WHAT GOES UP MUST COME DOWN:

PUBLICATIONS FROM DEVELOPING COUNTRIES IN THE AQUATIC COMMONS

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Abstract

During 2010-2012, the Fisheries and Aquaculture Branch Library (FBL) of the Food and Agriculture Organization of the United Nations (FAO) was involved in a project that included the selection, digitizing, web-optimization, creation of metadata, and uploading into the Aquatic Commons (AC) digital repository of grey literature published by, amongst others, issuing agencies in several African countries, and a regional project in Asia - the STREAM Initiative. Furthermore, links to these full text online versions have been added to the Aquatic Sciences and Fisheries Abstracts (ASFA) bibliographic database.

The AC is a thematic digital repository covering the marine, estuarine, brackish and freshwater environments. This repository is directed by the International Association of Aquatic and Marine Science Libraries and Information Centers (IAMSLIC) and hosted by the UNESCO/IOC International Oceanographic Data and Information Exchange (IODE) project office in Belgium.

The AC repository is built on Eprints software. In addition, it uses the related Interoperable Repository Statistics (IRS) software for usage statistics. The paper presents the results of the analysis of the access to the grey literature from selected issuing agencies in developing countries, whereby it focuses specifically on the Technical Documents, published by the Lake Victoria Fisheries Research Project and those published by the Support to Regional Aquatic Resources Management (STREAM), which was based in Bangkok, Thailand.

Examples of digital preservation and repatriation to countries of origin, two of the main objectives for FAO's participation in the repository, are discussed.

By using the IRS software the paper seeks to evaluate FAO's contribution to the content development of the repository and it finds a confirmation of the increasing visibility of and access to some baseline information in the field of fisheries and aquaculture published by institutions and/or projects in developing countries. Finally, the paper describes some of the utilities and limitations of the software.

1. Introduction

As is mentioned in one of the publications by Jean Collins, former FAO Fisheries Librarian,

> One of the characteristics of the literature of fisheries and aquaculture – in particular the practical and management rather than the scientific aspects **–** is that it does not easily find its way into commercial journals. The results of research and the development lessons learned are often lost because of inadequate opportunities to publish, especially but not only in developing countries.[1]

So, often scientific and practical knowledge generated in fisheries and aquaculture is presented in multiple formats of grey literature. The amount of information available as grey literature, which includes project reports and technical documents, training manuals and practical guides, workshop and conference materials, thesis, etc., is rather high and widely spread through marine and fisheries institutions in both developed and developing world. The value of grey literature is recognized and it is widely used in fisheries and aquaculture management.

Aquatic grey literature originating from developing countries can be often considered documents at high-risk of getting damaged due to frequent natural disasters and improper storage conditions or lost due to various human reasons. Access to these documents that are of limited distribution, often remains fragmented and inconsistent not only for the international community but also for internal users.

In the years 2010-2012, FAO's Fisheries and Aquaculture Branch Library (FBL) has been involved in a project that included the selection, digitizing, web-optimization, creation of metadata and uploading into Aquatic Commons (AC) repository of grey literature published by, amongst others, issuing agencies in several African countries and a regional project in Asia, the STREAM Initiative. Links to these full text online versions have been added to the Aquatic Sciences and Fisheries Abstracts (ASFA) bibliographic database.

In speaking about digital information sharing with countries of origin, we use the term "repatriation". By retrospective scanning and uploading of grey literature from developing countries we are carrying out a digital repatriation of information.

Besides thematic repositories like Aquatic Commons and OceanDocs, there are several other open access digital archives related to fisheries and aquaculture which have been developed. Relevant examples from developing countries are the institutional repositories from the Central Marine Fisheries Research Institute in India, the Kenya Marine and Fisheries Research Institute, the Aquaculture Department from Southeast Asian Fisheries Development Center, based in the Philippines, and the Digital Library from the Fisheries, Aquaculture and Marine Ecosystems Division (Secretariat of the Pacific Community), based in New Caledonia. Furthermore, there are multidisciplinary full text resources which include aquatic sciences, like Global Agricultural Research Archive (GARA), related to CAB Abstracts.

The paper presents the results of usage analysis performed with the Interoperable Repository Statistics (IRS) software. The focus is on the access to the grey literature from selected issuing agencies, specifically the Technical Documents published by the Lake Victoria Fisheries Research Project and the documents published by the Support to Regional Aquatic Resources Management (STREAM), which was based in Bangkok, Thailand.

2. Resource Sharing

Information resource sharing is a way to increase availability of documents through optimizing collections' usage while minimizing expenses. With regards to grey literature, the cost of the document is often a secondary issue to limited availability which becomes a determinative and negative factor in the dissemination of fisheries grey literature. Resource sharing programmes,

such as traditional interlibrary loans or innovative repositories of digital collections such as the AC, are required to overcome this challenge.

Shared use of available resources is a concept that has been implemented into marine information management several decades ago by establishing national, regional and international resource-sharing networks as well as through facilitating sharing of marine and aquatic information by several UN organizations and programs.

 2.1 IAMSLIC

The International Association of Aquatic and Marine Science Libraries and Information Centres (IAMSLIC), which consists of more than 300 members, plays an important role in aquatic and marine information resource sharing.[2] More than 90 participating libraries from more than 25 countries offer their local holdings to other member libraries through *IAMSLIC Z39.50 Distributed Library*. The libraries that do not have online catalogs that can be searched via Z39.50 can add selected serials holding information to *The Union List of Marine and Aquatic Serials.* The Union List provides access to several thousand titles including a large number of report series originating from developing countries. The program was implemented in 2002 and since its inception more than 38,000 requests have been submitted through the system. In 2011/2012, 124 IAMSLIC libraries in 45 countries used the service; whereas the volume of activity was continuously high for Latin America and increased significantly for African countries while remaining moderate in the Pacific Region. The IAMSLIC Resource Sharing Program includes *duplicate exchange*. Members of the Association use the IAMSLIC Discussion List to share information about duplicates available to be sent free of charge or for the cost of mailing to other libraries on their request.

The Resource Sharing Program took a new approach with the development of the Aquatic Commons digital repository, which is complementary to the OceanDocs repository project in which many IAMSLIC members also participate.

2.2 IODE

The program "International Oceanographic Data and Information Exchange" (IODE) of the Intergovernmental Oceanographic Commission (IOC) of UNESCO was established in 1961 with the objective to stimulate the management and exchange of data and information on a regional and international scale in the area of marine science and oceanography.[3]

In addressing its mission, IODE has developed a number of marine information projects, two of which can be mentioned as examples of aquatic resource sharing efforts:

OceanDocs is an electronic repository developed to collect, preserve and facilitate access to research outputs from members of Ocean Data and Information Networks (ODINs). In addition to IODE working documents (525 items), the repository currently includes eight Latin America country collections (1855 documents) and 16 African country and program collections (1618 documents).[4]

The Open Science Directory IOC/IODE has been developed by EBSCO and the Hasselt University Library; it provides users in developing countries with a comprehensive search tool for all open access and research program serial titles. The Directory offers open access to about 13,000 scientific and scholarly journals. Among the main collections available through the Directory are DOAJ, BioMed Central, HighWire Press and PubMed Central as well as the special programs HINARI, AGORA and OARE.[5]

In 2011, IODE and IAMSLIC signed a Memorandum of Agreement on cooperation in the field of marine information management which, among other objectives, aims at "promoting the capacity of libraries and information centers to disseminate and provide access to marine scientific literature for the benefit for marine scientists and other relevant users".[6] As part of the Agreement, the Aquatic Commons is hosted by the IOC Project Office for IODE in Oostende, Belgium.

2.3 FAO Fisheries and Aquaculture Branch Library (FBL)

The Library has a mission of providing specialized, high quality library and information services to FAO staff, particularly in support of the activities of the Fisheries and Aquaculture Department, and to stakeholders involved in fisheries and aquaculture, especially those in developing countries, and to disseminate globally FAO information to fisheries and aquaculture organizations.[7]

Resource sharing and library networking is one of the core activities of FBL, which includes an interlibrary loan service (ILL) and retrospective digitization of documents for inclusion into the FAO Corporate Document Repository.

ILL services. The FBL fisheries and aquaculture serials collection (including all FAO fisheries and aquaculture report series as well as over 600 serials from developing countries) is available to aquatic science libraries worldwide through the IAMSLIC Resource Sharing Program.

The FAO Corporate Document Repository contains FAO documents and publications in electronic format. Currently, there are more than 6,000 digital documents on fisheries and aquaculture in the repository; this collection represents slightly more than 25% of all documents published by FAO Fisheries and Aquaculture Department over the years.

Selective Retrospective Digitization of regular FAO fisheries and aquaculture series, project reports as well as papers presented at many FAO technical meetings, which collect and analyse unique information and data, is an important library activity. Many of these documents are published in limited numbers, have narrow distribution and are not readily available in electronic format, although frequently requested by specialists in fisheries and aquaculture around the world. The Library makes every effort to identify, acquire and digitize FAO project documents. Selections of these documents have also been published on CD-ROM.

FAO and IAMSLIC signed a Memorandum of Understanding (MoU) on fisheries information systems and services in 2005. Within the framework of the MoU, FAO and IAMSLIC collaborate to enhance aquatic information resource sharing through improving coverage and access to fisheries and aquaculture publications from developing countries. The IAMSLIC Z39.50 Distributed Library and the Aquatic Sciences and Fisheries Abstracts (ASFA) database, as well as promoting the development and use of the Aquatic Commons e-repository and improving linkages from ASFA to full text open access resources, e.g. FAO fisheries documents and records in Aquatic Commons, are the tools and techniques used to achieve this goal.

2.4 Aquatic Sciences and Fisheries Abstracts (ASFA)

The Aquatic Sciences and Fisheries Information System (ASFIS) is engaged in the collection and dissemination, of information covering the science, technology and management of marine, brackish water, and freshwater environments.[8] The ASFA bibliographic database is the main product of ASFIS. Input to ASFA is provided by international network of co-operating institutions and organizations. ASFA partnership is composed of 66 co-sponsoring, national and international partners responsible for monitoring, selecting, abstracting and indexing publications for inclusion in the ASFA bibliographic database. The database includes more than 1.6 million

bibliographic records (Oct. 2012), covering a large number of grey literature, which is one of its important comparative advantages with respect to other information sources. The Secretariat, provided by FAO, develops and maintains the ASFIS system. ASFA, through its Trust Fund, which is the collective property of ASFA partners, supports the projects initiated by partners and aimed at digitization of grey literature published in their countries. The ASFA partners deposit these documents in open access repositories such as Aquatic Commons and link them to the relevant records in the ASFA database, which increases the utility and value of the database.[9]

The ASFA Thesaurus is a freely available indexing and searching tool. It contains the subject descriptors used to index the records which are contained in the Aquatic Sciences and Fisheries Abstracts (ASFA) bibliographic database.

3. Aquatic Commons

The Aquatic Commons repository, established by IAMSLIC in 2007, is a subject based, thematic digital repository covering the natural marine, estuarine, brackish, and freshwater environments. It includes the science, technology, management, and conservation of these environments, their organisms and resources, and the economic, sociological and legal aspects.[10] It contains a growing collection of published and unpublished research, organizational publications, and other materials, including an increasing number of (grey) literature from developing countries.

The repository is funded and directed by IAMSLIC, through a Board of IAMSLIC members and representatives of the UNESCO/IOC project Office for IODE, which is hosting the repository. It is powered by EPrints software. Its multi-language interfaces are available in English, French and Spanish. Aquatic Commons supports self-submittal of digital resources by authors or issuing agencies, or deposits are done by third parties, with permission from the copyright

owners. The repository offers archiving of digital copies where local information and communication technologies (ICT) are lacking or inadequate.

Three-quarters of the uploaded documents are published before the year 2000; therefore, the major part of the repository is the result of retrospective scanning. The more than 90 issuing agencies give proof of the international focus of the repository. Examples are the following national and international organizations:

From the USA:
- California Department of Fish and Game (594 uploaded documents)
- United States National Marine Fisheries Service (539)
- United States National Ocean Service (127)
- Florida Cooperative Fish and Wildlife Research Unit (84)

From Latin America:
- Facultad de Ciencias Naturales y Museo, Univ. Nacional de La Plata, Argentina (112)

From Africa:
- Fisheries Society of Nigeria (431)
- Centre de Recherches Océanographiques, Côte d'Ivoire (128)

From Europe:
- Freshwater Biological Association, United Kingdom (552)
- Environment Agency, UK (Freshwater Biological Association) (102)
- German Federal Research Centre for Fisheries (2158)

From international projects and organizations:
- Charles Darwin Foundation (353)
- Inter-American Tropical Tuna Commission (233)
- Support to Regional Aquatic Resources Management (126) (Asia)
- Aquatic Plant Management Society (101)
- North Pacific Marine Science Organization (PICES) (93)
- Lake Victoria Fisheries Organization (77) (Africa)

The German Federal Research Centre for Fisheries has uploaded 2158 documents: this is one third of the total repository. This Research Centre has no plans to create its own repository with long-term storage, but has preferred to use the AC as its home repository. One of its main
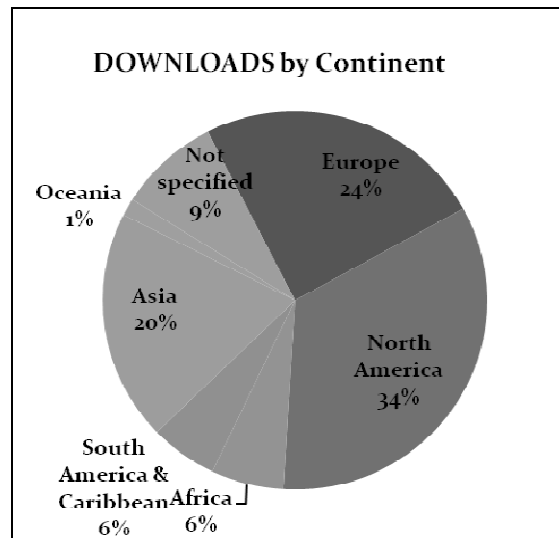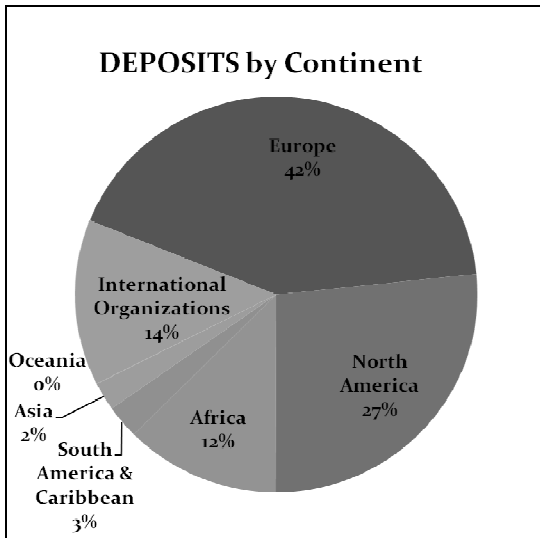
contributions is the deposit of articles of their magazine, *Informationen aus der Fischereiforschung* (Information on Fishery Research). The AC is the primary source of their online journal and the URLs will be linked in the DOI of each publication.

The number of uploads in the AC is increasing from a monthly average of 48 additions in the first year (2007) to 215 monthly deposits in 2012. The usage of the repository has also been growing over the years, with an average number of 13.5 thousands of downloads per month in 2012. By the end of October there were 575,306 downloads from a total of 7973 deposits. The IRS allows for presentation and interpretation of these statistics.

The IRS (Interoperable Repository Statistics) software was implemented in 2008 and permits ongoing monitoring of the repository. The advantage of the software is in its presentation possibilities, offering various kinds of graphs and tables. IRS creates raw data and other usage statistics, for the whole repository as well as for individual papers and authors. Unfortunately, it is not yet possible to get detailed statistics for a particular issuing agency and these calculations have to be done "manually" which can be rather time-consuming.

The majority of AC users are directed to the repository from a Google search (Google 47% and Google Scholar 8%); a number of searches was performed using simple or advanced option provided by the AC search engine, which shows name recognition among users.

Avano has been the sole marine and aquatic sciences OAI harvester. Developed by IFREMER, the French Research Institute for Exploration of the Sea, it gives access to more than 200 open archives. With the increasing importance of Google and Google Scholar, it seems now that the efforts of Avano have been superseded and the harvester will cease in the near future after five years of activity.[11]

DEPOSITS by Continent
- Europe 42%
- North America 27%
- International Organizations 14%
- Africa 12%
- South America & Caribbean 3%
- Asia 2%
- Oceania 0%

DOWNLOADS by Continent
- North America 34%
- Europe 24%
- Asia 20%
- Not specified 9%
- South America & Caribbean 6%
- Africa 6%
- Oceania 1%

A large majority of deposits are from Europe, Canada and the USA, while the usage statistics show a broader, more varied picture with higher representation of developing countries. For example, Asian and South American deposits constitute subsequently 2% and 3% of a total number, while downloads by users in these regions are 20% in Asia and 6 % in South America. Downloads by African countries still remain moderate with only 6 percent of a total number for the period 2007-2012.

4. ASFA Trust Fund Project on Grey Literature for AC

ASFA Trust Fund provides funding for small projects that aim to increase visibility of grey literature from partner institutions through filling gaps in the ASFA bibliographic database as well as by digitization of documents and adding full text links to ASFA records.

For FAO, a long-term goal of its participation in Aquatic Commons is to assist in providing access to legacy collections from institutions and projects in developing countries that have never been easily accessible. FAO's support for the Aquatic Commons is primarily aimed at content development and mainly intended to assist institutions in developing countries to

improve visibility and access, sharing and preservation of fisheries and aquaculture management publications.

The ASFA Trust Fund Project "Published and Grey Literature of African Aquatic/Fisheries Institutions for Aquatic Commons" aimed to retrospectively digitize grey literature from developing countries, and to provide links to the full text for those documents already cited on the ASFA Database or to create new ASFA records where they are not yet available. The project was executed by FAO's Fisheries and Aquaculture Branch Library between 2010 and 2012. In total, almost 15,000 pages have been scanned, compressed and web optimized, metadata of the documents have been created and 754 PDF files were uploaded and links to the ASFA Database have been added. Several participating issuing agencies have also received CD-ROM's of digitized documents for offline consultation, both in TIFF and PDF format.

Seven issuing agencies participated in the project: Fisheries Society of Nigeria (FISON); Institute of Marine Biology & Oceanography (IMBO), Sierra Leone; Nigerian-German Kainji Lake Fisheries Promotion Project (NGKLFPP), Nigeria; Centre de Recherches Océanologiques (CRO), Côte d'Ivoire; Instituto de Investigação Pesqueira (IIP), Mozambique; Lake Kariba Fisheries Research Institute (LKFRI), Zimbabwe; and Lake Victoria Fisheries Research Project (LVFRP- now Lake Victoria Fisheries Organization, LVFO), Kenya-Uganda-Tanzania.

5. Statistics and Usage Analysis: Examples of Repatriation

A lifetime of uploaded documents is still too short to conduct valid citation analysis for evaluation of the documents impact. Also, knowing that many of the project documents (for example, those from STREAM) are of technical rather than scientific nature, it can be assumed that those documents have their main impact in the area of practical application of knowledge,

for example, in implementing new technologies in aquaculture. Other documents are related to fisheries management and will be of importance to managers and other stakeholders.

By applying IRS software for the usage analysis of the grey literature from selected issuing agencies in developing countries, the paper seeks to address a further evaluation of FAO's contribution to the content development of the repository, confirming the increasing visibility of and access to some baseline information in the field of fisheries and aquaculture published by institutions and projects in developing countries.

Firstly, we focus on the Technical Documents published between 1998 and 2001 by the Lake Victoria Fisheries Research Project, a regional project on the African lake.

Secondly, we analyze the usage of the documents published by the Support to Regional Aquatic Resources Management (STREAM) during 2000-2009, which was based in Bangkok, Thailand.
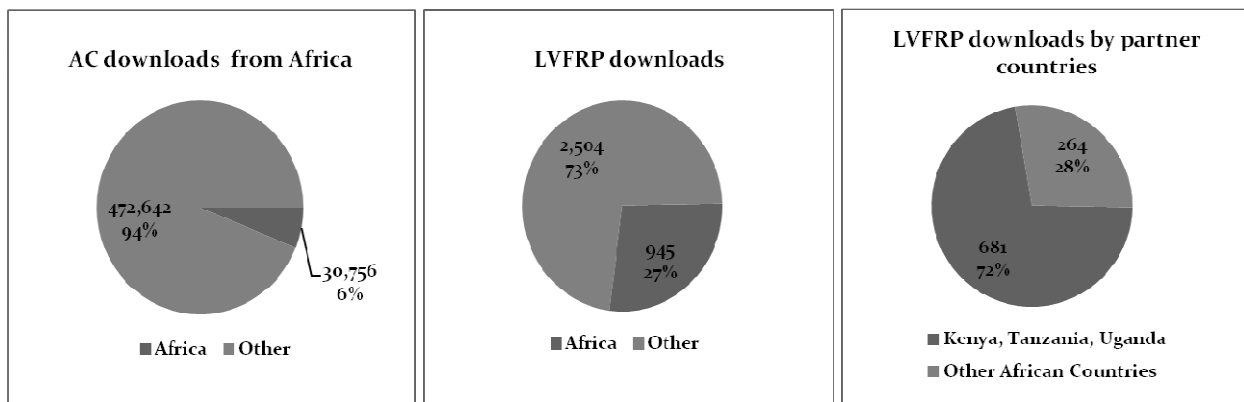
These project documents are examples of digital preservation and repatriation to the countries of origin, two of the main objectives for FAO's participation in the AC repository.

Downloads of all project documents were analyzed for geographic origin. Whereas downloads that originated from the project region were paid closer attention than downloads that originated from other areas, in order to evaluate impact of the project documents for the whole region and for the country of their origin in particular. Raw data analysis allowed conclusions to be drawn regarding user search strategies and dynamics of uploading and downloading activities, as well underpinning some assumptions on the repository name recognition and web crawlers downloads. The analysis shows that significant number of downloads for the period 2010-2012 comes from a range of IP addresses in France: these are most probably web crawlers. Starting with 3,2 % in 2009, at present every 10th download is done by a robot. In order to maintain the reliability of the analysis of LVFRP and STREAM documents, and taking into account that 87%

of all French downloads are from this IP range, downloads originated from French IP addresses were excluded from our analysis.

5.1. *Lake Victoria Fisheries Research Project*

The Lake Victoria Fisheries Research Project (LVFRP) aimed at creating a framework for the management of the Lake's fisheries, with the objective of improving the management of its resources. The Lake Victoria Fisheries Management Plan, published in 2001, is based on the concept of co-management, which includes stakeholders at local, regional, national and international level; the Plan has been adopted by the Council of Ministers of the Lake Victoria Fisheries Organization (LVFO). The LVFRP Technical Documents have been digitized by the Trust Fund project and in total 75 records have been added to the repository.

Statistics show a correlation between download activity and national involvement into specific regional projects by the riparian countries - Kenya, Tanzania and Uganda. While indicating a comparatively low download activity for the entire repository by the African continent (6 % of the total number of downloads), the statistics indicates higher usage (27 %) of the repository by African users for the Lake Victoria regional project based in Africa. A close look into this project statistics reveals a high interest towards those documents by countries involved in the

project. 72 percent of the total number of project document downloads comes from the countries bordering Lake Victoria - Kenya, Tanzania and Uganda.

Some of the project documents were quite intensively downloaded by users in developed countries. For example, tracking one of the referring IP addresses for a document on ownership and co-management of Lake Victoria, we discovered that this document was included in the list of compulsory reading for university students in the Netherlands; 47 % of all downloads were presumably done by students between September-December 2011.

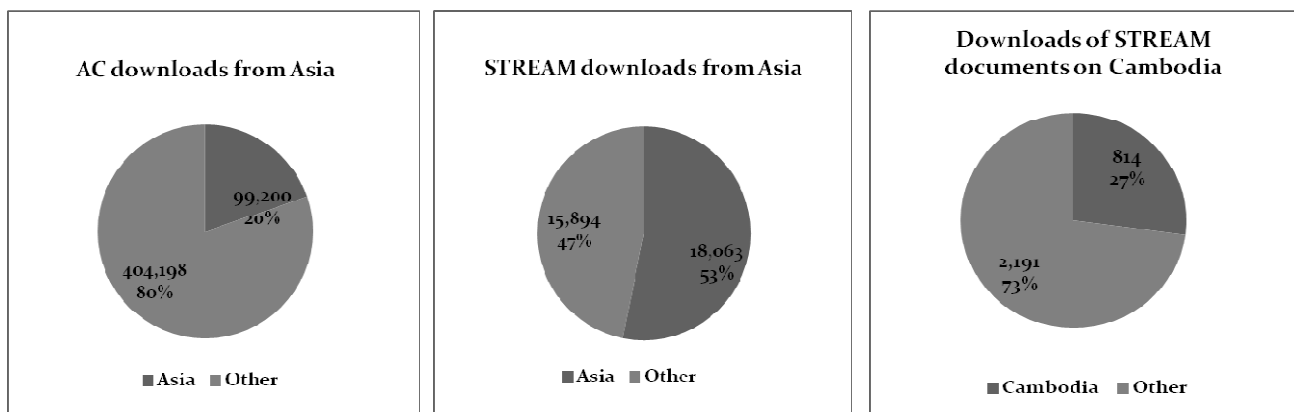*5.2 Support to Regional Aquatic Resources Management Project*

STREAM, the project "Support to Regional Aquatic Resources Management" was an initiative executed within the framework of the Network of Aquaculture Centres in Asia-Pacific (NACA). Besides NACA, partners included FAO, the Department for International Development of the UK (DFID), the Voluntary Service Organization (VSO) from the United Kingdom, and the Australian Government Overseas Aid Program (AusAID). The project aimed to support agencies and institutions to: 1) utilize existing and emerging information more effectively, 2) better understand poor people's livelihoods, 3) enable poor people to exert greater influence over policies and processes that impact on their lives, and 4) develop policies and processes of mediating institutions and capacity building. It adopted an approach where stakeholders engaged in aquatic resources management participated actively in the development of the Initiative.

The STREAM Initiative was based at the NACA Secretariat in Bangkok, but operated in several Asian-Pacific countries, including Cambodia, India, Indonesia, Lao PDR, Myanmar, Nepal, Philippines, Vietnam and China.

A large part of the published outputs of the project have been added by FAO to the AC between 2008 and 2010. All 126 uploaded documents were so-called "born digital" and were originally available on the STREAM Web site.

The website of the STREAM Initiative had a short lifespan and was only up from July 2002 to June 2008. Since then electronic copies of the documents produced by STREAM have been hard or even impossible to find, if it were not for the AC. Documents from the STREAM Initiative are good examples of preservation; without the AC, hardly any of the documents would still be available on the Internet.

The usage statistics for the STREAM documents show a similar picture as that of the documents of the Lake Victoria project. Although one-fifth of all downloads from the repository are from the Asian continent, more than half of all downloads of the STREAM project documents come from users in Asia. Once again a high percentage of downloads comes from the "country of origin" or the country covered by the documents.

AC downloads from Asia	STREAM downloads from Asia	Downloads of STREAM documents on Cambodia
99,200 — 20%	15,894 47%	814 27%
404,198 80%	18,063 53%	2,191 73%
■Asia ■Other	■Asia ■Other	■Cambodia ■Other

6. Conclusions

Based on the results of the usage analysis of the repository it can be concluded that the digitization of grey literature published by fisheries and aquaculture institutions in developing

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countries increases overall **access and sharing** of information, contributes to **preservation** and enables **repatriation** to the countries of origin.

By participating in the AC, institutions in developing countries are challenging some of the information constraints, outlined in FAO Technical Guidelines for Responsible Fisheries 12, such as lack of awareness of and access to historical and baseline information, poor opportunities to publish and disseminate the results of research as well as dispersion of information between various government agencies, scientific and academic institutions and industry.[12] Through the Aquatic Commons, fisheries and aquaculture grey literature has found a new and much wider audience, and is integrated into the international information exchange.

Providing access to, and sharing of this historical and baseline information through the AC further enables issuing agencies to solve a problem of inadequate ICT support as well as to avoid costly and wasteful duplication of effort.

Destructive natural disasters which heavily affect tropic and sub-tropic coastal areas in developing countries may cause serious damage to grey literature print collections. Also, damage caused by human factor, such as lack of or poor knowledge transfer, short-sighted managerial decisions, language barriers, can be a reason of a permanent loss of the only available hard copy of the document. Digital preservation of grey literature on fisheries and aquaculture originating from developing countries ensure availability of these unique documents for future generations.

Repatriation of digital documents was carried out in two ways. Firstly, after signing the permission to upload the documents by third party, the issuing agency, retaining its copyright, has access to their documents in the AC repository. Additionally, they receive a CD containing electronic copies of the documents. The agency can create links on their website to the full text

of these documents in the AC repository. Secondly, in a broader context we can talk about the repatriation to Internet users in the country of origin.

FAO's Fisheries and Aquaculture Branch Library will continue to promote the participation of institutions in developing countries in the Aquatic Commons and will seek to undertake digitization projects in the future.

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