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REGIONAL RISK MANAGEMENT AND ECONOMIC DEVELOPMENT

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ABSTRACT: Globalisation has exposed regional economies to greater competition and risk. This paper presents the results of a pilot research project to evaluate regional risk. Using a technique referred to as Multi-Sector Attribute Analysis (MSAA) the paper evaluates three aspects of regional risk related to impact, possibility and anticipated risk and is based on a case study of the Far North Queensland (FNQ) region economy in Australia. An analysis was undertaken of 26 risk attributes for 16 industries sectors using a survey of 202 firm and public agency managers, together with inputs from regional industry focus groups. The results have been used to develop regional risk management strategies for several export industry clusters in the region. The research suggests that with the move towards increasing collaborative competition, strategic alliances and partnerships between firms and organizations, regional risk assessment will become an important part of economic development planning and management in future.

1. INTRODUCTION

Risks are chances, factors or harmful events relating to uncertainty that we learn to manage as part of everyday life. In business, science and forecasting, techniques for analysing the probability and impact of risks are becoming increasingly sophisticated and accurate. As a result, economic, natural and physical risks affecting economic development are becoming more manageable; however, new dimensions such as social, political and environmental risks are having an increasing influence on economic development. These emerging areas of risk often have the greatest potential impact on regions, but as recent international terrorism events have shown, some regional risk impacts have international impacts which can be cumulative and prolonged.

Risk is a matter that few firms or organizations can afford to disregard if they want to stay in business. The types of risks that affect business, governments and communities take many forms. In business, the main concerns about risks relate to the protection of financial, physical, knowledge and human capital. In government, political and environmental risks are becoming high priority concerns. In communities, loss of habitat, social and cultural factors are having an increasing influence on local development and investment decisions. In regions, managing risk is a factor of which businesses, governments and communities are becoming increasingly aware. This is particularly true for regions facing decline as the result of the weakening of traditional industries or the possibility of potential political or social instability.

In regions, many risks have the potential to impact much more adversely upon a local economy than upon the larger national economy. Risks associated with regional investment, poor or disrupted communications and transport services, skill loss, loss of markets through competition or substitution, impacts of natural and man-made disasters, pressure groups and political uncertainty all have the potential to affect, in varying degrees of severity, the economic competitiveness and development of regions. It is the cumulative potential and/or perceived impact that these different events might have upon sectoral business, tourists, investors, trading partners, governments and other agents in a region that is collectively referred to in this paper as 'regional risk'. The approach taken to analyse regional risk could easily be applied to measure urban or community development risk.

Regional risk varies significantly between regions. Perceived and actual risk can affect the type, duration and scale of investment, especially by banks (Biron, 1998). Most large firms and organizations understand risk and develop strategies to insure or hedge against events or activities that may cause potential loss. Risk is something that most governments consider the responsibility of firms and individuals except for societal, sovereign and related risk where government takes responsibility. In an age when regions must become more competitive and operate in international markets, local firms may no longer be capable of managing risk individually. A more collective or collaborative approach to regional risk management seems necessary to overcome scale, geo-political and societal issues that all have the potential to impact on the development of local economies.

This paper reports on the development and tests a technique to measure anticipated risk in regions. Anticipated risk is a measure of the priority managers of regional firms and public agencies should place on the likelihood of different events occurring and their potential impact on an economy. A measurement of anticipated risk can be used to develop risk management strategies and contingency measures at a regional and sector level to minimize or mitigate their impact upon a regional economy. Applying Multi-Sector Attribute Analysis (MSAA), a tool first developed by Roberts and Stimson (1998), the paper explains the process used to derive a measurement of anticipated risk. Subsequent research by the author using a survey of 202 organizations representing 26 risk variables has enabled a much more detailed assessment to be made of anticipated regional risk in the Far North Queensland (FNQ) region. The data from this analysis is used to develop three indices of risk: impact, possibility and anticipated risk. Two short case studies on anticipated risk in the Food and Tourism industries are then presented. The conclusion to the paper argues the need for further research and a more collective approach by government and business to regional risk management.

2. WHY REGIONAL RISK MANAGEMENT IS IMPORTANT

Until very recently governments and business paid very little attention to risk management in dealing with regional economic planning and development. Land was there for development. It was a matter of governments investing in

infrastructure to develop regions, and through a range of policy measures, largely designed to develop national economies, regional development occurred. Globalisation and national competition policies have removed much of the protection regions once had against external shocks and threats. In so doing, regional and local economies are now much more exposed to risk than they were in the past. Subsequent environmental, technological and social changes have added to regional risk exposure.

Very little though has been written as to how regions should manage their increasing exposure to risk. An extensive review of economic geography and regional science literature uncovered a lack of research on the subject[1]. It is often not until a disaster like September 11 occurs with a sudden impact and loss of markets, significant social disruption or the closure of major industries that the full impact of regional risk is realised. At this time it is often too late for regions or governments to do anything about it.

For businesses to survive under conditions of increasing uncertainty and change, it is vital managers understand and develop strategies to manage risk (Bahlmann, 1990). Risk is a factor businesses consider carefully in making choices about investment strategies and acceptable returns to shareholders. For regions there is the need to consider risk in much the same way. For many regions the easiest course of action is to develop economic development strategies that are low risk. Regions that choose this course can run the gamble of being left behind in the highly competitive world of business. If a region fails to develop the smart infrastructure needed to keep local core businesses competitive, it chances losing these activities to other regions or seeing the competitiveness of local industry decline. Regional businesses and public organizations need to understand risk in order to develop strategies to maintain competitiveness and to prepare communities to manage events and activities that have the potential to be harmful.

Many economists argue that risks are factors that must be managed by individual firms and enterprises. Governments are responsible for managing sovereign and natural risk. Some economists will argue that there is very little that regions or organizations can do to manage regional risks; that regional risk is so complicated it is almost impossible to systematically analyse and therefore manage. As regional economies become more internationalised and open to competition, risk will become a factor that business and public sector agencies will need to consider carefully. Regional risk can be lessened by a more collective and responsive approach to risk management. Regions that work collectively to anticipated risk and to develop strategies to manage them are more likely to overcome quickly and recover from disruptions, like natural disasters and other calamities than those that leave risk to chance.

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[1] Colin White, *Mastering Risks: Environment, Markets and Politics in Australian Economic History,* is one of the few publications that has attempted to study risk in the context of national economic development. White examines the evolution of risk over the economic development of the Australian economy since the 1850s to the modern day.

All regions are exposed to risks but some regions have greater risk exposure than others. Events or activities perceived or known to be high risk, such as natural or man-made disasters, need to be monitored. Regional organizations can adopt two approaches to manage regional risk. The first involves strategies and measures to mitigate the potential impacts of risk. These are preventative strategies. The second are strategies to facilitate recovery following events that have a severe impact on an economy. These are recovery strategies. Both strategies require an understanding of the potential impact that risks have upon different sectors of an economy.

The level of exposure regions have to risk will have a dramatic impact on the formulation of strategies for risk management. However, risk factors may not impact uniformly across an economy. For example, a rapid rise in energy or utility charges will have a lesser impact on heavy manufacturing than on agriculture. Understanding the impact of regional risk upon different industry sectors will be important in deciding how to manage risk across different sectors. By methodically assessing risks, regional organizations and firms can improve their understanding and allocation of resources for risk management.

3. FRAMEWORK FOR ANALYSING REGIONAL RISK

The analysis of regional risk is not easy and there are no well-established techniques for analysing regional risk. There is a myriad of risks that affect the economic development of regions. Risk also affects sectors of regional economies in different ways. For highly internationalised economies, exogenous factors such as exchange rate shifts, national transport disruptions and commodity price stability are risk factors that have a significant influence on the competitiveness and management of regional economies. In other economies, ethnic, cultural, social and religious differences can present entirely different kinds of risks. All these factors affect investor confidence, productivity, industrial relations and community stability. Measuring the way risks affect different parts of a region's economy is difficult and presents methodological challenges.

Economic Computer Generated Equilibrium Modelling (ECGE) has been used to evaluate economic impacts of poverty and environmental risks (Hams, 2002; Lee and Roland-Hols, 1997). However, ECGE models are not sufficiently developed to take into account political and social risk factors. Building non-social and environmental risk into ECGE modelling is notoriously difficult, as many risks in these fields are unknown or not predictable. ECGE models provide a very useful basis for post disaster assessment, and can be used in a limited way for risk scenario modelling.

There are three broad types of risk. Predictable risks are those that relate to known or cyclical events. They have a propensity to reoccur within specific timeframes and with predictable intensities. Organizations make extensive use of statistical data to analyse these events to determine the likelihood of future occurrence. Public and private sector investment decisions, insurance payments and future damages make extensive use of predictable risk forecasting. The second type is unexpected risk. Unexpected risks are known events or activities,

but there is no reliable estimate of time, place or duration of occurrence. They are highly unpredictable, and the probability of occurrence is largely guesswork or supposition. The third type is unknown risk. There is no way of knowing what these are, but economic and social systems have an inherent ability to deal with these events after the initial shock or impact has worn off.

Some risks have the potential to create cumulative or knock-on impacts. Thus, an event that may in the first instance seem insignificant can seriously undermine business confidence and competitiveness, and result in a rapid economic slowdown or setback to an economy. This occurred in 1989 in the Cairns region of Australia when a pilot strike, which was expected to last a few days, protracted to several months bringing about a near collapse of the region's tourism industry. It was impossible to assess the cumulative affect this event had on the economy. The need to consider causation effects of risk has given rise to a whole new area of operational research in chaos theory involving business (Crook, 1996; Khalil, 1997).

To develop strategies for regional risk management, it is useful to broadly categorise risks. There are five broad risk categories that are important in the management of regional development. There are others, such as personal and technology risk, but these are not easily discernable as they vary significantly between individuals, communities and industry sectors.

- ***Economic Risk*** relates to the impact of global markets, trade factors, inflation, transportation and communication affecting goods and services.
- ***Production Risk*** relates to access to resources, profits, and production costs, such as labour disruptions, and change in material and energy prices affecting production.
- ***Governance Risk*** relates to sovereign risk, government instability and loss of control over economic development processes by government.
- ***Environmental Risk*** relates to resource depletion, pollution, disease, natural and man-made disasters and quality of life.
- ***Societal Risk*** relates to public liability claims against businesses, community attitudes towards development and pressure groups.

Each category listed above has an exogenous and endogenous element. Societal risks, such as acts of terror, are something that can manifest locally or externally.

4 REGIONAL RISK ASSESSMENT USING MULTI SECTOR ATTRIBUTE ANALYSIS

There are many well-established techniques used by business and government to estimate and quantify risk. The difficulty in assessing risk is that all models or risk assessment based on scientific methods have an error factor. Nor are they reliable in forecasting events or circumstances for which there is no precedent. Some risks are associated with cyclical or patterns of activity and are capable of measurement. Other types of risks, such as societal, personal and reputation risks can be explained by historical analysis and observation methods (Popper, 1957). There is however always a danger in supposing that historicism

or scientific methods can be used to predict the future. The future will always be uncertain and therefore any form of risk assessment has some degree of unreliability. Many of the things we acknowledge as risks are also based on our perception about the uncertainty of events or outcomes. Just as we can never be sure about the future, we can never be sure about risk. However, if we can develop better tools to predict risks that have the potential to impact upon regional economies, or at least to anticipate them, this could greatly reduce the uncertainty associated with regional economic development.

To develop a measure of risk that will give regional firms, organizations and communities greater certainty over events that have the potential to cause harm is difficult. Single event forecasting of risk can be attempted relatively easily if reliable data is available. However, multiple risk events, especially if they combine social, environmental and economic factors, are much more difficult to predict. To predict these, and to assess their possible impacts, we need to develop techniques that enable us to measure the elements of risk of what we know and can predict with some certainty, with events associated with risks that we don't know much about but perceive as threats to regional business and communities. Game and chaos theory offers possible explanations for better risk assessment, but these tools are generally far too complex to provide meaningful information for a wide range of people who are involved in making decisions about investment and other activities related to economic development in regions every day. We need a simple technique that provides decision makers with some degree of confidence about what risks they face and how best to manage these. One analytical tool that has shown promise in doing this is Multi Sector Analysis MSA (Roberts and Stimson, 1998).

In 1996 the author developed a simple technique, Multi Sector Attribute Analysis MSAA, to measure elements of competitiveness in the FNQ economy (Roberts, 2000a). MSAA has its origins in Multi-criteria Analysis and Structural Analysis (Nijkamp *et al.*, 1990; Godet, 1994) and uses qualitative data matrices to analyse the strength and importance of a range of attributes, such as core competencies, resources, infrastructure and risk within and across different sectors of an economy. MSAA examines relationships and measures the relative strength of selected variables (or criteria) within and between different industry sectors. The technique uses qualitative data derived from informed option and other evidence, some of which might be derived from historic records. The perceived strengths or impact of attributes of risk are recorded using Likert numeric scale scores in a matrix, as shown in Table 1. The X_{ij} column and row scores for each non-zero cell in the matrix are then summed. The column and row scores can then be presented graphically. The horizontal index scores permit a measurement of risk attributes across all industry sectors of the economy to be graphed. The vertical index scores enable industry sectors with the greatest attribute impacts to be graphed.

Table 1. Basic Matrix Format used for MSAA.

	Industry Sectors			
Criteria	**A**	**B**	**C**	S
X	0	1	0	1
Y	1	3	0	4
Z	0	0	2	2
Σ	1	4	2	

Using the basic matrix structure described above, three measurements of risk can be obtained from the analysis. These are:

Risk Impact (R_I), which is a measure of the perceived impact that different types of risk might have upon sectors of an economy should the event occur,

Risk Possibility (R_P) which is an assessment of the likelihood of these events occurring, and

Anticipated Risk R_A, which is a measure of the combination of risks ***Impact*** and ***Possibility***. It provides a basis for firm and public agency managers to anticipate which risks should be given priority in terms of their potential impacts on an economy. An explanation of the method used to estimate anticipated risk will be given later.

The framework used to analyse regional risk advances the basic framework for Multi Sector Attribute Analysis (MSAA) shown in Table 1 to develop a more refined measure of risk attributes. This is shown in Table 2. The left hand column lists the attributes under the five broad categories above. The second rows represent industry sectors that make up the economy. (Any number of industry sectors *i* and attributes *j* can be defined). The X_{ij} score for each cell in the R_I, R_P, matrices are then obtained from a structured sample survey of experts/informed persons involved in specific industry sectors. The mean for all the sectors is then calculated in the second-last column and row of the matrix. The ***risk attribute index*** is shown in the last column and is calculated by dividing the mean of the row risk factors by 5 (the maximum Likert scale score used in this example). These index figures are graphed. The *industry risk index* is derived by dividing the mean of the column scores shown in the second-last row by the maximum score for each industry.

Multi Sector Attribute Analysis (MSAA) offers a different approach to risk analysis from that used by insurance and financial institutions and emergency services organizations. MSAA introduces the concept of holistic risk and tries to measure individual and cumulative risks on a sector and multi-sector basis. It is recognised that certain risks can have a low impact on one sector of society but could cumulatively have far-reaching impacts on others. For example, the SARS outbreak was initially viewed as a societal health problem, but it has had a greater economic impact than was foreseen in the tourism, transport, business and technology sectors of many Asian countries. Terrorism is another case in point.

Table 2. Basic Risk Analysis Matrix Hypothetical Example.

	Industry Sectors				**Mean**	**Sum**	**Index**
Assessment Criteria	I_1	I_2	I_3	I_n			
Economic X_j	2	2	4	1	9	2.25	0.45
Production N_j	2	0	1	2	5	1.67	0.33
Governmental Gj	3	2	4	4	13	3.25	0.65
Environmental E_j	4	1	5	1	11	2.75	0.55
Social S_j	3	2	3	1	9	2.25	0.45
Sum	14	7	17	9			
Mean for Sectors	2.8	1.75	3.4	1.8			
Index	0.56	0.35	0.68	0.36			

There are similarities between MSAA and institutional approaches to risk analysis. Both embrace the idea of portfolio risk analysis. However, the portfolio analysis undertaken by institutions tends to be used to manage specific types of risks within a confined portfolio of interest, i.e. economic risk, environmental risk, public health risk etc. The portfolio assessment of risk is derived by drawing on very large databases of information gathered over long periods of time to analyse the frequency or estimate the probability of certain risk events occurring. The probabilities are used to set premium margins or discount rates in insurance and financial markets. Probabilities of accidental death or diminis hing profits by a firm can be predicted (but never with certainty) using statistical data or observed changes of behaviour in the phenomenon being observed.

MSAA involves multiple portfolio of risk assessment of all sectors of an economy. Its value is that it can point to sectors of an economy most at risk and specific types of risk that could have multiple industry impacts affecting the entire local or regional economy. Thus, something like exchange rate risk will be higher in some sectors of the economy than others, but overall it may be one of the most significant risk factors that a region may need to manage. The challenge is how do regions anticipate and manage these types of risks. MSAA of regional risk provides a tool to do this.

4.1 Data Collection

The basic method used to derive data for the risk matrices is to survey managers of firms and public agencies employed in different industry sectors and ask them to evaluate the perceived impact and possibility of specific events occurring on their sector of the economy. R_I, and R_P, data can be collected using face to face and telephone interviews, return mail surveys or e-mail questionnaire means. An alternative approach used for a quick assessment is Delphi or expert group techniques to develop the R_I, R_P, risk matrices. It is a necessary to specify a time period during which the types of event specified might be expected to

occur, for example a natural disaster. This is usually 10 years, but it could be shorter.

The survey sample is structured in such a way that only firms, enterprises and organizations which are the drivers or play a key role in the economic activities of a region are selected, i.e. those that contribute significantly to employment, regional trade, services and governance. If the sample is uniform and random, there is the chance that some key firms that dominate employment or regional output could be missed and the results might underestimate the true impact of risk upon an economy. The sample spread in sectors can therefore vary significantly. For metropolitan regions, larger sector sample sizes will permit a range of statistical tests to be conducted that provide insight into relationships between risk factors.

4.2 Impact Analysis

The raw risk impact scores (R_I) entered in the matrix assume that all attributes carry equal weighting for each industry sector. This may not be true, as some sectors of an economy contribute substantially more to economic activity than others. For example, if 6% of a region's economy is devoted to agriculture and 12% to tourism, the impact of a major natural diaster on the economy is likely to be greatest on the tourism sector. It is necessary, therefore, to weight each impact score by some measure of economic activity, either gross regional product (GRP) or employment. For the case study described later, the weights were applied in proportion to contribution each industry sector made to the gross regional product using previous research to develop input/output tables for the region (AHURI, 1995). Thus the weights W_{ij} are applied to each risk impact attribute according to industry contribution to GRP. The weight system used was

$$W_i = X_{ij} (R_A \text{ raw score}) \times [1 + \% \text{ contribution } i_n \text{ to GRP}]$$

4.3 Possibility Analysis

Data on risk possibility is gathered in the same way as the above. In many sectors of the economy risk possibility will be the same. For example, the possibility of a natural disaster (such as a cyclone or earthquake) or exchange rate change shift would be expected to be the same for all sectors. In some sectors the possibility of risk will be different, for example, the possibility of prolonged labour disputes is likely to be greatest in more unionised industry sectors. Where risks apply equally to all sectors the mean of the total survey responses can be used to provide a very good measure of risk possibility. With large samples ANOVA test can give a useful indication of variation of means within and between sectors.

4.4 Estimating Anticipated Risk

The potential impact that different risk events have upon a regional economy varies between industry sectors. An exchange rate shift or sudden movement in commodity prices will affect export industries more than community service industries. Risks also have different time horizons or likelihood of occurrence. Thus, while the impact of an event may be very significant, the likelihood of that

event occurring may be very remote. The need to allocate resources to low impact and low probability risk management would be given a low priority. On the other hand high impact and high probability risks would be given a high priority. If a risk impact factor is multiplied by its risk possibility factor, it is possible to gain an indication of magnitude/time of events. This is an index of preparedness, which is referred to as anticipated risk. Thus

$$\textit{Anticipated risk } (R_A) = [\textit{weight risk impact} \times \textit{risk possibility}]$$

If we assume i industries and j risk attributes in the matrix, the anticipated risk R_A is calculated

$$R_A = \sum W_{ij} P_{ij}. I_{ij}$$

Where W_{ij} is Weight Impact Score
I_{ij} is the Raw Impact Score
P_{ij} is the Possibility Score

The Anticipated Attribute Risk Index (R_{AI}) is calculated as follows

$$R_{AI} \quad \sum_{1=n}^{i=1} (W_{ij} S_{ij} I_{ij}) / n \qquad (1)$$

and the Anticipated Industry (R_{II}) Risk Index as

$$R_{II} = \sum_{J=m}^{j=i} (W_{ij} S_{ij} I_{ij}) / m \qquad (2)$$

Where n = number of firms or organizations responding for each sector and m = number of risk attributes for which there was a response.

As mentioned earlier, in order to test the application of the technique, the author conducted a survey of 202 firms and industries in the Far North Queensland region. 26 risk attributes were evaluated for 16 industry sectors. Both matrices were developed using a Likert scale scoring system ranging from 0-5. A 0 response meant not applicable or no answer. The risk possibility was treated as uniform across all industry sectors as there was a general consistency between the means for sector. For some risk possibility estimates historic data was used to confirm the reliability of cyclical or repeated events occurring at some time in the future. In the case of natural disasters, there was a high level of consistency. The following presents a case study of the analysis.

5. FAR NORTH REGION QUEENSLAND CASE STUDY

The Far North Queensland region is a highly internationalised economy, with a population of 250,000 and a gross regional product of $6 billion. The economy has grown at over 5% annually since 1985. In the 1980s, the FNQ area was a small branch line economy, farming sugar, bananas, tobacco, harvesting fish and forests. In 1984, the region began a remarkable transformation following the development of the Cairns International Airport. It is now one of Australia's leading international tourism destinations, and has a more diversified economy involving large-scale mining, tropical agriculture, international education and business service activities.

The FNQ region has benefited greatly from the reform of the Australian economy. Almost half the workforce is involved in export activities. However, the openness of the economy, and the high risks of natural disaster from tropical storms and disease add to the investment risk of the region. In recent years, the economy has been very dependent upon high levels of foreign investment and trade. Between 1985 and 1991 foreign investment in mining, tourism and associated infrastructure projects exceeded $1 billion (Stimson *et al*., 1998). A significant proportion of the region's trade is foreign, making the economy vulnerable to sudden changes in commodity prices, exchange rates and tourism market preferences. Local issues such as indigenous land title claims, incidents involving foreign visitors and environmental pressure groups have had a significant impact on investor confidence in the region. These are all events which represent risks that that have the potential to impact on the development and management of the region's economy.

6. ASSESSING REGIONAL RISK IMPACT IN FNQ

The first stage in regional risk assessment was to develop a matrix of raw score data (see Table 3). Weights were applied to each industry category score in proportion to its percentage contribution to gross regional product[2]. Thus agriculture, which contributes 7% to GRP, was assigned a weight 1.07[3]. Without applying the weights, it would be assumed that two industries of different sizes with similar risk impact scores would have the same impact upon the region's economy. Table 4 shows the weighted impact scores for the FNQ region. This table was used to develop the risk impact indices shown in Figures 1 and 2.

Figure 1 shows a loss of telecommunication services, natural disasters, transport cuts, changes in consumer demand and government policy would have the highest impact upon the region's economy. Other high levels of perceived risks to the FNQ economy are a rise in production costs, exchange rate change, inflation, and international crises. The results suggest that the highest risk factors tend to be concentrated in the export trade sectors. Anecdotal evidence suggests

[2] GRP based on the 1995 Input Output Table for the Region (AHURI, 1995).

[3] An alternative method of weighting would be to use the proportion of employees by industry groups as a weight.

many businesses in the region in these sectors operate on very low profit margins and do not manage regional risk well. Consultation with industry groups suggests there is a low level of risk awareness in many industries and/or knowledge on how to manage risk.

Table 3. Impact Assessment Scores.

	Exchange Rate	**Inflation**	**Tariffs**	**Product Substitution**	**Change in Consumer Demand**	**Transport Services**	**Telecommunications Services**	**International Instability/Crisis**	**Loss of Markets**	**Interest Rates**	**Transport Costs**	**Telecommunications Costs**	**Energy Costs**	**Utility Charges**
Agriculture	4.3	3.8	3.73	3.3	4.0	4.11	3.6	3.9	3.5	3.5	3.4	3.13	3.22	2.63
Forestry	3.0	3.75	2.5	3.25	3.25	4.25	4.0	4.0	3.25	3.5	3.25	3.5	3.25	3.0
Fisheries	4.56	3.6	3.56	3.63	4.0	4.6	4.0	4.0	3.44	2.7	2.7	2.5	2.4	3.1
Mining	3.4	4.2	4.0	4.5	4.0	4.0	4.67	3.6	4.2	3.8	4.0	3.17	3.17	4.0
Food Processing	3.91	4.09	1.78	3.22	4.4	4.27	4.4	4.18	4.5	3.89	4.0	3.44	4.22	4.11
Manufacturing	4.15	3.86	3.5	3.75	3.67	3.8	4.07	3.23	3.67	2.93	2.93	2.47	2.33	2.8
Public Utilities	3.67	3.0	3.33	3.0	3.67	3.67	5.0	4.0	2.5	3.0	3.0	3.0	2.5	3.0
Construction	3.25	4.13	2.6	2.83	3.89	4.56	4.22	3.88	3.88	3.1	2.9	2.8	3.2	3.44
Wholesaling	3.33	4.25	3.67	2.5	3.75	3.6	3.67	4.5	3.5	4.25	3.75	3.33	4.0	4.0
Retailing	4.14	3.84	4.06	3.39	4.11	4.42	4.44	3.81	3.42	4.88	3.95	3.63	3.44	3.38
Land Transport	3.2	3.2	3.5	3.67	3.86	4.4	4.55	2.33	3.0	3.27	3.5	3.42	3.08	3.0
Air Transport	4.5	3.29	2.33	2.0	3.57	4.14	4.38	4.0	3.71	3.25	3.2	2.8	2.5	2.5
Business Services	3.65	3.53	2.87	3.0	3.67	3.36	4.22	3.88	3.58	3.56	2.79	3.27	2.93	3.0
Public Services	4.13	3.75	2.8	3.67	4.25	3.75	4.38	3.67	3.33	3.29	3.0	2.75	2.33	2.25
Personal Services	3.5	3.5	3.0	3.0	3.92	3.73	4.25	3.75	3.67	3.3	2.83	3.36	3.0	2.91
Tourism	4.14	3.71	2.56	3.07	4.15	4.68	4.23	3.86	3.72	3.67	3.35	2.68	3.11	3.0

Table 3 *(contd)*. Impact Assessment Scores.

	Labour Costs	Industrial Relations	Government Policy	Natural Resource Depletion	Public Health	Environmental Degradation	Natural Disaster	Man-made Disaster	Quality of Life	Public Liability Claims	Community Conflict	Pressure Group Action
Agriculture	3.44	3.11	4.0	2.8	3.25	2.29	4.11	1.57	2.33	2.5	2.86	3.13
Forestry	3.5	3.5	3.5	2.0	1.67	1.75	3.75	2.0	1.75	2.25	2.0	2.75
Fisheries	2.5	2.8	4.1	2.63	2.57	2.88	3.56	2.86	2.75	2.89	3.14	3.5
Mining	3.0	4.2	4.33	2.67	3.67	3.0	4.5	2.25	2.67	4.0	3.67	2.75
Food Processing	4.11	3.89	4.2	3.22	3.89	3.67	4.89	3.22	3.9	3.33	3.11	2.78
Manufacturing	2.81	3.07	3.83	2.38	3.33	3.0	3.85	2.71	2.73	2.55	2.88	2.88
Public Utilities	3.0	3.0	2.5	3.5	3.0	3.5	4.0	2.5	3.0	3.0	3.0	3.0
Construction	3.5	3.4	3.0	2.56	2.5	2.57	3.22	2.0	2.56	3.38	2.88	2.71
Wholesaling	3.67	3.33	3.0	4.5	3.5	3.67	4.4	4.0	4.0	2.8	5.0	3.0
Retailing	3.89	3.4	4.39	3.18	3.78	3.21	4.41	2.57	3.56	2.48	3.07	2.63
Land Transport	3.42	3.83	3.73	2.67	3.0	3.1	3.83	1.67	3.67	2.8	2.89	3.11
Air Transport	2.75	2.4	3.67	2.43	3.33	2.0	3.86	1.71	2.0	2.29	1.6	1.5
Business Services	3.63	3.43	4.43	3.5	3.18	3.08	4.0	2.38	3.67	3.0	2.91	3.55
Public Services	3.63	3.33	3.8	3.0	3.6	2.75	3.67	2.25	2.8	2.17	2.2	2.67
Personal Services	2.91	3.18	4.2	2.27	2.91	2.8	4.17	2.67	2.67	2.1	2.1	1.67
Tourism	3.11	2.94	4.05	2.74	3.1	2.9	4.24	2.4	2.79	3.67	2.82	3.24

Note: Anticipated Risk for each industry *ij* is calculated by the average of the Σ jk1 + jk2 +jk3 + jkn for valid cases in industry group *j*. *The maximum ij* =5

Table 4. Weighted Impact Assessment Scores.

	Exchange Rate	**Inflation**	**Tariffs**	**Product Substitution**	**Change in Consumer Demand**	**Transport Services**	**Telecommunications Services**	**International Instability/Crisis**	**Loss of Markets**	**Interest Rates**	**Transport costs**	**Telecommunications Costs**	**Energy Costs**	**Utility Charges**
Agriculture	4.60	4.07	3.99	3.53	4.28	4.40	3.85	4.17	3.75	3.75	3.64	3.35	3.45	2.81
Forestry	3.00	3.75	2.50	3.25	3.25	4.25	4.00	4.00	3.25	3.50	3.25	3.50	3.25	3.00
Fisheries	4.65	3.67	3.63	3.70	4.08	4.69	4.08	4.08	3.51	2.75	2.75	2.55	2.45	3.16
Mining	3.67	4.54	4.32	4.86	4.32	4.32	5.04	3.89	4.54	4.10	4.32	3.42	3.42	4.32
Food Processing	4.11	4.29	1.87	3.38	4.62	4.48	4.62	4.39	4.73	4.08	4.20	3.61	4.43	4.32
Manufacturing	4.36	4.05	3.68	3.94	3.85	3.99	4.27	3.39	3.85	3.08	3.08	2.59	2.45	2.94
Public Utilities	3.74	3.06	3.40	3.06	3.74	3.74	5.10	4.08	2.55	3.06	3.06	3.06	2.55	3.06
Construction	3.45	4.38	2.76	3.00	4.12	4.83	4.47	4.11	4.11	3.29	3.07	2.97	3.39	3.65
Wholesaling	3.60	4.59	3.96	2.70	4.05	3.89	3.96	4.86	3.78	4.59	4.05	3.60	4.32	4.32
Retailing	4.43	4.11	4.34	3.63	4.40	4.73	4.75	4.08	3.66	5.22	4.23	3.88	3.68	3.62
Land Transport	3.33	3.33	3.64	3.82	4.01	4.58	4.73	2.42	3.12	3.40	3.64	3.56	3.20	3.12
Air Transport	4.64	3.39	2.40	2.06	3.68	4.26	4.51	4.12	3.82	3.35	3.30	2.88	2.58	2.58
Business Services	4.05	3.92	3.19	3.33	4.07	3.73	4.68	4.31	3.97	3.95	3.10	3.63	3.25	3.33
Public Services	4.46	4.05	3.02	3.96	4.59	4.05	4.73	3.96	3.60	3.55	3.24	2.97	2.52	2.43
Personal Services	3.92	3.92	3.36	3.36	4.39	4.18	4.76	4.20	4.11	3.70	3.17	3.76	3.36	3.26
Tourism	4.64	4.16	2.87	3.44	4.65	5.24	4.74	4.32	4.17	4.11	3.75	3.00	3.48	3.36
Wt Impact Assessment Index (col Average/5)	0.81	0.79	0.66	0.69	0.83	0.87	0.90	0.80	0.76	0.74	0.70	0.65	0.65	0.67

Table 4 *(contd)* Weighted Impact Assessment Scores.

	Labour Costs	Industrial Relations	Government Policy	Natural Resource Depletion	Public Health	Environmental Degradation	Natural Disaster	Man-made Disaster	Quality of Life	Public Inability Claims	Community Conflict	Pressure Group Action	Weights	Index*
Agriculture	3.68	3.33	4.28	0.58	0.63	2.45	4.40	1.68	2.49	2.68	3.06	3.35	1.07	0.66
Forestry	3.50	3.50	3.50	2.00	1.67	1.75	3.75	2.00	1.75	2.25	2.00	2.75	1	0.60
Fisheries	2.55	2.86	4.18	2.68	2.62	2.94	3.63	2.92	2.81	2.95	3.20	3.57	1.02	0.67
Mining	3.24	4.54	4.68	2.88	3.96	3.24	4.86	2.43	2.88	4.32	3.96	2.97	1.08	0.79
Food Processing	4.32	4.08	4.41	3.38	4.08	3.85	5.13	3.38	4.10	3.50	3.27	2.92	1.05	0.80
Manufacturing	2.95	3.22	4.02	2.50	3.50	3.15	4.04	2.85	2.87	2.68	3.02	3.02	1.05	0.67
Public Utilities	3.06	3.06	2.55	3.57	3.06	3.57	4.08	2.55	3.06	3.06	3.06	3.06	1.02	0.65
Construction	3.71	3.60	3.18	2.71	2.65	2.72	3.41	2.12	2.71	3.58	3.05	2.87	1.06	0.68
Wholesaling	3.96	3.60	3.24	4.86	3.78	3.96	4.75	4.32	4.32	3.02	5.40	3.24	1.08	0.81
Retailing	4.16	3.64	4.70	3.40	4.04	3.43	4.72	2.75	3.81	2.65	3.28	2.81	1.07	0.79
Land Transport	3.56	3.98	3.88	2.78	3.12	3.22	3.98	1.74	3.82	2.91	3.01	3.23	1.04	0.69
Air Transport	2.83	2.47	3.78	2.50	3.43	2.06	3.98	1.76	2.06	2.36	1.65	1.55	1.03	0.60
Business Services	4.03	3.81	4.92	3.89	3.53	3.42	4.44	2.64	4.07	3.33	3.23	3.94	1.11	0.75
Public Services	3.92	3.60	4.10	3.24	3.89	2.97	3.96	2.43	3.02	2.34	2.38	2.88	1.08	0.69
Personal Services	3.26	3.56	4.70	2.54	3.26	3.14	4.67	2.99	2.99	2.35	2.35	1.87	1.12	0.70
Tourism	3.48	3.29	4.54	3.07	3.47	3.25	4.75	2.69	3.12	4.11	3.16	3.63	1.12	0.76
Wt Impact Assessment Index (col Average/5)	0.70	0.70	0.81	0.58	0.63	0.61	0.86	0.52	0.62	0.60	0.61	0.60		

* Index is derived by dividing the average of the column or row scores by 5 (the maximum score on the Likert Scale).

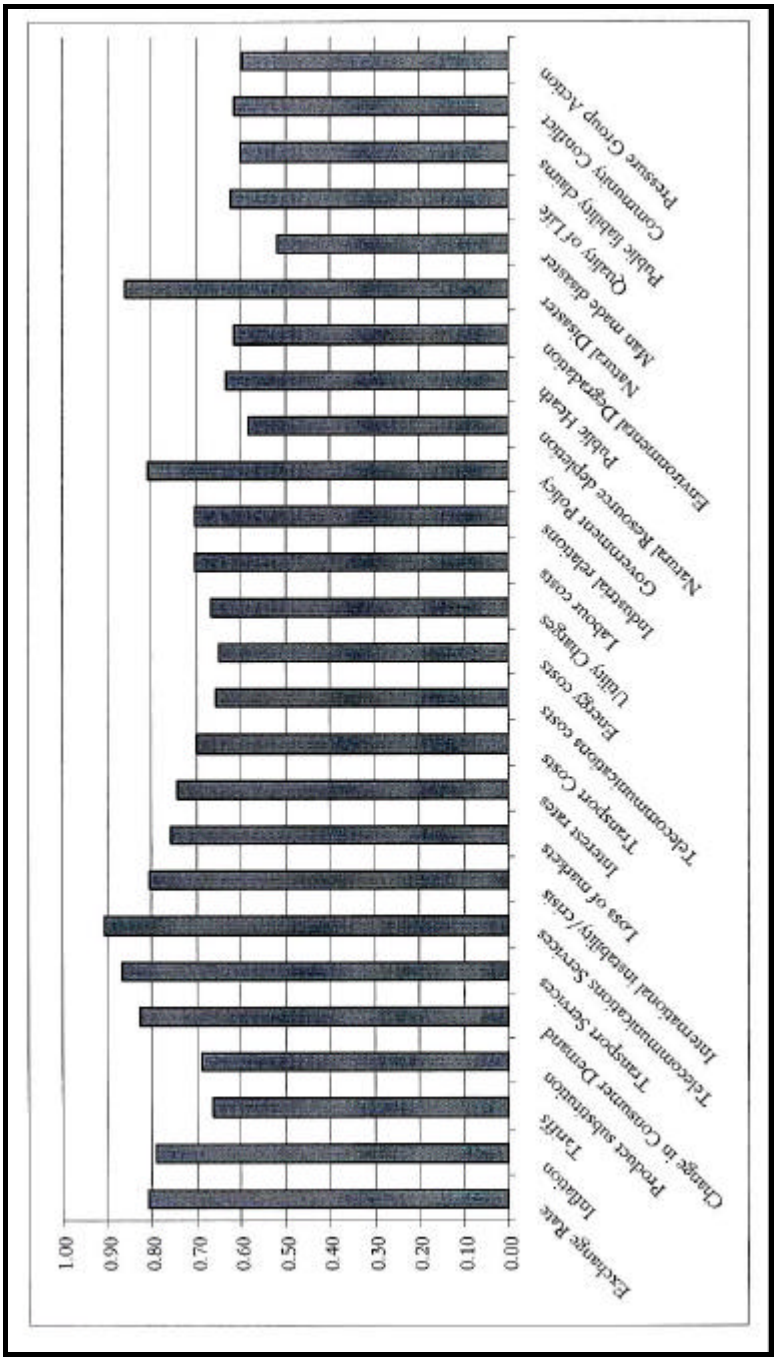

Figure 1. Weighted Risk Impact Index.

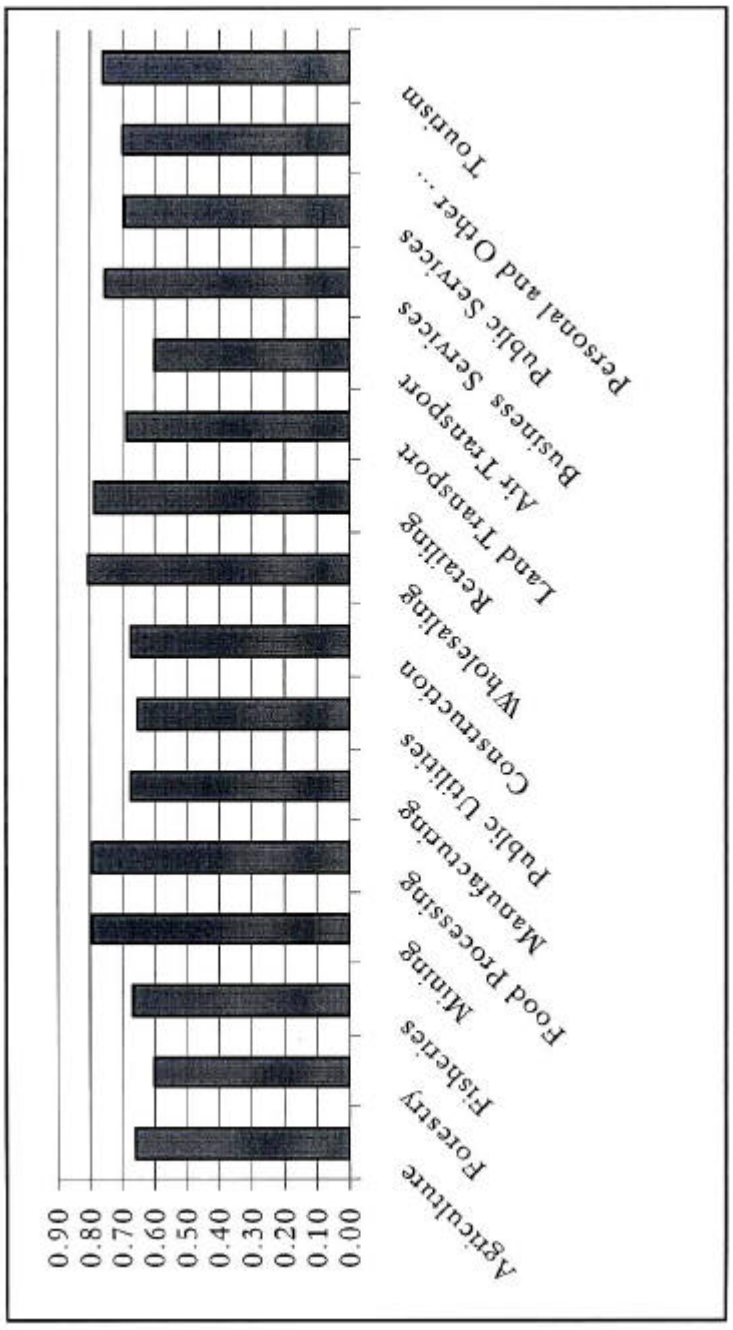

Figure 2. Weighted Industry Risk Impact Index.

Figure 2 shows the weighted industry risk impact index for 16 industry sectors of the FNQ economy. Food processing, mining, wholesaling and retailing are the industry sectors perceived to have the highest risk impact attached to them. Other sectors of the economy with high levels of risk exposure are: tourism, business services, general manufacturing, land transport and fishing.

Figures 1 and 2 provide important indicators of the potential impact of various risk on the FNQ economy. It would be interesting to use these indicators to test potential financial impacts on the region's economy using the input/output model developed for the region in 1994 (AHURI, 1995). This was not undertaken for this research, but the area is worthy of further investigation for application on regional risk scenario analysis to assist with developing regional risk management strategies. Such research may provide a very useful means of applying Multi Sector Attribute Analysis for disaster management and economic recovery planning in the FNQ region.

7. RISK POSSIBILITIES ANALYSIS

The second assessment involved a regional risk possibility analysis. Table 5 shows the risk possibilities of the 26 attributes. The table was derived from the average score of the 202 responses for each risk category[4]. Exchange rate risk is the highest risk possibility factor, followed by natural disaster and changes to government tariff policies. The first two events are perceived to have more than 80% possibility of occurring in the region during the next 10 years. The 81% chance of a natural disaster suggests a 1 in 12 year event, which is very close to what has taken place since metrological records have been kept for the region. Other risk factors that have high possibilities of occurrence include: an international crisis, inflation, rapidly rising interest rates, disruption to transport systems and loss of markets. Factors such as exchange rate, changes in government policy and international crises etc. are very difficult to predict.

Developing some estimate of risk possibilities has been important in formulating strategies for regional risk management in FNQ. The region perceives the possibility of some of the events shown in Table 5 to be high, and it has been in a much better situation to manage these, as was demonstrated recently. The response to the SARS outbreak is a good example of where the region's tourism industry switched and discounted heavily into the domestic market to make up for an expected international visitor short falls ahead of other regions. It was also able to swing back its marketing into the international market and recover quicker from SARS than other regions of Australia. Through improved industry risk assessment FNQ has been able to manage risk much better than other regions.

Risk factors perceived by respondents to have a low possibility of occurrence are widespread actions by pressure groups, natural resource depletion, racial conflict, public liability claims, community unrest and man-made disaster. These

[4] ANOVA comparison of means tests showed a high level of significance between means for 16 of the 26 risk factors for the industry sectors evaluated.

Table 5. Risk Possibilities.

Risk Factor	Risk Possibility < 10 years
Exchange rate	0.86
Natural disaster	0.81
Tariffs	0.77
Government policy	0.76
International instability/crisis	0.75
Inflation	0.74
Loss of markets	0.71
Interest rates	0.70
Transport services	0.70
Labour costs	0.66
Industrial relations	0.66
Transport costs	0.66
Change in consumer demand	0.64
Telecommunications services	0.64
Public health	0.63
Utility charges	0.63
Telecommunications costs	0.62
Energy costs	0.61
Product substitution	0.61
Quality of life	0.59
Environmental degradation	0.58
Community conflict	0.58
Natural Resource depletion	0.58
Public liability claims	0.57
Pressure group action	0.56
Major man-made disaster	0.48

findings suggest survey respondents perceived relatively high levels of social stability and sound management practice of the region's resources and infrastructure. This implies that there is a very favourable climate for long-term investment in the region's economy.

8. ANTICIPATED RISK

Table 6 shows anticipated risk for all sectors. The table was used to derive the anticipated risk attribute index shown in Figure 3. Exchange rate risk and natural disasters are the two highest anticipated risk factors affecting the region. Over 40%of the economy (i.e. tourism, agriculture, mining and fishing sectors) is dependent upon access to the region's natural resources and natural capital assets. The impacts of a natural disaster on the economy can be very significant, as past events have shown. The internationalisation of the economy makes it very susceptible to fluctuations in exchange rates, which especially affect the mining, agriculture and tourism sectors.

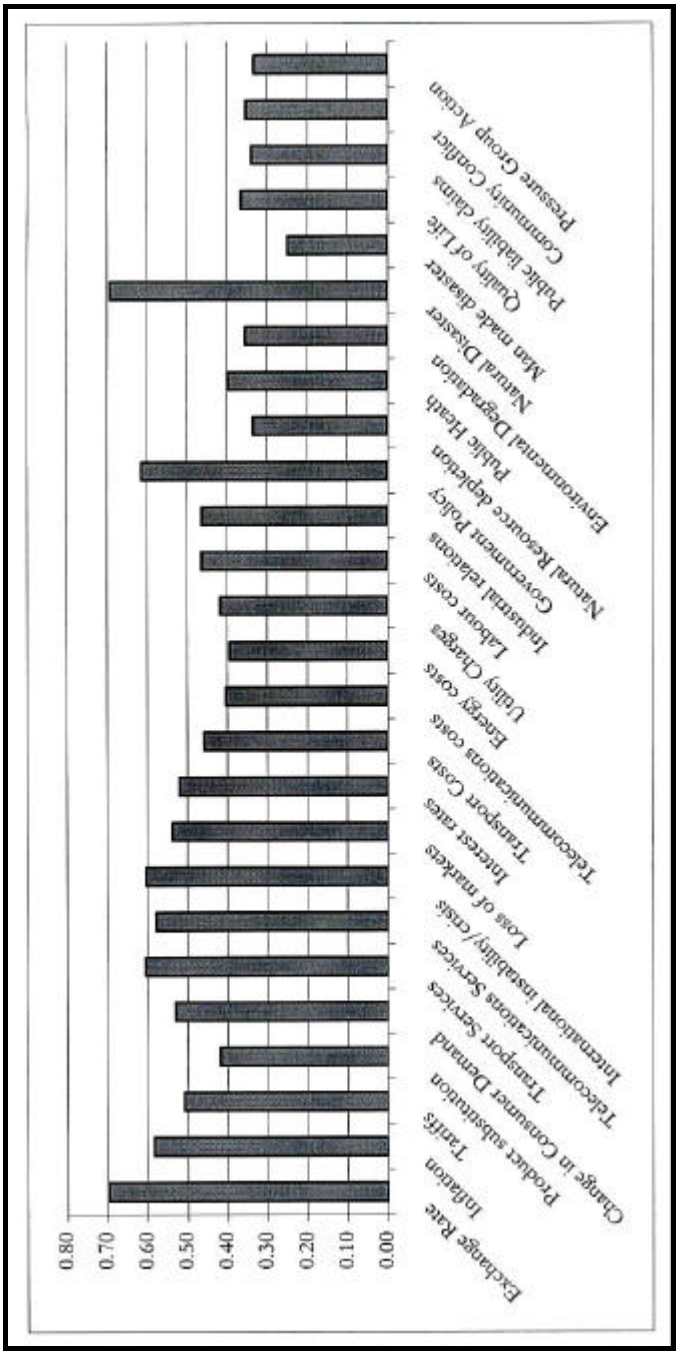

Figure 3. Anticipated Risk Index.

The high level of anticipated risk associated with the disruption of transport systems, the loss of markets and telecommunication services are risks affected by geographic location. The region has a small population and is remote from its principal supply centres and the trunk freight distribution network; subsequently many consumer goods and services must be imported at high cost. Disruption to the communication and distribution networks would have a significant impact upon many sectors of the economy. Inflation, international crises, interest rates, labour costs and changes in consumer demand are other anticipated risk factors that have the potential to impact significantly upon the economy. The low level of anticipated social risks suggests the region, is relatively stable and free of factors of concern to long-term investors. Environmental risks are perceived overall as low; however, some sectors of the economy have high anticipated environmental risks.

Table 6. Anticipated Risk Scores.

	Exchange Rate	**Inflation**	**Tariffs**	**Product Substitution**	**Change in Consumer Demand**	**Transport Services**	**Telecommunications Services**	**International Instability/Crisis**	**Loss of Markets**	**Interest Rates**	**Transport Costs**	**Telecommunications Costs**	**Energy Costs**	**Utility Charges**
Agriculture	3.9	3.0	3.0	2.1	2.7	3.0	2.4	3.1	2.6	2.6	2.3	2.0	2.1	1.7
Forestry	2.5	2.7	1.9	1.9	2.0	2.9	2.5	3.0	2.3	2.4	2.1	2.1	1.9	1.8
Fisheries	4.0	2.7	2.7	2.2	2.6	3.2	2.6	3.0	2.4	1.9	1.8	1.5	1.4	1.9
Mining	3.1	3.3	3.3	2.9	2.7	3.0	3.2	2.9	3.2	2.8	2.8	2.1	2.0	2.7
Food Processing	3.5	3.1	1.4	2.0	2.9	3.1	2.9	3.2	3.3	2.8	2.7	2.2	2.7	2.7
Manufacturing	3.7	2.9	2.8	2.3	2.4	2.7	2.7	2.5	2.7	2.1	2.0	1.6	1.4	1.8
Public Utilities	3.2	2.2	2.6	1.8	2.4	2.6	3.2	3.0	1.8	2.1	2.0	1.8	1.5	1.9
Construction	2.9	3.2	2.1	1.8	2.6	3.3	2.8	3.0	2.9	2.3	2.0	1.8	2.0	2.2
Wholesaling	3.1	3.3	3.0	1.6	2.5	2.7	2.5	3.6	2.6	3.2	2.6	2.2	2.6	2.7
Retailing	3.8	3.0	3.3	2.2	2.8	3.3	3.0	3.0	2.6	3.6	2.7	2.3	2.2	2.2
Land Transport	2.8	2.4	2.8	2.3	2.5	3.1	3.0	1.8	2.2	2.3	2.3	2.1	1.9	1.9
Air Transport	4.0	2.5	1.8	1.2	2.3	2.9	2.8	3.0	2.7	2.3	2.1	1.7	1.5	1.6
Business Services	3.4	2.8	2.4	2.0	2.6	2.6	3.0	3.2	2.8	2.7	2.0	2.2	1.9	2.0
Public Services	3.8	2.9	2.3	2.4	2.9	2.8	3.0	2.9	2.5	2.4	2.1	1.8	1.5	1.5
Personal and Other	3.3	2.8	2.5	2.0	2.8	2.9	3.0	3.1	2.9	2.5	2.0	2.3	2.0	2.0
Tourism	4.0	3.0	2.2	2.0	2.9	3.6	3.0	3.2	2.9	2.8	2.4	1.8	2.1	2.1
Anticipated Risk	0.7	0.5	0.5	0.4	0.5	0.6	0.5	0.6	0.5	0.5	0.4	0.4	0.3	0.4

Table 6 *(contd)***.** Anticipated Risk Scores.

	Labour Costs	Industrial Relations	Government Policy	Natural Resource depletion	Public Health	Environmental Degradation	Natural Disaster	Man-made Disaster	Quality of Life	Public Liability Claims	Community Conflict	Pressure Group Action	Industry Anticipated Index *
Agriculture	2.43	2.20	3.25	0.33	0.40	1.41	3.55	0.81	1.46	1.51	1.76	1.88	0.45
Forestry	2.31	2.31	2.66	1.15	1.05	1.01	3.03	0.97	1.02	1.27	1.15	1.54	0.40
Fisheries	1.69	1.89	3.17	1.54	1.65	1.70	2.93	1.41	1.64	1.67	1.85	2.00	0.44
Mining	2.14	2.99	3.55	1.66	2.49	1.87	3.93	1.18	1.69	2.44	2.29	1.67	0.53
Food Processing	2.85	2.70	3.35	1.95	2.57	2.22	4.15	1.64	2.40	1.98	1.88	1.64	0.53
Manufacturing	1.95	2.13	3.05	1.44	2.20	1.82	3.27	1.38	1.68	1.51	1.74	1.70	0.45
Public Utilities	2.02	2.02	1.94	2.05	1.92	2.06	3.30	1.24	1.79	1.73	1.76	1.72	0.43
Construction	2.45	2.38	2.41	1.56	1.67	1.57	2.76	1.03	1.59	2.02	1.76	1.61	0.45
Wholesaling	2.62	2.37	2.46	2.80	2.38	2.29	3.84	2.09	2.53	1.71	3.11	1.82	0.53
Retailing	2.75	2.40	3.57	1.96	2.54	1.98	3.81	1.33	2.23	1.50	1.89	1.58	0.52
Land Transport	2.35	2.63	2.94	1.60	1.96	1.86	3.22	0.84	2.24	1.65	1.73	1.81	0.45
Air Transport	1.87	1.63	2.87	1.44	2.16	1.19	3.21	0.85	1.21	1.33	0.95	0.87	0.41
Business Services	2.66	2.51	3.73	2.24	2.22	1.97	3.59	1.28	2.39	1.88	1.86	2.21	0.50
Public Services	2.59	2.37	3.12	1.87	2.44	1.71	3.20	1.18	1.77	1.32	1.37	1.62	0.46
Personal and Other	2.15	2.35	3.57	1.46	2.05	1.81	3.77	1.45	1.75	1.33	1.36	1.05	0.47
Tourism	2.30	2.17	3.44	1.77	2.18	1.87	3.84	1.30	1.83	2.32	1.82	2.04	0.50
Anticipated Risk	0.46	0.46	0.61	0.34	0.40	0.35	0.69	0.25	0.37	0.34	0.35	0.33	

*Index is derived by dividing the average of the column or row scores by 5 (the maximum score on the Likert Scale).

Figure 4 shows the anticipated industry risk index for the FNQ economy. The wholesale trade industry has the highest anticipated risk exposure level in the region. Wholesaling has a high degree of interaction with other industry sectors (Roberts and Bayne, 1995) supplying a wide range of goods to the retail, tourism, construction, manufacturing and process industry sectors. The wholesale trade industry sector has both primary and secondary risk impacts. Rapid changes in exchange rates and changing markets in other industry sectors will trigger a major impact in the wholesale trade sector, but so will secondary risk factors such as disruption to transportation. Retailing, manufacturing and business services have similar characteristics. Food processing is the second highest anticipated risk industry, followed by wholesaling, retailing and mining.

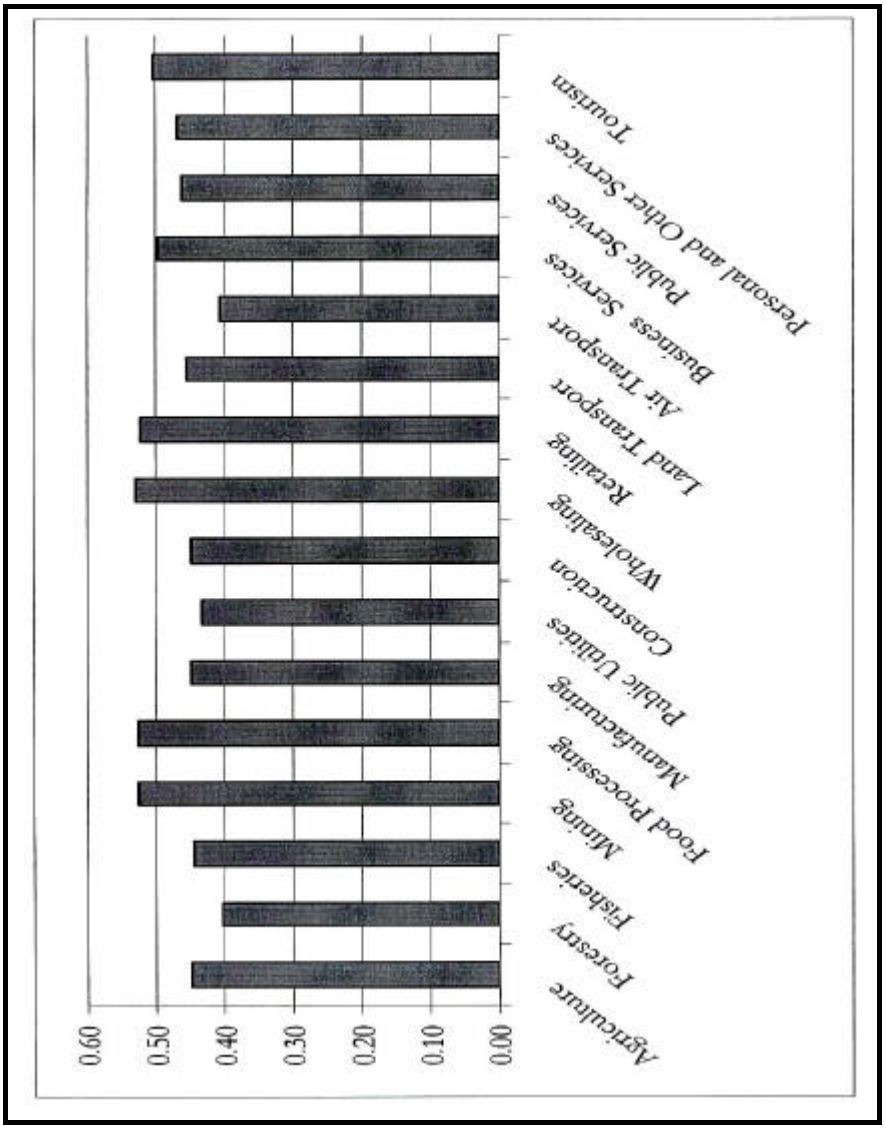

Figure 4. Anticipated Industry Risk Index.

Sectors of the FNQ economy that have low exposure to anticipated risks are predominantly endogenous industries including construction, community needs or small-scale enterprises. These sectors are not highly exposed to competition and trade – except where major construction is involved.

9. TWO CASE STUDIES OF SECTOR INDUSTRY ANTICIPATED RISK

The multi-sector attribute analysis of risk above gives a useful insight into the ways risks impact upon the FNQ region's economy. Of more interest to planners and managers in the region is the anticipated risk for specific sectors. Seven case studies of anticipated industry risk were undertaken in the region (Roberts, 2000a) but only two case studies, the food industry and tourism industry clusters are reported here. Strategies for regional risk management in FNQ require more detailed analysis of sector industry risk.

9.1 Food Processing Industry

Table 7 shows the anticipated risk for the food processing industry in FNQ. The scale measurement of anticipated risk shown as high (>0.75), very significant (0.65–0.75) and significant (0.5–0.64) are nominal and were determined as an outcome of a focus group discussion. The highest anticipated risk factors for the sector are natural disasters and exchange rate changes. The sector is dominated by the sugar industry, which is subject to intense international competition, and many of its practices must improve if it is to remain competitive (Hildebrand, 2002). In particular the sugar industry is sensitive to exchange rate fluctuations, changing international markets, disruption to transport systems, diseases and labour costs. Other moderately high-anticipated risk factors are utility charges, industrial relations and energy costs.

Anticipated risk in the sector is expected to rise in future as the food processing industry expands onto the Atherton Tablelands and demand for water and improved transport services arise. Water access, transport, energy and pollution factors will become critical factors to the competitiveness of the food processing industry. The provision and reliability of these services is by no means certain as community pressures grow to contain development to existing cultivated areas. Many of the risks to the sector are endogenous and will require careful management in the future.

The high level of exposure of the food processing industry to international competition will require comprehensive regional and state-wide industry strategies to manage regional risk. Regional growers and the State Government are not in a position to influence the global sugar market, as Australia supplies less than 3%of total world demand. The region, and more specifically the State needs to support initiatives to minimize exchange rate risk and prices through schemes that allow greater efficiencies at the production level and price hedging and future options in support of exchange rate and market price exposure. The industry will need also to address improved farming practices to offset growing environmental concerns related to pollution caused by nutrient enriched run off and the impact this has on coastal reefs. The application of industrial ecology (Graedel and Allendby, 1995), and an emphasis on cleaner production will be necessary to minimize pollution and rising production costs in the industry in future.

Table 7. Anticipated Risk Food Processing Industry.

Food Processing	Anticipated Risk Score	Priority
Natural disaster	0.83	High
Exchange rate	0.71	Very Significant
Loss of markets	0.67	Very Significant
Government policy	0.67	Very Significant
International instability/crisis	0.66	Very Significant
Inflation	0.63	Very Significant
Transport services	0.63	Very Significant
Change in consumer demand	0.59	Significant
Telecommunications services	0.59	Significant
Interest rates	0.57	Significant
Labour costs	0.57	Significant
Transport costs	0.55	Significant
Utility charges	0.54	Significant
Industrial relations	0.54	Significant
Energy costs	0.54	Significant
Public health	0.51	Significant

9.2 Tourism Industry

Table 8 shows the anticipated risk for tourism in the FNQ economy. Tourism is the largest industry sector contributing to more than 24%of gross regional product (Horwarth and Horwarth, 1993). The industry is highly internationalised and amongst the most competitive in the world. The highest levels of anticipated risks affecting the industry are exchange rates changes, natural disaster, disruption to transport systems and government policy on tariffs. These reflect operating conditions in global markets and consumer choice of the tourism product offered by the region. Because of the degree of international risk exposure created by these conditions, tourism product and services diversification is essential as part of a strategy for risk management in the region. The region is now developing successful links with other industry sectors to promote a broad range of regional products and services.

The regional tourism industry will continue as a high-risk industry because of its dependence upon international markets for growth. There is little the industry can do to protect itself against global factors, such as terrorism, that might impinge upon international travel. It is not in a position to influence tourism markets, compared to competitor destinations such as Hawaii where the domestic tourism market is very much stronger. However, continuing to develop and diversify the tourism product, and attending to environmental, political and social risk management are means of maintaining a competitive product and

Table 8. Anticipated Risk for the Tourism Sector.

Tourism	Anticipated Risk Score	Priority
Exchange rate	0.80	High
Natural disasters	0.77	High
Transport services	0.73	Very Significant
Government policy	0.69	Very Significant
International instability/crisis	0.65	Very Significant
Inflation	0.61	Very Significant
Telecommunications services	0.61	Very Significant
Change in consumer demand	0.60	Very Significant
Loss of markets	0.59	Significant
Interest rates	0.57	Significant
Transport costs	0.49	Significant

position in global and domestic tourism markets. This will require a more collaborative approach to risk management by the tourism industry in the region, as well as support from government and regional business. The tourism industry will also need to develop stronger strategic and cultural alliances with other regions and nations to overcome increasing competition from destination product competitors.

An important strategy and risk management for regional tourism must be greater leveraging of opportunities for the development and promotion of other regional products and services through the tourism industry. This has the potential to create new value-added industries in the region's economy.

10. THE MANAGEMENT OF REGIONAL RISK

This developmental research has provided an important insight into risk and its potential impact on one of Australia's fastest growing regions. Statistical analysis undertaken for the research, but not reported in this paper, suggests there are significant statistical relationships or links between risk factors (Roberts, 2000a). For example, government policies, interest rates and exchange rates, transport costs and industrial relations and government policy and tariffs. This suggests risks can have significant cumulative causation or knock-on effects (Krugman, 1995; Myrdal, 1957), which can vary within and between industry sectors. Further investigative research is needed into this field, possibly using input output analysis to model flow-on effects. Such research would need to be supplemented by building into the analysis intensity, duration and scale factors. These could have a very significant influence on the elasticity of regional economies and industry sectors to recover from high impact events.

The research suggests that, in the case of FNQ, exogenous risks are of greater concern to the region than endogenous risks. This reflects the highly international nature of the region's economy, and the fact that endogenous risk can generally be managed or controlled more easily. However, some aspects of

endogenous risk, especially economic risk, can be managed through instruments available in the financial and insurance markets. For highly disruptive international political or social events, there is little a region like FNQ can do but to try and manage these as best it can. For high export regions, especially rural/mining regions, exogenous risks are likely to have high impacts. For the metropolitan regions of Australia, endogenous risks are likely to be more significant. This raises an important policy issue whether governments should provide some measure of support to regions with high exogenous risk exposure. Many of these regions have smaller populations and do not have the resources and/or expertise to collectively manage exposure to exogenous risk.

There are certain risks that FNQ will always find difficult to manage. Natural disaster is an ever-present risk. Better post-disaster management involving the restitution of physical and economic infrastructure, as shown after the most recent cyclone in 2000, enabled the economy to recover much more quickly from this type of event. Several industries such as fishing, mining, tropical agriculture and education services have developed a more collective approach to risk management. Collective risk management by some sectors of the horticulture industry, for example, should provide some stability for prices and also enable better business management and budgeting.

The tourism industry is examining collective risk management of social risks involving crime against international visitors. There is a realisation in the region that collective risk management can have an impact on reducing risk exposure to individual business enterprises. This was not the case until very recently when risk was seen by government and business as something that was the responsibility of individual enterprises. Regional risk management is now understood by many firms to be important not only in protecting the significant capital base that the region has developed, but also in maintaining its competitive position as one of Australia's most dynamic regional economies.

11. CONCLUSION

Risk management is a new and largely unexplored area of regional economic research. Few regional organizations understand or consider risk and the impact it has on sustainable economic development. It is often not until a disaster has struck that business, public authorities and communities realise that preventative measures could have substantially reduced the impact of risk-related events. Regional risk management is important, not only to the protection of investment and lives, but to maintaining and developing systems in a state of preparedness to respond to potential threats. Risk management also has an impact on regional competitiveness, especially investor assessment of expected returns, trading conditions and visitor attractiveness.

High levels of regional risk may also be conducive to speculative and short-term investment. This event was shown with investment in the region's tourism industry by Japanese corporations in the in the late 1980s (Daly and Logan, 1989; Daly and Stimson, 1993). Where government instability or corruption is high, governance and social risk to investor's increases. Regional development and municipal managers, like financial managers, need to treat regional

industries as a portfolio investment, and to develop strategies to minimize risk within the portfolio where this is possible. Just as portfolio finance managers have well-established techniques for analysing economic and trade risks, regional economic development organizations, governments and business organizations must also develop techniques to analyse the risks that affect regions and how these can be managed to maintain competitiveness and protect assets used for production. Regions that do this will be in a strong position to attract investment and other business.

The extent to which governments should act as a guarantor to reduce risk exposure of local firms and industries needs to be considered carefully. Governments can do much to reduce risk exposure to business and society through the services they provide, the laws and regulations they enact, and the measures they can take to protect public and private property, persons and investment. It is the Commonwealth and State Governments that are in the strongest position to take action on these matters. Firstly, however, there is a need for regional business and government to identify, evaluate and monitor risks that have the potential to impact upon their economy before seeking Commonwealth and State government support for risk mitigation measures. Strategies need to be developed nationally to guide government intervention to reduce public and private sector exposure to known risks; to spread risk management between the public, private and community sectors; to protect employment and investment loss from poaching by large corporations and other state investment incentive schemes; and to reduce heavy capital outflows from regional economies should these occur in the future.

This exploratory paper has sought to investigate the application of Multi Sector Attribute Analysis as an analytical tool for developing a better understanding of how to evaluate and manage regional risk. More research is needed to develop better techniques to access the impact and the possibility of regional risk events occurring. This information is needed to improve risk forecasting for business planning and insurance. The analysis provides useful information for portfolio risk management of the industry sectors in the economy. The application of the MSAA technique provides useful information to improve regional risk management and for contingency measures for post-risk recovery. An important point noted by the research is the very limited attention given to regional risk strategic planning processes. The tendency of economic development strategies to focus on growth and competitiveness, without consideration of regional risk, is highly dangerous. Risk management is one of the highest priorities for business success and survival. It should be the same for managing regional economies in the future.

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