merit) (UWO), CertIV Training and Assessment.

Kathy joined the WRI team in February 2018 having previously worked on a variety of boards and in senior management roles across sectors including media, health, education, regional development, government, event management, research and sales.

For a number of years Kathy also ran a consultancy specialising in services for not for profit entities, focusing on best practice techniques in management and governance.

With formal qualifications in change management, company directorship, community engagement, economics and training, and well developed skills in human resources, information technology, finance and economic development, Kathy offers a unique skill set to assist with most business needs.

This is the second time Kathy has worked for WRI, previously fulfilling the role of Business Development Manager. A position as a research officer for a similar organisation in the Illawarra rounds off the experience in economic modelling and research.

Mr Alistair MacLennan – Senior Research Consultant BA Political Economy, First Class Honours (UNE)

Having served in a variety of parliamentary, public service and private sector roles, Alistair brings research experience to WRI. Alistair has well developed skills in data analysis, economics and business and has a wide understanding of government. He also has experience in policy development in the energy sector where he engaged with industry, government agencies and Non Government Organisations to inform policy.

Alistair's experience in engaging with clients, stakeholders and the public assists WRI to fully understand its clients' needs and provide tailored research.

Mr Chris Mullen – Research Officer BEcon UNE

Chris is an Economics graduate from the University of New England currently undertaking a Master of Economics course. Chris has a great interest and passion for macro and microeconomics, policy analysis, and development economics. Throughout his degree, Chris has gained skills in benefit-cost analysis, business statistics and economic modelling. Having grown up on a property on the mid-north coast, Chris has a strong understanding of life in regional Australia and the issues rural communities face.

Ms Dale Curran – Executive Officer BA ANU

Dale is responsible for all administrative processes at WRI including executive support, finance, management of the Board of Directors, maintenance of policies and also assists with project work.

She has worked in a variety of roles at WRI, including Fieldwork Supervisor and Research Assistant, and has worked on several community and business surveys.

Dale brings a high level of organisational skill to her role as Executive Officer.

