Computer game strengthens control of foreign fishing

RIU

Validated RNRRS Output.

A new computer game is helping fisheries managers learn how to control foreign ships fishing in their exclusive economic zones. The game lets them experiment with control measures such as licence fees, fines for illegal fishing and the costs of law enforcement, to get the maximum social and economic benefits from the fishery. Many less-developed coastal countries have little expertise in these areas and this game helps fisheries managers and policy makers understand the issues they need to address. The model underlying the game has been tested in the Seychelles and Indian Ocean where it helped decision-making on fishing licence fees and fishing legislation. It has great potential for helping managers select and apply suitable tools to control foreign fishing.

Project Ref: **FMSP08:**
Topic: **3. Improving Fishers Livelihoods: Better Fishing Management & Aquaculture**
Lead Organisation: **MRAG Ltd, UK**
Source: **Fish Management Science Programme**

Document Contents:

Description

FMSP08

Research into Use
NR International
Park House
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Geographical regions included:

British Indian Ocean Territory, Oceania, Seychelles, Solomon Islands,

Target Audiences for this content:

Fishers,

A. Description of the research output(s)

1. Working title of output or cluster of outputs.

Full title:
Optimal control of foreign fishing through improved fisheries governance.

Short title: Control of Foreign Fishing

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

Fisheries Management Science Programme

3. Provide relevant R numbers 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.

R Number	Institutional partners	Current contact persons
R4775	Forum Fisheries Agency, Solomon Islands	Chris Reid, Economist
R4775	MRAG Ltd	Dr Graeme Parkes
R5049CB	Seychelles Fishing Authority	Michel Marguerite, Principal Economist
R5049CB	Forum Fisheries Agency, Solomon Islands	Chris Reid, Economist
R5049CB	British Indian Ocean Territories (FCO)	
R5049CB	Ministry of Fisheries & Marine Resources, Namibia	
R5049CB	Govt of South Georgia and South Sandwich Islands	
R5049CB	Department of Conservation & Fisheries, BVI	
R5049CB	MRAG Ltd	Dr Graeme Parkes
R8463	Fisheries Department, Kenya	Mrs Nancy K Gitonga, Director of Fisheries
R8463	Fisheries Department, Tanzania	Mr Geoffrey Nanyaro, Director of Fisheries
R8463	MRAG Ltd	Dr Robert Wakeford

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.

Coastal States exercising jurisdiction over their Exclusive Economic Zones (EEZ) under the provisions of the 1982 United Nations Convention on Law of the Sea have an obligation to manage sustainably the marine resources within these boundaries. Where their capacity to harvest the entire sustainable catch is low, coastal States must make provision for other States to access the "surplus allowable catch" through **access agreements**.

Permitting access to **foreign fishing** can be of considerable value to a developing country. In addition to the transfer of income through licence fees from the distant water fishing nation (DWFN) to the coastal State, benefits such as increased local landings and local fishery development through joint ventures with DWFNs may also be realised. However, a country's capacity to derive net benefit from these resources depends on a number of key factors, including: domestic fishing capacity; estimation of surplus yield available for foreign fishers; potential benefits to foreign fishers of fishing within the EEZ; and the coastal State's capacity to effectively monitor and control fishing activity and enforce fisheries regulations. If foreign fishing is permitted, then the terms and conditions of access must be both optimised for the coastal state and effectively implemented through sound **governance** procedures. Devising these terms and conditions involves a series of secondary decisions, regarding the level at which **licence fees** should be set, the extent of expenditure on surveillance and enforcement, and what legal framework should be developed, especially the **penalties** for **illegal fishing** activities to be imposed. Many developing coastal States have been severely hampered in this **decision-making** process by a lack of local expertise and of effective frameworks for **monitoring, control and surveillance** (MCS).

The Control of Foreign Fishing research, carried out initially from 1991 through to 1995 and again in 2005, aimed to address this short-fall in developing countries. The outputs produced within the cluster included a training tool in the form of a spreadsheet-based management game and a generalised modelling framework based on modern mathematical bio-economics and optimal control theory, providing structured guidance to developing coastal States for maximising economic opportunities and benefits derived from foreign fishing activities.

Essentially two types of analysis underpin the theory behind the framework. The first relates to determining the potential benefits to foreign fishers of fishing within the EEZ and hence the demand for access, comparing catch and effort inside and outside the zone; the second requires the estimation of the probability of detection and successful prosecution of unlicensed foreign fishing vessels inside the EEZ arising from different surveillance operations.

Case studies indicate that, in the short term, total state revenue from foreign fishers is more likely to be gained from improving compliance and increasing the number of licences sold, rather than increasing the licence fee. However, over the medium to long-term, the priority should be to acquire more precise data on the variability and value of the resources taken within the EEZ, by both licensed and illegal vessels, in order to improve management of the stock. Case studies also

illustrate the importance of tailoring the analysis to the particular fisheries and surveillance characteristics of the region or country.

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***
X			X	X	

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

Access to fisheries resources within EEZ and the economic benefits / revenues derived from these.

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***
					X		

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

Small-holder rainfed humid	***Irrigated***	***Wetland rice based***	***Small-holder rainfed highland***	***Small-holder rainfed dry/ cold***	***Dual-istic***	***Coastal artisanal fishing***	***Inland fish-eries***	***Deep sea fish-eries***
								X

*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.

Two major constraints have hindered the application of methodologies promoted by the CFF research. Firstly, limited availability and quality of data required for the model, and secondly in-country capacity for monitoring, control and surveillance in order to enforce any developments in legislation.

For example, two recent case study countries, Kenya and Tanzania, only receive catch reports

from vessels fishing within the EEZ on a voluntary basis and there is scepticism that the data available accurately reflect the true extent of foreign vessel effort in the EEZ. Incorporating data reporting requirements into licensing agreements would certainly improve the availability of this data to fishery managers. However, in order for effective stock assessment to be implemented, the relevant database systems and analytical frameworks/tools must also be in place/available. There are outputs from three FMSP clusters which might be able to address these data limitations:

Cluster 5: Fisheries stock assessment and management, a collection of tools for assessing fisheries and simple guides to their use and to writing a fisheries management plan

Cluster 6: Tools for assessing and managing fisheries in data limited situations

Cluster 12: Training courses in fisheries stock assessments and management.

Outputs from these three clusters, designed specifically for developing country situations where resources are limited, include a number of tools and guidelines for stock assessment and management, providing advice on how to select and apply appropriate tools for different circumstances with the ultimate aim of providing advice to managers and policy makers on the status of fish stocks. Coordination of training on these tools and on the CFF methodology within the same institutions would have great potential to add value to each of the clusters and future capacity.

Short-fallings with in-country capacity to mobilise effective MCS operations and governance constraints would be well complemented by much of DFID's (non-RNRRS) current work aimed at tackling Illegal, Unregulated and Unreported (IUU) Fishing. Some current relevant projects commissioned through the Programme of Advisory and Support Services to DFID (PASS) include:

- Analysis & Monitoring Through an IUU Tracking Network
- IUU Fishing: UK Co-ordination Unit Post
- Scoping of a Programme of Support to an African Policy Process aimed at Tackling IUU Fishing.

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)****.*

Peer review of the underlying scientific methodology and modelling used within the Control of Foreign Fishing cluster has been through presentation at a number of meetings over the last 14 years. These have included a presentation to a wide audience of fisheries managers at an FAO/ Norway regional workshop on Monitoring, Control and Surveillance in 1996 in Mauritius, a presentation at the 128th Annual meeting of the American Fisheries Society, August 1998 in Hartford, Connecticut and more recently a paper submitted to the 2006 meeting of the International Institute for Fisheries Economics and Trade in Portsmouth, on 'Rebuilding Fisheries in an Uncertain Environment'.

A series of case studies were used to examine how effectively the modelling theory transferred to in-country practical situations. The objective was to assess the extent to which the principles and methodology could be used by governments in developing countries in forming policies for controlling foreign fishing in their EEZs. This was achieved by collaborative research with regional and national fishery management authorities (e.g. intermediary and end users).

Case studies were selected where a fishery already existed within the respective EEZ which was currently being exploited by foreign fishers either under an existing licensing scheme, or where there was potential for one and where data on foreign fishing activities both inside and near to the EEZ existed and could be accessed. Strong preference was given to cases where the potential revenue to the coastal State was substantial.

Field visits were undertaken for familiarisation and collation of data on the fisheries, surveillance capabilities and fisheries law. Analyses of these data provided estimates of benefits of fishing in the EEZs for foreign fishers, estimates of detection probabilities resulting from surveillance, and information on likely penalties for illegal fishing. This in turn allowed for amendments to be made to the methodology already developed, accounting for complexities arising within each case study, and the surveillance model was substantially improved as a result.

The principle conclusion from the case studies was that it is indeed possible to apply the methodology and results generated from the CFF research to develop practical advice on management of foreign fishing, if the following can be estimated:

1) The benefits to foreign fishers of fishing within the EEZ from analysis of catch and effort data pertaining to fishing both inside and outside the coastal state's EEZ;
2) The probability of detection and the likelihood of successful arrest of unlicensed fishing vessels arising from different levels of surveillance.

More recently, the CFF management game was validated through a promotional workshop, and assessment of the extent of knowledge transfer to participants through a post-workshop questionnaire indicated that knowledge had been improved across a range of CFF-related topics for a high percentage of participants.

*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)**.*

Case studies were carried out between 1993 and 2005 for a number of different fisheries. The first was in 1993 for longline and purse seine tuna fisheries in the South Pacific, collaborating with staff from the Forum Fisheries Agency in Honiara, Solomon Islands. A study in 1993 of the hake fishery in Namibian waters was short-lived, because fisheries had developed more rapidly than expected since Namibia's independence in 1990, and the Government took a decision to pursue policy which promoted local rather than foreign fishing.

An additional case study for a tuna fishery took place in the British Indian Ocean Territories (BIOT) in 1994. This provided a test of the actual application of the methodology, rather than just its potential application, as the fisheries management regime for BIOT came into operation during the term of the adaptive phase of this cluster, and hence its design was based heavily on the results of the early research.

In 1994-5, the toothfish fishery around South Georgia and the South Sandwich Islands provided an interesting arena for testing of the CFF methodology. A number of special features combined to make the toothfish fishery an ideal case study. Firstly, the fishery is highly lucrative and secondly it is subject to major conservation constraints, both on catches and on the number of vessels allowed to fish. Issue of licences is therefore heavily restricted, and with a large number of vessels wishing to fish, the resultant bottleneck creates a strong incentive to fish illegally. This places a much greater premium on surveillance and enforcement than in the other cases studied.

Possibly the most successful of the studies for tuna fisheries with respect to direct follow on impact, took place in the Seychelles in 1996, while more recently in 2005 the impact of studies in Kenya and Tanzania were limited by data availability.

The production system in which the case studies were carried out was land-water interface and the farming system deep water fisheries**.**

Current Situation

C. Current situation

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

Fishery managers and policy advisers in developing countries that have been subject to a case study, or have attended a regional workshop such as the one in Dar es Salaam in 2005 continue to benefit from and use the knowledge gained through this interaction in their decision making and provision of advice on controlling foreign fishing. In a number of these countries, the CFF recommendations have influenced the licensing strategy or surveillance decisions (see q.13 for details).

The spreadsheet-based management game that puts the CFF modelling framework into practice can be used as an interactive training tool during workshops in developing countries to improve institutional governance capacity for controlling foreign fisheries (e.g. promotional training workshop, Dar es Salaam, November 2005). This game is too general to provide specific guidance on MCS parameters such as licence fees, surveillance expenditure and fine levels in a particular developing country, but it provides a valuable contribution to the local understanding of how fisheries governance systems should be constructed for maximum benefit to the coastal State. It is particularly relevant for training fisheries managers and policy advisers in developing countries where local resources for surveillance are limited. The output of the model has also been used, and will continue to be used if requested, at FAO regional workshops on Monitoring, Control and Surveillance (e.g. in Mauritius in 1996 and Malaysia in 1997).

*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 influence of the CFF intervention is still being felt in most countries that have been subject of a case study. Where case study interventions have influenced the formulation of policy and development of licensing and enforcement strategies, the related/resultant management regimes in the countries in question are still in place. For example in the Seychelles, licence fee discussions and the review of legislation, including the increase in fine levels in line with the outputs of the model, which followed the original CFF case study, were based on the original recommendations. Similarly, in the British Indian Ocean Territory (BIOT), the licensing and surveillance strategies have been strongly based on the principles that underpin the CFF model and the core relationships demonstrated in the model continue to steer decision-making by the BIOT Authorities in management of the purse seine and longline tuna fisheries.

In the south Pacific, the geopolitical circumstances mean that it is difficult to identify specific instances where the CFF intervention has driven specific licensing and surveillance decisions. States in the south Pacific show a wide variety of approaches. Some, such as the Federated States of Micronesia (FSM) have opted for very large penalties for illegal fishing, as advocated in the CFF model, but others have opted for a more cautious approach. Centrally, however, the picture is clearer. For example, the modelling exercise demonstrated clearly the value of specific types of data such as the accurate and routine recording of surveillance activities and the sightings and apprehensions of fishing vessels to better assess the probability of detection and the costs of surveillance. In response to this need for better information, the FFA developed their Violations and Prosecutions Database, which now contains information on prosecutions brought in FFA Member countries over the period January 1978 to the present, including vessel types, violation

type and the resulting penalties.

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

The scale of current use is primarily within countries and regions that have been subject to a case study. Application of the model in case study situations showed that there is little scope for generalising from one country to another, hence there is little expectation of a "natural spread" of the influence of the outputs. Targeting of existing regional management organisations such as the FFA has encouraged wider uptake to some extent, but even after years of regional coordination in the south Pacific on many fisheries issues, there remain substantial differences in the approach to fisheries management between States (not just in the control of foreign fishing). Presentation of the model outcomes and use of the spreadsheet management game at regional workshops is likely to have broadened the influence of the approach to decision-makers beyond the case study countries, but it is virtually impossible to gauge accurately the extent of this. Where rapid uptake was feasible (such as in the cases of Seychelles, BIOT and South Georgia) there was a more or less immediate influence on the setting of fine levels in fisheries legislation and (in the case of South Georgia and BIOT) in the setting of licence fees. The CFF model shows clearly the benefits of imposing large fines on unlicensed vessels to deter IUU fishing and encourage the purchase of licences, especially where surveillance is limited and the probability of detection is consequently low. This was the case in all three examples listed above.

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 outputs of the CFF project have been promoted through a number of different platforms and institutions. In terms of the central themes of setting appropriate licence fees and backing this up with a credible surveillance system and high penalties for IUU fishing, this has best been promoted through international organisations such as the FAO (e.g. the series of MCS workshops under FISHCODE; Mauritius in 1997, Malaysia in 1998) and other regional workshops and fora. The CFF reports are quoted in the international literature on fisheries MCS (e.g. The Costs of Monitoring, Control and Surveillance of Fisheries in Developing Countries, Kelleher, K. 2002 FAO Fisheries Circular No. 976).

More detailed and specific guidance on improvements in fisheries governance has been achieved at the individual country level through high level interaction with policy makers either at the time of the case studies themselves (e.g. as in the Seychelles), or subsequently through interaction with the same individuals on other projects. Key factors in the success of the adoption of the outputs have been the willingness of the target countries to take the advice forward into policy formulation, and their commitment to developing and maintaining robust governance structures for the control of foreign access to their fisheries. Where outputs have been incorporated into the development of fisheries policy and/or management regimes, the process has been facilitated by the existence of well developed data collection systems. Other factors that have helped to maintain

benefits derived from CFF outputs include improved MCS capacity and in particular frameworks/ structures enabling coordination among agencies responsible for MCS (e.g. coastguards) and the licensing (e.g. fishing authorities). In the Seychelles, a Fisheries Monitoring Centre has helped provide a link between the two agencies.

It is clear that significant adoption of the CFF outputs is achieved more over the long term, and therefore longer term interaction with individuals and institutions, beyond the time scale of an individual project or case study is required. Stability in institutional structures and personnel in target countries is therefore helpful in adoption of outputs, and this is often not the case in developing countries.

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).***

Generally, and at global scale, CFF outputs are currently promoted on the FMSP website www.fmsp.org.uk, where reports, papers and policy briefs relating to the methodology and case studies can be downloaded. Promotion is also through the FAO Technology for Agriculture website (TECA) www.fao.org/sd/teca and on the Onefish internet portal www.onefish.org, and various reports and circulars, referring to documents detailing the CFF methodologies, are available from the FAO website.

The concepts and relationships demonstrated and promoted by the CFF project are being further promoted through several current and related projects and programmes, such as the DFID-funded analysis and review of the *Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries* (July 2005: http://www.dfid.gov.uk/pubs/files/illegal-fishing-mrag-report.pdf) and other UK inputs into the High Seas Task Force, plus current UK initiatives resulting from this, funded through DEFRA.

In the Indian Ocean, the EU-funded *Pilot Project for MCS of large pelagics in the Indian Ocean* (EuropeAid/119455/D/SV/d "Assistance technique pour le project pilote régional de surveillance, control et suivi des grand pélagique migrateur dans l'Océan Indian") is developing regional harmonisation in fisheries MCS, including licensing systems and the setting of penalties. A recent paper prepared under this project on penalty scales notes the importance of high fines to support the deterrence of IUU fishing and quotes the CFF project reports as important source documents for this conclusion.

More specifically, in Seychelles outputs are being promoted by the Seychelles Fishing Authority via

the coastguards and through legislation in the courts. FFA staff have used the model in demonstrations to visitors, particularly aid donors, as a means of expressing FFA's commitment to innovation. While in east Africa, as a result of a SADC representative participating in the promotional workshop held in Dar es Salam, November 2005, aspects of the spreadsheet management game have since been used in training workshops under the regional SADC-EU MCS project.

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)****.*

Negotiation for access by distant water fleets to developing country waters with large international economic entities such as the EU creates a significant asymmetry of information and negotiating capacity between the entity with authority over the EEZ and the entity seeking access on behalf of its vessels. This limits developing countries' opportunities to better understand the value and potential of their own resources and to set licensing conditions that are optimal for the coastal State and its citizens. It may therefore be difficult for developing coastal States to adopt advice for optimal policies and strategic positions for negotiations. This was highlighted by case studies for Tanzania and Kenya, where data availability was clearly a key factor in the ability to negotiate access conditions within international agreements. A new DEFRA/DFID project *Comparative study of the impact of Fisheries Partnership Agreements* will be addressing these issues, among others.

In the south Pacific there is a lack of regional cohesion on the issue of strategies and policies for controlling foreign fishing. For political and strategic reasons individual countries have tended to adopt their own approaches and not share information with others. Regional cooperation is improving through the avenues of the FFA and the recently established Western and Central Pacific Fisheries Commission (WCPFC). However, many small island states that rely heavily on revenues from licensing foreign vessels still feel at risk of collective action from foreign clients and are therefore cautious in their setting of licence fees and imposition of penalties for IUU fishing. Some of the island nations have set large fines in their fisheries legislation, but others are reluctant to impose the necessary penalties. In addition, there is a continuing loss of qualified staff from small island countries making them less able to meet the demands of assessing resource potential and designing and negotiating international access agreements.

The necessary improvements in governance take place over the longer term. This requires sustained funding for policy advice and improved facilities for MCS, stability in administration and sustained political will. Inherent instability in some developing countries introduces delays in this process.

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).***

Longer term interventions in developing countries to work alongside fishery managers and policy-makers at the highest level will enhance the development of pathways for adoption of the outputs

of the CFF project, encourage the collection of necessary data and enable the development of strategies specifically tailored for each fishery and developing country. Under these interventions should fall more widespread training and awareness-raising activities.

Developing coastal States need enhanced capability to understand better the economic value and potential of their fisheries and their associated revenue-generating potential in order to realise the benefits that may be derived from setting licence fees at the highest levels that foreign fishers will be willing to pay. Coastal States need a better understanding of their resources and their potential, particularly in terms of the "surplus production" to which foreign fishers are seeking to gain access. This provides a more informed view of how optimal benefits can be achieved over the longer term, by capturing the maximum possible portion of the resource rent, while not endangering the sustainability of the resource. Developing countries also need assistance with developing the necessary governance structures and enforcement facilities to provide an effective deterrent to unlicensed activity and thereby maximise the number of licensed vessels.

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).***

The outputs of the CFF project are primarily targeted at intermediary organisations and policy. They aim to create an enabling environment that through their implementation will deliver more wide-scale benefits to the poor. Whilst they have not been designed to be used directly by poor fishers, it is important that fishers participate in management decisions, particularly when access is being granted to foreign fishers that will directly impact local fishers, for example through the exploitation of a common resource. The best way to achieve this is through engaging fishers and policy makers in dialogue from the start. Thus mechanisms for communication, linking policy makers, fishery managers, economists, legal specialists, and resource users are the key to both successful implementation of these outputs and to engaging the poor in the process. This can be achieved in part through representation of these groups at technical workshops, such as the regional workshop in Dar es Salaam in November 2005.

Governments of developing countries need to be encouraged to use the financial resources derived from licensing foreign fishing to improve MCS structures, and management initiatives both for foreign and local fishing.

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.

The CFF outputs were designed to generate economic benefits to developing coastal States whilst maintaining sustainability of fisheries resources of that State; both of these desired impacts have great potential to alleviate poverty. In addition, improved systems for managing foreign fisheries are likely to arise from general improvements in fisheries governance structures that will also benefit local fishers. Several general impact assessments (including poverty) have been made:

Cambridge Resource Economics (1998) Evaluative review of DFID RNRRS Fisheries sector Research Performance (CNTR 98 5029) Volume 1: The impacts of Fisheries Research; Volume 2: Nine Case Studies.

Arthur, R.I., E. Fisher, R. Mwaipopo, X. Irz, and C. Thirtle, (2005). Fisheries Management Science Programme: An overview of developmental impact to 2005, Final Technical Report., MRAG Ltd. (www.fmsp.org.uk Search Project Database, Project R4778C; http://www.fmsp.org.uk/Documents/r4778c/R4778C_FTR.pdf)

Wakeford, R.C., G.B. Parkes and R.E. Mitchell (2005) Promotion of models generating national economic benefits through control of foreign fishing, FMSP Final Tech. Rep. MRAG Ltd., London, 283pp.

Fisheries Management Science Programme: assessing developmental impact, Policy Brief, March 2006, http://www.fmsp.org.uk/Documents/r4778c/R4778C_Brief.pdf

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*

The impacts on capital assets resulting from application and adoption of the CFF methodologies to date are primarily of a financial nature. Although it is difficult to assess quantitatively, the Seychelles case study provides some indication of the extent to which poor people can benefit from improved control of foreign fishing. Follow-on reviews of legislation led to increased revenues of up to US$2 million per year, four times the previous income from the fishery. As a result of the increased flow of funds to the consolidated revenues of the government from the sale of foreign licences, money has fed back to support activities of the Seychelles Fishing Authority for improving conditions in the domestic fishery, from which a number of artisanal fishers may have benefited.

In 2005, licence fees paid for access by foreign fishing vessels to the Seychelles EEZ generated approximately 5% of the total government budget. The entire population of the Seychelles are beneficiaries of these revenues. The increase in regularisation of foreign fishing has also encouraged foreign vessels to use the local ports to a greater extent, with knock-on linkage effects (e.g. use of port services and processing sectors) and provision of extra income (e.g. from demurrage). The Seychelles port of Victoria on the main island of Mahé is the regional hub for handling of catches from purse seine tuna vessels.

While the fisheries of the UK overseas territories of BIOT and South Georgia made excellent case studies for testing the CFF methodology, the absence of significant local populations mean that it was not possible for the application of the outputs in these examples to generate benefits for poor people. In the south Pacific, because the case study was with the FFA and not with individual countries, it is practically impossible to ascertain the actual level of benefit to poor people in those countries. So while it was possible from this example to view the project outputs on a regional basis, it was at the expense of those gained at a national level. However, depending on the status of the fishery and the size of catches, which is highly variable across the Pacific, the potential for benefits to be realised in this environment, given the willingness and the capacity to implement the project outputs, could be similar to that of Seychelles.

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.

Due to the range of natural environmental fluctuations and the lack of detailed baseline information prior to the start of the project, it is difficult to prove whether a specific project outcome has had a statistically significant impact (either directly or indirectly) on the environment. However it can be expected that where the CFF methodology has been adopted, increased monitoring, control and surveillance (MCS) of foreign fishing has led **directly** to a greater protection of the living marine resources and environment by promoting long-term sustainable yields. By limiting the number vessels and setting catch limits within a regulated licensed fishery, targeted fish populations within the EEZ are more likely to be maintained above safe biological thresholds.

Regulating catches within a licensed fishery (enforced by Fisheries Observers) can lead to a range

of **indirect** benefits that can mitigate against environmental degradation, such as mechanisms to reduce by-catch (e.g. non-target fish, birds, turtles etc), discarding (including high-grading fish of the same species for better quality) and prevent pollution (illegal dumping of solid and liquid waste etc). Moreover, effective MCS can help reduce the level of IUU fishing within the EEZ, which might otherwise use destructive fishing methods and ignore more expensive mitigation procedures.

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

A successful MCS program for foreign fisheries within areas of national jurisdiction might lead to a number of IUU fishing vessels relocating to the High Seas to prevent prosecution. If the same target species can be exploited outside the EEZ as within it (i.e. highly migratory or transboundary fish stocks), an element of caution should be given to the overall status of the population. Under these circumstances further regional co-operation between fisheries agencies will be required.

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 CFF methodology is designed to promote long-term benefits to the developing coastal State from both the generation of licence fee revenues and sustainable resource exploitation. Part of the revenue generated from selling licences and prosecuting illegal vessels fishing within the EEZ could be allocated by the Coastal State to financing pro-poor alternative livelihood programmes outside the fisheries sector where additional training or new skills and other support are required.

Helping to ensure long-term sustainable yields from target species within the EEZ might also lead to a stable ecosystem which is more robust against natural perturbations such as climate change.
