

4. INTERPRETATION OF RESULTS

Input-output analysis of up to six Reef-based sectors for four economic regions and the state of Queensland provides a vast amount of data which cannot all be discussed individually. As will be emphasised in section 5 of this report, the total multipliers and the total impacts calculated from these are of most interest as it is these total figures which are of most use in understanding economic impacts. Input-output analysis provides a great deal of information on the elements which make up the total effects. Appendices I to IV contain the complete results of analysis for the four regions, Cairns, Townsville, Mackay and Rockhampton, and for the state of Queensland.

This section of the report contains a guide to interpreting the multipliers contained in the Appendices for all Reef-based sectors. The guide is in the form of an 'interpretation' of the multipliers using an example of one sector for one region, in this case, the Island Resorts sector in the Rockhampton Region. Any other sector may be interpreted using this formula. The following passages in this section are largely quoted from Jensen (in Driml et al., 1982).

4.1 Island resorts - Rockhampton Region

The various multipliers making up the output income and employment effects are discussed below. The interpretation is based on Table 3, (similar tables for each region are presented in Appendices Ia, IIa, IIIa, and IVa).

Examination of the Island Resorts rows in Table 3 shows that each (average) dollar of output of the Island Resorts sector can be expected to exert the following effect on the Rockhampton regional economy.

Table 3. Rockhampton Region: Multipliers by activity, regional level^(c).

| SECTOR | MULTIPLIERS | | | | | | RATIOS | | | |
|---------------------------------------|-----------------------|----------------------------|------------------------|-------------------------|--------------|----------------|----------------|----------------|-----------------|------------------|
| | Initial Impact (1) | First Round Support (2) | Indust. Support (3) | Consump. Induced (4) | Total (5) | Flow on (6) | Type IA (7) | Type IB (8) | Type IIA (9) | Type IIB (10) |
| A. OUTPUT MULTIPLIERS (\$) (a) | | | | | | | | | | |
| 1. Island Resorts | 1.000 | .297 | .114 | .275 | 1.686 | .686 | - | - | - | - |
| B. INCOME MULTIPLIERS (\$) (a) | | | | | | | | | | |
| 2. Island Resorts | .184 | .087 | .034 | .098 | .404 | .220 | 1.476 | 1.663 | 2.198 | 1.198 |
| C. EMPLOYMENT MULTIPLIERS (b) | | | | | | | | | | |
| 3. Island Resorts | .020 | .009 | .004 | .009 | .043 | .023 | 1.448 | 1.623 | 2.083 | 1.083 |

- (a) Per dollar of output
 (b) Employees per thousand dollars of output
 (c) Rounding errors occur.

Output effects (Row 1)

- (i) 29.7 cents in First Round output effects (Column 2), as a result of direct purchases by Island Resorts from other firms in the regional economy. These firms, in effect need to supply output to a level of 29.7 cents for each dollar of output of the Island Resorts.
- (ii) 11.4 cents in Industrial Support output effects, as the firms supplying first round goods and services to the Island Resorts in turn purchase goods and services from each other in terms of second, third and subsequent round effects. Each round of purchases becomes progressively smaller due to leakages from the economy in the form of imports, until the effects of each additional round are insignificant.
- (iii) 27.5 cents in Consumption Induced effects. These arise from consumer expenditure arising from household income generated by Island Resorts. The employees of the Island Resorts, and of the firms experiencing First Round and Industrial Support effects can be expected to undertake personal consumption expenditure in the region; this expenditure in turn is responsible for a certain level of demand and output in the region. Together with the initial dollar, these result in:
- (iv) a Total Output effect on all firms in the region of \$1.686; or
- (v) a Flow-On output effect, including First Round, Industrial Support and Consumption Induced effects, of 68.6 cents. While the initial impact or cause of the impact is the average dollar of output of the Island Resort (or each additional dollar of output), the effect of the impact on the local economy is the Flow-On multiplier.

Income effects (Row 2)

Each dollar of output of the Island Resorts sector results in household income effects in the regional economy of:

- (vi) 18.4 cents in household income for employees within the Island Resorts sector (Column 1), or 'own sector' employment.
- (vii) 8.7 cents in household income associated with employees in firms supplying First-Round goods and services to Island Resorts.
- (vii) 3.4 cents in household income associated with employees in firms supplying Industrial Support goods and services.
- (ix) 9.8 cents in household income associated with Consumption-Induced output, making
- (x) a Total household income effect of 40.4 cents or

- (xi) a Flow-on household income in all sectors of the economy of 22.0 cents.

Employment effects (Row 3)

Each \$'000 output of the Island Resorts sector is associated with:

- (xii) .020 employees within the Island Resort sector,
(xiii) .009 employees in firms supplying First Round goods and services
(xiv) .004 employees in firms supplying Industrial Support goods and services,
(xv) .009 employees in firms as a result of Consumption Induced output effects, making:
(xvi) .043 employees in Total effects; or
(xvii) .023 employees in Flow-On employment effects.

Type I and II ratios

As noted above, these multipliers refer to the average dollar of output of each sector. Income (and employment) impacts are often expressed on a 'per unit of income' (or employment) basis in terms of the Type I and Type II ratios shown in Table 3. These ratios are not multipliers in the strict sense since they do not employ a casual linkage, but are often used to denote an association between the impacting sector and the expected impact. For example, each dollar of household income generated in the Island Resorts sector is associated with \$1.476 in household income in Type IA effect (Initial + First Round effect), \$1.633 in Type IB effect (Initial + Direct - Industrial Support effect), \$2.198 in type IIA (Total effect) and \$1.198 in Type IIB (Flow-On) household income effects. Similarly, Type I and II employment ratios are provided in Part C of Table 3.

Regional and state distribution of flow-on impacts

As outlined above, the multipliers of Table 3 show the relative impact of the Island Resorts sector on the economy of the Rockhampton Region. Similarly impacts on the state as a whole may be interpreted from Table 4 and Tables Ib, IIb, IIIb and IVb in the Appendices. As expected, the multipliers for the impacts at the state level are larger due to the fact that the multipliers for the state as a whole include purchases from the rest of Queensland i.e. Queensland other than the Rockhampton Region. It is useful to draw these multipliers together and to compare the impact of flow-on effects, according to the distribution of the impacts. This has been done, as far as existing data will allow.

These 'flow-on' effects are presented for all regions in the Appendices (Tables Ic, IIc, IIIc and IVc) and the information for Rockhampton Region Island Resorts is mirrored in Table 5.

To continue the use of Rockhampton Region Island Resorts as an example, Table 5 shows (Column 1, Row 1) that each dollar of output of Island Resorts can be expected to produce an output flow-on of \$1.33 in the rest of the economy. Row (2) shows that the expected flow-on to the sector of the region will be 68.6 cents, meaning that 64.4 cents (Row 3) will flow to the rest of the Queensland economy, it can be reasonably expected that the large part of this rest of state flow-on will occur in Brisbane, which is the main source of supply of non-local goods and services to the regions of the state.

In a similar way, each dollar of output of Island Resorts can be expected to be associated with 15.7 cents in household income in the rest of the state and each thousand dollars of output of that sector to result in 0.014 persons employed in the rest of the state. Although it would be expected that there will be a similar general pattern in the spatial distribution of output, income and employment flow-on effects, there is no a priori reason why there should be a close correspondence.

In fact the proportion of total state flow-ons which occur in the region are respectively 51.6 percent for output, 58.5 percent for household income and 59.9 percent for employment in the case of the Island Resorts. These proportions are shown in Part C of Table 5.

Total Impacts

The interpretation so far has been confined to the relative impacts of the various activities in terms of the average dollar of output of these activities. Part B of Table 5 converts these impacts into absolute terms to allow some examination of the scale of the effects of these activities on the regional and state economies. For example Column (4) shows that the total flow-on output effect of the Island Resorts sector on the sectors of the state as a whole is \$16.23m (i.e. \$12.2m output in 1981/82 dollars x 1.330 (Table 4) with rounding errors), on the region \$8.372 and by subtraction \$47.86m on the rest of the state. In a similar manner the absolute household income effect on the state as a whole is expected to be about \$4.60m, on the region as a whole \$2.68m, and on the rest of the state to the extent of \$1.91m.

The previous discussion has been cast mainly in terms of flow-on effects. The total economic effect of each activity will include both the operations of the activity and the flow-on impacts on the rest of the economy. These are shown in Table 6 (and Tables Id, IIId, IIId and IVd in the Appendices), which simply aggregates for each activity the value of output, income and employment used in the input-output transactions tables, with the flow-on effects shown in Part B of Table 5 (and Appendix Tables Ic, IIc, IIId and IVc).

Table 4. Rockhampton Region: Multipliers by activity, Queensland level^(c).

| SECTOR | MULTIPLIERS | | | | | | RATIOS | | | |
|--|----------------|-------------|-----------------|---------------|-------|---------|---------|---------|----------|----------|
| | Initial Impact | First Round | Indust. Support | Cons. Induced | Total | Flow-on | Type IA | Type IB | Type IIA | Type IIB |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| A. <u>OUTPUT MULTIPLIERS (\$)</u> ^(a) | | | | | | | | | | |
| 1. Island Resorts | 1.000 | .478 | .309 | .542 | 2.330 | 1.330 | - | - | - | - |
| B. <u>INCOME MULTIPLIERS (\$)</u> ^(a) | | | | | | | | | | |
| 2. Island Resorts | .189 | .122 | .081 | .173 | .566 | .377 | 1.647 | 2.078 | 2.992 | 1.992 |
| C. <u>EMPLOYMENT MULTIPLIERS</u> ^(b) | | | | | | | | | | |
| 3. Island Resorts | .020 | .012 | .008 | .017 | .057 | .037 | 1.597 | 1.999 | 2.810 | 1.810 |

(a) Per dollar of output

(b) Employees per thousand dollars of output

(c) Rounding errors occur.

Table 5. Rockhampton Region: Spatial distribution of flow-on effects^(c).

| SECTOR | PART A. MULTIPLIERS ^(a) | | | PART B. AMOUNTS ^(d) | | | PART C. PROPORTIONS | | |
|-----------------------|------------------------------------|-----------------------|---------------------------|--------------------------------|--------|-------------|---------------------|--------|------------|
| | Output ^(e) | Income ^(e) | Employment ^(b) | Output | Income | Employment | Output | Income | Employment |
| | (\$) | (\$) | (employees) | (\$'M) | (\$'M) | (employees) | (%) | (%) | (%) |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| <u>Island Resorts</u> | | | | | | | | | |
| 1. State Level | 1.330 | .377 | .037 | 16.23 | 4.60 | 451 | 100.0 | 100.0 | 100.0 |
| 2. Rockhampton Region | .686 | .220 | .023 | 8.37 | 2.68 | 280 | 51.6 | 58.5 | 59.9 |
| 3. Rest of Queensland | .644 | .157 | .014 | 7.86 | 1.91 | 170 | 48.4 | 41.5 | 40.1 |

(a) Per dollar of output

(b) Employees per thousand dollars of output

(c) Rounding errors occur

(d) Drawn from Tables 4.1 and 4.2

(e) Calculated by application of multipliers to sector output levels (shown in Table 2.1) 1981/82 dollars

For example, the value of output of the Rockhampton Region Island Resorts sector is \$12.20m (in 1981/82 dollars); summed with the flow-on effects of this sector at the state level of \$16.23m (Table 5), produces the total output value of Island Resorts at the state level of \$28.42m (in 1981/82 dollars).

Table 6. Total impacts (including own-sector effect and flow-on effect) of six major activities in Rockhampton Region.
(all values are in 1981/82 dollars)

| | Output (\$million) | Income (\$million) | Employment (employees) |
|-----------------------|-----------------------|-----------------------|---------------------------|
| <u>Island resorts</u> | | | |
| State level | 28.42 | 6.84 | 696 |
| Rockhampton Region | 20.56 | 4.92 | 525 |
| Rest of Queensland | 7.86 | 1.92 | 171 |

Disaggregated impacts

Most of the interpretation of results above has referred to the impacts of the Island Resort sector on the economy of the state of Queensland and the Rockhampton Region as a whole, i.e. including all sectors in those economies. It is possible to develop disaggregated or partial multipliers which show how these aggregate flow-on effects are distributed over the various sectors of the economy.

The disaggregated impacts developed for this study are shown for Island Resorts, in Table 7 and for those sectors of sufficient size to make this analysis meaningful, in Tables Ie, IIe, IIIe and IVe in the Appendices. The results presented for output and employment effects are limited in two ways. First, it will normally be the case that the main effects of sector flow-ons will be concentrated in a few sectors, with a number of small impacts recorded in various sectors.

In recognition of the limitations of the data and technique, impacts of less than five percent of total flow-ons have not been shown in Table 7 and in the Appendices. Secondly, the flow-on disaggregation has been limited to the two or three 'larger' sectors in the region for presentation in the Appendices, in further recognition of data and technique limitations.

Table 7 shows output impacts in Columns (1) and (2), and employment impacts in columns (3) and (4). It shows (Column 1) for example that at the regional level 18.9 percent of the output effects of the Island Resorts sector occur in the Building and Construction sector and that there is a wide distribution of almost equivalent impacts over six other sectors.

It has been illustrated in this chapter that input-output analysis can provide a large amount of data useful in describing sectors and economies. The interpretation illustrated here for Island Resorts in the Rockhampton Region may be applied to any or all of the sectors in the four regions. In order to assist this application, appropriate references have been made to the relevant tables in the Appendices throughout this chapter. A caveat should be issued here as the results of input-output analysis are not exact measures but are order of magnitude estimates only, and this warning is especially important for the smaller sectors. Although much detail is available from input-output analysis perhaps the best way to use the information is in gross comparison as presented in the following chapter.

Table 7. Rockhampton Region: Disaggregated flow-on impacts of activities^(a).

| SECTOR | OUTPUT IMPACTS Island Resorts | | EMPLOYMENT IMPACTS Island Resorts | |
|-----------------------------|-------------------------------------|--------------|---|--------------|
| | Region (1) | State (2) | Region (3) | State (4) |
| 1. Animal Industries | - | - | - | - |
| 2A. Other Agriculture | - | - | - | - |
| 2B. Forestry, Fishing | - | - | - | - |
| 3A. Coal Mining | - | - | - | - |
| 3B. Other Mining | - | - | - | - |
| 4A. Food Manufacturing | 7.8 | 11.0 | - | 5.9 |
| 4B. Wood & Paper Manufact. | - | - | - | - |
| 4C. Machinery, etc. | 6.2 | 7.8 | 7.6 | 6.6 |
| 4D. Metal Products | - | - | - | - |
| 4E. Non-metallic Minerals | - | - | - | - |
| 4F. Other Manufacturing | - | 7.0 | - | - |
| 5. Elect., Gas & Water | - | - | - | - |
| 6. Building & Construction | 18.9 | 11.6 | 15.1 | 8.9 |
| 7. Trade | 10.2 | 10.4 | 15.3 | 17.5 |
| 8. Transport, Communication | 10.9 | 11.5 | 12.7 | 13.7 |
| 9. Finance | 10.3 | 9.1 | 10.7 | 10.7 |
| 10. Public Admin. | - | - | - | - |
| 11A. Community Services | - | - | 5.5 | 5.3 |
| 11B. Entertainment | 9.6 | 8.0 | 10.8 | 9.3 |

(a) This table includes only the "main" listed flow-on efficient or over.