UNITED NATIONS UNIVERSITY

UNU-IAS
Institute of Advanced Studies

FEBRUARY 2013

BYTES BEYOND BORDERS:
STRENGTHENING TRANSBOUNDARY INFORMATION SHARING ON WILDLIFE CRIME THROUGH THE WILDLIFE ENFORCEMENT MONITORING SYSTEM (WEMS) INITIATIVE

Introduction

The multi-billion dollar illegal wildlife trade is a global crisis that not only threatens the conservation of protected species but also has deep implications for peace and security in nations across the world. As wildlife trafficking becomes more organized and illegal trade of wildlife continues to flourish on the ground and in cyberspace, there is an urgent need for a concerted international effort to gather and share wildlife crime information among law enforcement and policymakers, empowering them to stem the tide of wildlife trafficking. There are several good examples out of such efforts, primarily by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and INTERPOL, to combat wildlife poaching and transboundary illegal wildlife trade. At a policy level, the formation of the International Consortium on Combating Wildlife Crime (ICCWC)[1] can be considered as one of the major achievements in recent times, where CITES, INTERPOL, World Bank, UN Office on Drugs and Crimes (UNODC) and World Customs Organization have come together as one unit to address the issue. The good work done by civil society, including WWF, TRAFFIC, International Fund for Animal Welfare (IFAW), Environmental Investigation Agency (EIA) and member organizations of the International Union for Conservation of Nature (IUCN) and Species Survival Network (SSN) including grass root NGOs, is noteworthy as well. Yet, combating wildlife crime remains a big challenge. The collective efforts of the conservation community and governments are still unable to check the behaviour of poaching syndicates and organized criminals. We remain far behind in finding an adequate response to the crisis.

Photo credit: Remi Chandran. Bunagana Customs Border Gate, Democratic Republic of Congo (DRC).

[1] CITES (2013). *International Consortium on Combating Wildlife Crime*. Available at: <http://www.cites.org/eng/cop/16/doc/E-CoP16-15.pdf> [Accessed 4 February 2013].

The role of the research community in joining these efforts has been constrained due to several reasons. The main reason is the difficulty in getting access to crime-related data from the national enforcement agencies. Second, scientific research based on wildlife crime data so far has not made any significant contribution in tracking criminals or in reducing the levels of poaching. These two factors have created a disjoint and rendered science less relevant in policy-making in response to poaching. Science is currently more insightful for assessing threats to species and in negotiations of trade bans of specific species. A third constraint lies in that a problem for a scientist may not be "the" problem for a policymaker – a reason why very few scientists (exceptions are research through DNA analysis) have come up with viable solutions for addressing enforcement and compliance of CITES.

Technocratic solutions run the risk of developing over-elaborate tools, which are unsuitable to the task and operation of combating poaching. Even if such a tool is developed, enforcement officials are reluctant to use it. The reason is quite obvious – as one government official from an African country puts it, "when we do not have enough manpower to run a combat operation against poachers, do you think we should prioritize our resources developing information systems?" In addition, the beliefs within the wildlife policy subsystem remain severely polarized, primarily between the proponents and opponents of trade rendering a politicized science emerging from each faction.

With all these constraints, the UN system is experiencing the odd circumstance of asking governments from developing countries to control poaching while simultaneously being unable to offer necessary resources (scientific, technological and financial) for them to bring it under control.

Responding to this situation, the United Nations University (UNU), the research arm of the UN, aims to address this issue more pragmatically with intense grass root level capacity development and practical research by bringing together governments, UN agencies, industry, research institutions, civil society and local communities to a common understanding on dealing with poaching and wildlife crime.

With this objective, in 2005, UNU developed the first prototype of a transboundary information sharing platform – Wildlife Enforcement Monitoring System (WEMS)[2]. In 2007, in order to maintain the sovereignty of wildlife crime data, UNU sought the direct participation of government agencies in compiling wildlife crime seizure information into the system. In 2011, with the support of the UNU Campus Computing Centre the early prototype was redesigned to meet the actual needs of government agencies based on feedback gathered from a capacity building workshop held in Kenya[3]. Following the workshop, the milestone transition from prototype to an operational version began, with WEMS establishing its first roots in Africa.

Also in 2011, a Memorandum of Understanding was signed between the United Nations University Institute of Advanced Studies (UNU-IAS), Lusaka Agreement Task Force for Co-operative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (LATF) and the Faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente to further develop WEMS as a common information sharing platform between government agencies and research institutions with necessary protection protocols for the enforcement data. The same year, UNU-IAS and the Center for Geographic Analysis at Harvard University signed a Memorandum of Understanding to incorporate WorldMap functionalities into WEMS, thereby bringing in additional datasets on civil conflicts, terrorism and socio-economic data from the Harvard University library into the WEMS system.

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2 Chandran, R., Krishnan, P. & Nguyen, K. (2011). Wildlife Enforcement Monitoring System (WEMS: A solution to support compliance of Multilateral Environmental Agreements. *Government Information Quarterly*, 28(2), 231–238. doi: http://dx.doi.org/10.1016/j.giq.2010.09.002.

3 WEMS (2011). *WEMS Training Workshop*. Available at: <http://wems-initiative.org/p4> [Accessed 4 February 2013].

With all these functionalities, WEMS-Africa was inaugurated by the Minister of Forestry and Wildlife of Kenya, Dr. Noah Wekesa, on 14 August 2011. Speaking on the occasion, he declared, WEMS "marks a new beginning in the history of Africa, where we show the world an example of good governance in Africa[4]". As a pilot phase, Kenya, Uganda, Tanzania and Congo joined the initiative and have since been effectively sharing information transboundarily.

During the period of 2011 to 2012, WEMS recorded a total of 164 cases of wildlife crime from the four countries with most of them having transboundary significance. The WEMS initiative currently serves as a potential tool to provide an end-to-end framework for addressing the enforcement and compliance to multilateral environmental agreements including CITES and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). The building block for this initiative is in the core value that information system design and maintenance will be the role of UNU and not to let developing countries bear the burden of investing in system design and maintenance. WEMS is thus a specific effort by UNU to address the Millennium Development Goals through a Geo-ICT initiative.

The geographical component comes from a collaborative input of geocoded ground information from the grass root level which is fed into the system at the local level. This data, when it moves from the local level to national, regional and international levels, can be analysed using spatial and non-spatial information technology to complement policy research to advise policymakers on trends and threats of wildlife crime. Through this mix of information sharing, capacity building and research, it provides a mechanism for dealing with wildlife enforcement on a practical level and a governmental level, while also providing data to help understand the linkages between land use, habitat degradation, wildlife conservation and strategies for implementing environmental multilateral agreements.

What technology is behind WEMS?

The core component within the WEMS initiative is its database. At the heart of the WEMS technology infrastructure is a secure web-based multi-tenant database application developed by UNU, which allows the different partner agencies to upload spatial and non-spatial wildlife crime data privately and securely onto the system for analysis and visualization. The data also can be selectively shared across all the agencies through an approval workflow process. Thus, not only does the system streamline the distributed input processes but it also allows for coordinated, responsible sharing of the data. For interoperability with established standards, the data in WEMS is readily available in the standard Ecomessage format, which is widely supported by international organizations such as Interpol and CITES.

Designed with strong security in mind, the data is encrypted both at rest and in transit. Given its sensitivity, the data and underlying system components are entirely hosted at UNU's private cloud. The private cloud is managed 100 per cent in-house by the Campus Computing Centre, the technology arm of UNU.

WEMS is implemented utilizing free and open source software components as well as free and contributed data sources to keep the implementation and operational costs low, thereby increasing the likelihood of long-term sustainability of the project. In its current state, the system rests upon a core foundation built around Linux, Tomcat and MySQL. It can interface with Esri's maps, Google maps and Harvard's WorldMap. The system's cloud-hosted model enables us to accommodate changing system resource requirements and meet our future aspirations of leveraging the technology for other areas related to the effective and sustainable use of ICT for development. Furthermore, the model also contributes to simplifying the eventual transfer of the system to Africa in that it is software-based and inherently portable.

[4] UNU (2011). *Africa's war against wildlife crime continues.* Media Report. Available at: <http://unu.edu/news/news/africas-war-against-wildlife-crime-continues.html> [Accessed 4 February 2013].

More specifically, the WEMS platform allows for the following capabilities:

a. Report generation in a format compatible with that of Interpol and CITES (Ecomessage)
b. Statistical analysis including spatial and non-spatial time series analysis
c. Mapping functionalities enabled with Harvard 's WorldMap
d. Spatial model describing time series movement of goods

Research and analysis using WEMS data

The importance of researching trends and threats on wildlife crime was discussed earlier. The challenges associated with scientific research and collecting information and samples are well documented in several literatures as well. The WEMS initiative addresses this issue by collaborating with regional bodies like LATF and ASEAN to make data and samples accessible to researchers. One potential model is that researchers are then asked to provide the results of their research directly to the governments before they publish it. This ensures trust between the researcher and the government entity that provides the data. The researcher then acknowledges the effort of the agency in the main text of his/her publication.

The wealth of data in the WEMS database allows for a range of different analyses. Figure 1 presents a snapshot of the types of species in trade detected in Uganda, Kenya, Tanzania and Congo Brazzaville from as early as 2001 even though the Memorandum of Understanding for WEMS was signed only in 2011. This information was first collected by the parties to the Lusaka Agreement long before the initiation of the WEMS initiative.

Figure 1: Proportion of seizures by species in the database

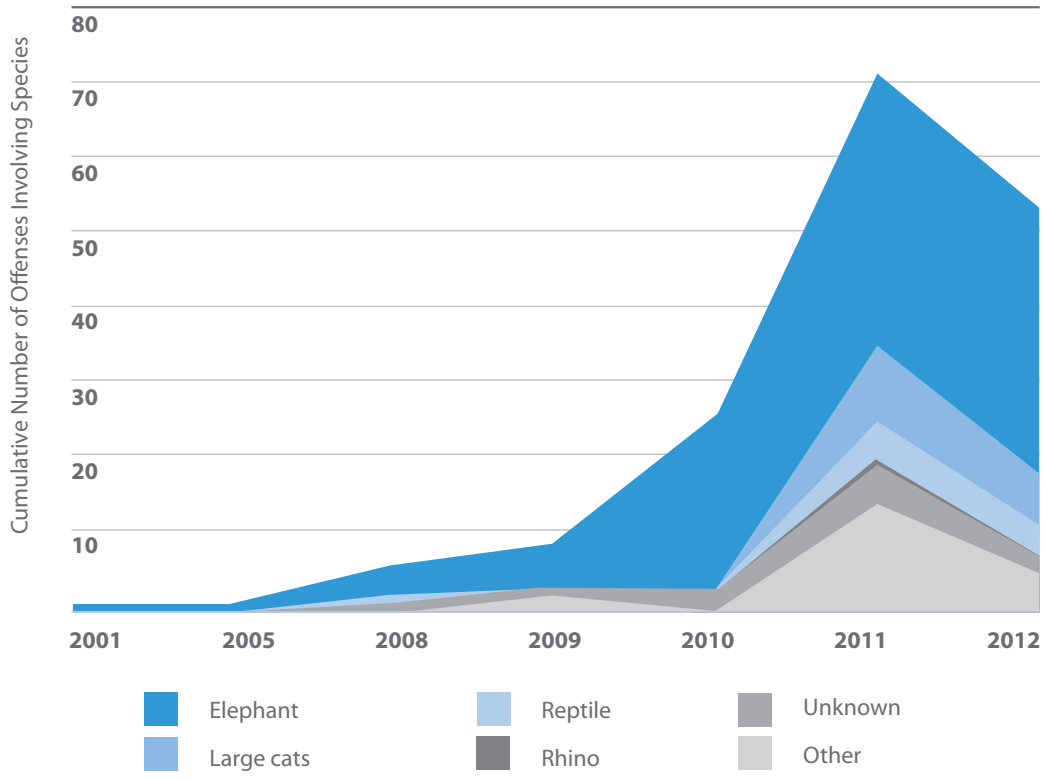
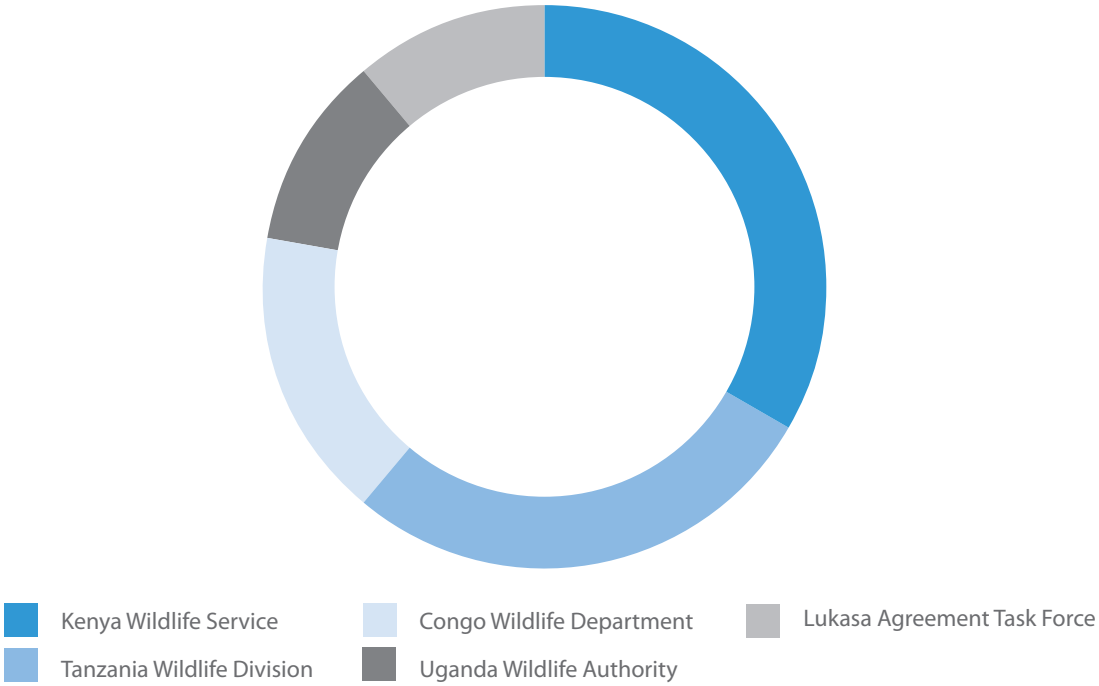


Figure 2: Number of cases input by agencies participating with the LATF



WEMS simplifies the integration of information across borders and avoids duplication of effort by individual agencies. The information sharing capacity of WEMS enables governments to improve enforcement efforts by providing a consolidated picture of transnational crime. It may also identify agencies that require support to strengthen their capabilities through capacity development and better infrastructure (Figure 2).

The fact that the information is explicitly geocoded allows the remaining attributes of the dataset to be spatially rendered to reveal patterns and trends in seizures. Figure 3 shows how the data can be mapped to reveal trends. In this case, the number of seizures in each location is represented by a symbol of proportional size to the number of cases recorded there. Here we observe the importance of borders (both land and sea) in the Congo, and while the highest number of seizures are recorded in the capital cities of Congo, Uganda and Kenya, Tanzania's seizure hotspot is Mpanda in the west of the country. According to WEMS figures, Kenya and Tanzania have a relatively high number of seizure locations.

Figure 3: Location and magnitude of seizures from participants in the WEMS initiative

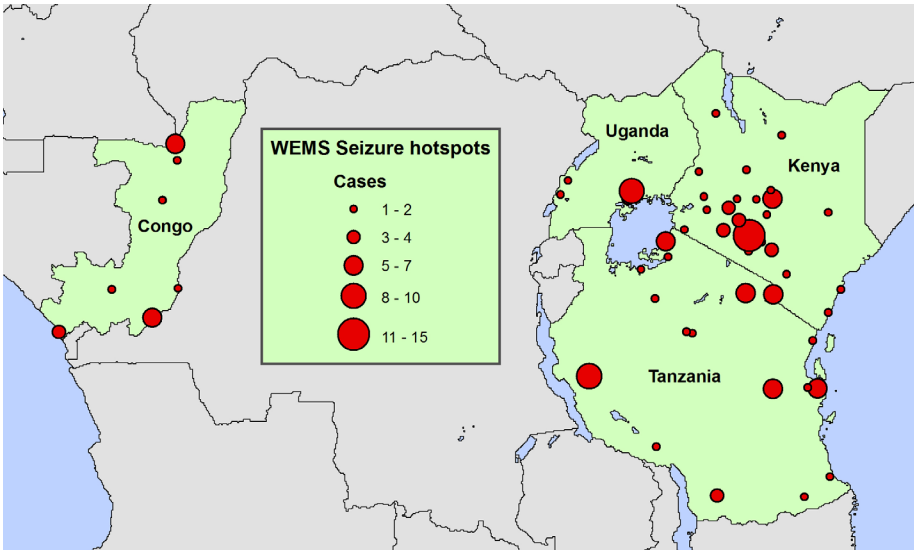
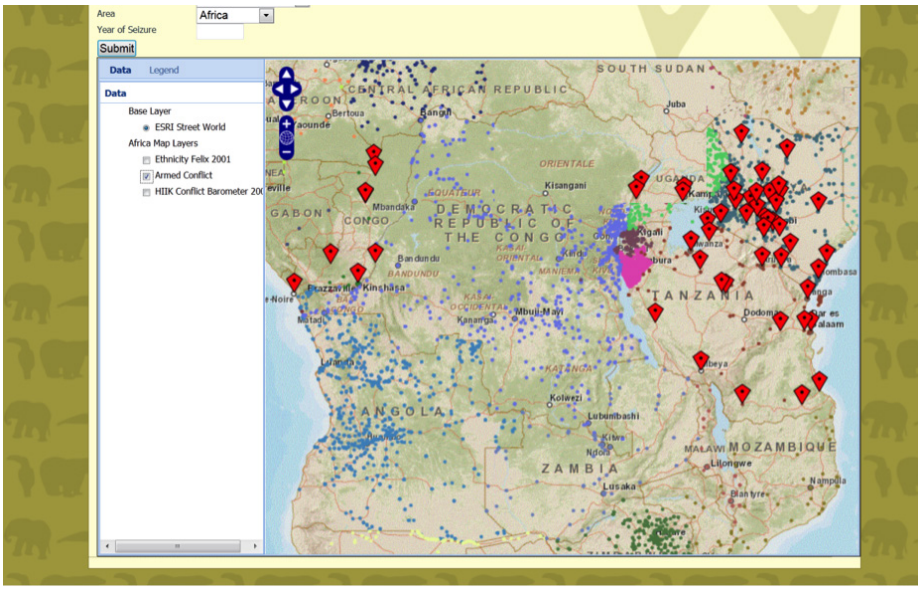


Figure 4: Co-location between armed conflict and wildlife crime



While the data being collected can be basically analysed, it is but one spatial data layer and its full utility can only be realized when the information is processed in conjunction with other spatial datasets. Through our collaboration with Harvard's WorldMap, other data layers will be included. Figure 4 shows how the system can incorporate other socio-economic data from the Harvard library in relation to wildlife crime, in this case a screen shot from the WEMS database showing the same seizure data in relation to armed conflict in the region.

The addition of satellite imagery will also provide an extra dimension to analysis on land use and habitat changes. The emphasis on local information also provides a platform to integrate a range of relevant data from local communities on their activities and the condition of their habitats creating a research component which integrates elements often considered separately or with cursory acknowledgement of their inter-linkages.

The current data entry model in WEMS includes provision for information about its origin/destination, if known. Should sufficient volumes of data be available over time, there opens the possibility to map trade routes and distribution networks, which can help inform other data agencies that may be in this domain. Large scale data integration may even allow for the possibility to develop predictive models of seizure locations which could help in the deployment of rangers in pursuit of poachers.

Trust and technology in sharing networks

No doubt technology plays a particularly relevant role in facilitating and enhancing the information gathering, sharing and analysis capabilities of wildlife trade monitoring networks. In the case of WEMS, the technology galvanizes trust building with the participating countries and new information-driven wildlife enforcement monitoring approaches. But the ultimate success of WEMS rides upon the synergy of the UNU-LATF partnership and the commitment of the Lusaka Agreement member countries to work together, hold themselves accountable and take concerted ownership of the shared goals and vision toward a total elimination of illegal trade in wild fauna and flora in Africa.

A successful cross-boundary information network that is designed to combat illegal wildlife trade hinges heavily on effective management of trust and expectations of the participating organizations and striking a balance between information sharing and security. A high level of trust can reduce conflicts among the organizations

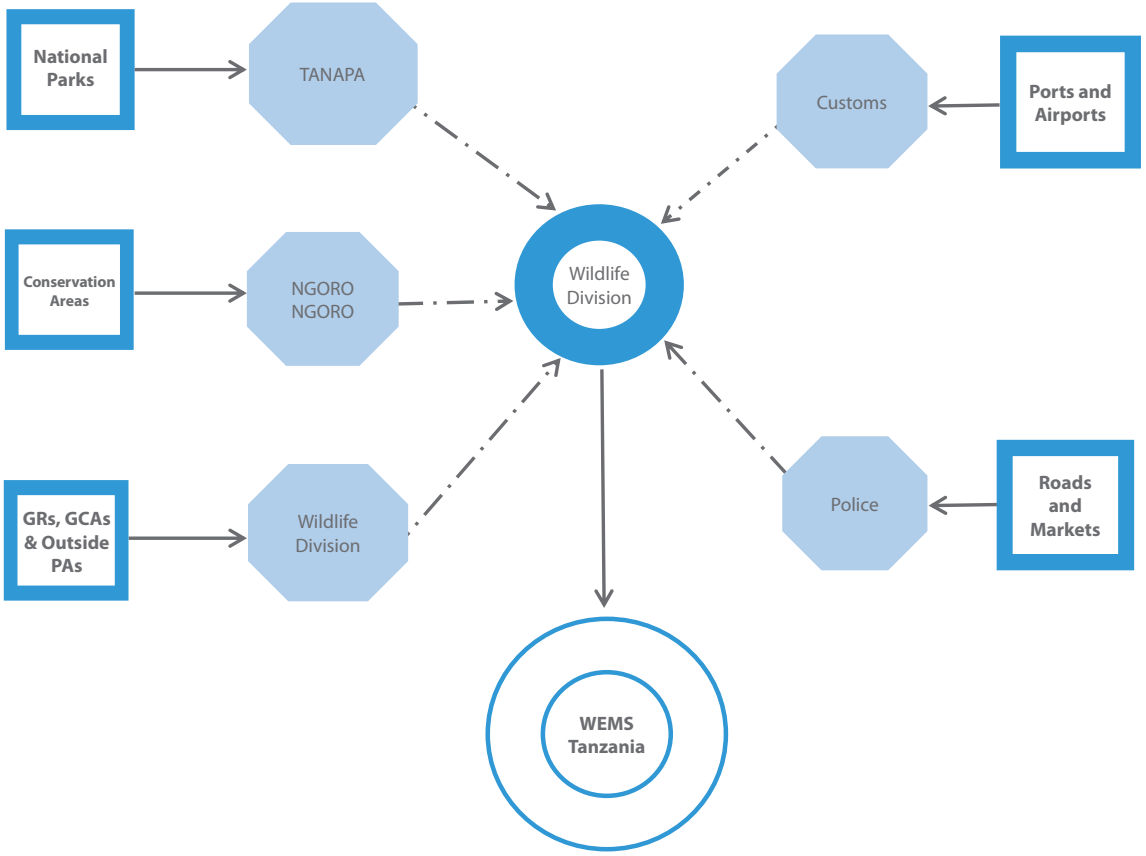
and individuals while increasing collaboration. The formation of LATF in conjunction with its formal structures provides the perfect political climate and legal framework for transnational cooperation, setting the stage for the arrival of WEMS to be in the right place at the right time.

While handling highly sensitive, transboundary illicit wildlife trafficking data, UNU's cloud computing provides a perfect platform for hosting WEMS, offering the unique benefit of neutrality along with other prime advantages such as security, efficiency and elasticity. Under this arrangement, UNU's cloud will serve as a common, trustworthy information sharing foundation, built once and used for all relevant purposes and by all participating governments, providing a single instance of accurate information without unnecessary duplication of infrastructure.

Getting the bytes beyond borders: Governance structure at the implementation level

Though we discussed the immense potential of WEMS as an enabling tool in policy-making and research, the core component for its success is in how regional bodies convince member states to share information. As rules differ across borders, the mere signing of a Memorandum of Understanding will not address the existing gaps in information sharing. For instance, the implementation of WEMS-Africa was successful due to a strong willingness among the parties of the Lusaka Agreement to come to a common agreement on data collection and sharing. The Lusaka Agreement, through its governing council, has been deliberating the need for cross-border information sharing by bringing countries to several meetings and workshops where the advantages of information sharing were stressed. All aspects of WEMS from information collection to input to a database and to sharing the database with a regional body through the national focal person were all well-articulated. An example of the data sharing model in Tanzania is shown in Figure 5.

Figure 5: Interagency information sharing in WEMS-Tanzania



Note: GRs = Game Reserves; GCAs = Game Controlled Areas; PAs = Protected Areas; TANAPA = Tanzania National Parks; NGORONGORO = Ngorongoro Conservation Area

What is next?

The WEMS initiative is still evolving and continuous efforts are being targeted at advancing cross-boundary information sharing and safeguarding the technology, protocols and policies to ensure that functionality, access control and privacy requirements are satisfied. The future direction of WEMS seeks to further development on five fronts:

1. Making WEMS as training-free as possible.
2. Heightening public awareness and encouraging civil society participation.
3. Providing better support for research and analysis of the compiled data by forming a network of researchers working on wildlife crime issues.
4. Developing a capacity development tool in line with recommendations from CITES, INTERPOL and ICCWC in general.
5. Making WEMS compatible with the needs of UN multilateral environmental agreements including CITES, the Convention on Biological Diversity, CMS and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

Conclusion

The 16th meeting of the Conference of the Parties to CITES will take place from 3 to 14 March 2013 in Bangkok. The agenda is full with important matters to be discussed, including "enforcement matters". This policy brief calls for unified action to bring an effective transboundary information system – not through a "carrot and stick" approach or through a containment process, but instead, by calling on the parties to be self-responsible and articulate, and where necessary, to seek the support of external agencies. Good information brings good actions on the ground and good analysis can in fact inform how we can move forward in saving our natural resources. Although we agree that wildlife crime is a threat to global biodiversity, we are still divided in the ways in addressing the problem, which means seeking consensus will be difficult based on the standpoint of each actor.

The overall objective of the WEMS initiative is to identify appropriate "boundary objects" that bind together the beliefs and views of all stakeholders (scientists, UN agencies, governments, NGOs, industries and local communities) in addressing illegal wildlife trade.

[*] *The WEMS database is developed to complement the existing mechanism initiated by CITES, INTERPOL and ICCWC. It does not replace any of the existing systems developed by the organizations mentioned in this brief.*

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Chandran, R., Chong, N.S.T., Doll, C.N.H., Lee, L.Y., Mathai, M.V., Nguyen, K. and Parayil, G. (2013). Bytes beyond Borders: Strengthening Transboundary Information Sharing on Wildlife Crime through the Wildlife Enforcement Monitoring System (WEMS) Initiative, Policy Brief (pp. 8). Yokohama: United Nations University Institute of Advanced Studies.

For more information on the WEMS initiative, please visit: http://www.wems-initiative.org

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