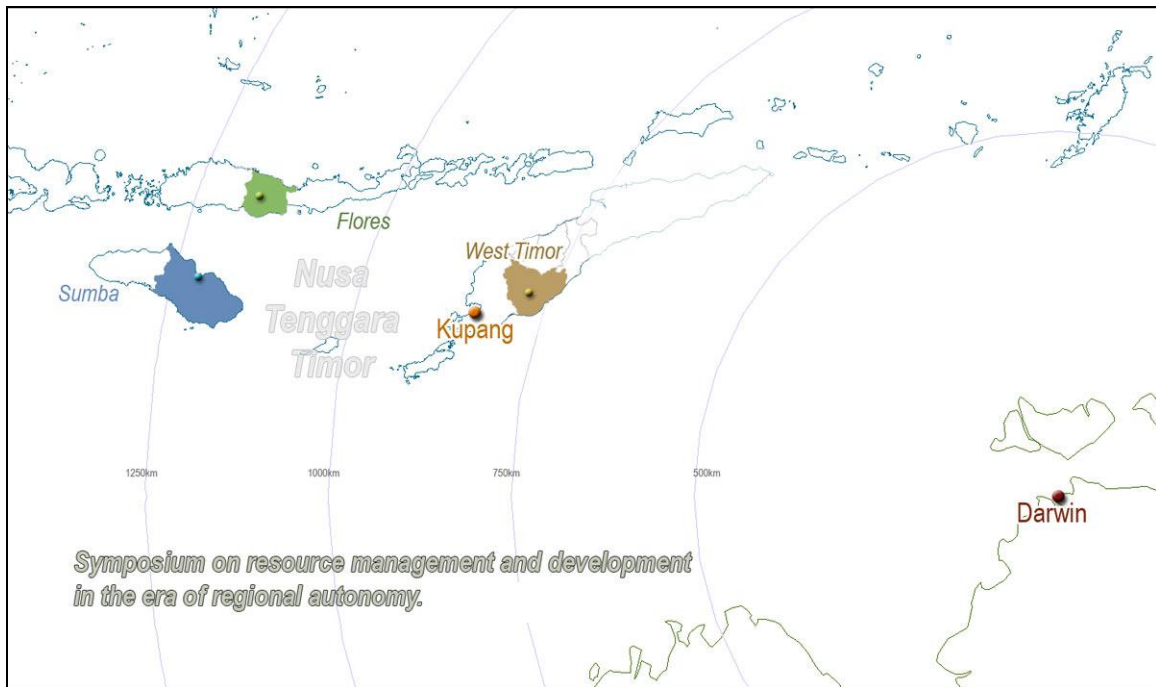


## Charles Darwin University Symposium

### *Resource Management and Development in East Nusa Tenggara in the Era of Regional Autonomy*

**Wednesday 26 September 2007**



The purpose of this symposium was to foster regional links with East Nusa Tenggara (NTT) and build mutual capacity in tackling regional issues. This symposium was part of a Charles Darwin University project, funded by AusAID's Public Sector Linkage Program.

This document summarises presentations and discussions at the symposium, and includes a concept note for future development activities in NTT.

## SYMPOSIUM PROGRAM

Welcome		Chair: Prof Stephen Garnett
Opening speech	Colin McDonald QC	
Issues for regional development in NTT province	Onni Benyamin SEKBER NTT	
Background to collaborations between CDU/NTG	Bronwyn Myers CDU	
Morning tea		
Higher education collaborations in NRM, language and health	Penny Wurm, Richard Curtis, Robyn Aitken CDU	
Issues for development in NTT, including perspectives from East Sumba, Ngada, Nagekeo, TTS - Discussion	Ir Umbu Mehang Kunda, Bupati East Sumba Drs Piet Jos Nuwa Wea, Bupati Ngada, Elias Djo, Bupati Nagekeo Danial A Banunaek, Bupati TTS	Chair: Prof Bruce Campbell
Lunch		
Natural Resource Management and Livelihoods in eastern Indonesia	Bruce Campbell, Stephen Garnett and Jo Karam (CDU)	Chair: Dr. Bronwyn Myers
Northern Territory approaches to land and water assessments	Jason Hill (NRETA), Steve Tickle, Donna Lewis	
Fire history in NTT and Arnhemland NT and the potential for carbon offsets through fire management	Rohan Fisher (CDU), Andrew Edwards, Jeremy Russell-Smith (Bushfires NT),	
Final discussion • opportunities/priorities for collaboration steps to achieve collaborations		
Close	Prof. Bob Wasson (Deputy Vice Chancellor Research, CDU)	

# “Coming together in the Era of Indonesian Regional Autonomy”

## Opening Address

Colin McDonald QC

*Chairman, Royal Darwin Hospital Management Board,*

*Head, William Forster Chambers*

*26 Harry Chan Avenue, Darwin NT 0800*

*Email: colin.mcdonald@bigpond.com*

I am delighted to be invited to open this symposium by the organisers here, at CDU. The symposium entitled “*Resource Management and Development in East Nusa Tenggara in the Era of Regional Autonomy*” focuses on fostering regional links with East Nusa Tenggara (NTT) and building mutual capacity in dealing with regional issues. The symposium is part of a Charles Darwin University project funded by the AUS AID Public Sector Linkage Program.

Charles Darwin University has developed very good relations with Indonesia, especially NTT for over a decade and has worked in collaboration with Government agencies, universities in NTT and NGOs. Sometimes this has been in partnership with the Northern Territory Government agencies and the Tropical Savannas Cooperative Research Centre.

Indonesia has undergone major political and constitutional change since the fall of President Soeharto in 1998. The Indonesian Constitution has been amended four times since 1999 introducing major political reforms and entrenched constitutionally protected human rights. Indonesia is today one of the most vibrant and interesting democracies in Asia. The Indonesian President is now directly elected by the people. There is a new Constitutional Court which is responsible for reviewing laws against the amended Constitution and upholding international standards of human rights. The *Makamah Konstitusi* is representative of the new, bold and democratic Indonesia.

Part of the political change and democratisation of Indonesia has been a devolution from centralised power and control in Jakarta to greater regional autonomy. The regions of Indonesia have more political power and greater flexibility to develop than ever before. This political development offers great challenges to the Indonesian regions in their quest for development, especially so in Eastern Indonesia. This political development of regional matters gives my profession chances of practical success.

Australia and Indonesia are linked by geography as neighbours, in some ways strange neighbours. The political relationship between Australia and Indonesia has become more and more important. There is more inter connectedness. There has never been a more important time and now, it is fair to say, there is very dedicated mutual commitment to greater understanding between our two democracies in practical ways. You only have to look at the success of APEC and Australia and Indonesia’s pivotal roles in this regional body’s success.

I was privileged to be a member of the Australia – Indonesia (AII) in the life of the Hawke and Keating governments. I recall many fascinating visits to Indonesia as the Australian Government sought through the AII to forge more diverse and lasting relations in science, the arts, culture and education. A commonly used word of those times 1989 – 1995 was “Openness”. Openness was referred to not just in the geographical sense of a vast archipelagic nation of Indonesia and the huge land mass of Australia fringing many oceans and seas. The word “Openness” also referred

to Australia and Indonesia's openness to regional trade and a diversity of others links of a kind not necessarily found in other regions of the world.

Times have changes since 1989 – 1995, but so have the issues and the opportunities. Countries of the region share problems more and more. The commitment to “Openness” too has developed. Climate change, poverty, sustainable agriculture have become more pressing and urgent issues.

Unlike the nation to nation relationship between Australia and Indonesia which has developed in texture, warmth and with a measure of understanding essentially only since the late 1980's, the relationship between the people of Indonesia and the people of the Northern Territory has been a long one, enduring, natural, culturally significant and relatively free of the political ebbs and flows of modern politics. The role and importance of economic, sensitive and non-economic links between the people of Indonesia especially Eastern Indonesia and the people of the Northern Territory has been at the heart of this long and natural relationship.

So it is timely that the regions of NTT and the Northern Territory come together again. NTT is the Indonesian province closest to Darwin and the Top End of the Northern Territory. We share similar climates. We share remoteness from central Governments. There is a need to forge closer links between NTT and Northern Australia. There is a need to promote rural development in NTT to ensure not just economic and political stability but also the health and the happiness of its millions of people, So this symposium is timely.

We are privileged to have with us in this symposium distinguished visitors from NTT:-

- Drs. Danial A Banunaek, Chief Administrator of South Central Timor (Bupati of Timor Tengah Selatan)
- Ir. Uмба Mehāng Kunda, Chief Administrator of East Sumba (Bupati od Sumba Timur)
- Dr Elias Djo and Drs. Piet Jos Nuwa Wae chief Administrator of Ngada and Nagakeo (Bupatis of Ngada and Nagakeo in central Flores)
- Drs. Jan Christofel Benyamin (“Onny”) M Si Head of SEKBER from province NTT – Agency for coordinating international collaborations

We look forward to their practical contribution to this symposium.

May this symposium help in the task of capacity building and addressing practical regional issues.

Kepada semua delegasi dari NTT saya mengucapkan selamat datang  
Semoga Sukses!

In the spirit of that great Indonesia essayist, poet and editor of *Tempo* magazine Goenawan Mohamad, let us today have conversation with difference.

I happily declare this symposium open.

**Terrestrial to Marine Continuum**  
**Nusa Tenggara Timur**  
Holistic regional development to connect the land and the sea

Head of BAPPEDA  
Nusa Tenggara Timur Province

Presented by Drs. Jan Benyamin  
SEKBER NTT

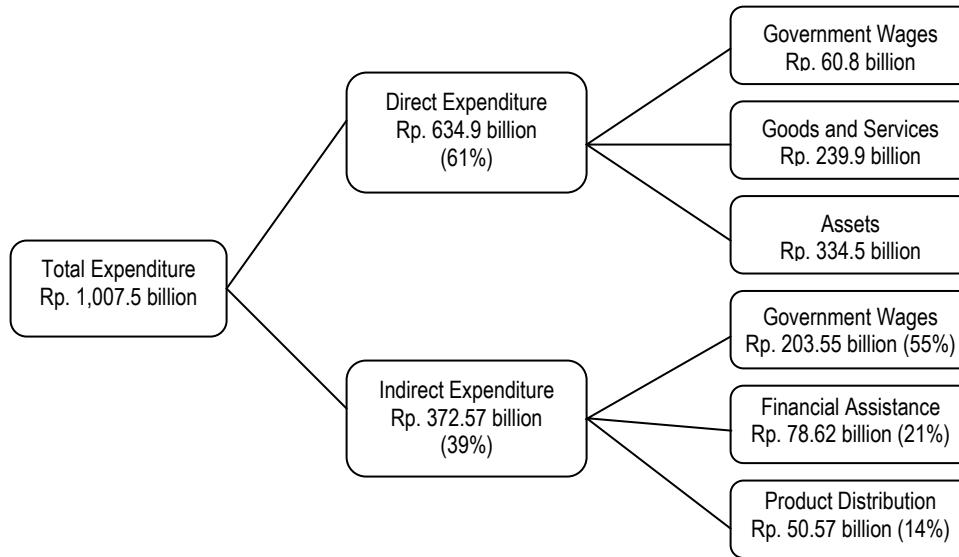
- In accordance with the letter sent to us, this presentation will:
  - Discuss important issues regarding regional development in cooperation with corresponding agencies in northern Australia
  - Review past and current cooperative activities between NT and NTT agencies
  - Identify potential opportunities for future cooperation
- Analysis of the cooperation that has developed between the NT and NTT governments.
- Analysis of various programs that are currently being implemented by the Government of the NTT
- In this presentation we will make recommendations for a program with a continuum from 'land' to 'sea'

**NTT** Area = 47,349.90 km<sup>2</sup>, Population (2005) = 4,260,294  
15 Kabupaten (districts) and 1 city, 215 Kecamatan (sub-districts), 2,737 villages/local administrations

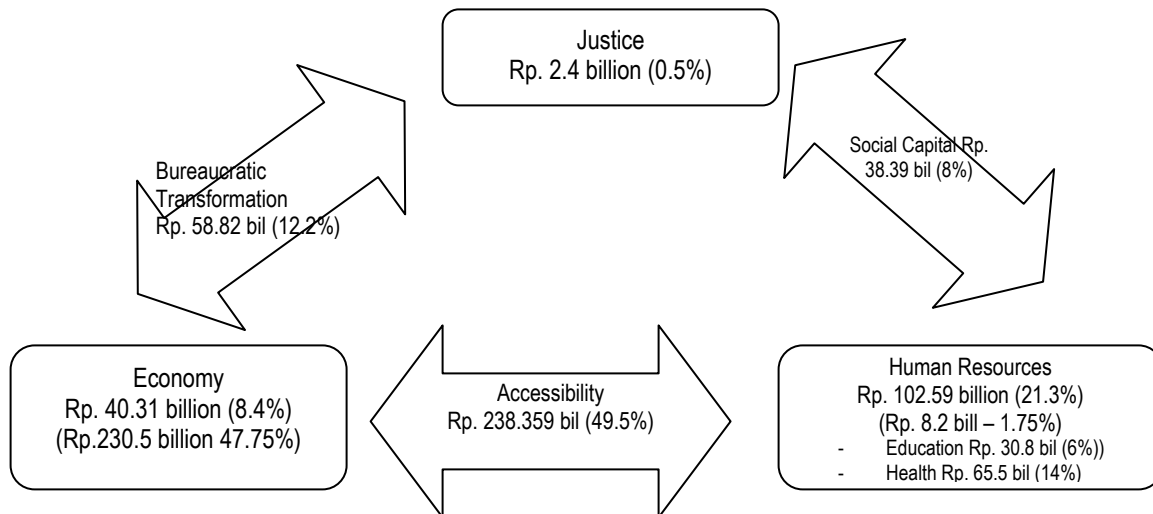
**GENERAL CONDITIONS in NTT PROVINCE**

- NTT has an area of 47,350 km<sup>2</sup> spread across 566 islands, of which 42 islands are populated
- Area of marine zone, ±191,800 km<sup>2</sup>; length of coastline, 2,699 km; topography, 2/3 of land is classed as sloped – very sloped
- Rainfall occurs for 3-4 months per year
- NTT consists of 18 kabupaten and 1 city, 215 kecamatan and 2,762 villages
- Average income per capita in the NTT during 2005: Rp. 3,235,699. This is 30% of the average national income per capita of Rp. 11,193,856
- Regional Gross Domestic Product is dominated by the agricultural sector (41.27%)
- Portion of families living in poverty: 68.5%
- Income generated within NTT is 28% of the local government's income (Rp. 498 billion)
- NTT population in 2005: 4,260,294 (952,508 households), population density 90 people per km<sup>2</sup>
- 70% of the population live in rural areas
- Unemployment of people over the age of 15 is 5.46%
- 78% of workers are employed in the agricultural sector
- 70% of the workers have not studied beyond primary school level

## Budget Profile for 2007 Financial Year



## Direct Expenditure for the 2007 Financial Year



## Utilisation

In terms of use: fisheries resource potential is 365.1 tonne/year. However actual use is only around 26.56% of this.

## Damage to Marine Ecology

Many factors can explain this damage:

- Climate change due to global warming
- Natural disasters: besides floods, forest burning etc, NTT is located in the region known as the 'Ring of Fire' which is particularly susceptible to various natural disasters such as earth quakes
- Man-made Disasters: including damage to coral reefs through cyanide fishing, extraction of reef materials for house and infrastructure construction and inappropriate development planning leading to marine damage
- Land-based activities (including toxic agricultural run-off, deforestation, residential and road construction, household waste) which flow into the sea as the 'giant rubbish bin'

## Coral Bleaching Caused by the 2002 El Niño

Indonesia has already been affected on a large scale several times by the El Niño effect such as in 1996 and 2002 as well several other times on a smaller scale.

It has been predicted that the NTT will experience El Niño again this year

A direct impact of this on fishermen is the destruction of fish habitat and 'natural destructive waves'

## Land Activities that Impact on the Sea

Estuaries are disappearing as a border between land and sea. Fertilizer and insecticide residues from the rice farmers are Tarus end up in Kupang Bay without any 'natural filtration'. There are no longer any marine biota, birds or the seaweed that act as a local salmon hatchery visible at this site. Is all of this that is thrown away on the land being collected in the sea?

## Land Destruction – Marine Destruction

- Since the El Niño of 1995, many farmers have built new houses and communities on the waters edge
- That which is left of the coastal zone, has been taken over by the 'new fishermen'
- While the 'old fishermen' make use of the intertidal zone
- The reasons for this are clear:
  - There needs to be policies for holistic regional development that considers the terrestrial and marine environments as one
  - *It is necessary to have a planning team to oversee and provide input to linking land and sea on a regular basis*

## **Priorities**

- Identify special sites for terrestrial and marine (estuarine) planning
- Undertake regional level marine conservation planning
- Improve knowledge and access to data already collected by various stakeholders, particularly data relating to marine resources and the relationship between marine and terrestrial environments
- Develop communication and cooperation between stakeholders in the field of marine and terrestrial conservation
- Develop the community's sense of stewardship and decision-makers at all levels
- Develop alternative education systems for the community
- Establish a Regional Resource Centre as a focus point for '*Linking Land to Sea*'

Together we can DEVELOP NTT

## **Background to the Symposium**

### *Resource Management and Development in East Nusa Tenggara in the Era of Regional Autonomy*

Dr. Bronwyn Myers  
*Charles Darwin University*  
*Bronwyn.Myers@cdu.edu.au*

CDU has enjoyed positive collaborations with government agencies, NGOs and universities in Nusa Tenggara Timur (NTT) for more than a decade, in partnership with Northern Territory Government agencies and the Tropical Savannas Cooperative Research Centre. A group of these projects provides the background to today's symposium.

The overall aims of these projects have been:

- Improved land and resource management for improved rural livelihoods, increased food security and enhanced nature conservation in NTT.
- Increased capacity (skills, applications) in the Northern Territory (NT) of Australia and NTT, Indonesia.
- Partnerships in Higher Education collaborations with Indonesian universities.

Today's symposium is part of a one-year project (see insert below) funded by AusAID's Public Sector Linkage Program (PSLP). We appreciate your participation today, and particularly welcome our visitors from NTT.

This project builds on a number of past projects that have been developed in response to issues identified as high priorities by our Indonesian partners. The partnerships began with an international conference on agricultural development in semi-arid eastern Indonesia in Kupang in 1995. Then the causes and impacts of wildfire management were investigated in a workshop in Darwin in 1999 and a large project focusing on East Sumba and Ngada (Flores) from 2002-2005 – both projects funded by ACIAR. Integrated rural development in NTT was reviewed at a workshop in Kupang in 2006. Collaborative curriculum development in higher education was part of the fire project and has been further developed in a workshop in SoE in West Timor in December 2006 (funded by Crawford Fund). A PSLP-funded project in 2006 continued to build capacity in land and resource management in NTT and to strengthen links between NTT and NT government counterparts.

These past projects have been highly successful.

- Geographic Information Systems have become a key component of development planning at Provincial & Kabupaten level, e.g.
  - Provincial Spatial Plan 2006-2020
  - Critical Land Assessment Ngada
  - Nagekeo Development Plan
- There has been on-going extension of controlled burning as a land management tool in savanna landscapes in East Sumba and Ngada.
- National award for agroforestry was awarded for the demonstration plots at Dorameli, Ngada, Flores.
- Bilingual training materials have been created: GIS tutorial CD Rom & Manual on Burning practices
- Collaboration in higher education have been extended and will be described in more detail in another paper today – UNDANA, UKSW, CDU



The past projects have taken a participatory approach, included engagement with villagers, NGOs, and government agencies (Provincial, Kabupaten, Kecamatan). The methods have included Participatory Rural Appraisals of livelihoods, community land management planning, strategic burning for wise land management, and forest resource inventories.

Integrated Rural Development in NTT was reviewed in a workshop in April last year. The proceedings of that workshop have just arrived from the printers in Canberra and Kupang and are available here today. One of the major outcomes of this workshop was an action strategy for rural development in NTT. Two key elements for success of development projects were identified:

- Integration of environmental, economic, social and political factors
- Engagement of all stakeholders.

The current PSLP project aims to increase capacity in NTT in resource and land management for improved rural livelihoods in NTT. The project activities are:

- Symposium and meetings in Darwin, 25-29 Sept 2007
- GIS training and GIS forum in Kupang
- Work attachments for Indonesian government officers with NT government staff
- Community agroforestry training and fire management forum in NTT
- Controlled burning training in rural communities in NTT

This symposium is an opportunity for us to strengthen links between the NT and NTT for integrated approaches to rural development, both in the areas of current collaborations and by exploring new areas for linkages and collaborations. I trust we will all find the day interesting and useful.

#### **For more information:**

##### 1. Websites

<http://cdu.edu.au/indon/>

<http://fireindon.cdu.edu.au/workshop/>

<http://indonNRMpslp.ehs.cdu.edu.au/>

##### 2. Workshop Proceedings

- **Fire and sustainable agricultural and forestry development in eastern Indonesia and northern Australia** (ACIAR Proceedings No.91, 2000)
- **Integrated Rural Development in eastern Indonesia** (ACIAR Proceedings No.126, 2007)

##### 3. Journal papers:

- Fisher R, Bobanuba W, Rawambaku A, Hill G, Russell-Smith J (2006) Remote sensing of fire regimes in semi-arid Nusa Tenggara Timur, eastern Indonesia: current patterns, future prospects *International Journal of Wildland Fire*, 2006, **15**, 307–317
- Russell-Smith, J., Djoeroemana, S., Maan, J. and Pandanga, P. (2006). Rural Livelihoods and Burning Practices in Savanna Landscapes of Nusa Tenggara Timur, Eastern Indonesia, *Human Ecology*, **35**,345-359

##### 4. Fire management training manual

## Enhancing land management capacity for sustainable rural development in eastern Indonesia – Stage 2

Charles Darwin University, BAPPEDA NTT

Funded by AusAID's Public Sector Linkage Program (PSLP): 1 July 2007 - 30 June 2008

The project aims to build on existing skills, capacity and research for sustainable land management.

### Project Activities:

1. **Symposium and meetings in Darwin** by new Head of BAPPEDA NTT and the Bupatis from East Sumba, Nagekeo (Flores) and TTS (West Timor), to discuss important regional development issues with counterpart agencies in northern Australia. 25<sup>th</sup> - 29<sup>th</sup> Sept. 2007.

**Symposium at CDU on Wednesday 26<sup>th</sup> September 2007**

*Resource Development and Management in the Era of Regional Autonomy*

2.1 **Work attachments with NT Government staff** for four Indonesian staff to learn field skills in land resource assessment by collecting and analysing field survey data. Data collected will include soils, vegetation and land form as inputs into land mapping. Landscapes of both NTT and NT are dominated by wet-dry monsoonal savanna, and techniques learnt will be relevant to applications in NTT. Two staff will visit NT in late dry season 2007 and two in late wet season 2008.

2.2 **In-country GIS training** in the integration of land resource field data into GIS and the use of GIS for identifying opportunities for rural development, land rehabilitation and resource conservation, and potential environmental and economic risks associated with proposed developments. Anticipated timing of this activity: March 2008

2.3 **GIS Forum** to share experiences of applications of GIS in Ngada/Nagekeo, TTS and East Sumba with neighbouring Kabupatens (Manggarai, TTU, Kupang, West Sumba), and to explore potential applications and cooperation across Kabupaten boundaries. March 2008.

Discussions would include the role of GIS in

- ◆ Resolution of land tenure issues
- ◆ Infrastructure development
- ◆ Provision of health and education services
- ◆ Land capability assessment
- ◆ Catchment modelling and water resource management
- ◆ Resource monitoring, including agricultural productivity, extent of forests, weeds and fires

3.1 **Community agroforestry training** at Ngada/Nagekeo in systems for community-driven agroforestry and microfinance, and institutional capacity building. Training provided by staff from Yayasan Mitra Tani Mandiri and Mr Efraim Muga (BAPPEDA Ngada).

3.2 **Community agroforestry and fire management forum** to discuss experiences of community-based development enterprises and fire as a management tool. Discussions and visit to demonstration plots at desa Dorameli (Flores), recipients of the national forestry rehabilitation award in 2006.

3.3 **In-country burning training** at key village communities in Nagekeo, East Sumba and TTS in safe, effective controlled burning methods. Training to be provided by Indonesian staff and villagers involved in past projects, in Sumba and Nagekeo, by staff located there, and in TTS, by staff from Nagekeo. Experienced staff from YMTM and E. Sumba will also visit TTS to contribute to the activities of Plan Indonesia in developing wise burning practices for resource conservation, food security and consequent improvements to human nutrition and health.

Website: <http://IndonNRMpslp.ehs.cdu.edu.au> Contact: Dr. Bronwyn Myers [Bronwyn.Myers@cdu.edu.au](mailto:Bronwyn.Myers@cdu.edu.au) Ph: +61 8 8946 6726

# Collaborative Curriculum Development

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Ms. Robyn Aitken

Academic Leader Acute Care Nursing, CDU

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## Introduction

The common, non-collaborative model for International education “delivers” Australian education products off-shore, assumes that existing western expertise is applicable and better, and assumes that learning occurs in one direction. In contrast, we propose a collaborative model for International education. This model

- acknowledges and takes advantage of expertise in both countries,
- considers the context for practice and expertise,
- critiques applicability and acceptability of western knowledge and practice,
- is based on shared objectives,
- questions assumptions of the need for standardised practices within shared profession,
- questions assumptions about “best way to learn”,
- acknowledges potential for mutual capacity building.

## Case Studies

### 1. Collaborating for nursing practice and education

Robyn Aitken has experience in World Bank HP5 projects in Central Java, WHO CPMDs and Post Tsunami Emergency Care, and Pusdiknakes National Strategic Plan for Clinical component of D3.

The strategies used were an in country team approach, a collaborative needs analysis at leadership level, and collaborative development of program objectives, identification of local expertise, and stakeholder meetings (bilingual) to identify local situation and context.

The outcomes were the collaborative development of education program, joint teaching and learning, and stakeholder and participant evaluation to inform further development.

### 2. Eastern Indonesian field studies intensive – integrated rural development

Penny Wurm described the development of a field studies unit, proposed by colleagues at Satya Wacana Christian University (UKSW, Salatiga) during research collaborations between UKSW and CDU through a ACIAR-funded fire project and AusAID-funded capacity building projects.

The curriculum plan for the proposed field studies unit has been developed collaboratively by Indonesian and Australian staff, for both Indonesian and Australian students, to include research project outcomes with a focus on real problems. It was expected that students would be future public servants, agency and NGO staff working in the region. This collaboration has been built on trust and respect built during research activities, staff visits between the partner universities and has resulted in a trilateral MoA

The outcomes to date include

- curriculum plan – learning objectives, assessment plan, study plan, learning resources, institutional support and future plan for a shared Master program
- increased understanding of Indonesian and Australian university curricula
- increased mutual capacity to engage

### 3. Intensive incountry Indonesian language and culture program

Richard Curtis described collaborations in language and culture studies.

The history of the collaborations is summarised as follows:

- 1998-2002: NTU (now CDU) and Universitas Mataram (UNRAM) – MoU with 5 eastern Indonesian universities
- 2003-2004: Bali bombing 1 – program suspended – CDU students attend privately
- 2005-2007: program resurrected – MoA between UNRAM, CDU and University of the Sunshine Coast (USC)
- 2008: Program consolidates – MoAs with UNRAM, CDU, USC, University of Tasmania (UTAS) and University of New England (UNE).

The benefits of expanded collaboration include viability because of greater student numbers, it is an affordable in-country experience, there is security (despite DFAT warnings), and a high quality shared curriculum is continually being developed.

Currently CDU has a guest lecturer, Pak Untung, from UNRAM. Pak Untung contributes to teaching at CDU, has an opportunity for PhD study with an Australian university and contributes to curriculum development.

The current benefits of the program are the shared culture based language curriculum, improved teaching practices and meeting Australian student needs. There is also potential benefits through other PhD opportunities, development of an Australian Studies Centre, and Indonesian and English tuition for researchers in the environmental and health sciences.

### **Future directions**

- Opportunities for collaboration in health, integrated rural development and languages
- Areas of shared expertise
- Joint initiatives for practical collaboration and research into effective practice
- Links to external funding sources
- Links to internal (e.g. Ministry) budget allocations



## Collaborative Capacity Building for Higher Education in Eastern Indonesia

### Charles Darwin University

Charles Darwin University staff continue to build strong relationships with partner Indonesian universities, with the aim of mutual capacity building and collaboration. These collaborative and collegial relationships among staff from Universitas Kristen Satya Wacana (UKSW), Universitas Nusa Cendana (UNDANA) and Charles Darwin University (CDU) have grown from research partnerships primarily funded by ACIAR, AusAID and ATSE Crawford Fund, described elsewhere.

In summary, these collaborative higher education activities include:

#### Cross-institutional agreements

UKSW and CDU have an established bilateral MoU. In December 2006 UNDANA, UKSW and CDU signed a trilateral Letter of Intent, under which ongoing and future activities will be fostered.

#### Staff development and cross-campus exchanges

- UKSW staff have visited CDU to attend specialist workshops and brief Faculty staff. CDU staff have attended UKSW to present seminars, staff development workshop and brief Faculty staff.
- A CDU staff member has run professional development workshops in GIS/Remote Sensing for UKSW staff on-campus, which were also attended by Indonesian NGO and agency representatives.

These activities have been funded primarily by the universities and ATSE Crawford fund.

#### Collaborative curriculum development

- Learning materials developed at CDU have been used in new coursework postgraduate programs at UKSW.
- An innovative new project in collaborative curriculum development is underway, which involves key staff at UKSW, UNDANA and CDU. This project will result in a field intensive unit of study for advanced undergraduate and postgraduate students, located in eastern Indonesia, focussing on integrated rural development. The curriculum will be developed collaboratively during 2007 and taught collaboratively for Australian and Indonesian students in 2008. The consortium also hopes to engage the National University of East Timor in the programme.

#### Future projects include:

- A jointly accredited Master by coursework program, focussing on integrated rural development
- Scholarships for postgraduate study in Australia for Indonesian university staff and students
- Ongoing professional development, mentoring and exchanges for university staff.

Contact: Dr. Penny Wurm [Penny.Wurm@cdu.edu.au](mailto:Penny.Wurm@cdu.edu.au) Ph: +618 8946 6355

# Kabupaten Timor Tengah Selatan (TTS), West Timor

*Bupati TSS, Drs. Danial A. Banunaek, MA*

## A. Keadaan Umum Kabupaten Timor Tengah Selatan

### 1. Area

Kabupaten TTS : 3.947 Km<sup>2</sup> 394,700 Ha (90 28, 13'' – 100 10, 26'' and 1200 4, 00'' – 1240 04, 00'')

To north is Kab. TTU, to south is the Timor Sea, to east is Kab. Belu and to west is Kab. Kupang.

Wet Season : 4 months ( December – March) Dry Season : 8 months (April – November)

Average temp : 24° C

### 2. Population

Population of Kabupaten Timor Tengah Selatan (according to 2005 data) is 420,798 Jiwa, consisting of 208.131 male and 212.667 female.

### 3. Government administration

23 Kecamatan, 230 Desa (villages) and 12 Kelurahan (political districts).

### 4. Education

Not completed Primary School 44%

Completed Primary School 35%

Completed Junior High School 12%

Completed Senior High School 6%

University Graduates 1.8%

### Numbers of schools, teachers and students 2004

Schools	No. schools	No. teachers	No. students
<b>Primary School</b>	<b>453</b>	<b>3.744</b>	<b>69.179</b>
<b>Junior High School</b>	<b>65</b>	<b>1.043</b>	<b>15.579</b>
<b>Senior High School</b>	<b>17</b>	<b>407</b>	<b>6.022</b>
<b>Technical high School</b>	<b>4</b>	<b>160</b>	<b>2.369</b>

### 5. Health

#### a. Life expectancy

Male : 59 years Female : 61 years

#### b. Nutrient status of children under 5:

Good : 35,664 : 69%

Malnourished : 13,229 : 26%

Severely malnourished : 2.825 : 5%

#### c. Health Personnel

16 doctors, 93 nurses, 165 midwives, 180 other medical staff

### 6. Economics

a. Economic situation: per capita incomes and regional gross domestic product (PDRB) are still extremely small.

In TTS in 2005, average percapita income was Rp.2.791.695 and Regional Gross Domestic Product was Rp.2.581.190.

b. Community poverty levels : 10.852 KK and 51.888 KK very poor

## B. Main issues

### 1. Education sector

- Low education levels: 44.12% of people adults have not completed primary level education
- Ratio of teachers to students is not even between education levels
- Insufficient number of competent teachers

### 2. Economic sector

- Low incomes and low purchasing power
- High levels of unemployment and community dependence
- High levels of poverty

### 3. Health sector

- High numbers of children under five who are malnourished and severely malnourished
- Infectious diseases that are potentially fatal (diarrhea, malaria, TB, pneumonia and measles) occur

- High levels of maternal and child mortality

#### **4. Infrastructure tools**

- Limited infrastructure
- Infrastructure is vulnerable to natural disasters

#### **5. Public service**

- Limited quality and quantity of human resources
- Insufficient infrastructure

### **C. Policy directions for Development in the Era of Autonomy**

1. Review of district planning, including in coastal regions, to develop centers for economic growth with a regional approach through increased infrastructure and public facilities to improve community services.
2. On-going improvement of integrated community empowerment programs and encouraging communities to be active in all stages of the development process from planning to implementation.
3. Encourage investment to drive sustainable economic growth and development, particularly through employment creation to reduce poverty.
4. Improving the effectiveness of government-run economic institutions (Regional Enterprises) and community economic institutions.
5. Implement effective financial management with increased monitoring at all levels to minimise all forms of corruption, make efforts to increase economic efficiency and increase public accountability.
6. Increase tax revenue, through more efficient tax collection, adequate human resources, improved information from local government and enforcement of tax legislation.

### **D. Development priorities in Kabupaten TTS**

#### **1. Economic sector**

Community economic empowerment through a hands-on approach with communities who depend on primary industries to increase per capita incomes, improve purchasing power, decrease poverty and improve equality

#### **2. Education and Health sector**

Increasing the quality and quantity of human resources and improve health and education facilities.

#### **3. Infrastructure**

Improving the quality and availability of adequate regional infrastructure to support community socio-economic activities.

#### **4. Services Sector**

Focusing on improving quality of government services, development and social apparatus that is professionally equitable, honest and appropriate.

#### **5. Special Sector: Faith and Devotion to the Almighty God**

Focused on efforts to create a climate that allows individuals to undertake their religious duties whatever their religion in order to create harmonious relationships within and between religious groups.

### **Conclusion**

**So ends our presentation. On behalf of the government and community of TTS I would like to thank you and express our sincere appreciation. We hope that this event will contribute to building a commitment for future cooperation between our governments.**

**That is all and may God be with us.**

## Sustainable Resource and Environmental Management

*Bupati Nagekeo, Elias Djo*

The Kabupaten (District) of Nagekeo was formerly part of Kabupaten Ngada. Separation as a new District was declared in Regulation No. 2, 2nd January 2007 and officially endorsed on the 22nd of May 2007.

Land area is 1,416.96 km<sup>2</sup> and consists of 7 Kecamatan (sub-districts), 15 Kelurahan (village administrations) and 75 Villages.

### Development of District Gross Domestic Product – Nagekeo 2004-2006 (in millions of rupiah) before and after division

Economic sector	Before separation		After separation	
	2004	2005	2005	2006
<b>Primary industries</b>	<b>301.4</b>	<b>316.6</b>	<b>154.1</b>	<b>162.9</b>
1. Agriculture	295.1	310.1	152.3	161.1
2. Mining	6.3	6.5	1.7	1.7
<b>Secondary industries</b>	<b>54.3</b>	<b>56.5</b>	<b>16.0</b>	<b>16.7</b>
1. Processing industries	9.7	10.2	4.2	4.4
2. Electricity, gas and water	2.2	2.4	0.65	0.66
3. Building and construction	42.3	43.9	11.1	11.5
<b>Tertiary industries</b>	<b>173.7</b>	<b>183.1</b>	<b>47.7</b>	<b>48.9</b>
1. Trade	44.7	46.7	10.7	11.1
2. Communication and transport	24.1	25.4	8.0	8.3
3. Finance and service provision	24.8	22.0	6.8	7.0
4. Other services	84.0	88.9	22.0	22.3
<b>GDP Ngada</b>	<b>529.5</b>	<b>556.2</b>	<b>217.9</b>	<b>228.6</b>
<b>Total population</b>	<b>246,997</b>	<b>252,093</b>	<b>118,899</b>	<b>121,382</b>
<b>Income per capita</b>			<b>1,726,506</b>	<b>1,771,679</b>

Economic Sector	Regional economic structure after separation in 2006
	Nagekeo
<b>Primary Industries</b>	<b>14.37</b>
1. Agriculture	14.76
2. Mining	-0.39
<b>Secondary industries</b>	<b>-2.86</b>
1. Processing industries	0.10
2. Electricity, gas and water	-0.14
3. Building and construction	-2.82
<b>Tertiary industries</b>	<b>-11.51</b>
1. Trade	-3.54
2. Communication and transport	-0.91
3. Finance and service provision	-0.87
4. Other services	-6.20



**The most urgent development priority now is *how to make Mbay a sustainable city.***

Geomorphology consists of the S. Aesesa Delta, Alluvial Plain (Alluvial Fan), Sedimentation Processes, Alluvial Geology

***The City of Mbay:***

Location: 121°10'48''-121°24'4'' East, -8°26'15''-8°40'0'' South

Area ± 25,806 Ha Administration - 14 Villages

Land use includes irrigated rice (6,500 Ha), wetlands, mangroves, scrublands, residential areas, horticulture, fields, fish and prawn aquaculture.

***The demography of Mbay:***

*Population:* 5,156 households (25,766 people) - 12,688 male and 13,078 female

Population growth averages 2.67% per year

*Livelihood:* agriculture 86.45%, services 4.78%, industry 2.43%, trade 2.33%, fisheries 2.13%, livestock 0.45%, transport 0.33%, horticulture 0.26%. others 0.84%

Mbay is located in the centre of Flores island across the sea from Makassar, the centre of trade for eastern Indonesia. Mbay is on Flores' northern highway extending from Bajo Port to Larantuka. It is a gateway for people, goods and services in and out of Flores. Government and trade centre are showing strong growth because it has a sea port and an airport.

**The Problems**

- Water pooling because of poor drainage as the city is low-lying, almost at sea level
- Threat of salt water intrusion due to minimal ground water and mangrove destruction
- Out-of-season flooding due to upstream damage to the Aesesa river catchment
- Mangrove destruction to build aquaculture ponds
- Unauthorised construction
- Threats caused by the conversion of irrigated land into residential areas
- Coastal pollution from residential and industrial waste
- Population pressure with rapid increases from migration
- Threat of a tectonic earthquake that could cause a tsunami
- Reduction in clean water supplies as the amount of critical land increases in hinterland
- Low economic status of the community. One contributing factor to this is the low level of female participation in the local economy

**Adopted Policies**

***1. Management of the Aesesa Catchment***

- Aim: to reduce the extent of critical land within and surrounding forest, reduce surface water flow, reduce erosion rates, increase water infiltration to ground water
- Comprehensive management of the Aesesa catchment involving all sectors
- Minimalise off-season floods upstream
- Increase groundwater stores with the potential to produce springs
- Improve community welfare by encouraging women to play an increased role in community economic activities (economic institutions)
- The Aesesa catchment spans the Ngada and Nagekeo Districts so **a joint body should be formed to manage the catchment**

***2. Creation of a Buffer Zone***

- A buffer zone will be created to protect irrigated land from the expansion of urban/residential areas
- To act as a green corridor, protective barrier between irrigated land and urban areas
- A Buffer Zone to act as an filter for air pollution and to produce oxygen for the human population
- Buffer zone along primary channels and circling the city of Mbay
- The species of trees and plants planted within the buffer zone will be multifunctional. They will have conservation value and an economic value to communities that own land that is included in the buffer zone
- Special binding regulations to protect the buffer zone

***3. Control of salt water intrusion***

- To increase the supply of ground water to reduce the landward flow of salt water

- Limiting maximum permitted flow rates for the exploitation of ground water (bores)
- Providing information on well construction with all building permits
- 30% of urban areas must be green open spaces

#### ***4. Mangrove conservation and reforestation***

- To maintain the balance of mangrove ecosystems
- To reduce salt water abrasion that threaten Flores' northern highway (largely follows the coastline)
- As a barrier against tsunami or sea level rise

#### ***5. Fisheries development***

- To increase incomes of people working in fisheries without damaging mangroves
- Integration of fish cultivation with mangrove management as an environmentally appropriate tool for fish and prawn breeding

#### ***6. Revegetation of the Hinterland – Aemau sub-catchment***

- To reduce erosion rates that have the potential to produce critical land
- To increase infiltration of water to the ground water and decrease surface water flow rates as a result of erosion
- To create a micro-climate that encourages local rainfall
- Conservation of the natural environment to improve community welfare

#### ***7. Air and sea transport development***

*Marapokot sea port* with the following facilities:

- Construction of a waiting room for arriving and departing passengers
- Clean water supply for ships
- Parking space for public transport and for vehicles awaiting to board the barge

*Surabaya II airport*

- Preparation of a master plan for an airport
- Completion and certification of land dedicated for an airport with an are of  $\pm 300$  Ha
- Attracting interested investors

#### ***8. Domestic and industrial waste management***

- Solid Waste
  - Use rubbish bins in residential areas, rubbish trucks at central locations that act as rubbish collection points from where is taken to the rubbish dump
  - An environmentally friendly dump must be developed and managed as such so that rubbish can also provide a local source of income (eg. through compost)
- Liquid Waste
  - Construction of a facility for processing domestic and industrial waste liquid waste before it is released to waterways to prevent marine pollution

#### ***9. One-stop service for permits***

- To control construction in accordance with urban and district planning
- Provide prime services to the community in a way that is fast, appropriate and cost effective and efficient (reducing red tape)

#### **Concrete activities required**

- Assistance in planning, mapping and creation of a hydrological model of Mbay
- Assistance in the research and planning for management and use of ground water
- Assistance to create a master plan for the management and use of the Aesesa catchment in cooperation with Ngada District, particularly for the Aemau sub-catchment, which is most critical
- Material assistance with tools and spatial data for development of GIS and regional planning
- Assistance to increase capacities amongst local government staff
- Assistance with effective and efficient planning and management of water resources
- Increasing capacities of community economic institutions and gender mainstreaming

## Natural Resource Management and Livelihoods in eastern Indonesia

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Rural livelihoods in Indonesia are heavily based on natural resources. Four features of livelihoods are highlighted: there is a diverse portfolio of activities; they are highly dynamic; there is high differentiation; and they vary markedly spatially.

On the basis of this it is suggested that:

- research and development investments in one sector or in one commodity are going to make marginal gains;
- if livelihood diversity is reduced then risks are increased;
- it is necessary to build adaptive capacity (i.e. human capital is crucial); and
- investments in export/major crops will often mean that support is provided to the wealthiest rural dwellers.

Current activities of CDU's School of Environmental Research in Indonesia include:

- CIFOR – CDU Partnership: Forests and Livelihoods Programme (Campbell)
- Enterprise development of NTF products for agroforestry systems (ACIAR/SMAR)(Cunningham)
- Traditional Ecological of Whale Sharks in NTT (DEW) (Stacey)
- Special Issue for the journal *Ecology and Society*, focuses on Borneo rainforests (Campbell)
- Economics of Indonesian illegal shark fishing in n. Australia)(Bradshaw)
- PhD research on drivers of illegal fishing from Merauke -Torres Strait (Every)
- Boats to Burn Book (Stacey)

Proposed activities include:

- Discussion with SADI/ANTARA on future research projects (SPI)
- Concept Note: possible projects in West Papua and Sulawesi
- ARC Linkage Proposal: NRM & enterprise development for improved Indigenous livelihoods? (CIFOR/RHC – Arnhem Land - Sumba)
- Preparing an AYAD proposal for an ex-PhD student to work in Java on teak producer organizations
- Preparing an ALA for Indonesian from WWF to work on CBNRM in Alor – Solor, NTT
- Preparing a case for approaching DEW regarding the \$AUD 200 million allocated to forestry in Indonesia

## **Soil, Land and Water Resources Information in the Northern Territory**

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The Northern Territory and Australian Governments have been collecting land and water resource information across Northern Australia since the late 1940's. This information has been vital for the development of Northern Australia including the development of communities, managing population growth and developing agricultural industries. These investigations continue today.

In the earlier days investigations and mapping centred on developing water resources for townships such as Darwin and its rural area, Katherine, Alice Springs and numerous Aboriginal communities. This continues today but with an increased emphasis on making sure the use of water is sustainable, especially in the more populated areas such as Darwin's rural area, Katherine, Alice Springs and key agricultural areas.

Soil, land and vegetation investigation and mapping originally targeted landscapes considered to have agricultural potential as well as identifying suitable areas for proposed townships and communities. These formed the basis for developing horticultural industries in the Darwin region and agriculture in the Katherine Daly Basin region. This information is still used for agriculture today but satisfy's ever widening land use demands including rural living, national parks and in very recent times carbon accounting.

Soil descriptions, bore reports and vegetation descriptions are now captured in a digital format and there is a priority to capture a historical backlog of data. Once the data is digital it is simpler to interrogate the data for a specific purpose.

Baseline soil, land and water information can be interpreted for a wide range of land uses. As a result land and water resource information is increasing becoming an integral part of integrated land use plans for most regions across the NT. The information has recently become available on line for the public to utilise (<http://www.nt.gov.au/nreta/nretamaps>).

# Remote sensing of fire regimes in semi-arid Nusa Tenggara Timur, eastern Indonesia: current patterns, future prospects

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Substantial areas of eastern Indonesia are semi-arid (with a pronounced dry season extending from April to November) with extensive areas of uncultivated vegetation dominated by savanna grasslands and woodlands. These are highly fire-prone, despite high population densities reliant on intensive subsistence agriculture and an official national fire policy that prohibits all burning. Before this study, no regional studies have been undertaken that reliably assess the seasonal extent and patterning of prescribed burning and wildfire.

Focusing on two case studies in east Sumba (7000 km<sup>2</sup>) and central Flores (3000 km<sup>2</sup>) in the eastern Indonesian province of Nusa Tenggara Timur, the present paper addresses:

(1) the efficacy of applying standard remote sensing and geographic information system tools as developed for monitoring fire patterns in savanna landscapes of adjacent northern Australia, for (2) describing the seasonal patterning of burning at village and broader regional scales in 2003 and 2004.

Despite recurring cloudiness, which significantly affected daily fire detection of 'hotspots' from Advanced Very High Resolution Radiometer and Moderate Resolution Imaging Spectroradiometer sensors, fire mapping from Landsat imagery was undertaken successfully to reveal:

- (1) fires burnt an annual average of 29% of eastern Sumba (comprising mostly grassland savanna), and 11% of central Flores (with large forested areas);
- (2) most fire extent occurred in savanna grassland areas, and significantly also in cultivated lands and small remnant patches of forest;
- (3) most fire activity occurred under harsh, late dry season conditions; and
- (4) while the great majority of individual fires were less than 5 ha, some late dry season fires were hundreds of hectares in extent.

The potential routine application of different image sensors for fire mapping and hotspot detection is considered in discussion.

Fisher R, Bobanuba W, Rawambaku A, Hill G, Russell-Smith J (2006) Remote sensing of fire regimes in semi-arid Nusa Tenggara Timur, eastern Indonesia: current patterns, future prospects. *International Journal of Wildland Fire*. **15**, 307-317.

## Western Arnhem Land Fire Abatement (WALFA) project

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**Background:** WALFA has been developed since 1996 to address chronic fire management problems in Aboriginal-owned, high biodiversity savanna landscapes of western Arnhem Land. In particular, the essential problem has involved extensive impact of annual wildfires occurring late in the seven month dry season period; over the period 1995-2004 the 28,000 km<sup>2</sup> WALFA region has been burnt ~40% on average, with 32% of this annual average occurring in the late dry season. Nearly the entire amount of this burning is attributable to human (anthropogenic) ignitions.

'Prescribed burning of savannas' attributable to anthropogenic sources is an accountable activity, as listed in Annex A of the Kyoto Protocol. Greenhouse gas emissions of the gases nitrous oxide and methane are accounted for in Australia's National Greenhouse Gas Inventory (NGGI). Contributions from savanna burning to Australia's NGGI amount to ~2-4% annually. Since 2000 it has been recognised (through the Australian Greenhouse Office) that appropriate fire management in the WALFA region could substantially reduce emissions of greenhouse gases.

It is important to appreciate that a savanna fire abatement project differs substantially and essentially from forestry-style sequestration projects established under different provisions of the Kyoto Protocol. No sequestration is involved; rather, accredited abatement projects operate against a pre-project baseline. Emissions abatement may be achieved *annually* against that baseline, both through reduction in the overall area (hence amount of fuels burnt), and also by shifting the intensity / seasonality of burning (also reducing amount of fuels burnt) through the undertaking of strategic management practices (e.g. prescribed burning of strategic firebreaks; prescribed burning earlier in the year to implement more patchy, more low intensity fires). In the case of WALFA, such fire management practice (burning throughout the year, typically under prescribed conditions) was undertaken extensively by Aboriginal people before societal collapse and associated abandonment of traditional practices with the advent of European settlement.

**WALFA arrangements:** WALFA was formally established as a greenhouse emissions abatement project in 2006, as part of a recognised (AGO-accredited) greenhouse emissions offset arrangement between the NT Govt and ConocoPhillips (CP). That arrangement arose out of a requirement for CP to gain licensing approval to establish and operate a liquefied natural gas plant (LNGP) in Darwin Harbour. It is notable that CP undertook exhaustive assessments of other, more conventional offset options (e.g. pine and blue gum plantations) before making their decision.

The arrangement essentially involves the offset of 100,000 tonnes CO<sub>2-e</sub> p.a. against an established contemporary baseline (1995-2004) for the WALFA region, and for which CP pays over \$1M p.a. (indexed for CPI) for the provision of the environmental service (fire abatement, delivered by WAL land owners). The agreement is for 17 years (life of Stage 1 of the CP LNGP) although, importantly, flexibility provisions are included within the contract so that the parties can renegotiate arrangements as required—for example, if the project was to move to a full carbon trading arrangement. Approximately \$100K is also provided by CP for independent annual auditing of the greenhouse gas emissions abatement achieved; this is currently performed by the Tropical Savannas CRC.

**Opportunities in Indonesia:** Conceptually, the same arguments that apply to the development of this 'prescribed burning of savannas' project in northern Australia, apply equally to savanna and forested landscapes of Indonesia under monsoonal rainfall conditions, particularly in the eastern archipelago and West Papua. Recent research undertaken through CDU in partnership with eastern Indonesian institutions and CIFOR has established that contemporary fire regimes are likewise inflicting significant damage to increasingly vulnerable forest resources, and associated social and economic wellbeing of dependent communities. While issues of scale are patently different under intense land usage and habitation in eastern Indonesia, it is evident that even small amounts of resources applied to enhanced fire management practice in that region would reap enormous social, economic, institutional and environmental benefit.

## Summary of discussion sessions

### *Rural Development in NTT*

#### **Background**

A Symposium entitled *Resource Management and Development in East Nusa Tenggara in the Era of Regional Autonomy* was held at CDU on 26<sup>th</sup> September 2007 as part of a project funded by AusAID's Public Sector Linkage Program (PSLP). Participants included the Head of SekBer NTT, the Bupati from East Sumba, Ngada, Nagekeo and TTS, NTT government staff, CDU research and teaching staff and students, NT government staff. Presentations included issues for development in NTT, natural resource management and livelihoods, land capability assessment, mapping and monitoring practices in the Northern Territory and collaborative curriculum development approaches in higher education.

The Indonesian participants at the symposium identified a need for on-going activities in collaboration with northern Australian partners for rural development in NTT. They proposed a framework ("master plan") be created for future development activities within which smaller more specific projects would fit. In this way activities in the region would not be *ad hoc* and would potentially have greater impact and sustainability. The principles of integration of social, environmental, economic and political factors, and the engagement of all stakeholders were accepted, as outlined in the Integrated Rural Development workshop in Kupang in April 2006.

There was an acknowledgment of regional similarities and a shared understanding of the particular environmental conditions of the semi-arid tropics in NT and NTT. And thus the particular relevance of agricultural and ecological skills residing in the Top-End....

#### **Major issues**

The major issues for NTT were identified as follows:

- **Natural Resource Management**
- **Human Resource Capacity**

##### **1. Natural Resource Management (NRM)**

- Land capability assessment
- Soil rehabilitation and conservation
- Land use planning

NRM is basic to improved livelihoods because 70% of the population of NTT live in rural areas and resources, particularly water, limit productivity.

Land capability assessments were identified as the basic information required for planning land use for sustainable development, and a basis on which to assess potential enterprises by local people and potential foreign developers (*e.g.* proposal for cotton plantation on Sumba). It is important that the skills and capacity to make and analyse land capability exist at the Provincial and Kabupaten levels so that informed decisions can be made at these levels.

There are management challenges associated with local people living in conservation areas. Studies are needed to accommodate the needs of these people and also maintain conservation of natural resources, possibly through collaborative management or community forestry enterprises.

The importance of empowering local people with the skills outlined above was stressed.



## **2. Human Resource Capacity**

- Education
- Health
- Workforce/employment skills (programs exist with Malaysia)
- Agribusiness

The development of agribusinesses was identified as a way forward for rural development in the region.

Some potential commodities were identified, including coffee (Flores and Sumba), maize, mung beans and peanuts (W Timor) and rice (Flores). However, it was recognised that rural livelihoods are traditionally diverse and this diversity of crops, livestock, harvesting of natural resources and some external income minimises risks to livelihoods. It was acknowledged that single commodity enterprise development may disadvantage the very poor.

The development of agribusiness must address potential obstacles including inadequate infrastructure, poor access to markets, poor fire management.

The process of agribusiness development was outlined as:

1. transfer of knowledge
2. increased incomes in communities
3. development of access to local markets

The following concept proposal was developed from the discussions during the Symposium on 26<sup>th</sup> September and in subsequent discussions on 28<sup>th</sup> September.

## **FUTURE PARTNERSHIPS**

**Aim:** To increase the skills and capacity within NTT for monitoring and management of natural resources, and increasing human resource capacity.

### **Activities:**

#### **1. Improved natural resource management.**

It is proposed to target a high priority catchments on each of Sumba, Flores and West Timor; Kambaniru and Maidang Catchment Area (East Sumba); Noelmina Catchment Area (West Timor); Aesesa Catchment Area (Ngada, Flores) in particular the impacts on development of M'bay as the capital of the new Nagekeo regency. Activities in the Aesesa and Noelmina catchments will complement existing catchment studies by Indonesian government agencies and NGOs.

##### **1.1 Land capability assessments within selected catchments, one in each of West Timor, Flores, and Sumba.**

Land capability assessment in a spatial framework (GIS) is the key to integrated planning for sustainable land and resource productivity. This type of assessment provides a basis for setting priorities, targeting development activities and a framework for directing infrastructure and service delivery.

Considerable spatial science skills exist in eastern Indonesia, particularly through GIS training provided by CDU and UKSW, and SEKBER Ngada. Areas for development include the extension of current landscape mapping, GIS, field skills in land capability assessment, and landscape-scale analysis of development risks and opportunities.

##### Proposed activities:

Within the selected catchments,

- Land capability assessments including soil, water and vegetation surveys, and institutional systems for prioritized land management at the regency and provincial level.
- Mapping of land cover, land use and fire, using topographic maps, satellite imagery and ground truthing.
- Inclusion of the above data within a spatial data base or Geographic Information System (GIS) for subsequent analysis.

These activities will be achieved by local NTT agencies with technical inputs from external agencies (*e.g.* CDU and NT Government agencies) and Indonesian universities. Through this collaboration, training skills will also be increased within NTT.

##### **1.2 Identification of “vulnerable” areas in NTT**

Areas that are degraded or prone to degradation or natural disasters have been identified as priorities for management attention in NTT. The major issues include:

- limited water supply in upper reaches of catchments,
- flood damage in lower reaches (*e.g.* Noelmina catchment in West Timor),
- landslides and erosion (*e.g.* sedimentation within Aesesa catchment limiting sustainability of M'bay reservoir)

- wildfire prone areas of savannas throughout NTT.

Catchment modelling and cooperative community management will be investigated with the aim of promoting sustainable land use without detrimental effects on downstream systems.

Proposed activities:

- Assessment of significant landscape scale land cover and land use change for whole of NTT: beginning with creation of operational land use and fire mapping in Ngada, Sumba Timur, and TTS, followed by expansion to other regencies.
- Identification of high priority areas because of vulnerability to soil loss (*i.e.* erosion, land slips), flood damage and fire damage.
- Catchment modeling and the application of soil loss equations will be applied for erosion hazard analysis.

### **1.3 Capacity to appraise potential for enterprise development in NTT**

The development of agribusiness is a high priority for development in NTT. The skills to assess the viability of potential agribusiness developments and to develop enterprises need to exist at the local and Provincial level.

Proposed activities:

- Assessment of significant landscape scale land cover and land use change for whole of NTT: beginning with creation of operational land use and fire mapping in Ngada, Sumba Timur, and TTS, followed by expansion to other regencies.
- Identification of high priority areas because of vulnerability to soil loss (*i.e.* erosion, land slips), flood damage and fire damage.
- Catchment modeling and the application of soil loss equation will be applied for erosion hazard analysis.

## **2. Improved Human Resource Capacity.**

### **Basic service delivery in selected areas of NTT**

Reliable social, economic and natural resource data are essential for good governance and service delivery. Being able to collect and interpret data at the local level is essential for regional autonomy

1. Social and economic data including demographic, economic, health and education data, and overlain with environmental data in GIS.
2. Interpretation of data within GIS for infrastructure development and the provision of health and education services.

**Proposed activities:**

- Training and support for government and NGO staff to conduct social and economic field surveys and analysis of these data.
- Use data for improved local planning for sustainable rural development and the effective provision of basic services, in particular health and education, as well as infrastructure development, livelihoods and epidemiological modeling.

Field surveys would initially focus on the catchments listed above, where local governments are already focusing development effort, and will later expand to other Kabupatens/catchments in NTT.

### **Capacity building through institutional collaboration with eastern Indonesian universities**

Eastern Indonesian universities can play a key role in increasing resource management skills in eastern Indonesia in a sustainable way. Eastern Indonesian universities can provide training in monitoring and management skills, through collaborations with other Indonesian and Australian universities, and also be active research partners in the region.

Institutional linkages between CDU and eastern Indonesian universities would be beneficial for mutual capacity building. Strong linkages already exist between Australian and Indonesian universities (see symposium summary), including UNDANA, University of Mataram, UKSW, CDU, USC, University of Tasmania, and University of New England, in language, nursing and environmental management training. The model of collaborative curriculum development has been adopted for maximum capacity building.

#### Proposed activity:

- Collaborative curriculum development
- Cross-institutional staff exchanges
- Cross-accreditation
- Contribution to peer review processes