Project: Development of an Environmental Assessment Method for Aruba

ISBN: 90-367-1864-3

Project participants:

Rijksuniversiteit Groningen, The Netherlands:

dr. A.J. Schilstra	Project co-ordinator
dr. D. Strijker	Project supervision
drs. K. Bettels	Project supervision
prof. dr. A.J.M. Schoot Uiterkamp	Advisory committee
dr. J. van Andel	Advisory committee
ir. J.P. van der Perk	Project research

Directorate of Housing, Spatial Planning and Environment VROM, Aruba:

drs. ing. E.L. Lioe-A-Tjam	Project initiator and supervision

Contact address information:

Rijksuniversiteit Groningen
IVEM Center for Energy and Environmental Studies
Dr. A.J. Schilstra
Nijenborgh 4
9737 AG Groningen, The Netherlands

Phone: 0031 50 363 4614
Fax: 0031 50 363 7168
Email: a.j.schilstra@fwn.rug.nl
Internet: www.rug.nl/ivem

The findings of the project “Development of an Environmental Assessment Method for Aruba” are described in four reports and bundled in two volumes.

First Volume A&B:

A The current volume, containing an overview of the other three reports and the translation into English of major parts of the second Dutch volume report B.

B Taking Stock of the Terrestrial Environment of the Isle of Aruba.

Second Volume C&D:

C Sustainable Development of Aruba: Indicators for Ecological Quality.

D Environmental Monitoring for Sustainable Development on Aruba.

Development of an Environmental Assessment Method for Aruba

Part A project RuG – VROM Aruba

IVEM Center for Energy and Environmental Studies
University of Groningen, The Netherlands

RuG

Contents:

Introduction: the why and how of the project

Aruba is a Caribbean island with a high population density and few natural resources. The economy is largely driven by tourism and the oil industry. It can be stated that the most important natural resource of Aruba is its nature and landscape: beautiful beaches and a relatively unspoiled rocky coastline and hinterland grace the island. With the pleasant climate these resources are the main attractors for tourism, and thus of vital economic importance to Aruba. Unfortunately, the resources are under constant pressure, from both the very tourism and the population pressure.

Prudent management of the remaining natural resources in harmony with economic development is crucial for the long-term prosperity. High standard management however does require knowledge of the systems concerned. Not only of the situation today but also of the dynamics concerned. Indicators that yield usable information on these valuable and vulnerable systems on a favourable cost/benefit basis is the key to "wise use" of the natural resources in the long run.

In this research report we describe the development of such an indicator approach. Drs. ing. E.L. Lioe-A-Tjam, director of VROM Aruba, the Directorate of Housing, Physical Development and Environment, of the Government of Aruba, and dr. A.J. Schilstra of the University of Groningen, the Netherlands, designed the project that has led to the results reported here. As its name indicates, at VROM the conflicting demands for infrastructure development, housing, developing facilities for tourism and the protecting of ecologically valuable areas, become painfully evident. A GIS-based system that describes the current situation for all these space using functions both quantitative and qualitative, and contains knowledge of the dynamics involved would be a very valuable instrument indeed for designing a sustainable spatial development for Aruba.

The first steps on the way to implement knowledge of Aruba's natural values into such a GIS system are made in the current research. It is designed in the following three consecutive parts.

First, *Taking Stock of the Terrestrial Environment of the Isle of Aruba*. Drs. J. van Belle, then student of Biology at Groningen University, made an inventory of available information on Aruba's ecosystems, drawing from literature, local expertise and from field work. His work places species from flora and fauna within the context of local, regional and global significance, their trends and vulnerability. Pages 7 and 8 describe in short his results. Part B is his full report, written in Dutch. From page 15 onwards major parts of van Belle's report are translated in English.

Second, *Sustainable development of Aruba*: *Indicators for Ecological Quality*. In this part of the report ir. J.P. van der Perk analyses Aruba's natural assets in terms of checklists of relevant natural systems, their ecosystems functions and carrier functions for human activities. Cross tabulating assets along these dimensions indicates opportunities and threats. The findings of this part are described on pages 9 and 10. In Part C the complete results are reported.

Third, *Environmental Monitoring for Sustainable Development on Aruba*. Ir. J.P. van der Perk deals with how to create and maintain the ongoing activities required for the ongoing usability of the envisaged GIS-system. Institutions, professionals and in particular volunteers are prerequisites for a successful instrument. In short, on pages 11 and 12, complete in Part D.

The three parts of the research were carried out by the two authors mentioned above in close collaboration with dr. A.J. Schilstra, project co-ordinator, dr. D. Strijker and drs. K. Bettels, project supervisors. Prof.dr. A.J.M. Schoot Uiterkamp and prof.dr. J. van Andel formed the Advisory Committee. Obviously regular contact with drs.ing. E.L. Lioe-A-Tjam and co-workers contributed to the project.

Part B: Taking Stock of the Terrestrial Environment of the Isle of Aruba.

Drs. J van Belle

(Volume B is written in Dutch. Major parts have been translated to English. These translations can be found in the Appendix of this volume)

Part B of the research concentrates on those organisms that deserve attention because of their national or international vulnerability, called here "focus plants" and "focus animals" (Dutch: aandachtssoorten). Focus species satisfy one or more of the following criteria:

1. Species rare on Aruba or the region, or threatened species.
2. Species who's local, regional or global existence is threatened by habitat disturbance, habitat fragmentation or disappearance of the habitat. This is especially the case for coastal ecosystems.
3. Species threatened now or possibly in the future by the (international) trade. Here the CITES treaty is important. Indigenous species on the CITES list are included in this report.
4. Species unique on regional or mondial level, including indigenous species.

Also attention is given to the authenticity of species: did they arrive (presumably) on Aruba without human interference? Does the species reproduce on the island? If so, it is assumed to be part of the Aruba ecosystem.

The research questions are as follows:
- What are the focus species of Aruba?
- How many individuals or pairs are there?
- How did the populations develop?
- Where do they occur?

To select the focus species from the complete list of flora and fauna of Aruba the following questions have to be answered:
- For which (sub)species is Aruba the natural habitat?
- Which from these (sub)species do reproduce on Aruba?
- Which from these (sub)species have a limited habitat? Or, as a local population, does the population decline in numbers or habitat size? Or are they (very) rare on Aruba or globally?

In order to be able to indicate where the focus species are present or could be present the Aruban landscape has been divided in units of landscape type. To arrive at such a system of types the following questions are put:
- What areas are not too heavily used as to preclude natural values?
- What level of human disturbance is present?
- How dense is the local vegetation?
- How can these areas be typified?

This has resulted in the following selection of species: flora species that are locally rare, locally diminishing in numbers and species with internationally very restricted habitats are included. Bird species that are clearly introduced by humans are excluded, as are the species that do not breed on Aruba on a regular basis. Also species that have an extensive habitat and that do not seem to have been reduced in numbers (on Aruba) are deleted from the list. Of the remaining species on the list the following information is presented: where do the birds occur, has the range increased, decreased or remained stable, both internationally and on Aruba; and other information available (f.e. specific threats) is added. Mammal species that have been introduced, that have an extensive range internationally and have a stable or increasing population on Aruba and those species that are quite common, are excluded from this research. Of the remaining mammals the following information is presented: where do these mammals occur, has the range increased, decreased or remained stable, both internationally and on Aruba. Reptile and Amphibian species that have been introduced, or are suspected to be so by Van Buurt to have been introduced are removed from the list.

Apart from flora and fauna, data landscape types are discussed, considering also the degree of disturbance and soil type is considered. Next, based upon photographs from an aerial survey, the rate of ground cover by the vegetation is estimated For the current research uses two categories: low and moderate. Low corresponds to bare. Moderate corresponds with moderate to coarse. De soil type system consists of three types: limestone underground, tonalite-batholite underground and Aruba Lava Formation underground.

The part from Aruba that is not considered is dived in areas densely built and less densely built, based on photo interpretations and covers the area that has a building density of more than 70% of the maximum density. These areas are not considered to be refugia for species of interest.

In the conclusion of Part A 47 plant species are tabulated that deserve attention or protection according to the selection criteria mentioned above. Animal species to be considered are 27 vulnerable bird species, 9 indigenous mammals, 1 amphibian and 11 reptile species. Finally, also several characteristic and vulnerable landscape types are tabulated.

Furthermore, no information was found concerning the critical population size of the focus species on Aruba. Most knowledge of the Aruba flora concerns trees, shrubs and succulents, while very little is known about grasses and herbs. On population trends of both flora and fauna very little is known. Classification of the landscape is problematic due to the lack of suitable information and classification criteria.

Part C: Towards sustainable development of Aruba: indicators for ecological quality.

Ir. J.P. van der Perk

This part is highlighting the main economic and ecological features, and qualifying its ecological values. Finally, indicators for determining the ecological values and qualities of the terrestrial ecosystem are discussed.
Recent insights in the current situation of Aruba show the necessity for identification of limits for physical and economic developments on Aruba, to control unregulated growth. With the help of an integrative management system, impacts and effects of proposed or planned human activities can be made visible for policy and decision making.

Aruba is investigated here from the point of view of function evaluation. On the one hand, nature performs a number of ecosystem-functions while on the other hand, humans designate certain anthropogenic (carrier) functions to the same area. This may cause several difficulties and conflicts. Many times the natural functions are replaced by some specific human use function.
In this report the term 'function' is being used for two different aspects, namely natural or ecosystem functions and human-use or carrier functions. Natural or ecosystem functions are the goods and services which are performed or 'produced' by nature. Human-use or carrier functions, on the other hand, is the collective term for human land use and occupation of natural areas for human activities. The natural area is only or mainly used as a substrate or carrier for human activities. To some degree ecosystem functions can coexist with human-use functions, until the limits of resilience of the natural ecosystem is reached. Many times the natural functions are replaced by some specific human use function.

A checklist of 24 natural functions, divided into 4 function-groups, is used to assess the ecosystem functions of the terrestrial, coastal and marine ecosystems. The main focus is on terrestrial ecosystems, which are subdivided into natural ecosystems, semi-natural systems and cultivated (man-made) ecosystems.

A large part of Aruba still has natural and semi-natural characteristics. The natural functions of Aruba are sub-divided per function category (regulation, habitat, production and information functions), and are ranked for the situation on Aruba. On local, site specific scale, the ecosystems functions of Aruba are more easy to quantify than on island scale. Various types of natural ecosystems can be distinguished, based on vegetation characteristics, fauna characteristics, geological formation and processes/functions. The most natural ecosystems with relatively little human influence still perform a multitude of ecosystem functions (actual and potential).

An overview of the natural functions of the terrestrial ecosystems of Aruba is given. When looking at the ecosystem functions, the most important natural goods and services for Aruba are provided by water regulation functions (including runoff regulation, flood control, control of groundwater flow and groundwater recharge), soil retention function, habitat refugium function, habitat nursery function, aesthetic

information function, sustainable recreation function, cultural and artistic inspiration function and finally the spiritual and historic information function. It is important to mention the criticality of the interactions between these functions, which connect all elements into one system. Due to the limited natural resources, the production functions of the ecosystems of Aruba plays only a minor role.

In the transition zone (former rural areas) between urban occupation in the south and natural (partly protected) areas in the north, the most important land use functions, which are conflicting with the natural functions, are new human settlements, infrastructure and small scale mining. Also the tourism industry has its repercussions on the landscape of today.

It is expected that the vulnerability of watersheds for erosion and storm damage during heavy rain periods will increase. Ongoing fragmentation of the former rural and natural areas continue reducing the habitat sizes of flora and fauna. This leads to habitats which are too small for a viable population size. Continuing desertification and degradation will lead to lower numbers of flora and fauna populations, reduction of the number of species on the island (biodiversity), reduction of the soil fertility, decreasing rain water infiltration, reduction of the ecological corridor function of seasonal gully valleys. A system for monitoring the ecological situation is needed to control further degradation and to provide a better basis for policy and decision making.
A number of biotic and abiotic indicators are identified which reflect the ecological values of Aruba terrestrial ecosystem. Selected abiotic indicators are erosion mapping and selected biotic indicators are the Aruban Burrowing Owl, indigenous bats and local rare tree species.

Also potential interesting indicators are mentioned. More research is needed to investigate the usefulness of these possible indicators. For areas which are fragmenting at a high rate, another useful indicator for the quality of such an area is a minimal ecological area size and ecological-infrastructure.

Part D: Environmental monitoring for sustainable development on Aruba.

Ir. J.P. van der Perk

This report is highlighting the possibilities for setting up an environmental monitoring system for the island of Aruba. The main objective of this study is the development of a monitoring system based on a set of ecological indicators and fitting within the socio-economic conditions of Aruba.
This objective was approached by setting up a workshop in collaboration with VOMIL, Curaçao, with invited external specialists and local experts from governmental and NGO side. In the form of a number of presentations, followed by extensive discussions an inventory was made concerning technical, organisational and practical implications of monitoring. This provided the basis for the development of a framework for a monitoring system that can be applied on Aruba. Although this framework is not a "blue print" with a ready-to-go manual, it does point out the criteria and main elements within a monitoring system suitable for the island of Aruba. The term 'environmental monitoring' is analysed and defined. The importance of monitoring for policy and decision making is to create a more transparent decision making process. This is a basis for environmental policy making and management and is relevant for a well underpinned spatial planning policy.

One of the discussed issues is how monitoring with volunteers is organised in the Netherlands and what can be learned from that for Aruba. It is concluded that collecting data with the use of volunteers is relatively cheap; up to 5 to 10 times cheaper then a professional consultant. But one still needs money for co-ordination of fieldwork, for education and communication with the volunteers, database management and quality control etc.
Another important issue is to take advantage of experiences elsewhere. This report takes a closer look at the way monitoring field data are being processed for policy makers in the Netherlands by the Environmental Assessment Office, part of the RIVM institute. The Environmental Assessment Office works with a coherent system of indicators for monitoring and models aimed at the biodiversity problem in the Netherlands (were little natural habitat is left with mostly common species and declining rare species). The Environmental Assessment Office keeps on evaluating its own system of indicators, monitoring and models by looking at whether the aim of the research is still covered. The system is used in the National Nature Outlook. This Nature Outlook focuses on conditions and trends of nature and landscape. Four environmental scenarios for the future are developed. Also the effects on nature and landscape in relation to these scenarios are investigated. Finally a number of response options are proposed to the policy makers which they can use for future policy.

An organisational model for a monitoring framework is discussed and can be filled in for the island of Aruba specifically. Several elements of this model already exist, but do not work together with other organisational elements. The challenge is to bring

these stakeholders together and set up a working program for monitoring. Collaboration should be promoted in the form of a platform or via a central co-ordination centre. Monitoring means observing and measuring periodically. Therefore continuity needs to be guaranteed. Data quality control is also an issue of importance.

Conclusions

The set of reports points towards opportunities and risks. As changes in land use are virtually irreversible, opportunities decrease and risks increase. Even though the reports may suggest a sequence of actions from inventory via developing and quantifying indicators towards action, all parts of the process should be taken up as soon as opportunities arise. According to the Precautionary Principle irreversible decisions should be taken very carefully and take alternatives into consideration. Keeping options open and heeding non-economic values does not preclude wise use of natural resources. The results from this project may help to proceed on a 'wise' road towards an Aruba where the quality of living is measured not only in economic quantities but also in experiencing valuable environmental assets. Crucial is that the urgency to develop an adequate policy is recognised and that as few opportunities are missed as possible.

Acknowledgements

These reports are the result of the co-operation of many individuals. In the consecutive parts the authors present their personal acknowledgements. Here I want to mention explicitly the efforts of drs.ir. E.L. Lioe-A-Tjam, director of VROM, Aruba. His diligent work towards improving Aruba's environmental policy is exemplified by the tenacity needed to obtain the funds for this project. These reports, valuable tools on the way towards a more sustainable Aruba (and other islands in the region as well), would not exist without Elton Lioe-A-Tjam.