Requirements for Standard Ecological Survey Procedures in the MENA Region

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REQUIREMENTS FOR STANDARD ECOLOGICAL SURVEY PROCEDURES IN THE MENA REGION

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Abstract
Countries in the Middle East and North Africa region house a variety of ecosystems from the dense pine woodland of the Algerian coast to the extremely sparsely vegetated desert of Oman. Although cataloguing of flora and fauna in certain areas has been meticulously detailed, standard techniques for rapid assessment across the variety of habitats has not yet been established. Such techniques are crucial for sustainable development, as exemplified by Environmental Impact Assessment – a key goal of the Rio Earth Summit. This paper recommends a number of standard techniques based on size, ecotype and habitat/species of interest. Recommendations are then made on approaches to determine nature conservation value. This can then be used for development projects to inform mitigation requirements and environmental management plans.

Main Text

EIA in the MENA Region

Environmental Impact Assessment is a key goal arising from the 1992 Rio Declaration on Environment and Development (Principle 17) and is enshrined within the laws of the majority of the MENA countries. The vigour in which these laws are applied, however, are variable (Ahmed & Wood, 2002), often with the result that projects are passed by local authorities without the proper understanding to adequately scrutinize the subsequent Environmental Statements. Often, the driving factor behind detailed EIAs in the Region is not national legislation but rather lender requirements. International investors in the Region will often have requirements for projects to be completed according to procedures consistent with, for example, the World Bank Environmental Assessment Sourcebook (1991) or the European Investment Bank Environmental Statement (2004).

Ecologists conducting field surveys within the MENA Region may be hampered by a lack of clear direction for which type of survey techniques to use. Rather, ecologists may then use methods based on their experience. However, survey techniques for temperate regions may not necessarily be suitable, or, certainly, the best option for surveys in drylands. Likewise, assessment of nature conservation value is often based upon legal instruments, such as statutorily protected areas. However, these may be lacking in many developing countries. The main aim of this paper is to present a series of survey techniques that can be used as a framework for performing terrestrial EcIA surveys, plus suggested means to determine the nature conservation value. Faunal studies are not included in this paper, nor are marine systems, with the exception of certain inter-tidal habitats.

According to the UK Guidelines for Ecological Impact Assessment (IEEM, 2007), surveys should be conducted using a three-stage process. Stage 1 (Scoping study) identifies the major environmental variables from correspondence, websites, such as Google Earth or/and a brief walkover survey. During Stage 2, the major habitats within the footprint of the project are mapped in some detail, thereby allowing comments on the nature conservation value of areas, including potential for protected species. Stage 3 is not always required but where the Stage 2 has identified important areas (for both fauna and flora), a further study can indicate the true value of the area. In the case of protected species, Stage 3 is often a legal necessity.

Recommended Methods of Habitat Survey

Remote Sensing

The advent of sites, such as Google Earth or Virtual Earth, has allowed ecologists unprecedented access to aerial and satellite imagery. Such imagery can allow broad mapping of 'habitat areas'. For example, a series of woodlands connected by wildlife corridors such as hedgerows may be classed as one 'habitat area' due to their interconnected ecology, rather than a series of disparate woodlands and hedgerows. Likewise, large areas of desert, agricultural land or urban conurbations may also be classed into their 'habitat areas' Figure 1.

Figure 1 Interpretation of an aerial image into habitat areas (taken from Jacobs, 2006)

As well as defining larger areas of habitat, remote sensing, in the hands of an experienced analyst, can also allow the breaking down of large areas of habitat into smaller portions of differing nature conservation value. For instance, woodland areas may be subdivided into compartments dominated by conifers, broadleaves and scrub. Desert environments may be broken down into dune systems, sabkhas, pavements and so on.

Mexican Rapid Arid Survey (Valverde & Montaña, 1995)

This methodology was developed to allow rapid assessment of semi-arid zones in developing countries. The authors examined vegetation communities in the Chihuahuan Desert and related these to environmental variables, specifically landform, topography, surface rockiness and soil origin - all of which have a direct effect on water variability (MacMahon, 1981; Noy-Meir, 1981; Ward *et al*., 1993). Landform was found to best explain the vegetation community (as illustrated in Figure 2 and Figure 3), with the other variables providing a high degree of predictability.

Often, topographical maps represent the best information available in MENA countries, providing, at least landform and topographical data. By linking this data with vegetation community types, a rapid assessment can be achieved. Initially, this means re-assessing the existing vegetation community data into basic landform data. For instance, Valverde & Montaña (1995) classified three vegetation types from literature (shrubland, mixed shrublands with rosulate succulents and mixed shrubland with cladophyllous succulents), plus another from field study (mixed shrublands with microphanerophytes) with landform (alluvial plains, valleys, rolling hills of calcareous origin, igneous plateaux and low hills, low sierras of calcareous origin, complex sierras of calcareous, igneous and metamorphic origin and high sierras of calcareous origin), topography (plain, nearly plain, slightly wavy, wavy, highly wavy and irregular) and other similar simple measures of surface rockiness and soil origin.

Figure 2 Landforms present in a 10 x 8 km surface of the Mapimí Bolsón. Extracted and redrawn from the 172,000 ha geomorphological map made by Breimer (1985). (■) = alluvial plains; ▦ = valleys; (▨) = rolling hills of calcareous origin; (▤) = igneous plateaux and low hills; (▩) = complex sierras of calcareous, igneous and metamorphic origin (taken from Valverde & Montaña, 1995).

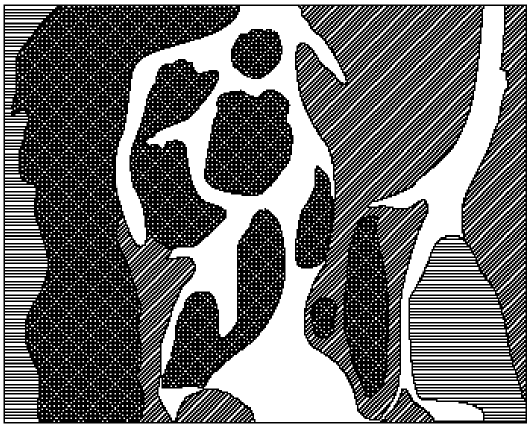

Figure 3 Vegetation types present in a 10 x 8 km surface of the Mapimí Bolsón. Extracted and redrawn from the 172,000 ha vegetation map made by Montaña (1988). (▤) = mixed shrubland with cladophyllous succulents; (▩) = mixed shrublands with rosulate succulents; (▨) = shrublands; (□) = mixed shrublands with microphanerophytes (taken from Valverde & Montaña, 1995).

Initially, this would require an investment into background work, as most of the vegetation literature and maps are readily available within the Region. With limited field trials to ground truth the data and provide amendments, this information may be transferred into a GIS system. An estimate of potential major ecological variables would then be readily available for any project within the scope of this data. Potentially, this may mean across the MENA Region as a whole.

Rapid Coastal Assessment (PERSGA, 2004)

Rapid Coastal Assessment was devised as a means of undertaking rapid surveys of the Red Sea in the 1980s. However, this technique has since been applied to a number of other area in Africa and the Middle East. This technique allows both the resources and impacts to be assessed within a given area. Conflicts between resource and usage can then be detailed. By detailing the areas of high resource versus high pressure, protection measures or site selection can be achieved early in a given project, thus putting mitigation at the heart of development.

At present, the proforma for this survey technique is heavily geared towards coastal systems. However, it would be logical to believe that modification of the survey questions could be adapted towards a number of different habitat systems. For example, the current listing of flora (mangroves, seagrass, halophytes, algae, freshwater vegetation and other) may be adapted to more terrestrial environments, such as semi-natural woodland, plantation, rough grassland, agriculture and so on, according to the geographical area.

Phase 1 Habitat Survey (JNCC, 1993)

Phase 1 habitat survey (Figure 4) is a suitable technique for assessing areas of diverse habitat, allowing delineation of major biotypes and the need for further, more detailed surveys to be considered and recommended where appropriate. This has become a widely accepted method for surveying semi-natural habitats and is regarded as an essential part of the EIA process whenever ecological receptors are likely to be affected by a development (IEMA, 2006; IEEM, 2007). Problems, however, are clear when attempting to map areas of desert where vegetation is sparse and remote. Similarly, in areas overwhelmingly dominated by a single ecotype, such as Aleppo pine forest, survey maps may be unsuitable. Although, forests with multiple canopies, such as Aleppo pine dominated areas combined with areas of oak dominated woodland, could benefit from an initial assessment to delineate, in this example, woodland compartments.

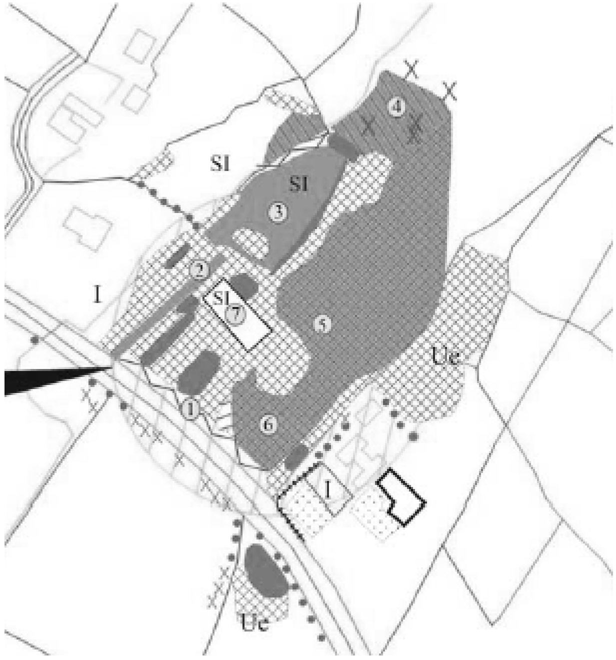

Figure 4 An example of a Phase 1 diagram (taken from Jacobs Babtie, 2006)

The Phase 1 technique was developed for UK vegetation, with the descriptions of the various types of habitat (such as salt marsh, semi-improved grassland, swamp and so on) centred on UK species. Thus, when applied to the MENA Region, the ecologist must interpret the habitats according to local species. For instance, a habitat containing species such as *Arthrocnemum macrostachyum, Suaeda vermiculata* and *Zygophyllum album* may be interpreted as salt marsh by an experienced ecologist, despite these not being indicator species listed within the Phase 1 survey manual.

Rare Plant Survey (ANPC, 2000)

The objective of a Rare Plant survey is to determine whether rare species are present on site. This survey does not necessarily record all plant species or changes in habitat. As such, this survey tends to be detailed and time-consuming. In EcIAs, this technique will largely be undertaken during Stage 3 as a result of recommendations made during a more general Stage 2 survey.

The term ‘rare plant’ in this case derives from the Alberta Natural Heritage Information Centre. Obviously, these rare plants do not transfer to the MENA Region. Instead, assessments of valued plants (most often this will translate as protected plants but may be locally rare where identified) should be made during Stages 1 and 2. Where further information is required on presence, abundance, location, health or another matter identified by an ecologist, then this technique may be recommended as an additional survey.

River Corridor Survey (NRA, 1992)

River Corridor Survey (RCS) was developed by the UK National Rivers Authority and involves the production of standardised maps of vegetation structure along 500 m stretches of river, along with mapping and recording all physical features on a 100 m wide corridor centred on the watercourse

(Figure 5). Naturally, being developed for UK habitats, this procedure requires some adjustment for use within the Region. However, this should be within the scope of an experienced ecologist.

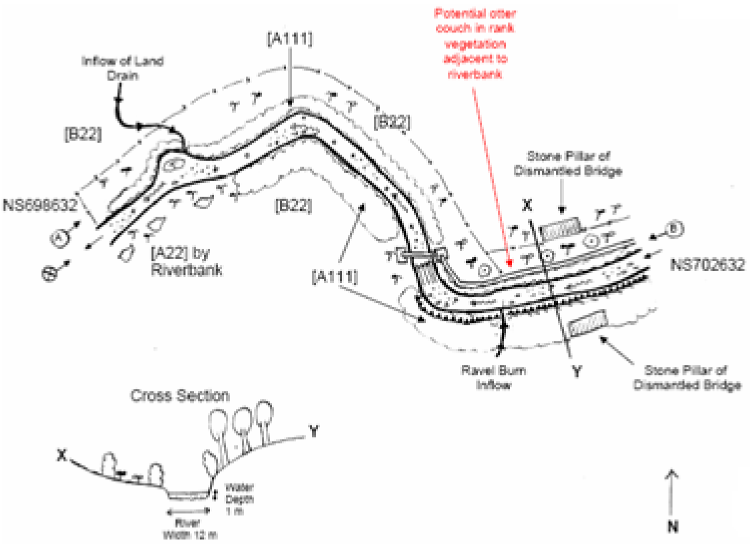

Figure 5 Example of a River Corridor Survey (taken from Young Associates, 2005)

Unsurprisingly, RCS is, with adaptation, a suitable method for surveying rivers within the MENA Region. However, RCS can also be easily adapted to survey any linear structure. Thus, this technique can be used to map rivers, canals, pipelines, roads, dry valleys, overhead lines and a variety of other natural or artificial features. Due to this survey being of a reasonably time-consuming nature, this technique is largely of use in the Stage 3 process, although with purely linear developments, this may be used in Stage 2.

Transects and Quadrats

Although used extensively in research to gauge vegetation composition, in EcIA, transects and quadrats are primarily of use for monitoring purposes. These cannot normally be used in EcIA for Stage 2 surveys as the survey must take account the entire footprint of the proposed impact. Hence, a technique which attempts to cover the whole footprint must be used in the Stage 2 survey. Although it would appear that linear structures would lend itself to a transect survey, the majority of times, a greater amount of information would be provided by using an adapted River Corridor Survey. In areas of high biodiversity identified using a Stage 2 survey, a Stage 3 quadrat survey can be used to obtain a comprehensive species list containing dominant ratings, constant species and differential vegetation.

Transects and quadrats can be useful for monitoring impacts and mitigation. By fixing a transect across an area due to be impacted, details can be provided regarding vegetation structure before and after the impact. For example, where mitigation of the impact is designed to re-vegetate an area, a transect can run from one area outside of the impact, across the mitigated area, meeting the non-impacted side directly across. Succession can then be measured using simple line drawings, combined with dominant species/community codings. Quadrats can be useful for monitoring species diversity and vertical succession (Figure 6).

Pre-impact
← 30 m →←10 m→← 30 m →← 20 m →←10 m→
Species *x* Bare Species *y* Species *x* Species *z*
Post-impact
← 30 m →← 60 m →←10 m→
Species *x* Bare Species *z*
Post-mitigation
← 40 m →← 40 m →←10 m→←10 m→
Species *x* Bare Species *x* Species *z*

Figure 6 Line drawings illustrating monitoring of dominant vegetation before impact, after impact (as shown by an increase in bare earth) and post-mitigation (regeneration reducing bare earth).

Recommended Methods of Assessment

Red List

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information of species. These species are globally evaluated to catalogue and highlight those taxa that are facing a high risk of global extinction to those of least concern (http://redlist.org, 2008). Species can be arranged by, for instance, country and habitat. Thus, by selecting the appropriate codes, the species of most concern in the salt marshes of Egypt may be listed.

There are, however, two main drawbacks to the Red List. Firstly, not all species are categorised due to data deficiency and those that are may not necessarily be categorised with the most up-to-date information. Secondly, the local or regional status of species is not necessarily the same as that of the global status. For instance, tree-dwelling invertebrates within Mediterranean forests may be of 'least concern' globally. However, within a sparsely vegetated environment, these same species may be a local conservation priority. Nevertheless, the IUCN Red List should always be referenced when deciding the key species of global conservation concern.

EUNIS

The EUNIS Database is useful both as a tool for identifying habitats from field data and as a source of conservation information. Ecologists are able to identify potential habitats using species identified from either surveys or data searches. Once a habitat is identified, the database can be used to assess distribution of this habitat and the legal status in, at least, the European Union. Although this may not at first glance appear to be useful in the MENA Region, many habitats, especially in North Africa, are reflections of those in the EU. Thus, it can be generally assumed a protected habitat in Southern Spain is likely to be as important if detected in, say, Morocco. Therefore, conservation value can be identified by proxy. This is similar to the procedure undertaken in many Eastern European countries not within the EU.

Legislation, Directives and Agreements

In areas such as the European Union, assessment of ecological value can be relatively straightforward, based as it is on defined priorities, national legislation and EU Directives. Where such legislation may not adequately cover species, for instance, a species not under threat nationally, may be locally rare, conservation bodies and other interested parties are usually present to offer advice on such matters. In MENA, such legislation or interested parties may not be present to identify such local species/habitats. Where such deficiencies exist, local expertise may be employed. The ecologist consulted may not be regarded as local to the area, if no suitable candidate exists, but may be local to the general area. For instance, an ecologist specialising in the Libyan desert will be able to identify priorities in the deserts of Egypt.

Habitat expertise can also provide valuable information on conservation concern. Although not neighbouring, the drylands of the Western Sahara and those of the Sudan have similar conservation concerns that can be identified by a suitable experienced ecologist. Likewise, the pine woodlands of the Maghreb extend to Israel and beyond. Although, differences exist, literature research by an experienced ecologist in this habitat should be able to interpret matters of conservation concern.

The use of remote sensing, such as Google Earth can provide an estimate of habitats of local conservation concern. For instance, a small wooded area in a site largely devoid of woodland would be of local or greater conservation concern.

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