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Further lessons from the Ord

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Abstract

In their 1982 publication 'Lessons from the Ord' Davidson and Graham-Taylor exposed the lack of information and the prevalence of political agendas in far-reaching regional development decisions in northern Australia during the 1960s. This paper revisits regional development issues in northern Australia four decades on. It does so in the context of ongoing natural-resource based development in the Kimberley region with specific reference to the Ord River valley. Focussing almost exclusively on the information aspect of development decisions with specific emphasis on mining and agriculture, and largely ignoring process and policy issues, this paper elicits three important lessons. (1) Preferred regional development in Northern Australia remains preoccupied with natural-resource based industries despite the relatively low economic and employment benefits for regional communities. Specifically, much of this development does not address the needs of a large Aboriginal population that is clearly disadvantaged. (2) Public debate about regional development is subdued and not informed by comprehensive information. Data, specifically of an economic and social nature, is sparse and access to existing data is carefully managed by State government agencies, allowing for limited scrutiny of development decisions. (3) Participatory and socio-economic research designed to widen the stakeholder base and develop and assess a wider range of development options is not supported by influential stakeholders.

1 Introduction

Tropical northern Australia stretches from Townsville in the east to Broome in the west. It is rich in natural resources, including minerals, land and water as well as terrestrial and marine biodiversity, and it is sparsely populated. Excluding the Queensland east coast, there are 255 thousand people – or 1.4 per cent of Australia's population – living on 1.78 million square kilometres of land – or 23 per cent of Australia's surface area (Johnson *et al*., 1999).

There is buoyant interest in the development and exploitation of tropical Australia's natural resources. Hodges (2001a) outlines a series of development projects across northern Australia, in various stages of realisation. Commercial development opportunities and proposals include expansion and intensification of grazing, new irrigation, aquaculture, fishing, mining and tourism projects (Hodges, 2001b). Natural resource-based commercial development is at the core of regional development in northern Australia.

Development of natural resource use in the southern parts of Australia has happened largely unregulated and in the absence of scientific data and understanding. Various resource degradation issues have emerged at a large scale as a direct consequence. Northern Australia has the opportunity to learn from the lessons of the South and develop its resources in a long-term sustainable manner.

The concept of ecologically sustainable development (ESD) has re-shaped thinking about planning and policy in all aspects of development (COAG, 1992). ESD acknowledges that increasing quality of life equally embodies satisfaction of non-material human needs and fulfilment of desires and aspirations many of which are directly related to environmental quality. Despite ongoing debate about what exactly sustainable development is, there is broad consensus that safeguarding of ecological resources and aspects of intra- and inter-generational equity are to be given equal consideration to economic growth arguments (eg. Common, 1995). ESD therefore demands a knowledge-based approach to development based on the principles of ecological sustainability, equity, precaution and economic viability.

This paper assesses whether natural-resource based development in the Kimberley region is based on ESD principles. It is structured into seven sections. Section 2 provides an overview of relevant geographical aspects of the Kimberley region. Section 3 reviews the history of agricultural development in the Ord River valley. Section 4 summarises the concept and progress of a research and development program designed to support ESD in the Kimberley. Section 5 analyses the contribution of natural resource-based industries to the regional economy and the welfare of the community. Section 6 deals specifically with the issue of water management in the context of agricultural development. Section 7 provides an interpretation of the material presented. The paper closes with a set of conclusions that contain 'further lessons from the Ord'.

The data presented in this paper is taken from a study undertaken by a team of people (Greiner *et al*., 2001).

2 Geographic context

The Kimberley region is an extensive and rugged region in Western Australia. The vast majority of the region is covered by the statistical division 'Kimberley'. It comprises four statistical local areas, which are identical to the four local government areas of Broome, Derby West-Kimberley, Halls Creek and Wyndham East-Kimberley. The eastern section of the Kimberley region stretches into the Northern Territory where it intersects the Victoria SLA.

Much of the East Kimberley area is drained by the Ord River, which flows into the Joseph Bonaparte Gulf. Acknowledging the land-sea interface, this region is referred to as the Ord-Bonaparte Region (Figure 1).

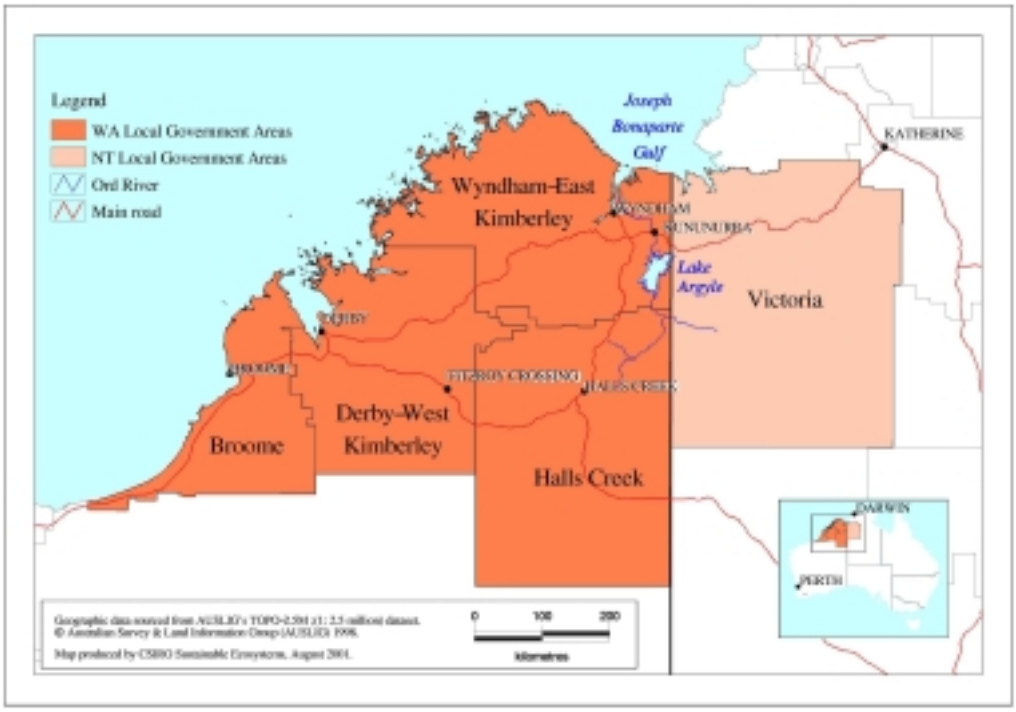

Figure 1: The Kimberley and the Ord-Bonaparte region

The Kimberley SD covers an area of approximately 419,000 square kilometres and occupies one sixth of Western Australia's total area. It is about twice the size of Victoria and three times the size of England. The majority of the population of approximately 35,000 are concentrated in and around Broome, Kununurra, Derby, Halls Creek, Wyndham and Fitzroy Crossing. 34 per cent of the regional population is Aboriginal. There are over 250 Aboriginal communities of various sizes throughout the region and nearly 100 properties involved in the pastoral industry.

Traditionally, primary industries have played a major role in the regional economy, specifically grazing and mining. The last major natural-resource based development occurred during the 1960s with the construction of the Ord Irrigation scheme and the development of the first stage of the Ord River Irrigation Area, often referred to as 'ORIA' or 'Ord' Stage 1.

Today, natural resource-based development is still seen as the key to economic growth for the Kimberley region (Department of Local Government and Regional Development and Kimberley Development Commission, 2001). The expansion of the ORIA (Stage 2) and the establishment of irrigated agricultural developments in the West Kimberley are critical to this vision. Other important developments include a large-scale aquaculture industry, expansion of pearling, and offshore and onshore mining and energy projects.

3 Lessons in history

"The Ord" epitomises agricultural development in Northern Australia and all the pitfalls associated with development that is not underpinned by ESD principles.

Ord Stage 1 was constructed in the 1960s. The project was financed through a Commonwealth Government grant to Western Australia for developing the North. The main water reservoir (Lake Argyle) was completed in 1972. In 1965 Bruce Davidson first published a rigorous assessment of agricultural and pastoral development in tropical Australia with specific reference to irrigation development in the Ord River valley (Davidson, 1972 [3rd ed]). He questioned the economic viability of the type of project and thought the non-economic arguments surrounding the ORIA were based on a misguided political agenda. Graham-Taylor's review of Ord Stage 1 (1982:31) demonstrates that economic risks became apparent during the planning stage and concludes that the project seemed motivated by political considerations such as 'defence and closer settlement'.

By the late 1970s the WA State and Commonwealth governments conceded that the scheme had failed due to its inherent high cost structure and a poor understanding of basic Ord agronomy and that the few farmers who were still cropping their lands were operating at a marginal level of profitability despite financial support from the WA government (Young 1979).

In 1982 Davidson stated that "in retrospect, the most interesting aspect of the Ord River Irrigation Project is that anyone should at any time have thought that it would be economically viable" (p.1) and "the project clearly demonstrates the danger of proceeding with any large-scale agricultural development in isolated areas of Australia without a thorough examination of the economics of the scheme" (p.19-20). Ord Stage II seemed imminent and Davidson concluded that "the political advantage to be gained from proceeding with the project outweighed the economic advantages of not proceeding with it" (p.20).

Based on the evidence that Davidson (1982) and Graham-Taylor (1982) collated, Lindsay (1982) summarised five 'lessons from the Ord':

1. Major decisions were made without clear and public argument about the virtues of private and public investment.
2. Fiscal responsibility by the federal government was abandoned to the point that one might argue that "our federal system has insufficient discipline built into it" (p.vii).
3. There was insufficient parliamentary scrutiny of expenditure.
4. There was a need for government to establish a reliable calculus of the pork barrel.
5. The viability of agricultural industries relied on ongoing government subsidies.

In the context of the ESD debate these lessons address a fundamental violation of the economic viability principle, the absence of sound data in decision making and the lack of a thorough debate on trade-offs and opportunity costs. Most importantly, the lessons demonstrate and substantiate the key role that policy failure plays in generating un-sustainability. Having been written in the pre-ESD era, the lessons do not highlight the utter disregard for the ecological impact of the scheme (Walker, 1992) or its social implications.

4 The Ord-Bonaparte Program

A recent scoping study into planning and management processes into northern Australia concluded that there was a critical lack of data and whole-of-systems understanding deemed fundamental if development decisions were to comply with ESD principles (Johnson *et al.*, 1999). In response to the study and in an endeavour to demonstrate the important contribution of research to sustainable regional development, a research and development (R&D) program was designed to support decision makers, planners and managers of natural resources in a case study region. The Ord-Bonaparte region in the Kimberley was chosen and the program called the Ord-Bonaparte Program (OBP). A business plan was developed as basis for negotiations

with stakeholders, contributors and collaborators (CSIRO, 1999), which provided the basis for a joint venture agreement by various Commonwealth, WA State and regional agencies and organisations (OBP, 2000).

The OBP concept is to complement existing planning and community processes with multi-disciplinary science and additional stakeholder engagement avenues, specifically with respect to the involvement of the indigenous peoples in the region (CSIRO, 1999). The OBP was to achieve this by:

1. providing better data and integrated understanding of biophysical, socio-economic, cultural and institutional aspects of natural resource management;
2. integrating across multiple natural-resource based industries including agriculture, aquaculture, fishing, grazing and tourism as well as indigenous and non-market uses of the resources;
3. combining the capability of all relevant local, regional, state and federal stakeholders; and
4. providing processes that involve a broad community base with specific emphasis on Aboriginal participation.

The underlying research paradigm is that research is an important contributor to sustainable regional development by combining traditional science with participatory approaches which enable people to learn from science and from one another, and by working with and supporting policy makers. This is encapsulated in the participatory research approach (eg. Roling, 1996). A participatory and ecosystem-based approach for sustainable natural resource management provides a unique opportunity for R&D to address natural resources-related issues and conflicts, improve engagement and negotiation, and support institutional and policy reform.

Greiner and Johnson (2000) demonstrate the philosophical alignment of the program with the principles of ESD and the concepts and methods underpinning ecological economics. Greiner and Zhu (2001) further outline how the research concept and its structural and methodological implementation were informed by the theories of systems analysis and integration.

The geographical scale of the program is pitched at the bio-regional level. A series of federal and state programs, policies and legislation in Australia now actively encourage regional involvement and governance. Examples are the initiation of catchment management bodies for integrated catchment management in the early 1990s, an ecosystem-based and consultative process of implementing the Oceans Policy, the 2001 National Action Plan for Salinity and Water Quality and the 2001 Stronger Regions, A Stronger Australia statement.

Integrating Aboriginal perspectives into planning processes was seen as a key area of effort given the relative disadvantage of Aboriginal people, which is evident in basic statistics such as unemployment rates – the rate of unemployment for Aboriginal people in 1991 was 20% compared to 7.6% of the non-Aboriginal population (Kimberley Land Council, 1995) – but also in complex indicators such as the ABS index of relative socio-economic disadvantage. Figure 2 shows that areas with a higher proportion of Aboriginal population have a lower index, meaning they are at a greater disadvantage.

Conceptually and methodologically the OBP featured a strongly interdisciplinary approach, integrating approaches in the areas of ‘socio-economic data and understanding’, ‘synthesis and integration’, ‘participation’, ‘institutions’, ‘capacity’, ‘indigenous social and cultural issues’ were given equal weight to the traditional areas of ‘biophysical resource inventory’, ‘process understanding’, and ‘monitoring and evaluation’.

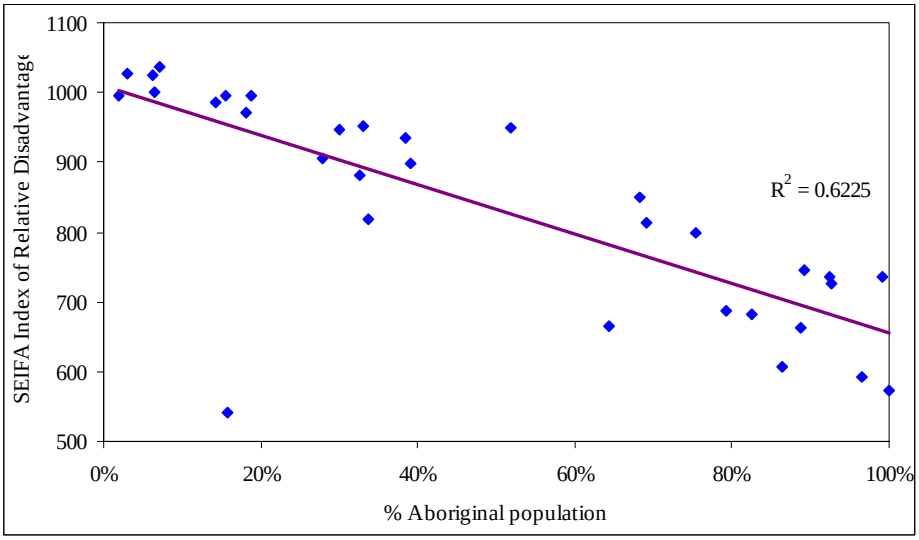

Figure 2: Correlation between Aboriginal population in collection districts and Index of Relative Socio-Economic Disadvantage for collection districts in the Kimberley

(Source: Greiner et al., 2001)

During the implementation process of the OBP in 2000 and a scoping phase of proposed research areas in 2001, the R&D content of the OBP was negotiated between collaborators and stakeholders. In response to expressed concerns of influential regional stakeholders and a reduced funding framework, the proposed integrative components did not proceed as planned, namely socio-economic and institutional analysis, integrated investigation and information delivery, and inquiry into tourism, non-commercial activities and non-market values. Despite maintaining an integrative intent in principle, the R&D program for now consists of projects that concern themselves primarily with water management issues in Ord Stage 1 and downstream impacts of irrigation on the lower Ord River. Capacity building activities are in place to enhance Aboriginal engagement and there is minor funding for rangeland research.

Notwithstanding the merit of the funded projects, the OBP will be unable to support investment in the Kimberley without a broader and integrative perspective, which can provide full account of environmental, social and economic considerations and potentially competing stakeholder objectives, thereby providing transparency, assessing trade-offs and challenging entrenched paradigms in planning and management processes.

5 The contribution of natural resource-based industries to the regional economy and welfare of the regional community

Natural resource-based industries are seen as the backbone of the Kimberley regional economy and an important source of welfare for the regional community as well as Western Australia and Australia at large. There is much optimism about future opportunities in enterprises associated with mining, agriculture, pearling and tourism (Coetsee and Kleyn 2000). Natural resources include landscape or ‘country’, vegetation and biodiversity, soils, water and minerals. Minerals are distinct from the others in that they are classified as a non-renewable resource.

There is a range of commercial and non-commercial uses of these resources. Table 1 provides a generic overview of natural resources in the Kimberley and their uses through various user groups, and differentiates extensive uses from more point-scale uses. It reveals a mix of

commercial and non-commercial uses of natural resources with 'country' and water being the most diversely and extensively used resources.

Different uses place different demands on a resource and where these demands are mutually exclusive or exceed the capacity of a resource, conflict occurs. The user groups should not be considered mutually exclusive. Specifically, most people working in commercial industries are also residents. Uses can be complementary, for example, pastoralists can also be tourist operators and recreational fishers. Many pastoralists are Aboriginal.

Table 1: Natural resources of the Kimberley region and their primary uses
(user groups in alphabetical order; *E)* indicates extensive uses as opposed to point-scale uses)

	Natural resources				
	Landscape or 'Country'	Vegetation and Biodiversity	Soils	Water	Minerals
Aboriginal People	Living, Cultural uses E), Recreation	Subsistence hunting and gathering E), Cultural uses	Subsistence agriculture	Human consumption, Cultural uses, Recreation	Cultural uses
Aquaculture enterprises	Enterprise location			Growth medium	
Farmers	Agriculture		Agriculture	Irrigation	
Commercial Fishers		Life support for and source of fish E)		Growth medium, Enterprise location E)	
Graziers	Cattle grazing E)	Cattle grazing E)	Cattle grazing E)	Cattle watering	
Mining and exploration companies	Enterprise location			Mineral processing	Exploration, Mining
Non-use interests	Conservation E)	Conservation E), Management	Support for natural processes E)	Support for natural processes E)	
Resident (non-Aboriginal) population	Living, Recreation E)	Recreation		Human consumption, Recreation	
Tourist operators	Tourist attraction E)	Tourist attraction E)		Human consumption, Scenic value	(Tourist attraction)
Tourists	Viewing E), Experience	Viewing, Experience		Human consumption, Recreation	(Souvenirs)

There is little economic data available at the level of individual natural resource-based industries at the regional scale. The reasons are:

1. The resolution of published data is usually limited to the state or territory level.
2. Agricultural, pastoral, forestry and fisheries sectors are aggregated into one category or industry titled 'agriculture'.
3. The contribution of 'tourism' is not commonly derived as it encompasses multiple industries including accommodation, restaurants and cafes, transport, and cultural services, amongst others.

There is one set of estimates of the monetary or gross value of production for the Kimberley for natural resource-based industries. The estimates were derived using the ORANI model, a multi-sectoral general equilibrium model, which, for the purpose of this exercise,

differentiates 27 industries and/or products. (KDC 1997: xii). The estimates for gross value of production are shown in Figure 3.

In 1995, the natural resource-based industries accounted for 43% of total production value generated in the Kimberley. In terms of individual contribution, mining was by far the largest revenue earner with $560 million. The most important mining products are diamonds, gold, iron ore, lead/zinc and oil (off-shore). The high revenue from fishing and aquaculture ($149 million) is predominantly generated by pearling off the West Kimberley coastline. However, commercial fishing in the Bonaparte Gulf, Ord River and Lake Argyle are important sources of fish and prawns. Revenue generated by tourism-related activities was approximately $140 million.

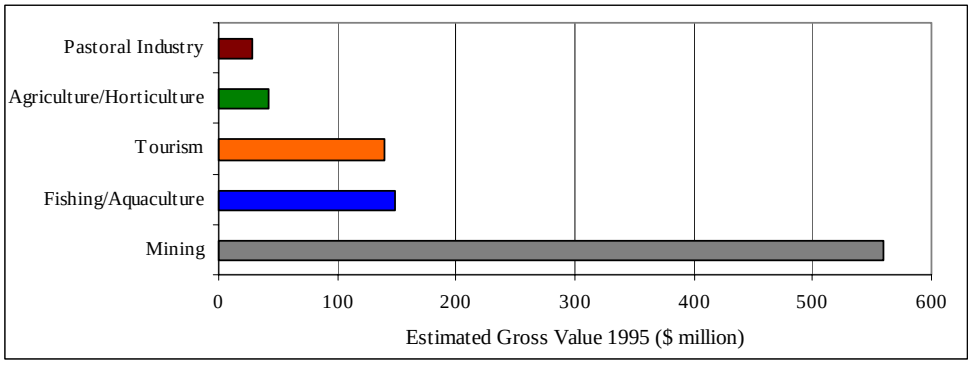

Figure 3: Estimated Gross Value of Production of natural resource-based industries for the Kimberley in 1995

(Source: Kimberley Development Commission 1997: xii)

The revenue of the land-use based industries agriculture/horticulture and grazing were $42 million and $29 million, respectively. The estimates indicate that in 1995 agriculture/horticulture generated approximately $4200 per hectare of land while grazing generated, on average, $132 per square kilometre (or $1.32 per hectare).

These ORANI estimates correspond well with recent estimates by Johnson (2001), who used a Kimberley-specific input-output framework to derive estimates for the total value of industry output for the year 1994/95. Johnson (2001:16) estimated gross value of production for mining, agriculture (including grazing and hunting), and fishing and aquaculture to be $566 million, $96 million and $149 million, respectively. This equates to shares of 38.0%, 6.5% and 10.0% of total economic activity in the Kimberley, respectively (Johnson 2001:9).

The ABS provides estimates for GDP at factor income. Estimates of total factor income for the agriculture[1] and mining in the Kimberley for the year 1995/96 were $81 million and $222 million, respectively. These estimates were kindly provided by WA Department of Commerce and Trade (May 2001) and derived from ABS data on annual estimates for total factor income of industries for Western Australia, considering 1996 ABS census employment shares. Agriculture and mining contribute 9.6% and 26.2% of regional GDP, respectively. During the 1990s, the contribution of 'agriculture' to regional GDP varied between a minimum of 6.4% (1999/2000) and a maximum of 9.6% (1995/96).

[1] ABS definition for 'agriculture' includes grazing, horticulture, forestry, fishing, aquaculture, and hunting.

Industries contribute most directly to the social welfare of a community through their employment of members of the community. The size of contribution to GDP of industries is not necessarily correlated to their workforce. Table 2 shows how many persons are employed per $1million GDP for the Kimberley across industries and ranks them according to employment impact. Across all industries in Western Australia, 16 persons are employed for each million dollars of GDP generated.

Table 2: Estimated employment shares for Kimberley industries for 1996

(ABS 2001(1996 Census); and data kindly supplied by WA Department of Commerce & Trade, May 2001; *) Agriculture includes Fisheries, Forestry and Hunting)

	Total Factor Income ($million)	Employment (persons)	Persons employed per $1million TFI	Share of regional employment
Accommodation, cafes, restaurants	22.7	919	40	6.9%
Retail trade	29.7	1119	38	8.4%
Education	32.2	1022	32	7.7%
Personal and other services	28.5	772	27	5.8%
Cultural and recreational services	8.0	206	26	1.5%
Health and community services	122.3	3065	25	23.0%
Property and business services	41.5	730	18	5.5%
Manufacturing	25.2	421	17	3.2%
Wholesale trade	20.9	343	16	2.6%
Construction	45.5	737	16	5.5%
Government administration, general and defence	45.8	629	14	4.7%
Agriculture *)	**80.9**	**1090**	**13**	**8.2%**
Transport and storage	52.3	609	12	4.6%
Communication services	11.0	112	10	0.8%
Finance, insurance and dwellings	32.7	170	5	1.3%
Electricity, gas and water	24.3	120	5	0.9%
Mining	**221.5**	**645**	**3**	**4.8%**
TOTAL	845.1	13316	16	100%

The contribution of mining to regional employment, in relative terms, is the lowest of all industries with only 3 persons employed per $1 million total factor income. This low regional contribution to employment is further weakened by a situation whereby workers and employees in mining are increasingly likely to be recruited from or living in major cities outside the region. They tend to live either in purpose-built villages adjoining mine sites or in major cities outside the region from where they commute on a fly-in fly-out staff rotation system. According to Sutherland (1997:42), 62% of the total mining workforce in the Kimberley in 1991 were Kimberley residents. This proportion would have significantly decreased over the past decade with increasing fly-in fly-out practices. Johnson (2001:16) summarises the industry transactions for mining in the Kimberley. The data are on an eight-industries basis. They show that the mining industry in the Kimberley sourced inputs from regional industries to the value of $53 million, equivalent to 9.4% of mining production value (p18), imported goods into the Kimberley to the value of $113 million and generated a gross operating surplus of $344 million. Almost the entire value of mining outputs (99%) was exported from the Kimberley.

Agriculture – in the ABS definition – employs 8.2% of the regional workforce. In the Shire of Wyndham-East Kimberley, 10.3% of the workforce find employment in ‘agriculture’ while, for Halls Creek Shire, this value is 8%. In terms of the relationship between agriculture and the local economies of rural areas it is important to note that a series of factors have caused a reduction of the traditionally assumed linkages between farming and the rest of the local economy in many rural areas. Stayner and Reeve (1990) provide empirical evidence that the

economic performance of agriculture is relatively uncoupled from key indicators of regional economic and demographic change. They show clusters of regions where rising agricultural production was accompanied by falling urban population and vice versa.

'Health and community services' is by far the region's largest employer making up 23% of the total Kimberley work force. This industry is specifically important to Derby-West Kimberley and Halls Creek where it employs 43 and 36% of the workforce, respectively. More than half of the Aboriginal work force is employed in this sector (ABS 2001; Kimberley Land Council 1995). In all other sectors Aboriginal people make up a small proportion of the work force. Figure 4 shows the contributions of Aboriginal persons to the regional labour force for various industries. Specifically, nearly 50 per cent of the Kimberley Aboriginal labour force are employed in Community Development Employment Projects funded by the Aboriginal and Torres Strait Islander Commission (KDC 2001: p.12). One could argue that this indicates that the welfare of the Kimberley community in general is much more reliant on government-funded programs than on the region's primary resource-based industries, with these programs providing important flow-on benefits for wholesale and retail trade, building and construction and other service industries.

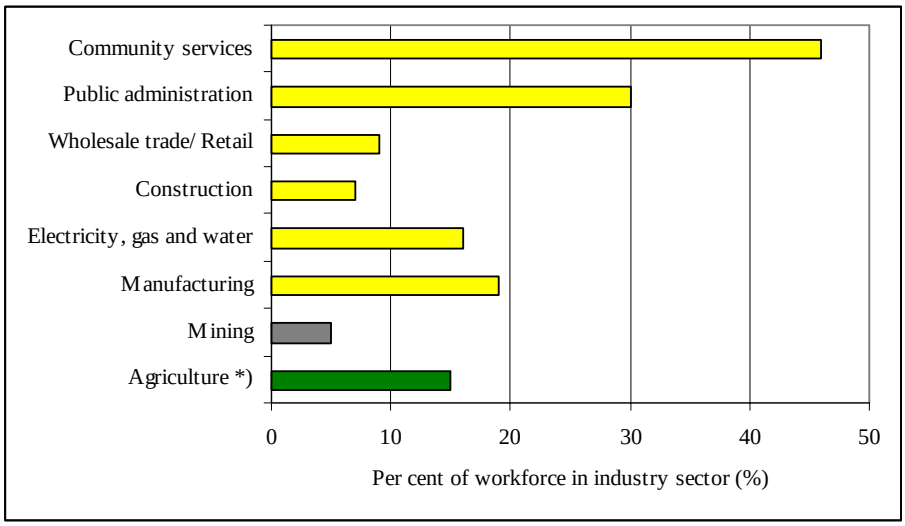

Figure 4: Aboriginal employment in industry sectors in Kimberley for 1991

(source: ABS 1991. as quoted in Kimberley Land Council 1995:59;
*) Agriculture includes Fishing, Forestry and Hunting)

Due to the nature of the tourism 'industry', it is impossible to compile employment numbers for the tourism industry from the available statistics. Even so, it is explicit in Table 2 that the employment shares of industries associated with tourism including 'accommodation, cafés and restaurants', 'retail trade' and 'personal and other services' occupy the top positions in that listing. Thus growth in tourism is likely to have a much larger beneficial impact on regional employment than growth in the primary industries.

In addition to the direct income and employment effects, economic activity also generates multiplier effects for investment, output, earnings, value added and employment. Multipliers measure marginal effects, eg. output multipliers show how much regional output will increase from a one dollar increase in demand for each industry's output. Region-specific economic data for the Kimberley have become available in the recently published analysis by Johnson (2001). The reference year for this analysis is 1994/95.

Table 3 shows output multipliers for selected industries. The figures include the initial one-dollar increase in that industry's output. The regional values are presented in the first column, state and national multipliers in the subsequent columns. Primary industries, specifically 'oil and gas' and 'other mining', occupy the bottom end of the spectrum of regional multipliers with values of 1.18 and 1.19, respectively. Agricultural industries are also below average with 1.29 for grains and 1.37 for beef cattle. The tourism related category 'accommodation, cafes and restaurants' rates average with an output multiplier of 1.51 while 'education' and 'health services' have high multipliers of 1.68 and 1.75, respectively, indicating that they are highly embedded into regional transactions.

Table 3: Output multipliers for selected industries in Kimberley and comparison to WA and Australia
(source: Johnson 2001: 24)

	Kimberley	WA	Australia
Education	1.75	2.61	3.06
Health services	1.68	2.51	2.92
Accommodation, cafes and restaurants	1.51	2.62	3.12
Non-ferrous metal ores	1.48	2.03	2.46
Beef cattle	1.37	2.33	2.38
Commercial fishing and aquaculture	1.37	2.05	2.56
Grains	1.29	1.65	2.54
Other mining	1.19	1.77	2.53
Oil and gas	1.18	1.40	1.79
Weighted Average	1.53	2.29	2.73

Employment multipliers relate to the additional employment generated by a change in demand for industry output. The unit for this multiplier is persons employed per thousand dollars of final demand. Various multipliers can be differentiated on the basis of whether they take into effect direct, indirect and consumption induced effects. Figure 6 depicts initial effect and total employment multipliers for selected industries for the Kimberley. The 'initial effect' employment multiplier is the increase in employment in a given industry in response to a one thousand dollar increase in final demand for its product(s). The total employment multiplier measures the direct, indirect and consumption-induced effects on employment within the region from an initial one thousand dollar stimulus to final demand of that industry.

'Initial effect' employment multipliers for the 38 industries in the Kimberley differentiated by Johnson (2001:42-43) range from 0.0020 (two additional persons employed per $1 million increase in output demand) for 'oil and gas' to a maximum value of 0.0220 (22 additional persons employed per $1 million increase in output demand) for 'personal services'. The corresponding total employment multipliers range from 0.0032 (3.2 additional persons employed per $1 million increase in output demand) for 'oil and gas' to 0.0261 (26 additional persons employed per $1 million increase in output demand) for 'personal services'.

The observations that were made previously in relation to the employment effects depicted in Table 2 also hold true for this input-output analysis, even though the numbers are not directly comparable due to the different methodologies used in estimating them. The employment benefits to the regional community from a growth in service industries are larger than from an equivalent value growth in most primary industries. The employment benefits associated with additional mining output are particularly low.

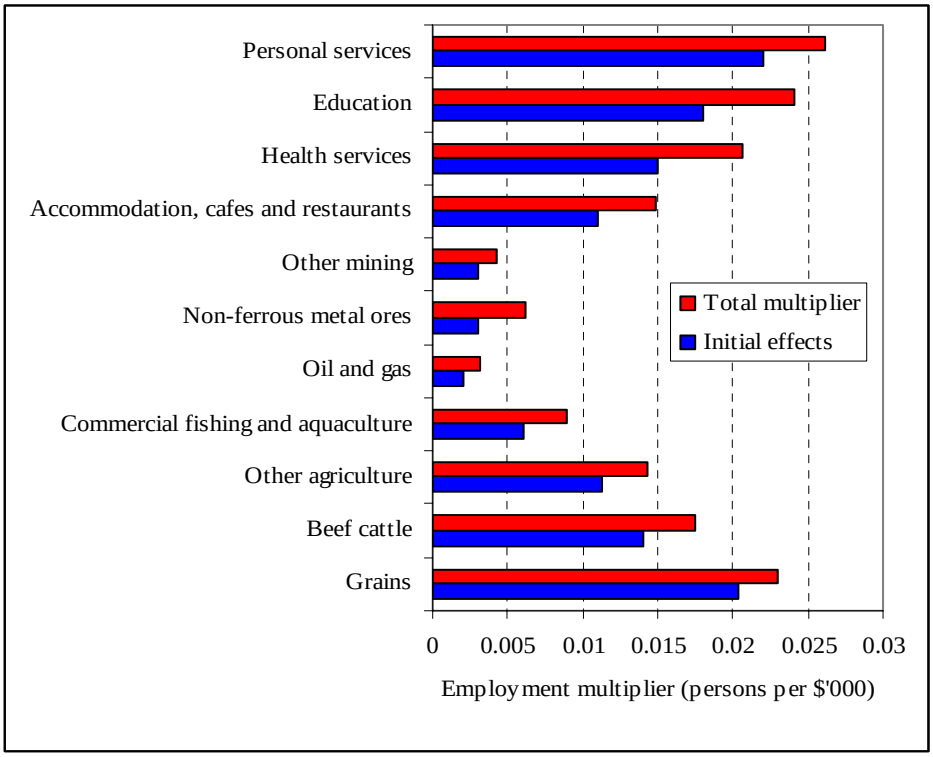

Figure 6: Employment multipliers for selected industries in Kimberley

(source: Johnson 2001: 42-43)

In summary, primary industries provide important revenue to the regional economy. However, much of the benefit accrues at the state, not at the regional level. This is especially true for mining, which, despite a huge gross value, contributes little employment and regional value adding and has minimal Aboriginal involvement. In terms of providing regional benefits tourism, which can be interpreted as a natural resource-based service industry, provides much greater direct and indirect benefits.

6 Water Management

Much of the regional development focus is on agriculture, specifically on Ord Stage 2. Agriculture is entirely irrigation dependent. Despite an apparent abundance of water in the region, climate, water management and multiple and increasing demands are set to generate a situation of competition for water. This section investigates the water issue in more detail.

The existence of agriculture in the Kimberley is based on the availability of irrigation water to satisfy crop water demand. The irrigated area increased from 1865 hectares in 1978 to 4407 hectares in 1990 to the current potential of the ORIA Stage 1 of approximately 13,000 hectares. The expansion is mirrored by the increase in production value of agricultural produce (Figure 7). Average annual growth in agricultural production value for the period 1982-2000 is 21.4%. Over that period real values of agricultural production have increased by 1000%. These numbers are commonly cited to highlight the success of the irrigation scheme (eg. KDC 1997 and 2001).

The viability of Ord Stage 1 – average gross income is approximately $5000 per hectare – has reinvigorated the impetus for an expansion of the irrigation area (McGieh 1990). A benefit-cost analysis of Ord Stage 2 undertaken in 1994 (Governments of Western Australia and Northern Territory 1994:p.44) anticipated an internal rate of return for the project of 61%. In

1995 the Western Australian and Northern Territory Governments agreed to cooperate in the development of approximately 64,000 hectares for additional irrigation area and a consortium of Wesfarmers Ltd and Maubeni Corporation became the commercial proponents.

The water demand for irrigators in the ORIA is satisfied through the Ord Irrigation Scheme, which is operated by the WA Water Corporation. The Scheme comprises Argyle and Kununurra Dams and reservoirs and the irrigation water supply system. Irrigation water is taken from Lake Kununurra above the Diversion Dam and distributed to the fields through a network of channels. The system is gravity-fed, with only a very minor proportion being pumped to some higher locations.

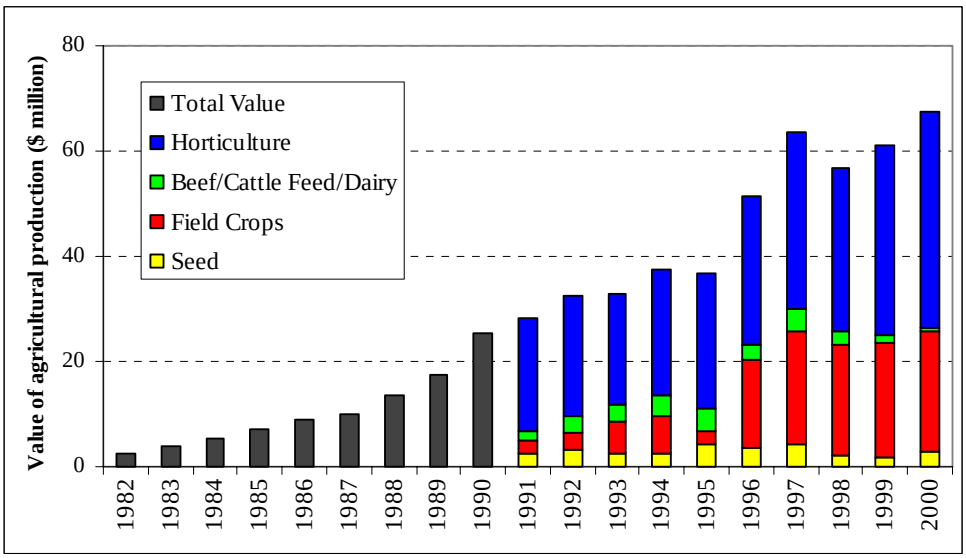

Figure 7: Production value of irrigation agriculture in the ORIA from 1982 to 2000

(source: data kindly provided by Agriculture WA; value for crop types available from 1991 only; values are nominal values)

Detailed information on the Ord Irrigation Scheme, especially data of an economic nature, is deemed 'commercial – in confidence' and is therefore not readily available. Despite multiple requests none of the WA state government departments would disclose any data, nor would the Ord Irrigation Cooperative. However, a first compilation is contained in the recent Australian Irrigation Water Provider Benchmarking Report for 1999/2000 by the Australian National Committee of the International Commission on Irrigation and Drainage (ANCID 2001). A summary of the statistics for the Ord is provided in Table 4.

In 1999/2000 there were 63 irrigation customers irrigating approximately 13,000 hectares of land. A total of approximately 170,000 megalitres of irrigation water was delivered (ANCID 2001:16). Water delivery efficiency is 68%, so the average annual delivery is an estimated 8.9 megalitres per hectare.

According to ANCID (2001), gross revenue of the Ord Irrigation Scheme was $1.906 million, equivalent to $167 per hectare. With the WA state government contributing $11.21 per megalitre (p.89), the subsidy equates to a total of $1,905,700, which is on average, $167 per hectare irrigated or $30,250 per irrigator. It is common for state governments to support irrigation schemes, and some (small) irrigation schemes attract higher government funding on a per-megalitre basis (ANCID 2001:89), but the vast majority of schemes have volume-based cost sharing arrangements in place and irrigators contribute substantially to overall revenue.

Table 4: Benchmark data for the Ord Irrigation Scheme for 1999/2000
(source: ANCID 2001)

Ownership structure	Public Cooperative
Water Supply Source	Surface water
Supply System	Gravity (100%)
Length of open drain and waterway	160 km
Evaporation minus rainfall (annual mean)	-534 mm
Irrigation deliveries	170,000 ML
Proportion of diversion that is delivered to customers	68 %
Water trading arrangements	None
Environmental issues	Tailwater quality, groundwater, drainage water quality
Number of locations where groundwater levels are monitored	70
Maintenance cost as % of replacement cost	1.63% (→ $700,900)
Ratio of maintenance cost to revenue	38 %
Replacement value of assets	$43 million
Gross revenue	$1.906 million
Maintenance cost / Revenue	37%
Environmental expenditure	$35,000
Nature conservation expenditure	$0
Internally/Externally funded R&D	$0
Cost of water supply (excl. capital works)	$3.06/ML delivered
Operating cost	$1.47/ML delivered
Capital works enhancements	(no data provided)
Basis for irrigation charge	Area of land serviced
Government funding on delivery basis	$11.21/ML delivered
Total revenue on delivery basis	$11.21/ML delivered

The Ord Irrigation Scheme is the only irrigation scheme in Australia that exclusively applies 'area of land serviced' as the basis for water charge to irrigators (ANCID 2001:86). The amount of that charge is not specified in the ANCID report, neither is the total contribution of irrigators to revenue. There is anecdotal evidence that cost sharing by irrigators may be more substantial than these publicly-available figures suggest and that irrigator contribution may be approximately $1 million, based on area charges between $34 and $125 per hectare. It is important to note that negotiations are currently underway for a reform of the charge base to comply with COAG (Council of Australian Governments) guidelines.

An important economic indicator of an irrigation scheme is the ratio of maintenance cost to revenue. For the Ord, the ratio is 37% (down from a past average of 42%). The ratio provides an indication how much of revenue is being consumed by maintenance costs and therefore may be a reflection of the state of the business assets (ANCID 2001:56). The long-term historic average across all irrigation schemes in Australia is 22%. A high percentage, such as that for the Ord Irrigation Scheme, could indicate that a large proportion of the assets require replacing, or that insufficient maintenance has been provided in the past. Fluctuations in this ratio occur due to the cyclical nature of significant repairs.

In comparison to other irrigation schemes, the cost of water supply in the Ord is very small at $3.06 per megalitre delivered (up from $2.37 past average), which is less than 10% of the weighted average of $37.53 per megalitre across all irrigation systems across Australia. The value is calculated by dividing total costs (excluding capital works) by the total volume of water delivered (ANCID 2001:72-74). Total volume includes water delivered to farms for irrigation and stock and domestic purposes as well as 'environmental flows', i.e. water that exits the irrigation system without being used. Operating costs (including salaries for people employed) are equally small at $1.47 per megalitre in comparison to a weighted average cost of $7.83 per megalitre for channel based irrigation systems across Australia (p75).

Three major water management issues within Ord Stage 1 have emerged over the years. They are (1) the quality of tail water from the scheme – with respect to sediments, nutrients and pesticides – that returns to the Ord River some way below the diversion dam, (2) rising groundwater levels and the potential for waterlogging in parts of the irrigation area and (3) the quality of drainage water from the irrigation scheme that also returns to the Ord River sub-surface (ANCID 2001; Gardiner & Associates 1998).

Water management in the ORIA is governed by a set of institutions and institutional arrangements that the following paragraph summarises. The *Rights in Water and Irrigation Act* 1914 sets the legal framework for water management in Western Australia. After the COAG resolution licensing and operations of water for irrigation in Western Australia were separated (WA Office of Water Regulation 1999). The Water and Rivers Commission is responsible for the management and protection of ground and surface water in Western Australia and for licensing the diversion and usage of water from any proclaimed watercourse. The Office of Water Regulation regulates standards of the provision of water services including supply, sewerage, drainage and irrigation. It is responsible for the economic regulation of service providers to ensure competition in the presence of suitable standards. The Water and Rivers Commission and the Water Corporation jointly own and operate all headworks and urban water supplies. The Water Corporation supplies water to four irrigation service providers including the Ord Irrigation Scheme (which, in turn, holds a water allocation licence to divert water to supply its customers).

Until recently, there was no regulatory framework in place that specified access rights to water in the Ord. This is changing with the COAG principles taking effect and with increasing demand on water in the light of the development of Ord Stage 2. Two processes are underway. First, negotiations are in progress to transfer the ownership structure from a public cooperative to a private cooperative with part of the current responsibilities of the Water Corporation transferring to the Ord River Irrigation Cooperative. This transfer will also involve changes to the charge system and may include transferability of rights.

Secondly, a water allocation planning process is underway, undertaken by the Water and Rivers Commission in consultation with stakeholders (http://www.wrc.wa.gov.au/using/Reforms_in_Allocation_and_Trading.htm). The Draft Interim Water Allocation Plan was released for public comment in 1999 (Water and Rivers Commission 1999). That plan identified interim water allocations for various uses. The total amount of water allocated to specific human uses was 1457 GL (210 GL for Ord Hydro power generation, 1235 GL for ORIA stages 1 and 2, 12 GL for Argyle Diamond mine) with the balance for environmental flow provisions. These numbers have to be assessed in the context of the water resource, the core parameters of which are provided in Table 5. Looking at the long term averages, this level of allocation does not seem to pose a problem in terms of the system being able to supply that quantity of water. The issue is in relation to reliability of water supply, specifically in the context of the provision of environmental flows for which there are currently no minimum

requirements. The planning process is further supported by economic modelling to establish water efficient cropping systems (Campbell White & Associates 2001). It is also embedded in an ongoing community and stakeholder consultation process.

Table 5: Long term annual averages for important parameters of the Lake Argyle water balance
(source: Ruprecht and Rodgers 1998 and WRC 1998, as cited in Richards 1999)

Long term average annual stream inflow into Lake Argyle	3940 GL
Annual rainfall	650 GL
Evaporation	1750 GL
Overflow	890 GL
Release	1950 GL
Coefficient of variation of annual rainfall at Kununurra	20-33%

7 Interpretation

This section seeks to interpret the data presented in the context of the initial question; is there evidence to suggest that regional development in the Kimberley, both in terms of direction and process, is based on ESD principles.

The vision for future development of the region is: *"To achieve a dynamic and diverse economy characterised by sustainable and balanced economic and social growth generating an enhanced and prosperous quality of life for all its people"* (KDC 1997, p.xi). "*Maintenance of the region's unique lifestyle, increased Aboriginal participation in the mainstream economy and management of the sensitive environment are key challenges the region will face in years to come"* (p.ix).

The regional strategy sees economic growth as the key to development. It does acknowledge, however, that development is not solely about increased GDP but also about social and environmental improvements. There is a strong belief that the natural resource-based industries will be central to the achievement of the vision. Expansion of irrigation agriculture (Ord Stage 2) and tourism growth are mentioned as key components of the development strategy (p.xiii).

The data presented in this paper confirm that the natural resource-based industries make substantial contributions to the regional economy and generate benefits for the regional community of the Kimberley. However, the data clearly indicate that the focus on few large-scale projects in primary industries, specifically mining and agriculture, may not provide the type and scale of resource rent that the regional community and specifically the Aboriginal population require to overcome their relative disadvantage.

Mining is the largest industry in terms of turnover but due to leakage and workplace management practices, the real contribution to regional community welfare is small. Agriculture is intrinsically linked to irrigation and recent prosperity in Ord Stage 1 and the likely expansion of agriculture into Ord Stage 2 guarantee the industry a key role in the regional economy. Water reform is the key challenge with a water allocation planning process underway and negotiations for a transfer of irrigation scheme property rights structure and the introduction of COAG-conforming water charges also underway. Through their water requirements and downstream impacts, water management and irrigation practices are directly linked to aquaculture and fishing, an industry in which Aboriginal people are intimately

involved. The resource rents from commercial fishing in the Joseph Bonaparte Gulf accrue largely at the State and national scale but regional benefits are high from recreational fishing by residents and tourists. Sufficient environmental flows are required to harness those benefits into the future and also to sustain current levels of commercial fishing.

This paper has not investigated the grazing and tourism industries in detail. Nevertheless, they warrant mention in the context of the development debate. The following assessment is based on Greiner *et al* (2001). Grazing is the most extensive industry and the one with the highest Aboriginal participation. The recent emergence of the live cattle trade and a series of favourable years see the industry in good shape. However, challenges remain in the form of infrastructure and marketing and new challenges arise from the steady increase in Aboriginal leasehold land and the growing association of pastoral land with tourism activities. "Tourism" summarises a wide range of commercial activities related to servicing the needs and demands of visitors to the region. The data available for tourism are insufficient to provide a basis for tourism planning and management in the region. However, in terms of more generic planning and development directions, the available statistics indicate that the economic multipliers associated with tourism are higher than for the other nature based industries and that the 'industry' generates much local employment. Tourism is closely tied with conservation, as nominated conservation areas are prime tourist destinations. Increasingly tourism is affiliated with other industries through stays and tours and other activities being offered on pastoral properties, through water storage and irrigation areas being part of the profiling of the destination, and through recreational fishing for the prized barramundi. Tourism is a fast growing industry that, unlike agriculture, is not limited by area boundaries.

As Head (1999) points out, there is much talk about economic spin-offs and perceived synergies between specifically agricultural and tourism development while the intensifying contradictions and conflicting demands are being ignored. It is interesting that the opportunity to underpin future planning through systematic research and economic investigation within the OBP (CSIRO, 1999; Greiner and Johnson, 2000; Greiner and Zhu, 2001) has not been seized by regional stakeholders.

8 Concluding comments

There is much recent interest in the agricultural development of Northern Australia. Hodges (2001a) warned that "a century after its southern neighbours first grew fat on the proceeds of irrigated agriculture, northern Australia is heeding the cargo cult call of cane and cotton and ignoring pleas from scientists and green groups to learn the lessons of the past". Some of the lessons from the past are summed up by Lindsay (1982) in his review of Ord Stage 1. Lindsay expressed the hope that the lessons from the Ord may be learnt and that there would be no need for a follow-up publication entitled *Further lessons from the Ord.* This paper has proved Lindsay's hope to be sadly mistaken.

Ord Stage 2 was to be an icon in modern agricultural development in northern Australia. In a recent twist of the tale, Ord Stage 2 has come to a halt. The proponents decided not to proceed with the development after a thorough feasibility study (Marubeni Corporation and Wesfarmers Ltd: Media release 12 Dec 2001). The main reason for the decision was the unlikely economic viability of the project due to "the continuing price volatility of sugar on the world market". This assessment seems hardly surprising given the fundamental economic parameters of sugar cane production (Greiner and Johnson, 2000). However, three additional impediments to the development emerged. They were "the great uncertainty about the amount of irrigation water to be made available to the project, outstanding environmental approvals and unresolved land access issues".

This experience shows a clear move towards tighter private and public sector scrutiny of large-scale projects. It is clear that the proponents have undertaken a thorough economic feasibility study that has revealed the economic risks, risks which they were not prepared to take. State and federal legislation demanded that an environmental impact assessment was completed. This assessment has been signed off by the Western Australia and Northern Territory EPAs, but not (as yet) at the federal level. However, the same level of scrutiny is not applied to small-scale, incremental change (eg. Crough and Christopherson, 1993). The COAG water reform process has led to a more realistic pricing regime for water, and while irrigators in the ORIA have long enjoyed maximum government subsidies, this bastion is now being dismantled and irrigators are forced to take responsibility for water management. It has also led to a rigorous water allocation process with the explicit inclusion of other demands, such as environmental flows, into water allocation decisions.

Despite the undoubted improvement in financial and environmental scrutiny of large-scale agricultural development projects, Lindsay would be sadly disappointed because, as this paper reveals, few of the *lessons from the Ord* have been learnt. Fundamentally, the development paradigm and politics surrounding regional development in Northern Australia remain unchanged. Indeed, further lessons have to be added. Focussing almost exclusively on the information aspect of development decisions with specific emphasis on mining and agriculture, and largely ignoring process and policy issues, this paper elicits three important lessons.

1. Preferred regional development in northern Australia remains preoccupied with natural-resource based industries despite the relatively low economic and employment benefits for regional communities. Specifically, much of this development does not address the needs of a large Aboriginal population that is clearly disadvantaged. Also, while there is scrutiny of the economic and environmental implications of large-scale projects, the same level of investigation does not apply to small scale change of an incremental nature.
2. Public involvement in and debate of regional development is subdued and is not informed by best available information. Data, specifically of an economic and social nature, is scarce and access to existing data is carefully managed by state government agencies, allowing for little assessment of trade-offs between possible options and scrutiny of development decisions. Certainly in the past, there have been large taxpayer subsidies to preferred industries and developments that were not disclosed to the public.
3. Participatory and socio-economic and institutional research designed to widen the stakeholder base and develop and scrutinise a wider range of development options is not supported by some influential stakeholders. Economic analysis should particularly be directed towards non-market valuation, trade-off analysis and policy development.

In conclusion, this paper demonstrates that current regional development agendas and processes in Northern Australia, despite the rhetoric, do not comply with ESD principles and seem suspicious of outside inquiry. A fitting summary impression of development in the Kimberley, with specific reference to the Ord, is provided by Hodge (2001a:p.19): *"The same frontier mentality that drove governments to build the improbable structure in the hope of taming the wild north is still evident in the steeled determination behind the new phase of development."*

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