EXPERIENCES IN THE USE OF THE FRAMEWORK FOR THE DEVELOPMENT OF ENVIRONMENT STATISTICS (FDES) IN BOTSWANA

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1.0 Introduction

At the time when I started working on Environment Statistics (ES) in 1996, I had 16 years experience as a statistician accumulated from teaching statistics at Universities and working in the Botswana National Statistics Office (NSO) for one year. When I was assigned to working on ES, I joined a team of two officers, one of whom was at the Senior Statistician level. At that point the Unit had existed for 8 years but had not produced any form of statistical release. The Senior Statistician had received a two-weeks training in ES and had been in the Environment Statistics Unit (ESU) since its inception; and, the second officer had a degree in Environment Science. Both of them were overwhelmed by the task assigned to them and were not sure how to move forward. There were many other very senior, middle level and junior statisticians in the NSO but like me, they too had no training of any kind in either environment science or ES and no idea on what exactly ES is all about, e.g., what information to collect, where to source it or how to analyse and report it. In brief, there was no statistician to advise us on what topics and variables ES should cover or another professional with whom we could brainstorm on these crucial issues.

To illustrate how serious the environment statistics knowledge vacuum was, let me brief the reader that after studying the United Nations Framework for the Development of Environment Statistics (FDES), we decided to consult potential data users, and providers of environment-related data. Most of the prospective users were drawn from the planning sections of the Ministry of Finance and Development Planning and the economic planners of the other ministries and of district local governments. Having never incorporated environmental considerations into their planning processes nor been introduced to environment statistics, the data producers unanimously told us to introduce them to the subject and to tell them what data they need and how to use it. It is important to emphasize that it is under exactly the same circumstances (of a "completely blank sheet") that many statisticians in NSOs in sub-Saharan Africa have to start when initiating ES production and dissemination work.

Under such circumstances, starting off was as hard as it can get, but we were able to initiate the work anyway because of having access to the Internet. I surfed the Internet for information on ES and came across ES work that had already been done in developed countries. The Internet gave us access to what was to us perfect and publications on ES.

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Well done and finished products are always impressive[2] and the publications I found on the Internet were not different. The challenge was in knowing how to arrive at those final beautiful tables, graphs and maps! This is no easy job when the work has never been done in a country and therefore the required raw data is not as readily available as it is in developed countries. Besides, the economies are different and some of the main environmental issues are different as a result – so it would not only be difficult to re-produce the tables due to paucity of the necessary data, but also, it would not make sense. For example, while countries from both the developing and developed parts of the world may be concerned about pollution, the causes of pollution are likely to be different to the same extent that the economies are, and as a result, a table of emissions while impressive on its own may not be helpful to a statistician aiming to produce the same table on the same pollutants for a country with a completely different economy.

It is from that background, and on behalf of other statisticians in sub-Saharan Africa who in initiating ES work are likely to find themselves in the same circumstances as we were in when we initiated ES work in Botswana that I write this paper. Considering that Botswana has a far stronger economy and is much more computerized than many countries in the same region, this assumption should not be considered an exaggeration. Therefore, in this paper, we emphasize that the FDES model is not only helpful but indispensable in guiding pioneer work in the production of ES and we report how it was used, why we found it very useful and the gaps that we observed in the framework.

2.0 The FDES and its usefulness

The main differences between FDES and the other ES models (PSR, DSR, DPSIR) have been well-documented. However, I find it necessary to document here my observations as an amateur working on ES that the FDES was more amateur-friendly than the other models because it is laid out in a way that enables an amateur to learn how to start and also provides momentum for continuity of ES work as explained in the next three paragraphs.

For each topic and associated information categories, the FDES gives a list of variables and an indication of possible classifications and measurement units. It also specifies the reasons for selecting a particular variable and thereby facilitates the identification and selection of statistical series for national data collection. This information enables a person that has never worked on the topic to construct dummy tables (or table frameworks) to guide data collection – and this was always the first step in tackling an assigned topic. For most of the required data the NSOs do not conduct environmental surveys and, therefore, have to request the multi-disciplinary data relating to ES from many different source institutions, some of which have overlapping responsibilities. Dummy tables helped the institutions to quickly understand what data is required, assess whether they can provide it or not and appreciate the required information's usefulness to the institution's own work. The increased recognition of what ES about is essential for both the amateur in ES and for gaining the cooperation of ES information source institutions.

[2] For example, I remember studying a particularly well-written ES publication by Statistics Sweden - and the relief of finding some tables with headings in both Swedish (which I do not know) and English!

The FDES separates the two dimensions of the "state" category of environmental information (stocks, inventories and background conditions of state of the environment and the effects of these on human well-being) separately, thereby enabling the collection of whatever information is available on the environmental – most usually "stocks, inventories and background conditions of the environment" – as a starting point because this is the basic type of statistics that can be most easily found in most developing countries. As we observed in Botswana, although it provides incomplete information on the environment, it can additionally provide a strong and fruitful bargaining stand for the collection and provision of other essential ES (e.g. impacts of human activities on human well-being). This is because the production of such information (especially if it reveals worsening situation over time) removes "abstractness" from the concept of ES and contributes to increase in appreciation of the need to make commitments essential to ensuring progress in compilation of ES. Therefore, by enabling the collection, appropriate categorization, analysis and therefore publication of the simplest available information on the environment, the FDES does not only give a spring-board for initiating ES work but also contributes to the momentum essential to ensure progress in and sustainability of ES work.

While in Botswana we participated in natural resource accounting (NRA) work using the guidelines set out in the System of integrated Environmental and Economic Accounting (SEEA). Before long we realized that for those topics where information on stocks, inventories and background conditions as well as social and economic activities and natural events were already available through the implementation of the FDES (minerals, water and wildlife (fauna)) it was easy to make progress in maiden NRA work, while on topics like "forestry" where such information was scarce, it was necessary to collect information on "stocks, inventories and background conditions of the environment" first before any NRA work could be done, as a result the satellite accounts for such topics were not constructed. Therefore, for a country in which ES work is still in its infancy or has not been initiated, the FDES is essential for progress in NRA work – even in the presence of the SEEA and while developing and/or implementing the FDES in a country it is important to take into account the data requirements of the SEEA. This implies that where gaps related to data needs of the SEEA exist, the FDES should be broadened to fill such gaps.

3.0 Specific Examples of How FDES was Used in Botswana

The determination of statistical topics under each information category constitutes an important step towards the identification of relevant statistical variables for each topic (United Nations, 1991). In selecting the statistical topics to include in the environment statistics programme, we used Botswana's National Conservation Strategy (NCS), the FDES and our knowledge of the social-economic structure of the country and other sources. In reading through these sources, we searched for answers to the following key questions:

i. What are the priority environmental issues in the country?
ii. What are some of the statistical variables/indicators that measure or indicate change in the levels of each of these issues?
iii. What environment-related initiatives have come out of the Agenda 21 and other environment-related commitments in the country?

Even after these questions were satisfactorily answered, we found the FDES very helpful in guiding the collection, analysis and reporting of the information.

3.1 The NCS

The NCS was prepared in the last half of the 1980's and it provided the answer to the first question. The NCS lists the main environmental issues as pressure on water resources; rangeland pasture degradation; depletion of wood resources; overuse of veld products; and, industrial/urban pollution and urban enhancement.

Furthermore, the NCS states three other issues namely the rate of population growth, the depletion and conservation of wildlife; and public awareness.

Seeing that these were the pressing environmental issues in the country, we felt that ES work had to begin with the collection of information on the same issues. To collect, compile and analyse data on these issues, we used the FDES to guide us in selecting the relevant variables.

3.2 The FDES

The FDES provided the answer to the second key question. Without previous experience in ES work, the FDES provided a reasonably clear 'picture' per environmental issue of the variables on which to collect data and their units of measurement, the corresponding classifications on which data needed to be collected and the associated indicators. Such a picture is essential in giving the statisticians doing the job an unclouded sense of direction in order to overcome the many hurdles that one can meet in the collection, analysis and compilation of the multi-disciplinary and multi-sourced environment related data.

3.3 Other Sources of Ideas on Topics and Botswana's Social-Economic Structure

This category provided the answers to the third key question Other Sources of ideas on topics included information required for monitoring environment-related government policies and programs, information required to meet the country's obligations arising from being Party to certain legislations/agreements (e.g., Montreal Protocol, Convention on Biological Diversity), information required to meet the country's obligations arising from being a member of certain organizations (for example, requests to supply data for MDGs, complete UN and other Questionnaires, etc.), other data requests (local, regional, international) and additional information found with data providers. Knowledge about the country's economy is important in ensuring that relevant and available environment data on economic activities that form the backbone of the country's economy is collected. Such data will enable stakeholders to assess the linkages between the economic activities and the environment and hence to assess whether planned /achieved economic development is sustainable in the long run, or not. Even with this information obtained, the FDES was essential in determining on what variables to collect information that we had to use in calculating the required indicators.

3.4 The need for FDES: Summary

Therefore, the need for (or usefulness of) the FDES to supporting maiden work on ES can not be over-emphasized, especially in view of its presentation of basic facts that enables initiation of work on ES and on its flexibility. Variables can be easily substituted for another because reasons for their inclusion under assigned topics are provides hence making it possible to substitute an appropriate one if in the social or economic settings in which the ES

are being compiled are different. FDES supports the development of objective, reliable and comparable environmental statistics and information at international level because of the consistent way in which the environmental topics are presented along with corresponding variables under each information category.

The summary FDES table (Table 2) on Page 5 of *Concepts and Methods of Environment Statistics: Statistics of the Natural Environment* was particularly helpful and we used it as the starting point for each topic that we handled for the first time. We looked for and listed all sections relevant to the topic that were under each information category and then proceeded on to the body of the FDES to look up the details on relevant variables and their relationship to the environment. We were, thus able to work on topics we had never dealt with before.

4.0 The challenges and gaps that were encountered and how a revised FDES could help

4.1 Topics that require broadening

The differences between the economies of developed and developing countries are so diverse that different topics covered in the FDES are in some places not sufficiently broad to provide for environmental information needs on the topics for the economies of most of the countries in sub-Saharan Africa. Some examples on topics that I suggest for consideration follow:

4.1.1 The Land Resource

Just like in many arid and semi-arid developing countries, the most dominant form of land use in Botswana is livestock production, which is also often one of the major causes of land degradation. Apart from being the main source of informal employment and therefore cash, livestock is held as a kind of financial/social security and as a status symbol. Arable farming in such countries is limited because of recurrent droughts. These factors lead to overstocking (stocking rates are higher than the potential carrying capacity of the land). This is worsened by the existence of big populations of wildlife which also use the same resource and increase stocking rates. Because the issue of unsustainable levels of stocking rates is cross-cutting as well as a common environmental issue in many African countries, it is necessary to produce guidelines for handling the issue. Furthermore, I think an indicator that relates the stocking rates of livestock to the potential carrying capacity of the land is essential for the effective evaluation of the use of the land resource.

Although potential carrying capacity can vary from period to period depending on rainfall, an average figure can be estimated for average weather conditions for appropriate countries. The indicator could then be estimated as the ratio equivalent to:

$$\frac{\text{Stocking rate}}{\text{Carrying capacity}}$$

The indicator's aim would be to assess whether the land resource is being used within the limits of its productivity (i.e. sustainably). A ratio less than or equal to unity would then be desirable as this level represents the sustained resource use principle. If the ratio is more than one, the respective country is not using the land resource sustainably.

4.1.2 Forestry

The Wood harvesting intensity indicator can be calculated from the information given in the FDES. However, total forest felling as a percentage of the net annual increment is on a national basis and does not reflect two criteria of concern:

- **Localised deforestation** especially around major settlements but with simultaneous abundance of wood in scarcely populated settlements in the same country. These disparities can be quite significant in arid and semi-arid countries like Botswana where the ability of the vegetation to recover from large scale exploitation or to produce sustainable yields that meet annual wood demand is restricted. It is possible on a national scale for the indicator to be less than unity while on a regional scale deforestation and consequent damage to biodiversity are evident. I think this is a major limitation when using the indicator to make international comparisons and therefore there is need for guidelines to have it reported with indicators aiming at highlighting localized deforestation – especially in sparsely populated countries like Botswana.
- **Selective harvesting**, and consequent depletion of some tree species that have significantly higher demand than others have been observed and documented in Botswana. Selective harvesting of the commercial species *Baikaea plurijuga* and *Pterocarpus angolense* moved the Government of Botswana to put harvesting from the country's forest reserves on hold since 1993. In order to reflect such destruction of biodiversity, I think the indicator (total forest felling as a percentage of the net annual increment) could be calculated for the main roundwood species (say 3-5 of them) that are in highest demand for commercial purposes, in each country, in addition to calculating it for total roundwood.

4.2 Gaps in the FDES

In producing maiden publications on various environment-related topics, I observed the following gaps in the FDES that could be considered for filling when it is revised.

4.2.1 Wildlife

In many sub-Saharan African countries, wildlife is a major natural resource and foreign exchange earner. In addition, conflicts between wildlife and other economic activities like livestock keeping and crop are common because they share the same resource – land. In addition, wildlife has environmental issues of its on arising from the impact of the tourism industry it creates and the management of associated by-products and activities. In addition there are wildlife-related international legislations. Therefore, it is necessary to include this topic in the revised FDES.

4.2.2 Biodiversity, Wetlands and Ozone

These are topics covered by international legislations and therefore, the need for having guidelines within the FDES for the compilation of statistics related to them is a must. Sub-Saharan Africa has a variety of flora at all levels of biodiversity (genetic, species and ecosystem) a lot of it endemic and some of it vulnerable and threatened with extinction, and a few already extinct, because of over-exploitation – mainly for medicinal purposes. Many of these species are endemic in the region (and sometimes in specific wetlands), and needless to emphasize, their protection is essential for the conservation of biodiversity. It is important to

have guidance towards the collection of appropriate information on them so that the the necessary legislations aimed at ensuring their conservation can be created. The common saying "If you can't measure it, you can't manage it," applies here. The compilation of relevant information will give strength to campaigns for the protection of concerned species.

5.0 Support of ES Work in Other Countries

As a result of the ES work done in Botswana, the SADC Statistical Committee recognized Botswana NSO as a leader in ES and requested Botswana to build ES capacity in other SADC countries. Therefore, Botswana hosted an ES Team of 6 officers from the Zambia Environmental Agency and Zambia NSO for two weeks before I left. I trained them in the compilation of ES using the FDES. Although at least 4 of them had previously attended short-term training in ES, the visitors confessed to the effectiveness of the approach I used in their training, as opposed to that used elsewhere, and attributed its effectiveness to the guidance the FDES offers which they had not been exposed to up to that point. The Team returned to Zambia and were able to produce ES reports. Unfortunately, I was not able to secure permission from my office to visit Zambia while they were doing their work nor after their drafts were ready. Therefore, I am unable to comment on the quality of the publications they used nor on the lessons learned and the challenges they encountered. Before I left, the Mozambique office had requested Botswana NSO to send a statistician to train them in ES. I understand that the training visit has not been undertaken to date.

6.0 Conclusion

This paper has been written from the point of view of the needs of a statistician who is collecting and analyzing environment statistics without available guidance within the NSO and country in which s/he is working. Therefore, all issues raised should be viewed in this light. I studied a lot of excellent literature on the Internet about Environment Statistics, but what enabled me to actually initiate ES work was the clearly laid down guidelines that the FDES provided. I believe that for most environmental topics, the challenge is always with where to start and on what variables to collect data and that is exactly what the FDES provides. It is important to note that this situation is not a rarity in many countries in Africa. For example the Uganda Bureau of Statistics is considered to be one of the leading NSOs in sub-Saharan Africa but up to this point they have not been able to produce any publication in ES despite sending some of their statisticians to several short-term (under 1 year) courses in ES over the years. I have interacted with some of these statisticians since I joined UNICEF Uganda several times. They are brilliant professionals whom I have concluded, based on my discussions with them, would have started the work if only they knew how/where to start. I have recommended the FDES for their use. Therefore, the issues raised here are very relevant. I would like to reiterate once again how useful the FDES was in the development and implementation of environment statistics in Botswana and my confidence that the revised FDES will continue to be an excellent guidance and tool for countries embarking on the implementation of an environment statistics programme.