

## **Training Course Evaluates Major Environmental Issues in Namibia**

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Namibia, a recently independent, developing country, is the most arid country south of the Sahel with the lowest production of calories per capita in southern Africa. The population is increasing at more than 3% per annum and long-term environmental sustainability is not a central focus of development planning. Namibia's tertiary education institutions were established with independence in 1990. In attempting to build the University of Namibia and Polytechnic of Namibia to serve the population of 1.6 million, the ministry of higher education has promoted a traditional, discipline-based structure. As yet reading and writing skills are not well developed in secondary schools, a deficiency that carries over to tertiary institutions. Nevertheless, as government restructuring proceeds, university and polytechnic graduates are frequently employed immediately upon graduation from three or four-year programs, despite their lack of extensive experience or appropriate job skills.

The problem solving approach to teaching is beginning to be addressed in conservation fields for university graduate students (e.g. Touval and Dietz 1994). Applications start at the graduate level and usually involve students with a background in conservation biology. They offer a cross-disciplinary approach addressing real-world problems. This approach addresses the need for graduates to make the transition from disciplinary training to jobs, usually without the benefit of any experience of problem solving.

In Namibia, we developed similar solutions to this problem in response to the particular conditions of the country, its education legacy and its current education system, but of necessity directed towards upper-class students and recent graduates. Our objective was to balance the prevailing attitude at Independence (1990) that environmental studies referred to birds, elephants and tourism, not to the broad analysis of use of resources. A summer field course, instituted in 1992 by a non-governmental organization, the Desert Research Foundation of Namibia (DRFN) and funded by Sida (Swedish International Development Co-operation Agency), targeted important large-scale environmental problems for analysis in training exercises. The course is organized to provide skills necessary for environmental problem solving by applying research techniques to the analysis of current national environmental problems. Each year, in consultation with colleagues, we selected an overall topic reflecting a current environmental issue related to public policy or development. Some important Namibian environmental issues are currently being addressed with outdated and inadequate information, so these were targeted for study.

Students are carefully selected and are expected to be amongst the future managers and decision makers influencing environmental policy and management in Namibia. Experience of the past eight years has shown this to be the case with alumni currently employed in at least five ministries, the private sector and with NGOs.

This summer course supplements the more formal and theoretical training students receive in their tertiary education institutions and provides direct experience with environmental challenges of current concern for sustainable development in Namibia. To implement this course, a variety of partners are involved. Partner institutions and individuals contribute to preparatory lectures and discussions during the introductory phase of the course, participate in field investigations, data analysis and writing while some, including government ministers and other high ranking officials, attend the final report-back presentations and participate in discussions relating to results and their application. As a result of this intensive environmental problem solving experience, now known as the Summer Desertification Programme (SDP), students have a broader view of the role of sustainable use of natural resources and the environment in the overall sustainable development of Namibia. Moreover, experience and information developed in these courses can be conveyed immediately and directly to government officials and others influencing and implementing environmental policies.

Scientific lessons learned vary widely. Environment reconnaissance exercises allowed students and other investigators to initiate diverse projects, often leading to more extended analysis of problems such as water use and allocation in urban and rural settings, illegal fencing and grazing rights and policies. Moreover, these student exercises have the potential to investigate sensitive environmental problems not easily addressed by foreign scientists and to promptly convey findings to a national audience.

Throughout the nine years of this course, the following challenges have been investigated and lessons learned.

- Namibia has an arid and variable climate. As in other arids, the use of mean rainfall does not provide appropriate information for management or development decisions as 'mean' rainfall is rarely realised. Participants, with support from the Namibian Meteorological Office, used all longer term data sets to develop a Rainfall Range Map. This depicted the range of rainfall that could be expected 90% of the time. The Namibian Farmers Union immediately adopted this map and distributed it to all commercial farmers and it is displayed in government offices throughout Namibia. Students and stakeholders alike gained an enhanced appreciation of the variability of Namibia's climate and its influence on sustainable development. They also were able to assess the impacts of variability on biodiversity in Namibia by comparing areas of high biodiversity with the concomitant rainfall range.
- Perennial rivers are found only on Namibia's northern and southern boundaries while one quarter of the interior is drained by 12 westward flowing ephemeral rivers. How is water shared amongst the six major consumer groups dependent on one of these rivers, the Kuiseb: commercial farmers in the upper catchment, communal farmers, a research centre and a nature park in the middle reaches, while two large towns and a uranium mine are supplied from an alluvial aquifer in the lower reaches? Particular attention was paid to the role of the Kuiseb as a 'linear oasis' supporting, in its middle and lower reaches, a fauna and flora otherwise excluded from the Namib Desert. During another summer session, a water balance was derived for the Kuiseb River with a focus on how to determine the 'environmental reserve' that is required for functioning of the ecosystem. Students learned how to derive a simple water balance model for the different water compartments of the catchment and identified and measured the effects of over abstraction from the lower river alluvial aquifer. This second project focused on ephemeral rivers drew the attention of the Department of Water Affairs who joined with the DRFN the following year to investigate the effects of farm dams in the upper Kuiseb on water flow and overall

water balance. Only recently completed, students learned techniques of land and vegetation survey in the field and interviewed a number of relevant stakeholders. In the laboratory, they developed a method for analysis of the farm dam data and a model to assess the effects of the dams on water flow. These results, with the supporting data, were presented to a variety of senior staff in water affairs and the environmental ministry and were prepared as an occasional paper of the DRFN. These studies contribute to an EU funded project that seeks to determine a common vision for use of the limited resources of the Kuiseb catchment. This project, in turn, will contribute to testing the Basin Management Committee approach espoused in the draft water bill. It has contributed to awareness raising amongst stakeholders, contributed basic information concerning water balance and outlined an approach to understanding an environmental challenge with limited basic information at hand.

- During two sequential seasons, the participants addressed the question of how to differentiate between the effects of drought, as an unusual and infrequent occurrence, and normal rainfall variability in arid to semi-arid farmlands. The students were confronted with essentially bare soil with scattered perennial shrubs and asked to assess if this was long term degradation and loss of productivity (desertification) or normal times of low productivity. They assessed the seed banks, soil nutrients and vegetation and investigated livelihoods of the resident communal farmers. The conclusions of the first year highlighted the necessity for alternative income generating activities to enhance coping strategies during naturally dry periods. The second year the approach was extended to a comparison between communal and commercial farms with the same rainfall and the different opportunities presented by elephants and huntable game under these two land tenure regimes.
- During two later seasons, the environmental costs of various uses of natural resources in Namibia's highly populated northern communal areas were addressed. Cost and use of woody vegetation and water in two differing habitats – central ephemeral delta and wooded Kalahari sands – was compared. The equivalent cash value of the woody vegetation provided by the environment, in the past at one site and currently present at the other, was assessed. The students concluded that use of woody vegetation was unsustainable at the current rate under current conditions. They also concluded that community based management of water installations, and cost recovery for their maintenance, would contribute to improved water use and management. They recommended interventions such as use of fuel efficient stoves, improved management of woody vegetation to enhance regeneration and greater overall awareness raising of the value of assets, particularly wood and water, provided by the environment. The second season in the eastern woodlands attention was focused on the illegal fencing issue. Fencing in communal farmlands is illegal, however, many rich farmers are fencing out their poorer neighbours, restricting their access to seasonal water and grazing and even fencing in government boreholes. The original question addressed the environmental impacts of this practice but impacts were observed only in older fenced areas. While in the field, attention soon turned to the social and economic consequences of the illegal fencing and the system that allowed this to continue unabated. Needless to say, the presentation of the results of this research generated great discussion amongst decision makers and other present.
- Based on the results of previous sessions, one year the Ministry of Lands, Resettlement and Rehabilitation asked the class to investigate the development options in an area occupied by resettled San people. Again, the students were able to address questions not accessible to foreign researchers. They concluded that

San people should be allowed at least a decade to develop in the directions they prefer, based on the use of indigenous veld foods and traditional knowledge, rather than moving in other groups of people, with livestock, to provide cash incomes for the San. This investigation has proved to be very topical when several years later the government identified this particular area for resettlement of an overflowing refugee camp. The reconnaissance investigation of the student course has provided background for those wishing to ensure that such a development is sustainable.

This case study illustrates the potential for integration of research and training during the investigation of environmental topics contributing to sustainable development. These projects all included participation by experts and affected stakeholders, ranging from individual farmers to government ministries. Throughout these studies, we emphasize acquisition of data addressing important and currently applicable hypotheses. We stress skills development such as critical thinking and communication rather than technical skills of narrow applicability. At the same time, issues of relevance to the sustainable development of Namibia are investigated.

#### Selected references

Touval, J. L. and J. M. Dietz. 1994. The problem of teaching conservation problem solving. *Cons. Biol.* 8:902-904.