Getting everyone to agree in natural resources management

RIU

Validated RNRRS Output.

Trade-off analysis is a way of building consensus among stakeholders in multiple use natural resource areas. It involves working with stakeholders to identify their interests and importance, developing different scenarios and iterative weighting of information leading to consensus. It is in use at the Buccoo Reef Marine Park in Tobago, where wide agreement was reached on the long-term objectives of sustainability and conservation of resources. Co-management, facilitated through trade-off analysis, has benefits for the wider social goals of conservation and social–ecological resilience. The method has been widely disseminated in the literature and is being used in Barbados, Canada, Mozambique, Sri Lanka, South Africa, Tanzania and the UK, in contexts such as fisheries, forestry, agriculture, tourism and climate change mitigation.

Project Ref: **NRSP08:**
Topic: **7. Spreading the Word: Knowledge Management & Dissemination**
Lead Organisation: **Overseas Development Group, UK**
Source: **Natural Resources Systems Programme**

Document Contents:

Description

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Barbados, Canada, Mozambique, South Africa, Sri Lanka, Tanzania, UK,

Target Audiences for this content:

Crop farmers, Livestock farmers, Fishers, Forest-dependent poor,

NRSP08

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Analysing trade-offs for resilience in resource management

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

NRSP

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

R6919
R7408
PD106

*4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? **(max. 400 words)**. This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.*

The main NRSP funded research took place under two projects ‘Evaluating trade-offs between users of marine protected areas in the Caribbean’ (R6919) reporting in June 1999 and ‘Building consensus among stakeholders for management of natural resources at the Land Water Interface’ (R7408) reporting in February 2001. The is was followed up by Programme Development Assignment funding, resulting in the publication of a book, ‘Making Waves: Integrating Coastal Conservation and Development’.

The project developed a method called **trade-off analysis** with the objective to identify common areas of concern and to build institutions of **co-management** between government and civil society in a shared vision for the **sustainable governance** of resource use. The project involved developing the analytical technique, writing and disseminating a manual for other users, and reporting the analytical findings in a book ‘Making Waves: Integrating Coastal Conservation and Development’ and in high profile academic journal articles. The techniques were widely disseminated in the **Caribbean** and elsewhere.

The trade-off analysis technique involves identifying the interests and importance of all stakeholders (formal **stakeholder analysis**); engaging with key stakeholder groups through **scenario** development; iterative weighting of information within **participatory multi-criteria analysis**; and **consensus building** among stakeholders

towards common goals. The projects developed and implemented these techniques for a case of Buccoo Reef Marine Park in Tobago showing that stakeholders had wide agreement on the long term objectives of sustainability and conservation of resources. The research subsequently analysed the conditions for the **institutionalisation** of the techniques and of co-management in general. Drawing on theories of institutional analysis it demonstrated the barriers to implementation at the levels of community, formal organisation and regulation. Re-analysis of the data also demonstrated how **cross-scale institutional links** were forged and maintained to analyse the importance of these linkages for sustainable management, as hypothesised in co-management theories. It also demonstrated the benefits of co-management, facilitated through trade-off analysis for wider social goals of conservation and building **social-ecological resilience**.

300 words

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	***Technology***	***Service***	***Process or Methodology***	***Policy***	***Other Please specify***
			xx	*xx*	

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

The project was focussed on small scale fishing and small scale tourism and related conflicts within multiple use marine resource areas. The techniques are applicable to all collectively managed natural resources – indeed the techniques developed and results have been directly applied in forestry, marine, coastal and wildlife resources throughout the world.

7. What production system(s) does/could the output(s) focus upon?
Please tick one or more of the following options. Leave blank if not applicable

Semi-Arid	***High potential***	***Hillsides***	***Forest-Agriculture***	***Peri-urban***	***Land water***	***Tropical moist forest***	***Cross-cutting***
xx	*xx*	*xx*	*xx*	*xx*	*xx*	*xx*	*xx*

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Coastal artisanal fishing***
						xx

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

The results of this research project are supported by findings elsewhere in the programme that look specifically at the management of complex natural resource systems and seek to identify and overcome barriers to their collective management. Thus the techniques and the findings on institutional analysis and design are relevant to forest, marine, coastal and water resource systems. The findings of the work are closely related to those of project R7973 (Bill Adams, Bhaskar Vira and others) on the nature of conflict in common property and open access resource systems. That project argued that conflicts arise not simply out of scarcity of a resource. Indeed political science analysis of wars and violent conflicts postulate that wars occur because of both resource abundance and resource scarcity. Adams et al (2003) [Adams, W. M., Brockington, D., Dyson, J. and Vira, B. (2003) Managing tragedies: understanding conflict over common pool resources. Science **302**, 1915-1916] argued that the major overlooked conflicts arise due to diverging values and worldviews about the objectives of conservation and of development. This resonates with our own findings – we provide a platform for the identification and presentation of such diverging values. But our project found in the case of Buccoo Reef that, contrary to common belief locally about intransigence and conflict, that long term priorities for management were convergent and formed the basis for action.

Other relevant projects that could be clustered include R7562 (Julian Barr on participatory planning in Bangladesh) and R3682 (Peter Preston and colleagues on community management of resources in Bolivia) as well as those projects that were more descriptive than analytical and reviewed marine resource issues in the Caribbean (R8317, R7976).

Validation

B. Validation of the research output(s)

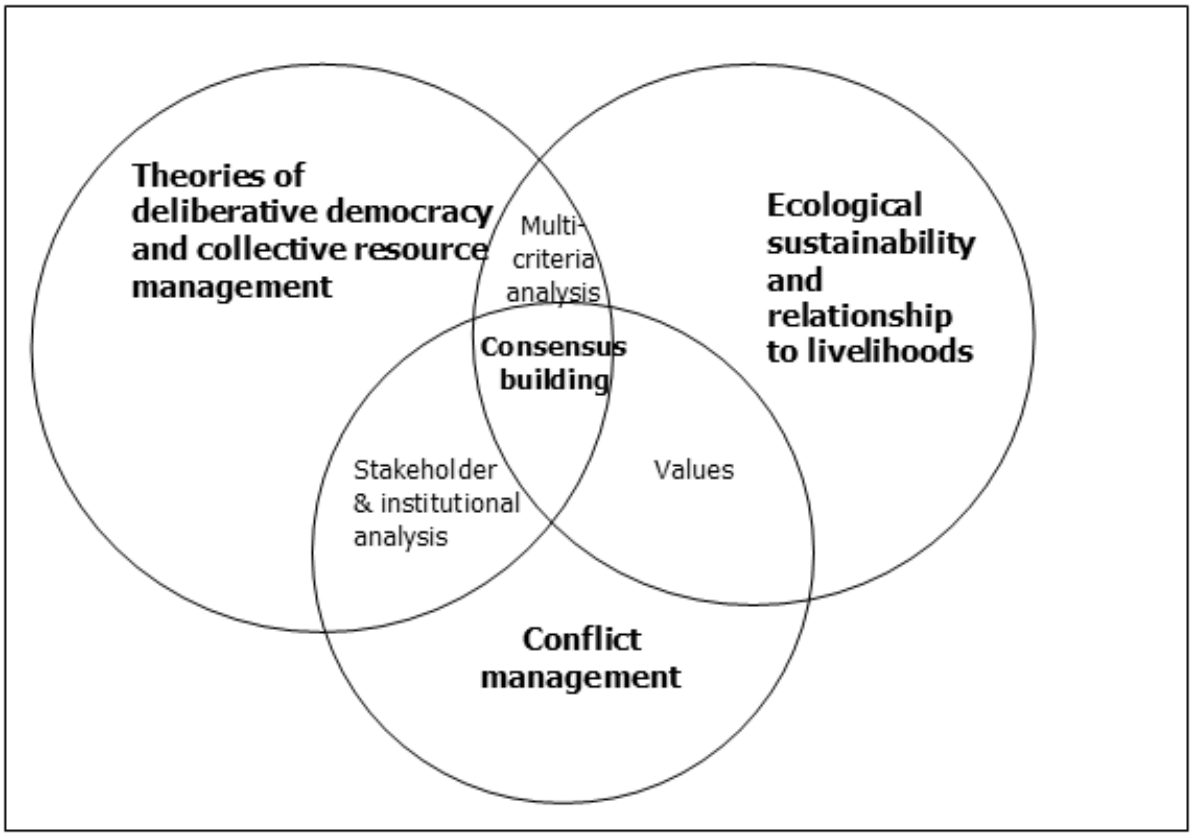
*10**. How** were the output(s) validated and **who** validated them?*

*Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation **(max. 500 words)**. (Or what evidence is there that the outputs have been effective, or have provided efficiencies to: beneficiaries, other researchers, advisory providers, or policy networks)***(775 words)**

10. 1 Description of methods used.

Trade-off analysis is a decision support tool that offers an interdisciplinary approach to natural resource management where there are multiple objectives and/ or resource use conflicts. There are three interconnected elements of the trade-off analysis approach which are used iteratively, see Figure 1 below.

Figure 1 Trade-Off Analysis: the theoretical building blocks



The trade-off analysis approach enables the integration of qualitative inquiry with quantitative research in a transparent structure. This integration is achieved through the amalgamation of three methods: stakeholder analysis, multi-criteria analysis and consensus building. See Figure 2.

Figure 2: The trade-off analysis process

The trade-off analysis process begins and ends with a stakeholder analysis process that allows stakeholders the opportunity to shape the project objectives and ensure their voices are heard and included. Together with stakeholders, future development scenarios are developed and criteria by which to assess them are identified. The future scenarios and impacts are quantified. Stakeholders are further engaged to assess the importance of the evaluation criteria. Feedback is given to all stakeholders on other stakeholders preferences. This process of feedback in conjunction with a conflict management approach can bring stakeholders to consensus on objectives for long term resource use. When this point is reached the stakeholders can be brought together to discuss the best approach for the medium term and the short term in a participatory decision making forum.

10.2 Evidence of use

The following outputs were delivered in Tobago.

- Costs and benefits of the Buccoo Reef Marine Park management options and their distribution among different stakeholders were assessed through stakeholder analysis and environmental economic valuation.

- Potential conflicts and trade-offs between different uses and users were identified. The biophysical and socio-economic data and stakeholder analysis was synthesised, and sustainable management options identified. These were presented back to the stakeholders in a 'multi-criteria analysis' type effects table. Sustainable management options and priorities for action were prioritised at two consensus building workshops, involving all Buccoo Reef stakeholders.

- A MCA framework was developed, demonstrated and promoted to support policy-making and decision-

making in regional target institutions, including the Tobago House of Assembly (THA) and local organisations.

A hands-on user manual on participatory decision support tools was produced, as well as 18 academic papers and a book on integrating coastal conservation and development.

10.3 To whom were the outputs beneficial, i.e. *beneficiaries, other researchers, advisory providers, or policy networks* were they useful?
Two partners continued to use the methods, findings, and lessons from the project after the project had ended, notably CANARI and the Buccoo Reef Action Group.

CANARI (Caribbean Natural Resources Institute)
CANARI organised a 2 week training course in January 2001, for marine park managers in the Caribbean. The course, entitled "Participatory Resource Management Approaches for Managers and Decision-Makers: Designing Participatory Institutions for Effective Management" aimed to help participants understand the requirements for designing institutional arrangements for natural resource management involving stakeholders that function effectively, and that result in effective management. The UEA project team worked with CANARI to communicate the results and findings from the project (R6919) more widely throughout the Caribbean. The report from the seminar suggests that the seminar was perceived to be a success by participants. (see http://www.canari.org/seminar2.PDF). CANARI also used research findings from project R6919 in their review of 75 MPAs in seventeen insular countries and territories of the Lesser Antillean and Central Caribbean biographic zones (Geoghegan et al. 2001).

Buccoo Reef Action Group
Following from projects R6919 and R7408, Buccoo Reef stakeholders agreed to form the Buccoo Reef Action Group at a workshop in May 1999. The first meeting was held in November 1999. Initially the project was facilitated by researchers from the University of East Anglia, the University of the West Indies, and the Department for Marine Resources and Fisheries. After August 2000 the group was facilitated by the Department of Marine Resources and Fisheries.

*11. **Where and when** have the output(s) been validated?*

*Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

The project was located in Trinidad and Tobago and the immediate beneficiaries were in Trinidad and Tobago. The beneficiaries were mostly the primary stakeholders engaged in the project, i.e. the local communities surrounding Buccoo Reef, (those in Buccoo, Canaan/Bon Accord, Store Bay and Crown Point). These communities had often been engaged before but had not been provided with any information from any of the other projects. This project began by providing information to the local stakeholders and sharing with them research findings from previous projects that had been undertaken in the area. All outputs from the project were shared with primary stakeholders and copies of documents were left with a local environmental NGO (Environment TOBAGO), the Institute of Marine Affairs in Trinidad, and the Department of Marine Resources and

Fisheries in the Tobago House of Assembly.

The manual and book produced from the project have been widely circulated. Two hundred copies of the manual were distributed through DFID. In addition, the project team circulated copies of the manual to their contacts throughout the world:

1) All heads of departments of the environment in the UK Overseas Territories, including:
- Gina Ebanks-Petrie, Director, Department of Environment, Cayman Islands Government, P.O.Box 486GT, Grand Cayman, Cayman Islands, BWI

2) All participants at the CANARI workshop in Tobago
- Noel Bennett, Rural Sociologist, Forestry Department, 173 Constant Spring Road, Kingston 8, Jamaica
- The Director, Environmental Management Authority of Trinidad and Tobago, P.O. Box 150, Newtown P.O., Port of Spain, Trinidad
- Susan Shurland-Maharaj, Institute of Marine Affairs, Hilltop Lane, Chaguaramas, P.O. Box 3160, Carenage, Trinidad & Tobago, W.I.
- Carole Smart, Director, Town & Country Planning Division, Eric Williams Finance Building, Independence Square, Port of Spain, Trinidad and Tobago

3) The South Pacific Applied Geoscience Commision (SOPAC), Suva, Fiji
- Mr Alfred Simpson, Director, South pacific Applied Geoscience Commission (SOPAC), SOPAC Secretariat, Private Mail Bag, GPO, Suva, Fiji Islands

4) South Pacific Regional Environment Programme (SPREP)
- Ms Seema Deo, Environmental Education Officer, SPREP (South Pacific Regional Environment Programme), P.O. Box 240, Vaitele, Apia, Samoa

5) Contacts from UNDP-disaster-risk and climate change workshop in Cuba 2002
- Professor Al Binger, Director, UWICED, University of the West Indies, Centre for Environment and Development, 3 Gibralter Camp Road, Mona, Kingston 7, Jamaica, W.I.
- Ulric O'D Trotz, Project manager, CPACC, Regional Project Implementation Unit, Lazarette Complex, Black Rock, St Michael, Barbados
- Professor John Hay, Director of Professional Training, International Global Change Institute, The University of Waikato, Private Bag 3105, Hamilton, New Zealand

6) Contacts from CAMPAM event 1997
- Richard Curry, Research Co-ordinator, Biscayne National Park, P.O. Box 1369, Homestead, FL 33090-1369, USA
- Dr Raul Garrido, Ministerio de Ciencia, Tecnologia, y Medio Ambiente, Capitolo Nacional, Prado y San Jose, Habana, CUBA
- Alessandra Vanzella-Khouri, Programme Officer, SPAW, UNEP CAR/RCU, 14-20 Port Roral St., Kingston, Jamaica
- Dr Leah Bunce, International Marine Affairs Specialist, Internatoinal Programme Office, National Ocean Service, National Oceanic and Atmospheric Administration (NOAA), 1305 East-West Highway, N/IPO, Silver Spring, MD 20910, USA
- Professor Mark Ridgley, Water & Society, Department of Geography, University of Haiwaii, Honolulu, HI 96822, USA
- Dr Asha Poonyth, Project Officer, Mauritius Oceanography Institute, 4th Floor, France Centre, Victoria Ave., Quatre-Bornes, Mauritius

- Dr Ghislaine Llewellyn, Marine Conservation Biologist, Conservation Science Programme, World Wide Fund for Nature, 1250 24th Street N.W., Washington D.C., 20037-1193, USA
- Elizabeth Nicholson, Sea Grant Fellow, NCCOS Coastal Ocean Programme, NOAA, 1315 East-West Hwy. Station 9700, Silver Spring, MD 20910
- J.R.B. Alfred, Director, Zoological Survey of India, Prani Vigyan Bhavan, M-Block, New Alipore, Calcutta – 700 053. INDIA
- Dr Rodney Salm, Director, Coastal Marine programme, 923 Nuuanu Avenue, Honolulu, Hawaii 96817
- Dr Kirsten Michalek-Wagner, Project officer Water Quality & Coastal Development, 2-68 Flinders St., P.O. Box 1379 Townsville, Queensland 4810, AUSTRALIA
- Etika Q Rupeni, Marine Conservation Officer – Fiji Programme, Worldwide Fund for Nature, WWF South Pacific Programme, Private Mail Bag, GPO, Suva, Fiji
- Daniel Brumbaugh, American Museum of Natural History/Biodiversity, Central Park West at 79th St., New York, NY 10024, USA.
- Rili Hawari Djohani, Director, Coastal & Marine Conservation Centre - Indonesia Programme, The Nature Conservancy, Jl. Pengembak No.2, Sanur – 80228, Bali, Indonesia
- Dr Mark Spalding, Senior Marine Ecologist, World Conservation Monitoring Centre, 219 Huntingdon Rd., Cambridge, CB3 0DL

8) Others

- John Ingram, GECAFS (Global Environmental Change and Food Systems), NERC CEH, Maclean Building, Wallingford, OX10 8BB, UK

Project R6919 involved developing a methodology. This methodology can be applied to the management of any resources under conflict where there are multiple objectives and multiple users. The approach has been applied in a variety of farming systems, i.e. cross-cutting (climate change adaptation), land-water (Buccoo Reef, Tobago), forest agriculture (British Columbia, Canada), fisheries (Sri Lanka) and as part of a marine protected areas project in southern Africa (Transmap). These are described in detail in section C.

Current Situation

C. Current situation

12. ***How and by whom*** *are the outputs currently being used? Please give a brief description* ***(max. 250 words****).*

Uptake by other researchers

There were 18 peer-reviewed publications from the project, which have been cited and applied in a variety of context.

1. Brown, K., N. Adger, et al. (1999). Evaluating Trade-Offs Between Users of Marine Protected Areas in the Caribbean: Final Technical Report to DFID NRSP. Norwich, UK, Overseas Development Group: 157.

2. Adger, W. N., K. Brown, et al. (2000). Evaluating Trade-Offs Between Uses of Marine Protected Areas in the Caribbean. *Sustainable Development and Integrated Appraisal in a Developing World.* N. Lee

and C. Kirkpatrick. Cheltenham, Edward Elgar: 159-179.

3. Brown, K., W. N. Adger, et al. (2001). "Trade-Off Analysis For Marine Protected Area Management." *Ecological Economics* 37(3): 417 - 434. (also published as CSERGE Working Paper GEC 2000-02).

4. Brown, K., W. N. Adger, et al. (2001). *Building Consensus Amongst Stakeholders For Management of Natural Resources at the Land Water Interface*. Final Technical Report to DFID NRSP. Norwich, UK, Overseas Development Group, University of East Anglia: iii + 207.

5. Brown, K., E. L. Tompkins, et al. (2001). T*rade-off Analysis for Participatory Coastal Zone Decision-Making*. Norwich, U.K., Overseas Development Group. URL http://www.uea.ac.uk/dev/faculty/brown/analysis.pdf.

6. Tompkins, E. L. (2001). *Trade-off Analysis: A Framework for Integrated and Inclusive Coastal Zone Management in the Caribbean*. PhD Thesis, School of Environmental Sciences. Norwich, University of East Anglia.

7. Brown, K., E. L. Tompkins, et al. (2002). *Making Waves. Integrating Coastal Conservation and Development*. London, Earthscan.

8. Brown, K., 2002. Innovations in conservation and development. *Geographical Journal* 168.1: 6-17.

9. Tompkins, E. L., W. N. Adger, et al. (2002). "Institutional Networks for Inclusive Coastal Management in Trinidad and Tobago." *Environment and Planning A* 34: 1095-1111.

10. Tompkins, E. L. (2003). "*Development pressures and management considerations in small Caribbean Islands' coastal zones*." CSERGE Working Paper. ECM 03-08: Centre for Social and Economic Research on the Global Environment (CSERGE), University of East Anglia. Norwich, UK.

11. Tompkins, E. L. (2003). "*Using stakeholders preferences in multi-attribute decision making: elicitation and aggregation issues*." CSERGE Working Paper. ECM 03-13: Centre for Social and Economic Research on the Global Environment (CSERGE), University of East Anglia. Norwich, UK.

12. Tompkins, E. L., K. Brown, et al. (2003). Trade off analysis for participatory coral reef management: lessons learned from Buccoo Reef Marine Park, Tobago. *Proceedings of the Ninth International Coral Reef Sysmposium*. S. S. M. K. Kasim Moosa, A. Nontji, A. Soegiarto, K. Romimohtarto, Sukarno, Suharsono. Bali, Indonesia, October 23-27, 2000, Ministry of Environment, the Indonesian Institute of Science and the International Society for Reef Studies.

13. Brown, K., 2004. Trade-off analysis for integrated conservation and development. In T McShane, and M. Wells, (eds) *Getting Biodiversity Projects to Work: Towards More Effective Conservation and Development*, Columbia University Press, New York pp289-316.

14. Tompkins, E. L. and Adger, W. N. (2004) Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society* **9**(2), 10. www.ecologyandsociety.org/vol9/iss2/art10

15. Adger, W. N., Brown, K. and Tompkins, E. L. (2005) The political economy of cross-scale networks in resource co-management. *Ecology and Society* **10**(2), 9 [online] URL: http://www.ecologyandsociety.org/vol10/iss2/art9/ (also published as Tyndall Centre Working Paper 65).

16. Brown, K. et al., 2005. Integrated Responses, In Chopra, K., Leemans, R., Kumar, P. and Simons, H. (eds) *Millennium Ecosystem Assessment: Responses Assessment Volume 3*. Island Press: Washington DC.

17. Brown, K., 2005. Addressing trade-offs in forest landscape restoration. In Mansourian, S., Vallauri, D., and Dudley, N. (eds) (in cooperation with WWF International). *Forest Restoration in Landscapes: Beyond Planting Trees*, Springer, New York.

18. Brown, K. 2006. Adaptive Institutions for coral reef conservation in coral reef conservation, in Côté, I. and Reynolds, J. (eds) *Coral Reef Conservation*. Cambridge University Press: Cambridge.

*13. **Where** are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used **(max. 250 words).***

The methodology developed is being used in, or is influencing research in the following countries: Barbados, Canada, Mozambique, Sri Lanka, South Africa, Tanzania and the UK. Examples of these applications are given below.

Examples of application of method or conceptual thinking in other production systems and sustainability issues

Climate change mitigation

Gough, C. and Simon Shackley (2006) Towards a Multi-Criteria Methodology for Assessment of Geological Carbon Storage Options. *Climatic Change*. Vol. 74, no. 1-3: pp. 141-174

Coastal zone management

Claudet, Joachim and Dominique Pelletier (2004) Marine protected areas and artificial reefs: A review of the interactions between management and scientific studies. *Aquatic Living Resources*. Vol. 17, pp. 129–138

Glavovic, B.C. (2006) Coastal Sustainability—An Elusive Pursuit?: Reflections on South Africa's Coastal Policy Experience. *Coastal Management*. 34, 111-132

Ledoux L. and Turner R.K. (2002) Valuing ocean and coastal resources: a review of practical examples and issues for further action. *Ocean and Coastal Management*, Vol. 45, no. 9, pp. 583-616

Lloret, Javier, Arnaldo Marín, Lázaro Marín-Guirao, M. Francisca Carreño (2006) An alternative approach for managing scuba diving in small marine protected areas. *Aquatic Conservation: Marine and*

Freshwater Ecosystems. Vol. 16, no. 6 , pp. 579 – 591
Pelletier, Dominique, Jose A. García-Charton, Jocelyne Ferraris, Gilbert David, Olivier Thébaud, Yves Letourneur, Joachim Claudet, Marion Amand, Michel Kulbicki and René Galzin (2005) Designing indicators for assessing the effects of marine protected areas on coral reef ecosystems: A multidisciplinary standpoint. *Aquatic Living Resources*. Vol. 18, pp. 15-33.
Ruitenbeek HJ (1999) Blue pricing of undersea treasures – needs and opportunities for environmental economics research on coral reef management in South East Asia. Paper presented to the 12th Biannual Workshop of the Environmental Economics Program for South East Asia, Singapore, 11-14 May. IDRC, Singapore.

Contaminated land

Linkov, I., F. K. Satterstrom, G. Kiker, T. P. Seager, T. Bridges, K. H. Gardner, S. H. Rogers, D. A. Belluck, A. Meyer (2006) Multicriteria Decision Analysis: A Comprehensive Decision Approach for Management of Contaminated Sediments. *Risk Analysis*. Vol. 26: pp. 1-61

Fisheries

Bennett, Elizabeth and Clerveaux, Wesley (2005) Social capital and fisheries management on small islands. *Aquatic Resources, Culture and Development*. Vol. 1, no. 2, pp. 109-118.
Mardle, S., E Bennett, S Pascoe. 2003. Multiple Criteria Decision Analysis of Stakeholder Opinion: A Fisheries Case Study. Presented at conference 'Rights and Duties in the Coastal Zone', Stockholm.

Forestry and agriculture

Meitner, M.J. Gandy, R. Sheppard, S.R.J. (2005) Reviewing the role of visualization in communicating and understanding forest complexity. In "Proceedings of the Ninth International Conference on Information Visualisation". pp: 121- 128
Robbins, M. (2005) Agricultural sinks in the developing world: Different disciplines and different perspectives. Environmental Sciences. Vol. 2, no. 1: pp. 15 - 29
Sheppard, S. R. J. and Meitner, M. (2005) Using multi-criteria analysis and visualisation for sustainable forest management planning with stakeholder groups. *Forest Ecology and Management* 207, 171-187.

Tourism

Belle, N. and Bramwell, B., 2005. Climate Change and Small Island Tourism: Policy Maker and Industry Perspectives in Barbados. *Journal of Travel Research*, Vol. 44, No. 1, 32-41

Theoretical contribution

Adams, W.M., Dan Brockington, Jane Dyson, and Bhaskar Vira (2003) Managing Tragedies: Understanding Conflict over Common Pool Resources. *Science*: Vol. 302. no. 5652, pp. 1915 – 1916
Kiker, G.A., Todd S. Bridges, Arun Varghese, Thomas P. Seager, and Igor Linkovjj (2005) Application of Multicriteria Decision Analysis in Environmental Decision Making. *Integrated Environmental Assessment and Management*, Vol. 1, no. 2: pp. 95–108
Nguyen-Khoa, S.; Smith, L.; Lorenzen, K. 2005. Adaptive, participatory and integrated assessment of the impacts of irrigation on fisheries: Evaluation of the approach in Sri Lanka. Working Paper 89. Colombo, Sri Lanka: International Water Management Institute.

14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading ***(max 250 words).***

The methodology was applied in Trinidad and Tobago initially and then communicated through the CANARI workshop, the 18 papers produced and variety of conferences and workshops where the project managers and research staff talked about the project methodology and its usability. The research team spoke at the following 8 conferences:

To coastal managers

LOICZ coastal session at the Open Meeting of the Human Dimensions of Global Environmental Change Research Community. Bonn, 9-13 October 2005.

To marine park managers

Ninth International Coral Reef Symposium, Bali, Indonesia, October 23-27 2000.

To climate change researchers

'Mitigation and Adaptation in Climate Change' Conference, Centre for Advanced Cultural Studies, Essen, Germany, May 15-16, 2003

UNDP Expert Group Meeting – Integrating Disaster Reduction and Adaptation to Climate Change, June 17-19, Havana, Cuba.

To development practitioners

Development Studies Association, Environmental Resources and Sustainable Development Study Group Conference, 'Environmental Resources: Conflict, Co-operation and Governance'. 17-18 May, University of Bradford, Bradford.

Impact Assessment in the Development Process: Advances in Integrating Environmental Assessment with Economic and Social Appraisal. Institute for Development Policy and Management, University of Manchester, 23-24 October 1998.

To human dimensions of global change researchers

Session on Innovative Social Sciences in the Coastal Zone. Open Meeting of the Human Dimensions of Global Environmental Change Research Community', Shonan Village, Kanagawa, Japan, 23-26 June1999.

To ecological economists

'Beyond Growth: Policies and Institutions for Sustainability' Fifth Biennial Meeting of the International Society for Ecological Economics, Universidad de Chile, 15th-19th November, 1998

Evidenced by the citations search for the outputs from the project, the trade-off analysis methodology developed has had, and is continuing to have, a significant influence on: the shaping and implementation of integrated conservation and development projects; the management of natural resources over which there is conflict, or multiple users and multiple objectives; and common property resource management issues.

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

The project involved the development of a methodology. The theoretical framework and the method developed have shaped academic thinking on resource management. For example Adams et al, 2002 use the method in

their thinking on *common property resource management,* specifically trade-off analysis is used to explain how stakeholders perspectives can be included in decision making about common property resources.

Matsaert (2002) used the approach to describe how institutions shape resource use. Authors such as Vermeulen (2004) have used the method to help shape thinking on pro-poor conservation and development.

There was a deliberate attempt by project researchers to ensure that the methods developed were not exclusive through complexity or through difficulty of operation. For example, the manual was written specifically so that anyone could replicate the trade-off analysis method with only the simplest of tools (pens and paper) necessary. Also, the basic elements of the project, i.e. the integration of stakeholder analysis, multi-criteria analysis and consensus building, were replicable in a variety of settings. It appears that researchers have identified the broad applicability of this approach, and now the method has been applied to a host of different resource management issues and to tourism and climate change.

The high profile of project R6919 in part arose from the dissemination strategy. Supplementing the 18 academic papers from the research with a wide range of conference participation, the production of the manual and the book led to a wide readership of the method. This outreach in part led to the widespread level of interest.

Current Promotion

D. Current promotion/uptake pathways

16. ***Where*** *is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion* ***(max 200 words).***

Canada: Stephen Sheppard in the University of British Columbia has been applying the method over the past five years to better understand the conflicts and trade-offs between forest users in British Columbia (see references above).

Cayman Islands: the trade-off analysis method was used by Catherine Bell of the Cayman Islands Government Department of the Environment in 2003 to assess the potential for establishing Barkers Marine Park in the Cayman islands.

East Africa (Tanzania, Mozambique, South Africa): The TRANSMAP project is working to explore the opportunities for creating transboundary networks of Marine Protected Areas (MPAs) along the coast of East Africa. Zoning plans that regulate activities and resource use will be developed for two distinct eco-regions one subtropical and one tropical on the boundary between South Africa and Mozambique (the Greater St Lucia Wetland Park World Heritage Site) and on the boundary between Mozambique and Tanzania. See project website at: http://www.transmap.fc.ul.pt/index.asp?01pu

Philippines: Lasco et al (2006) have applied the trade-off analysis approach in the Philippines where they tried to

explain how it was a useful tool in watershed management in the Pantabangan-Carranglan Watershed. Conflicts exist between water users for irrigation and power generation and these conflicts are expected to worsen under climate futures. The trade-off analysis tool was shown to be useful as it facilitated understanding by policy makers, without requiring technical training.

Sri Lanka: Researchers at IWMI (Nguyen Khoa et al. 2002) have applied the trade-off analysis approach to participatory fisheries impact assessment of the Kirindi Oya irrigation scheme in Sri Lanka. Bringing together stakeholders enabled a better understanding of the conflicts between farmers and fishers regarding water management in the reservoirs and lagoons and the trade-offs that would be required. An outcome of the project was the recommendation for improvements in the institutional arrangements for water management in the area.

Trinidad and Tobago: the initial project was based in Tobago and documented outputs have been stored at the Department of Fisheries and Marine Resources, Tobago House of Assembly; the Institute of Marine Affairs in Chaguaramas; and in the CANARI library (see http://canari.org/thacker.pdf).

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. ***(max 200 words)****.*

The effectiveness of the trade-off analysis method is linked to the level of buy-in from the main resource users and stakeholders. If there is buy-in there is much greater likelihood of the method generating supported decisions. This aspect of the project was explored in the follow-up project R7408. The main barrier to slow adoption or uptake of the method is rapid turnover of staff or people within an institution that is engaged and limited communication between stakeholders within that group. Institutional memory can be lost quickly where there is no handover or communication between group members. In addition, if there is a particular individual who refuses to engage with the process, this can slow the uptake of the method. It will not necessarily prevent the uptake of the method, but it can significantly increase the costs of implementation.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

The main findings from project R7408 suggested that there are opportunities and constraints to action at the community level, as the organisational level and in terms regulation and legislation. These include: identifying appropriate people to participate from each stakeholder group; be clear about the responsibilities of people in the process; prove information and feedback to the wider stakeholder groups; focus on collaboration and not necessarily projects. Other changes to remove barriers to applying the trade-off analysis approach include: enforce existing legislation, strengthen legislation, or remove constraining legislation; clarify roles and responsibilities of existing resource managers; keep awareness high, focus on consensus rather than disagreement.

Managing the issue of buy-in can be achieved by continued communication and outreach activities with stakeholders. However, it should be recognised that this assumes that there are unlimited resources (both time and financial) to implement the project. When there is a time-limited period within which to engage different groups, then additional financial resources may be needed to work with the reluctant stakeholders to understand their reluctance or unwillingness to engage.

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

In terms of direct impacts, the application of the trade-off analysis method, on the ground, can lead to higher levels of participation in decision-making about natural resources under conflict, and to a fairer distribution of the benefits from resource use.

Indirectly, the poor can be reached through government users of the research, through changed academic thinking on the subject of conservation and development, and through the training of young people in the subject (through university teaching). Producing a very user-friendly manual for government users is an important part of the process of embedding knowledge in the research location. This type of resource can prove invaluable to help shape thinking and decision making, when there are no other resources available. By providing information on how to undertake participatory decision making (in a rigorous analytical framework) there is a greater chance of buy-in by policy and decision makers.

Communicating the lessons learned from the research in a wide range of conferences, resulted in a greater understanding of the use of the method in different contexts. Teaching the approach to young coastal managers is also a longer term, but slower method of ensuring that ultimately the poor are included in decision making about natural resources.

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Impacts on Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

No formal studies have been carried out.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

Direct impacts on poverty: the application of the trade-off analysis approach has not been evaluated in terms of its impact on poverty. The method is expected to increase the resilience of communities to external shocks by encouraging collective action, by resolving user conflicts and by finding mechanisms to come to consensus on resources under conflict. Evidence has shown that community participation in decision making can lead to better conservation and development practices which can have significant impacts on poverty alleviation in natural resource dependent communities. Hence the methods developed in the project have only indirect impacts on poverty and there have been no direct studies of this impact.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

This project sought to promote sustainable resource use in marine and coastal resources and hence should have direct environmental benefits. These are outlined above in terms of the long term sustainability of the resource and its management institutions. But in addition the project had some direct benefits in terms of setting short term environmental goals.

At the end of project R6919 and R7408, stakeholder meetings were held. In these meetings it was agreed that priorities should be set that focussed on long term actions, medium term actions and short term actions. The prioritisation exercise led to the following four areas for attention.
1. Dealing with the issues of limited awareness and knowledge of the environment of Tobago (the long term challenge);
2. The level of waste water treatment (a medium term planning issue);
3. Direct physical damage to the reef, i.e. reef walking and anchoring (an immediate problem);
4. Oil and gas pollution in the lagoon (an immediate problem).

At the end of the workshop, a Buccoo Reef Action Group emerged comprising the various stakeholder groups. This group set about initiating actions over which they had some control. The first was to write a letter to the Tobago House of Assembly stating that they would support legislation or policies that brought about changes in reef management, that focussed on the above four areas. They also agreed to pay more attention to their own use of Buccoo Reef and to stop reef walking. Since that time some of the reef tour operators have stopped providing visitors to the reef rubber boots with which they can walk on the reef. The impact on the environment has not been measured quantitatively.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

None that we are aware of.

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

The outputs of this research directly affect the capacity of poor people to cope with climate change and disasters. We undertook an analysis using the Toboago data and presented these at a UNDP regional workshop on Disaster Reduction and Adaptation to Climate Change in Cuba in 2001 and published the paper as Tompkins and Adger (2004). That analysis shows that for Tobago that community-based management resulting from implementing trade-off analysis enhances adaptive capacity in two ways: by building networks that are important for coping with extreme events and by retaining the resilience of the underpinning resources and ecological systems. In Tobago the same networks and institutions that promoted reef conservation also serve as a resource for disaster planning – the networks overlap. But there is also strong evidence that sustainably managed coastal areas are more robust and resilient to hurricane damage and other environmental changes: evidence reviewed in Adger et al. (2005), for example, shows that social resilience was important in recovering from impacts of the Indian Ocean tsunami in 2004. Thus the single most important adaptive strategy for climate change is therefore

to maximise current resilience and promote institutions that represent a latent adaptive capacity in the face of climate change.

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