WINNING THE ENVIRONMENT

THE ECOSYSTEM APPROACH AND ITS VALUE FOR MILITARY OPERATIONS

A way to improve your mission

Second completely revised edition
By P. Wit and D.A. Noome

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Second edition updated and revised by P. Wit and D.A. Noome, 2016

IUCN Commission on Ecosystem Management
Gland, Switzerland

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Full situational awareness in CIMIC

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FOREWORD

Although there has always been a fundamental interdependency between the environment and stability, a renewed understanding of the role of ecosystem degradation in conflict dynamics is becoming increasingly urgent.

Humanity is dependent on nature for survival. At the same time we are driving a loss of ecosystem services through an increasing population, changing consumption patterns and production technologies. We are raising the demand on natural resources, leaving in its wake food insecurity, water scarcity and social unrest.

In addition, the impacts of climate change are becoming more and more apparent worldwide. Climate change serves as a threat multiplier to already vulnerable ecosystems and populations. Unusually long droughts, severe storms, floods, sea-level and temperature rise and other climate-related natural disasters can lead to mass displacement, food- and water shortages and increased competition for remaining natural resources.

The implications for local and global security are apparent, and military and civilian organisations need to have strategies in place to deal with these issues. This also has implications for military organisations, who will be faced with increasing demands for disaster relief, humanitarian assistance and peacekeeping operations. Understanding the complexity of environmentally related conflict is key to preventing conflict and restoring the peace.

A useful tool that can be used to that effect is the Ecosystem Approach. This book summarises the twelve principles of the Ecosystem Approach into four steps of a Rapid Ecological Assessment. Military (and civilian) personnel using this book will be guided to a more complete situational understanding, allowing them to create relevant partnerships and make decisions for long-term conflict resolution.

It will also create opportunities for working together with local partners in implementing climate change adaptation and mitigation strategies. Continued dialogue and collaboration are the only way we can solve the global challenges in environmental security.

Lt Gen Tariq Waseem Ghazi (Retd)
Former Defence Secretary of Pakistan and active member of GMACCC (Global Military Advisory Council on Climate Change)

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PREFACE

ISAF, Afghanistan.

During his first foot-patrol, a platoon commander is approached by a farmer who asks him to help his family with the rehabilitation of their irrigated land.

Is it a soldier's task to help this farmer?
The farmer needs food for his future, for a decent living for his family. Farmers without hope become desperate. Desperation breeds instability, feeds the insurgency. Combating despair goes beyond the short-term gain of winning hearts and minds. It generates hope and leads to a lasting peace. That is all in support of the military mission. The commander concludes that he might help this farmer.

What does a soldier need to know to assist a farmer?
This farmer asks for help with his irrigation system. What does he want exactly, where and why, and who else is there to help him. Before deciding what to do, it would be good to get more information from the farmer on questions like:

How much land he has; where is the water taken from; what is the main season for irrigation; where does the drainage water go? How many other people use the same water inlet and how much land do they have, what does the farmer want to grow with the additional water, where does he get his inputs, what will he do with the extra production: Will he sell it, or consume it himself? Is there a market nearby where traders may buy his produce? Does he own the land or does he have to pay for its use? Who distributes the water; is he representing only himself or a whole group of farmers, are farmers organised?

Are there local specialists around that are knowledgeable for repair of irrigation systems, such as agricultural extension workers, are these from the government or from NGOs; are there contractors that know what to do in these cases?

If time permits, more general questions may be asked such as about past trends (what have been the changes since your father was farming here?). But even within a short time frame of 10 to 15 minutes, one may get a reasonable picture of what the context is of the farmer's problem and what the army might do to help him. This contributes to achieving the mission's goal of security –in this case through food security and winning the hearts and minds– and to realise longer-term stability.

With time, gathering information during field trips, from colleagues, from internet, visiting experts and documents, the environmental picture will get more and more complete. This picture is necessarily complex with all the interacting components of nature, the different uses made of it by the people (including the army) and the different management regimes applied.

This publication guides you through the understanding of this complexity, how military operations may affect the people that depend on the products and services of nature, and what can be done to consolidate positive impacts and to avoid or reduce negative ones.

Soldiers discussing with farmers about their irrigation practice (Afghanistan)

SUMMARY

The goal of stability and peace support operations is to provide a safe and secure environment in which (civil) society can thrive. A commander needs a thorough understanding of the complex web of actors in the region in order to achieve this. Although there are various methods to create this understanding, they often overlook the role of nature in this web. This endangers the success of the mission and its results in the long term.

Through its deliverance of ecosystem services such as clean water, livestock fodder, crop pollination and mitigation of diseases, nature is vital to all humans. Control over and competition for natural resources are often (underlying) causes of conflict, and need to be taken into account when trying to end conflict. In essence every soldier depends on nature for his survival, to achieve his mission, and to avoid future conflicts.

The ecosystem approach is one of the most important principles in sustainable ecosystem management. It offers a quick way to gain insight into the environmental aspect of conflict situations, and will guide commanders in their decision making process. For this purpose, the twelve principles of the ecosystem approach have been integrated into four steps for a Rapid Ecological Assessment. These four steps are based on the three subsystems of the ecosystem approach: the resource itself, the users of the resource, and the managers of the resource.

By identifying all aspects of the local ecosystem, actors, and their interaction, these steps lead to an improved understanding of the socio-economic situation but also the natural system supporting it. This situational understanding is key to a course of action that leads to long-term stability in the region.

PART I:
LAND AND WATER MANAGEMENT AND THE MILITARY

Introduction

Conquering an area is one thing, securing and stabilizing it for the future is something different. Actions that unnecessarily endanger the achievement of this goal are to be avoided, while actions that may accelerate the achievement of this process should be promoted. Environmental considerations are therefore of prime importance for a military mission. This is the case for the military operation as such (for instance to ensure access to water for the army), but also to give the local communities a perspective to a prosperous future, based on a sound management of their resource base.

Stability and peace support operations are there to ensure security and stability in which the civil society can thrive. All actors in an area of operations will have their own mandates, goals and capacities. In this complex web of actors it is easy to overlook the role of nature, biological diversity as an important factor determining the outcome of the operation. We depend on nature for our existence; the air we breathe, the water we drink and the food we eat. Our activities, military or other, influence nature.

This publication outlines the role nature plays in stability and peacekeeping operations and what this means for commanders at different levels. In addition, it will provide a step-by-step guide on how to integrate this environmental dimension into your situational awareness and understanding (SA/SU) and your planned course of action (COA).

Introduction to ecology

Ecology can be described as the study of the abundance and distribution of organisms, the interaction between organisms and their relation to their surroundings. In ecology, the richness of nature is expressed in its biological diversity or biodiversity. Biodiversity can be defined as:

"The variability among living organisms from all sources, including, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems"

The more diverse nature is, the more interactions there are between its components, living (biotic) resources like flora and fauna and non-living (abiotic) ones like water, air and soil. This complexity of components and their relations into a functional unit is captured by the notion of an ecological system, or ecosystem. The United Nations Development Programme (UNDP) defines five broad ecosystem types:

1. Arid and semi-arid zone ecosystems,
2. Coastal, marine and freshwater ecosystems,
3. Forest ecosystems,
4. Mountain ecosystems and
5. Agricultural ecosystems. These are manmade ecosystems where human activities have become a functional element of the landscape.

Ecosystems as functional ecological units may fit in one (or more) ecosystem types as defined by UNDP, they can additionally be described for different levels of scale such as at the landscape level - like watersheds

or coastal plains - to local biotopes such as a fresh water lake or a small island. Ecosystems may differ in their reactions to external changes. Large-scale changes may completely alter ecosystems, as under influence of Climate Change, of large-scale conversion of forests or of dam construction in large rivers. In volatile areas this may lead to violent conflicts especially where water systems in dryland areas are affected (box 1).

Tropical rainforests and coral reefs belong to the world's most biodiverse ecosystems. In a tropical forest hundreds if not thousands of species live together on 1 hectare and a certain level of functional replacement is possible. Tracks made during army operations overgrow rapidly and the forests continue to deliver their products like clean water, wood and food as before.

Deserts have a much lower biodiversity, at the driest places desert ecosystems are composed of a few species only and therefore they are more vulnerable to the disappearance of one of them than is the case with tropical rainforests. In Iraq, the very thin crust covering the desert recovers very slowly (75 years) from damage. This means resilience in deserts is low. In ecology, resilience is:

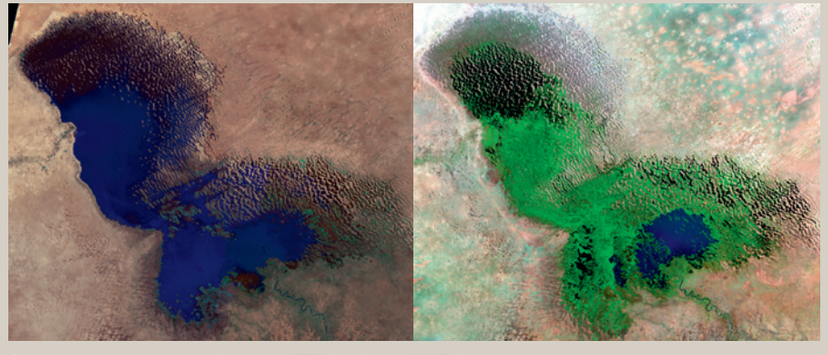
"The capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly."

Tank tracks in the Iraqi desert destroyed parts of this vulnerable ecosystem, accelerating wind erosion and negatively affecting the livelihoods of nomadic tribes.

Rangers in Kenya opening up a recently discovered charcoal kiln. Charcoal production is a good example of unsustainable use of natural resources, as it causes large scale deforestation and habitat degradation.

Box 1: Ecosystem vulnerability to climate change in western Africa

Poor land and water management, and decreased rainfall due to climate change has led to drying-up of most of Lake Chad in only 50 years time. This has resulted in growing numbers of environmental refugees and social pressure in the surrounding countries of Niger, Nigeria, Chad and Cameroon. Tensions and a number of military encounters arose between Nigeria and Cameroon in the 1980s due to water resource disputes. Nigerian environmental refugees had migrated in large numbers to Cameroon, contributing to increased social pressure on decreasing water sources. The dried up but still relatively humid areas were invaded by dense and thorny thickets, providing hiding places for criminals and terrorists.



Satellite photos of Lake Chad in 1973 (left) and 2013 (right).

Ecosystem services

Functioning ecosystems are crucial for humankind through their provision of ecosystem services. These services can be provisioning (e.g. production of food and clean water), regulating (e.g. control of climate or diseases), supporting (e.g. crop pollination) or cultural (e.g. spiritual or recreational benefits).

Although we all depend on ecosystem services in our daily life, they are especially important to poorer households. It has been reported that up to half of the income of poor households in Sub-Saharan Africa may depend on provisioning services such as firewood, fodder for livestock and drinking water. These services are especially important as a safety net in times of conflict or stress. Loss of ecosystem services through ecosystem degradation therefore undermines notably the livelihoods of the poorest members of the community.

Ecology and stability

Introduction

Natural resources as the basis of human livelihoods in areas of conflict often play crucial roles in the cause of the conflict, or lead towards prolonged or follow-up conflicts. Key drivers are resource scarcity, unequal access to and benefit distribution of natural resource exploitation and weak local leadership, aggravating poverty.

Natural resources can also serve to sustain and prolong a conflict. It happens regularly that high-value resources such as timber, oil, ivory and diamonds are exploited to finance armed forces or militia and to buy arms (box 2).

Box 2: Liberian timber trading revenues and ivory trafficking

From 1991 to 2002 the rebel group Revolutionary United Front (RUF) fought a war to overthrow the Sierra Leonean government. To finance the training and arming of its people, RUF used profits from the trade of Liberian timber. This was made possible by close ties between RUF and allies among the Liberian leadership. Another example is the militant group Al-Shabaab, that has been actively buying and selling ivory to fund its operations in Kenya and Somalia, using the profits to buy explosives, bullets and weapons. It has been suggested that ivory supplies up to 40% of the funding required to keep them in business.

Legal forest exploitation in Liberia. Sales of timber from illegal exploitations fuelled and prolonged the civil war

No stability without sustainability

Sustainable use is important to ensure long-term stability. Overexploitation means that more is harvested from a resource than can be renewed by nature. *Overexploitation inevitably leads to stress, not only on the environment, but also on human society, and therefore may lead to conflict.* Resource scarcity is often a result of overexploitation, land degradation, environmental disasters or sudden increases in population density (box 3).

Inappropriate agricultural practices will "mine" soil fertility, which may lead to irreversible losses of agricultural land through disappearance of vegetation and subsequent erosion. Fishing beyond the reproductive capacity of fish species, will inevitably lead to depletion of the fish stock, and - in the worst cases - to extinction of commercial fish species. Overgrazing will cause the disappearance of the grass cover, after which the livestock will die and vegetation can make its comeback (unless we keep the livestock numbers at an artificially high level through the import of fodder which in most cases is not sustainable). The situation whereby there is a balance between the natural productivity and the use of the natural resources, is known as the carrying capacity of an area. Carrying capacity is a dynamic concept, not an absolute fixed number e.g. a few years of good rainfall can totally alter the carrying capacity of Sahelian ecosystems. When use is at or below the carrying capacity, it is sustainable.

In some instances, the carrying capacity of an area can be increased by inputs. Such an increase can only be sustainable if the input can be provided sustainably, or "*sustainable input = sustainable output*". If for instance a farmer and his family consume all the additional production from his land thanks to the application of a fertiliser and if they have no other source of income to buy fertilizer next year again, the farmer and his family may either starve or have to move away.

Sahel grazing in the Senegal valley, Mauretania

Box 3: Natural resources as a cause of conflict in Africa and Asia

When different groups of people depend on the same resource, it may lead to conflict. For example: Overgrazing by livestock leads to disappearance of grass cover, which might lead to starvation of large herds. This triggers the migration of the herders and their animals, exporting overgrazing and causing conflict with the local residents of the area they move into.

In Mali, the resource conflict between nomadic Touareg livestock keepers and sedentary Sonrhai farmers was one of the driving forces behind the Touareg rebellion. The former conflict area was the object of a restoration project by UNEP, which came to a halt when turmoil broke out again.

In Sudan, displaced people were moving in large numbers from conflict-affected areas in the South to the Darfur region. This mass migration to refugee camps put an even heavier burden on the already scarcely available fertile land, vegetation and water in Darfur. Natural resources became overexploited in order to satisfy short-term needs of the fast growing population. This threatened future availability of those resources, which contributed to the tensions in Darfur itself.

In Somalia the influx of several hundred thousand refugees from the Ogaden desert in 1979, and the ensuing overexploitation of natural resources, is one of the root causes of its permanent destabilisation ever since.

Somali refugee camp in Eritrea

Box 4: Mozambique: unsustainable management of forests and wildlife in early post-conflict period

During the time of armed conflict in Mozambique (1982-1992), natural resources rich areas were severely affected: hunting for meat and trophies by the army and re-settlements of displaced people contributed strongly to the high-rate decline in wildlife populations. The massive relocation of people had major impacts on the natural resource base; satellite images taken during that period show large-scale habitat destruction around urban areas and along transport corridors.

In the post conflict period, reconstruction in Mozambique focused on de-mining and rehabilitation of infrastructure, the latter facilitating resettlement of displaced people, and improving general access to wildlife areas. Hunting practices by resettled people continued, as they needed to supplement their diets with animal protein. In the absence of a strong authority, hunting practices and especially encroachment in forest reserves became easy and a common phenomenon. Moreover, much indigenous knowledge had disappeared and traditional natural resource management systems had become weak during the years of civil war. A new generation had been brought up far away from their parents' traditional environment, not having gained the traditional knowledge for sustainable natural resource management. In 1994, the government of Mozambique recognized this problem, and implemented a number of policies that provided better involvement of communities and traditional leaders in land and natural resource management.

Managing conflicting uses

Problems and conflicts are prone to arise when there is too high a demand for a resource whose availability is limited (box 4).

Water-use in dry areas can be a source of conflict, but also the limited availability of fertile land for an ever-growing rural population can lead to (extreme) violence (box 5).

Box 5: Shortage of land resources

Lack of good land for a large population was one of the major causes for the Tutsi-genocide by the Hutus in Rwanda.

In Uruzgan irrigable land has become so limited in extent that the average farm size is no longer able to support the family, certainly not with subsistence farming only. These small farmers take refuge to growing poppy for the opium production as this high-value crop allows them to make ends meet. Thereby they deliver themselves to the drugs trade reluctantly (Taliban and mafia-controlled), but in security matters, a ensuring survival of their family is understandably their first priority.

Dam reservoirs often flood fertile valley-bottom lands for which there is no real alternative nearby. The planned construction of a dam in the Sichuan province in China for instance led to civil unrest amongst the farming villages that were to be displaced to higher upslope, less fertile, areas.

Patrol through the fields in Afghanistan

Ecology and conflict

No security without ecological security

Ecosystems provide services that we need and products that we use: they provide clean water and air, they protect against hazards of flooding, they take care of the pollination of crops, soil fertility is restored after harvest, etc.. The armed forces themselves benefit from these services, as they also need water and food, shelter (e.g. shade, but also timber for constructions) and substrate for their transport, and so do the people that live in the area where they operate. However, in conflict situations local communities, unlike armies, often cannot easily transport or purchase ecosystem products from elsewhere (e.g. potable water, food) and may suffer from shortages of these essential goods.

Furthermore, the military operating in a mission theatre is there on a temporary basis. They consume and use what they need and disappear again, where the local population stays and has to face potential shortages afterwards. The military by origin do not necessarily have a longer-term vision for these kinds of needs of the local communities, as this is more related to development-oriented organisations (NGOs and others). Under the umbrella of a "Comprehensive Approach" this long-term outlook needs to be addressed. Appropriate solutions for the future must be integrated in the concerted planning and conducting of all operations.

Negative impacts of conflict on the environment

Conflict situations may have negative effects on the environment through (box 6):

Destruction of the environment. Armed operations can lead to intended or unintended disruption of the ecological balance. Military forces may consciously destroy the natural resource base (scorched earth tactics) to force people to leave the conflict zone and/or to cut supplies to the enemy forces.

Pollution and Chemical tactics of scorched earth; Pollution may be an unintended side-effect of warfare, but since Roman times, army commanders have also manipulated nature in order to deprive their opponents from essential ecosystem services. By spreading large amounts of salt over the fields, Roman generals destroyed the productive croplands of Carthage. Modern variants of this tactic include the use of "Agent Orange" to defoliate the Rain Forests during the Vietnam War. Iraqi troops strategically burnt oil installations in Kuwait in 1991, which resulted in prolonged air pollution because of the large amounts of soot.

Over-utilisation; formation of refugee camps often put heavy burdens on specific natural resources. This leads to scarcity and discontent among the resident population and may spread the conflict to formerly quiet zones (box 3).

Fragmentation; disruption of ecological connectivity will hamper exchange between and within ecosystems. This will affect their functioning and will impact directly those users that are depending on this connectivity, such as fisheries (since most fish need to reach special areas for spawning). Nomadic herders may revolt against those people and organisations (armies included) that they consider responsible for obstructions to reach their seasonal grazing lands.

Box 6: Examples of negative military impacts on the environment

Unintended environmental damage: During the battle of Chora (Uruzgan, Afghanistan), which occurred during the main harvest time of the winter wheat crop, fields took fire when ammunition exploded in the standing crop. (The affected farmers were compensated by ISAF for the inflicted damage).
Destruction through negligence: During the Chad conflict, the Cameroonian army cut down the last Sahelian gallery forests in the Kalamaloué National Park to provide themselves with firewood. The resulting deforestation aggravated the already precarious situation of local communities and announced the end of a once thriving protected area teeming with wildlife.
Deliberate destruction of the resource base: Saddam Hussein's army drained the Chatt-el Arab river to drive the Marsh-Arabs out of the Euphrates-Tigris delta.
Over-utilisation of natural resources: Virunga National Park in the Democratic Republic of Congo lost more than 150 km of forest in the 1990s, as fast-growing nearby refugee camps were in need of firewood; the combined effects of deforestation and large-scale poaching led to a threat for endangered mountain gorilla populations in the area. These animals form a major tourist attraction, bringing in large amounts of foreign exchange in this poverty struck part of our world.
Fragmentation: The Ministry of Defence in Israel announced in 2007 its plans to build a fence in the desert of Judea. The fence would prevent desert animals to migrate between the higher cliffs in wintertime and the riverbeds in the valleys in summer times.

Wildlife in Waza National Park, Northern Cameroon

In all cases cited, local resource users suffered heavily from the destruction of their environment. This lead to increased tension and continuously simmering conflict situations among resource users either at the area itself or in the area where they resettled after having been forced to leave their homeland. Any army that moves in to bring security in such a situation can only do so profitably when the ecological dimension is fully taken into the mission's account and causes for and consequences ecological insecurity are addressed.

Positive impacts of conflict on the environment

While military operations during conflict usually lead to destruction of natural resources, there are also good examples of the contrary (box 7).

Often the positive impacts of conflicts on nature can be related to the effects of isolation, keeping people out of an area. The most important potential environmental benefits however come from armed forces that actively manage land and water, restoring natural resources. These are benefits that have positive effects on the environment, as well on the local communities and the military themselves.

The establishment of a secure and stable environment in which communities can regain their confidence in a sustainable future is one of the main goals for a military operation during and after a man-made or natural catastrophe. During the early phases of the operation, access for the local communities to land, water, plants and animals may only be established with the assistance of the military forces. Under that military shelter people can regain confidence to invest their time and money in growing their own food, protecting their water resources, restoring their forests, managing their fish stocks and enjoying their landscape for cultural reasons. Proper ecosystem management therefore is essential to reconstruct such key-sectors as agriculture and animal husbandry, water management, forestry and recreation and tourism. It brings security and stability to the population and - in the case of peace support operations - contributes substantially to the achievement of military goals.

Even though this reconstruction work is of essential importance to achieve the objectives of the military mission, it should be handed over to the appropriate governmental agencies and civil society organisations as soon as the general security situation permits it. This is the principle of subsidiarity; issues should be dealt with at the most appropriate level by the most appropriate organisation.

Box 7: Nature's benefits "thanks to conflict situations"

Demilitarised zones often develop into real nature sanctuaries where species that are endangered elsewhere may find refuge. In Europe for example, the Green Belt initiative is transforming the former Iron Curtain into an ecological corridor linking The North Sea with the Mediterranean.

In the Batha Province of Chad traditional pasture management survived the decennia-long civil war. Elsewhere in Africa, the Sahel suffers from overgrazing triggered by "developments" such as the proliferation of new wells, veterinary care and importation of fodder, all measures that tend to maintain livestock numbers above the level that these rangelands can support. Here in Central Chad -in the middle of the African continent- excellent grazing opportunities continue to exist as a result of age-old pastoral management practices that have remained intact when (and thanks to) the decennia-long civil war raged through the country.

One of the last pieces of intact Sahel vegetation ("brousse tigrée") is where in 1985 a war started between two of the poorest countries on the planet, Mali and Burkina Faso. The area became a no-man's land providing the necessary undisturbed conditions for a calving ground for the last 450-odd elephants that still roam the Sahel between Mali and Burkina. In 2006 a mixed border commission ended the conflict by putting in mutually agreed markers.

Agriculture in Chad

The Ecosystem Approach

Introduction

The ecosystem approach is "a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way". It is considered as one of the most important principles in sustainable ecosystem management. It was developed in the late 1980's and was formally adopted by the Convention on Biological Diversity (CBD) in 1995. All governments that signed the Convention have officially adopted the ecosystem approach as the appropriate way to conserve nature, to use natural resources sustainably and ensure equitable access to these resources.

The ecosystem approach and its value for military operations

The (natural) environment in which military personnel is deployed may at first sight seem one intangible mass of complexity. If you pull one string, the whole complex will move and holes may appear in other places. It is important to structure all these impressions and observations in such a way that sufficient insight is obtained in how these elements interlink.

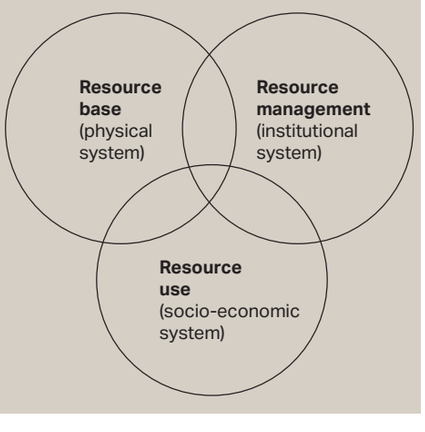
In a military context, political, military, economic, social, infrastructural, and informational (PMESII) modelling is often used to create more insight into these relations. Although it does go beyond the traditional horizon of examining the military effects of planned actions, PMESII does not take environmental factors into account. Including the ecosystem approach in your (PMESII) analysis will help to avoid pitfalls that otherwise may put the military mission in danger, and to identify further steps towards stability. It will contribute to keeping human wellbeing above a minimum threshold, thereby reducing the risk of future conflict.

The underlying principles of the ecosystem approach

The ecosystem approach consists of 12 principles, (cited in Annex 2, each one with an explanation of military relevance). For this publication, four steps have been identified, integrating the 12 principles into a Rapid Ecological Assessment.

The Ecosystem Approach makes a clear distinction between the natural system or the resource base, the socio-economic system which deals with the different uses of the resource base and, as different uses or users may conflict, the institutional system that addresses the management of the resource base and its uses.

Throughout this publication, these three subsystems of the Ecosystem Approach will be taken as starting point to describe the four different steps in a Rapid Ecological Assessment within the context of military operations.



PART II:
FOUR STEPS FOR A RAPID ECOLOGICAL ASSESSMENT

Introduction

The ecosystem approach has been developed to assist people to understand "their" environment better. A relatively simple but effective tool to assess the complex environment in which the military operate, to be used by - ecologically speaking- "military laymen" is presented in this section.

This tool, the Rapid Ecological Assessment is based on the 12 principles of the ecosystem approach (Annex 2).

The four steps

The Rapid Ecological Assessment is done in four steps:

Step 1: Resource base	Step 2: Resource use	Step 3: Resource management	Step 4: Environmental precaution & planning
Describe: Abiotic factors • Soil • Water • Climate • Air • Landscape units Biotic factors • Flora • Fauna • Humans	Describe: • User categories • Socio-economic characteristics of users • Use of ecosystem elements by user • Impacts of ecosystem use on ecosystem elements	Describe: • Institutions of the modern state, with legal texts and policies governing the use(r)s • Traditional authorities with legal texts and policies governing the use(r)s • Moral authorities • Economic powers • International community	Evaluate COA for: • Positive & negative impacts • On-and offsite impacts • Impacts during & after conflicts • Direct & indirect impacts

Description of the resource base: soil, water, vegetation, etc., elements that compose the natural and man-made ecosystems. Attention will be paid to how these elements relate to each other, e.g. in the food web.

Description of the use of the resource base: how stakeholders may use the different components of the ecosystem in which they live, how these uses may impact others and how people living in the surrounding area may be affected. Special attention will be paid to sustainable use and the notion of carrying capacity.

Description of the management of the resource base: existing management structures and regulations, power and power structures of traditional and modern institutions, and policies and legislation. A special section is dedicated to militarily

relevant international agreements and regulations concerning the environment.

Environmental precaution & planning: design military actions in such a way that the environmental impact of military operations is minimized and that sustained access for the local population to water, land and living resources can be secured. Effective actions in support of the military mission and to sustain local livelihoods can then be planned and implemented.

Tools for the assessment exercise

Steps 1 to 4. The following chapters will describe the steps in more detail and provide numerous case studies as examples.

Assessment tables. In Annex 1, four tables are provided to help you to organise your data. Each table refers to one of the 4 steps that are described in the following sections. The main purpose of these tables is to structure your assessment in such a way that you will not miss the most important aspects of your environmental situation. The tables are there as guidelines, nothing more. The tables are not complete, nor is it necessary to complete them fully for every situation. Their intention is to guide you through the assessment process so that the most important elements of your particular environmental situation are considered.

An instruction card is added separately with this publication that provides a first checklist that might be used when in the field. The assessment is a living document, its structure allows for data from detailed studies that may become available at a later date to be integrated. It is useful to make checklists for each of the 4 steps in which you systematically list the information on the environment in which you operate. The information collected can then be integrated in these checklists that may be updated continuously.

The 12 principles of the ecosystem approach can be found in Annex 2 and used for inspiration and further reference.

Sources of information

One of the most important sources of information that your own first judgment can be based upon are the local resource users. They are prime experts about their water, soils, seasons, harvests, etc. Sitting with them and joining them on transect walks (if the security situation permits this), exploiting their knowledge to fill in your checklist, pays off.

Other useful sources of information are resource persons from the armed forces themselves, local government agencies, NGOs, project staff and enterprises. They may refer you to "grey-literature" available with their respective organizations that you will not find in scientific publications or on internet.

Published data may be scarce, but the publications you do find can be very useful. Think of atlases, agricultural statistics, human development assessments, country profiles, computerized databases, etc. These are often aggregated at the national level, but combined with your own field observations they may allow a workable first assessment for the situation in the area where you are deployed. The column with "sources of information" in the assessment tables (Annex 1) indicate the most important places where to find information. There may be others!

Step 1: Assessing the resource base (the physical system)

Introduction

Military personnel read the landscape for military purposes: which places are exposed, where would be cover for opposing forces, where are the supply lines coming from and going to, what local resources are available, etc. It is an essential part of a commander's decision-making process. This assessment of the landscape can also be used to qualify it in more ecological terms: the capacity of the landscape to deliver products and services for human livelihoods, and how these are impacted by on-going developments.

Since people depend on natural resources, a logical first step is the assessment of the condition of the natural resources or ecosystems. In the next steps, it will be assessed how the military itself uses and affects these natural resources by their presence, and how the livelihoods of local communities are dependent on these resources.

Checklist for step 1

In the present approach, we assess the natural system component by component. Each of the non-living (abiotic) and living (biotic) components is described in qualitative and as much as possible in quantitative terms.

The following is a simple checklist with a few relevant guiding questions for each category. Table 1 in Annex 1 works it out in more detail.

Abiotic factors

- Air: Data on air pollution, e.g. fine dust
- Climate: Most relevant for plant production are precipitation and temperature over the seasons. Trends may indicate long-term changes.
- Landscape: Geology and geomorphology. Mountains and valleys carry characteristic soils and vegetation.
- Soil: Soils and soil fertility. Signs of erosion and soil depletion
- Water: Hydrology and geo-hydrology. Occurrence of surface water (rivers, lakes, marshes, etc.) and groundwater. Water quality. History of flash floods or increasing droughts. Groundwater depth (from wells).

Biotic factors

- Flora and vegetation: Natural and semi-natural vegetation patches may be important to deliver ecosystem services such as soil and water retention in watersheds, water purification, flood control, and clean air.
- Fauna: Key species like end-of-the food chain predators (indicators of general ecosystem quality), and carrion eaters, but also of species listed as endangered
- Man. Population numbers and density. Age and sex ratios. Occurrence of diseases. Life expectancies.

The Mount Everest: On the watershed between China and Nepal

Background to step 1

The food chain

Nature is composed of non-living and living elements. Non-living or abiotic elements refer to energy (such as the sun), water, soil, air, and minerals. Living or biotic resources on consist of flora and fauna. These living elements include everything from plants to insects, animals to bacteria and even us, humans. Within ecosystems, both abiotic and biotic elements depend on each other. Nature contains many feedback mechanisms in which it is a common law to eat and to be eaten. Food chains provide good examples of this: a combination of sun, rain and soils allows plants to grow. These plants are eaten by wild animals such as deer, which in turn are predated upon and eaten by carnivores (e.g. wolves, or humans).

The quantity and quality of natural resources are never constant, as nature is dynamic. There are many feedback mechanisms such as the described predator – prey relations where the number of prey animals is controlled by the predators and vice-versa.

Ecological versus military boundaries

There may be important differences between ecological and militarily relevant boundaries. A watershed may be relevant to both where it separates ecosystems and nations, such as at places in the Alps where the border between Switzerland, Italy and France more or less follows the watershed. But where a river may be an attractive defence line from a military point of view, it is the very heart of an entire ecosystem (box 8).

Box 8: The Toucouleur case

The Senegal river itself forms the international boundary between Senegal and Mauritania. The wide floodplain of the Senegal River is a major crop producing area in this drought-ridden part of Africa. The proud Toucouleur tribesmen are the traditional users of this ecosystem. In pre-colonial times the edges of the floodplain were the borders of the Toucouleur state, the river with its annual inundations was the pulsating heart of it. The economy of their state was based on the functioning of the floodplain and river system. When Senegal and Mauritania gained their independence from France, the Toucouleur state was cut in half and sacrificed to the notion of having a defendable border between the two new-born states. In 1989 a conflict erupted in Southern Mauritania about the use of the Senegal valley between the Toucouleur and the Maures, the political masters of the country with nomadic roots in the Saharan desert. The Maures wanted to control the Senegal floodplain for several reasons, one being the degradation of their grazing lands up north. A large part of the Mauritanian Toucouleurs was driven across the river to Senegal. The Toucouleur tribe lost half of its land. Senegal mobilised its army. A major conflict could be avoided but the outlook on lasting peace came only when the expelled people were allowed to return to grow crops on their former land in Mauritania again.

Managing one side of the river in isolation of the other side has consequences for the ecosystem on both sides. For instance building dikes on one side of a river will change the flooding patterns of the other side dramatically, with important impacts for natural values and human based uses of the ecosystem such as settlements, crop growing and fisheries. Conducting the assessment from a military point of view as well as from the resource base is key to reaching a meaningful result.

Step 2: Assessing resource use (the socio-economic system)

Introduction

All people depend on availability of and access to natural resources that are crucial in sustaining their living, such as drinking water and clean air. Step 2 guides you through the process of analysing the use of the resource base by the different stakeholders. Each component that was mentioned under Step 1 (description of the ecosystem) is matched with the importance that the component has for people. This describes the primary stakeholders; people (and users' organizations) that depend directly on the products and services of their environment.

Different people may use different components of the ecosystems where military operations are taking place. Farmers use land systems, fishermen use water systems. In other situations, different categories of users may use the same component. Water for instance may be used for navigation, fisheries, drinking water, irrigation, and industry and to maintain nature conservation values of wetlands.

Primary stakeholders can be matched with the ecosystem components in a matrix of uses. This is part of a stakeholder analysis. Other stakeholders are more involved with the management of the resource base, which includes institutions and power brokers, and will be dealt with in step 3.

Checklist for step 2

The following list guides you through the assessment process of the socio-economic system. It uses the identification of resource uses as a starting point. The most important usually are:

Extractive uses

Land system based

- Agriculture/horticulture
- Livestock keepers, herders
- Forest users, including hunting
- Mining
- Settlements and physical infrastructure

Water systems based

- Fisheries
- Drinking water, industrial water
- Hydropower

Non-extractive uses

- Conservation, nature protection
- Tourism and recreation
- Scientific research
- Cultural use. Most cultural users worship natural elements (sacred mountains, totems), but some require more consumptive uses to obtain cultural trophies

Try to be as precise as possible: Give numbers (hectares cultivated, people involved, average farm size, numbers of animals, yield per ha etc.) and locations (e.g. terraced small farms in the mountains, larger estates in the valleys).

To make sure that you have not forgotten any major use, it is important to double check by going through the outcome of step 1, and to check for each component of the physical system described if you have covered the major uses of that component. Uses do not always need to be consumptive. Communities may derive part of their cultural identity from the environment they live in. Negative impacts on the cultural values of ecosystems should therefore be avoided, as these may lead to very heated and emotional reactions.

When going over the elements of the first step to identify the major uses of ecosystem components in the second step, you may be confronted with difficulties on where to put a certain observation or appreciation. For instance, agriculture as a form of land-use may be mentioned under land and soils, but it can also be seen as a form of plant production that you may like to mention under vegetation and flora. Don't spend too much time on such issues. The important thing is that it is mentioned somewhere, so that when you plan your interventions (step 4) it is not forgotten.

Using table 2 of Annex 1 will help you to ensure that all major uses will be identified. The available tools mentioned in this table will give guidance on what categories may be relevant in different situations. This is done to help you through the process, but it is impossible to give a complete overview that is applicable worldwide for every possible situation. The user of the checklist or table should therefore not restrict him/herself to filling in the preset categories. Each situation has its own specifics and the user should interpret the situation on a case-by-case basis.

Trends in resource

For a rapid assessment, it is useful to have a first, qualitative appreciation about the impact of actual uses on the condition of the resource base. It is important to note if there are any indications of overexploitation as these may be a cause of conflict, i.e. exploitation beyond the natural capacity for renewal of the resources. Such an indication may be noted by direct observation in the case of recent signs of erosion for instance, but mostly it might be concluded from information about recent trends. Are groundwater tables going down? Are agricultural yields getting lower every year? Do key wild species such as raptors disappear? How many more kilometres do women have to walk to get firewood? Are fallow-periods shortening? Do people report declining harvests in spite of good rainfall? These are useful questions to ask.

Hindu people taking their ritual bath in the river

Background to step 2
When identifying the primary stakeholders in a specific region there are multiple categories that you may not think of directly. Unfortunately, some of the resource users are commonly ignored, or even simply forgotten. In order to avoid further tension, it is important to identify these as well and describe their dependence on natural resources. Such groups include:

General public / consumers As military also need clean water, a substrate to live on, etc., a first assessment to cover these basic needs will usually have been made before deployment. This assessment can serve as the starting point to identify the needs for access to these products and services for all local resource users.

Local producers / exploiters of natural resources. In a rural setting, most people will be farmers, herdsmen or fishermen. In Uruzgan (Afghanistan) for instance, 85% of the population are farming families. In other situations, local users of the resource base may also include industries like breweries or mines that use water for their production, forest concession holders, local tour operators, or hunting guides.

Enablers. When reconstructing human society, it is important to address the full production chain from input for primary production to the processing and commercialization of the products. Enablers are defined in this publication as organizations (entrepreneurs, agencies) that support primary stakeholders with the production process. One may say that without primary producers, enablers have no reason of being. These stakeholders usually have their ramifications within the power structure for which reason they are dealt with in step 3. Enablers include extension services, farmers' cooperatives and processing industries. Processing may also take place at the household level in which case we speak of cottage industries.

Absentee users. People may depend on the products and services that are delivered by ecosystems outside the area where they are living. Globalisation has increased this dependency on a worldwide scale. Inappropriate water management and irrigation technology can cause water to run off from the fields to adjacent rivers, lakes and wetland areas. This run-off water can contain elements such as pesticides that can have a toxic effect on wildlife, freshwater biodiversity and people. On the regional scale upstream water managers (e.g. dam operators) may not be paying sufficient attention to the downstream ecosystems and their inhabitants, which may create conflict. Egypt for instance has made explicit military threats to countries that may want to build dams on the upper Nile without Egypt's consent.

Nomadic people may be forgotten (sometimes deliberately so) when planning and implementing development programmes. Local communities of settled farmers that have confiscated these grazing grounds to grow more of their crops may deny nomads access to what they might rightfully consider as "their" seasonal grazing lands. Such confrontations may contribute to a volatile situation and violence, especially where these nomadic people have been the traditional powers, (e.g. the Fulani in the Sahel or the Orma and the Wardei in North-eastern Kenya).

Women. As in many cultures it may not be possible to communicate directly with women, their interests in resource use and in the restoration of ecosystems after conflict, tend to be underestimated or overlooked. It may not always be easy to gather information about the women's interests in male dominated societies, but that should not lead to ignorance of the importance of their role in environmental exploitation. In particular the access of women to resources such as land, water and wood should be looked into in order not to marginalise them with well-intended measures that cannot reach them because of cultural taboos. A CCOE publication on Gender (see Annex 4) gives more information on how to deal with this specific issue.

Maasai herdsman and his livestock, Serengeti, Tanzania

Youth. In many rural societies, "youngsters" include a large proportion of very capable, young adults that in their culture are considered to be too young to be associated to decision making. To ignore them not only leads to frustration on their side, and a loss of human resources in terms of both physical as well as intellectual capabilities, it may also lead to idleness, small crime and even joining opposing forces. Explicit attention to this target group is therefore needed.

Minority groups. Like with women, it may be politically sensitive to address the interests of minority groups explicitly as they have a low societal status. Again: there is no choice. If we want to arrive at a stable situation for the local society, larger groups of people should not be excluded from the benefits of development, as this will breed discontent and will carry the germ of future conflicts.

Box 9: Minority Groups
In Bangladesh a minority group of fishermen makes a living on the collection of fresh water pearls growing in the delta that constitutes this country. The low societal status and relatively low numbers of these people make that the water managers of Bangladesh tend to overlook the interests of this group. A good stakeholder analysis makes this group more visible so that their interests will be better integrated in future water management planning of the country.

Step 3: Assessing the resource management (the institutional system)

Introduction

Resource management deals with the access to resources for the different users. This institutional dimension of Ecosystem Management deals therefore with power. It is the most complicated step in land- and water management. Experience has learned that if projects fail to deliver the expected output, it is 9 out of 10 times because of problems at the institutional level: the existing powers proved too tough to tackle.

In irrigation schemes, we know exactly how to improve the use of land and water technically. We know that by doing so farm income is sufficiently raised to make technical innovation economically feasible. And still it may fail. That is because we did not pay sufficient attention to the power structure of the irrigation scheme in which we operate, where powerful farmers at the inlet take more than their fare share of the irrigation water and leave a mere trickle for the powerless at the end of the drain (box 10). Existing uses are embedded in the power structure with regulations to endorse different uses (or not). As societies and ecosystems change, new claims for access to natural resources will emerge and management will need to be adapted. Such changes may be root causes for conflict and may remain prevalent after conflict situations if existing powers continue to be challenged by opposing forces. This will have consequences for the uses of land and water, flora and fauna. Military personnel are generally well aware of who are the power brokers, whether it is the government itself, warlords or religious leaders. The other side of this institutional coin, the policies, regulations and legislations, usually are less well- known.

Step 3 helps you to assess the management structures and the associated rules and regulations that may prevail in the area of military operations. It draws attention to modern and traditional management, institutions and policies.

Checklist for Step 3

This checklist distinguishes the following categories of institutions with the power to influence and regulate resource conservation and use:

Institutions representing the modern state: Local level, Provincial level, National level

- Political administration
- Planning ministries/ departments
- Technical ministries/ departments

Traditional authorities and informal powers

- Traditional leaders
- Special functionaries in charge with natural resource management

Box 10: Controlling the tap

In Chora, Afghanistan, a particular clan that is related to the former Afghan King still maintains a power base strong enough to resist any challenge to their disproportionate share of the available water coming down from the mountains. This clan, composed of about 5000 individuals, has built a dam in the local river that may divert up to 50 % of the flow in the dry season to irrigate their tribal land, leaving the other 50 % for the 100.000 people or more downstream.

Aerial photograph of Arghandab River in Kandahar Province of Afghanistan

Box 11: A wetland for waste management and drinking water

The town of Masaka in Uganda is semi-circled by a large Papyrus wetland. Wastewater from the city enters the wetland on one side where it is purified so that the city can take good quality drinking water from the other side of the wetland again. There were ideas to reclaim this wetland to develop it for irrigation and grazing, in which case the water purification function would be lost. This calls for management decisions, in this case by the municipality, forbidding the reclamation of the wetland for irrigation purposes. (This and similar wetlands also played an important role to lay ambush for the opposing army during the Uganda-Tanzania war that caused the downfall of Idi Amin).

Papyrus growing along the Nile in Uganda

Moral authorities
- Religious authorities
- Teachers
- Non-Governmental Organisations

Economic powers
- (Large) enterprises
- Cooperatives

The international Community
- (International) donors
- Intergovernmental/multilateral agencies

The checklist provides a simple outline to organise information on the management of natural resources, both for the institutions as well as for the regulations. Table 3 (Annex 1) gives more details to guide you through the assessment of the institutional aspects. It does not pretend to be complete. However, by following it, you can be reasonably sure that your assessment covers most major institutions and their regulations.

Stakeholders do not exist or operate independently from each other: specific usage and management practices by one stakeholder will affect others (box 11).

Background to step 3

Categories of ecosystem management institutions, their tasks, policies and regulations

Natural resource management is executed in different ways, at all levels. On a local scale, resource users themselves need to apply management techniques in order to ensure future access to natural resources. On a larger scale, a whole range of management institutions, private resource owners, community cooperatives, NGOs and international institutions influence the overall resource management system in their own ways, following their own interests. The following overview of possible resource management stakeholders elaborates on the policies and regulations for the major categories of stakeholders from the checklist.

It is important to realise that some of these institutions and their representatives will be at the very heart of the conflict, while others may be considered as allies to settle the conflict and to bring opposing parties together. Modern and traditional authorities for instance may cross swords, while moral authorities may be useful to bring people together.

Modern administration

In general these are the first management structures soldiers get acquainted with when they operate in a given area. These are the official government structures at national, provincial and local levels.

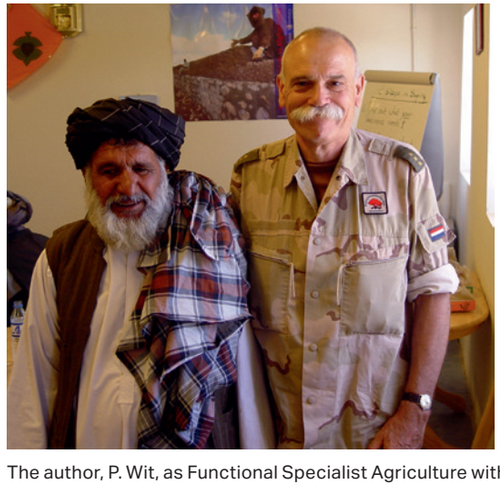
Politicians and administrators. Decisions on integrated development are taken at this level. Trade-offs are made on the desired use of natural resources within the framework of the official policies. Planning departments usually prepare the decision making at the integrated level whereby short-term economic gains are (too) often favoured. It is important to note whether criteria like sustainability play a role in the planning and decision-making processes.

Technical departments / ministries and technicians. Experts of technical departments prepare the decision taking at the integrated level. The departments that deal with natural resource use and their management usually represent a specific sector, e.g. Industry and Mining, Forestry, Agriculture, Energy or Water. Individual sector policies may be mutually contradictory as effective interdepartmental collaboration is not an all that common phenomenon in government circles. The technical planning department should integrate all sector policies into one coherent policy.

These Government institutions have a number of important roles to play in resource management, and where possible it should be checked if these roles are fulfilled or not:
- **Policy-making and implementation**: The government should provide a framework for guidance of all actors towards sustainable development.
- **Legislation and regulations:** Crucial legislation in resource management deals with land ownership, water rights, access to forest resources, et cetera. Is there a cadastre? Is the legislation on land tenure taking traditional, often communal, ownership systems into account?
- **Advancing knowledge:** Education, Research, Information/extension for the different sectors. For instance in agriculture: Are there agricultural colleges in the area? Is there an agricultural extension service? Are there pilot farms and demonstration fields? Etcetera.
- **Inspection and control, monitorig and evaluation:** Are there mechaisms in place in case ongoing developments do not lead to the desired results?
- **Coordination of all actors** involved in natural resource conservation and use: Government agencies, civil society (NGOs) and Private sector (which may include producers groups like fishermen's cooperatives).
- **Facilitation and stimulation** of other actors to invest in development. Are there subsidies available? Do these subsidies cater for sustainability of the use of natural resources?
- **Communication**: How transparent is the government in these matters? Is it accountable?

Traditional authorities, non-governmental power brokers

Fundaments of traditional powers are often based on cultural values. Compared



The author, P. Wit, as Functional Specialist Agriculture with his governmental counterpart in Afghanistan

to the frequency of changes in modern government systems, these traditional powers provide continuity and hence they are often very influential. Examples of traditional authorities include the village chiefs like the Malik in Afghanistan, but also the "Chefs de Terre" in West-African Societies, where they are in charge with the distribution of land.

Whilst traditional powers may provide continuity, the heads of these powers might not necessarily represent the interests of all the people within the community. A village head may look only after that part of the village community that enables him to stay in power. Within a rural community there may be other clans and tribes, each headed by their own leadership. It is important to know who these people are and to determine what their mandate, power base and influence is. In the more extreme cases these tribal heads may become warlords controlling a larger area with their own tribal militia, and as such they represent a security risk. Even in such cases it is possible to unite the antagonistic warlords around the issue of land and water management as they all depend on the natural resources of the area and usually have no interest in destroying (part of) these (box 12).

Box 12: Negotiating with traditional powers

In the Democratic Republic of Congo, staff of the Worldwide Fund for Nature (WWF), was able to convince all fighting parties that protection of the forests and the wildlife in it would also be in their interest. As a result, the incidence of poaching decreased dramatically.

In Uruzgan (Afghanistan) a "water-shura" reunited all traditional ("Murhabs") and state water managers of the province where decisions were adopted for a more equitable water distribution.

A *shura* in Afghanistan

Modern legislation does not always integrate traditional law. Notably in access to land- and water resources modern legislation can violate traditional user rights, thereby creating tension and conflict. Some notion of traditional regulations therefore is needed, especially when intervening in a rural context where traditions may be strong (box 13).

Moral authorities

Every society has a number of persons that derive their influence from the knowledge they have, or the societal values they represent. These include:

- Religious leaders and priests, like Shamans in pagan communities, Lamas in the Buddhist faith, Imams in Muslim communities or Pastors in Christian societies, may have a lot of influence. Their numbers may not be all that important, but their commitment to the conservation and management of natural resources can be very crucial. It is important to have a notion about what the faith itself tells about nature and how to deal with natural resources.
- Teachers in general are well respected and can provide direct access to the communities where they teach. The terms "guru" and "Marabout" indicate not only

Box 13: Gender issues in resource management

In some West-African Societies women cannot own land. Planting a tree in these societies means that you can claim a title on that land. So women are not allowed to plant trees, as this would make them own that field. Modern policies in these communities to stimulate women to plant trees as they are the first beneficiaries of improved availability of fire-wood and other tree products, will inevitably fail or will alienate the traditional communities from the government, with mutual irritation and conflict as result.

Basankusu women bringing in firewood, Democratic Republic of the Congo

An imam in Uruzgan, Afghanistan

classroom teachers as such, but also other persons with respected knowledge that people may turn to for advice.
- National and local Non-Governmental Organisations (NGOs) that represent the civil society often are much respected and therefore important. They may be of particular interest where access to women and minority groups is concerned. It is good to know if such organisations are present and if they are easy to be accessed.

Economic and other powers
Some organisations derive their power from the economic strength they possess.
- Private enterprise in natural resource exploitation has been dealt with under step 2, but it is good to realise that in these cases their influence usually goes beyond the exploitation as such, and influences the larger management of the resource base.
- Cooperatives are a special case of private initiative, as they represent collective interests. Their leadership often has a moral authority, representing the members at the governance level.

The international community
In a context of reconstruction, it is important to know what other facilitators may be there to further development, apart from Government and local NGOs. These are especially (international) institutions, donors and donor agencies (including implementing agencies like the German GTZ or the multilateral FAO) that may finance and implement projects dealing with the conservation and exploitation of the resource base.

International legal frameworks
Governments, armed forces and international donors generally will have to follow the international legal frameworks that have been ratified by their respective governments. Most of these legal frameworks are established in United Nations conferences (box 14).

Box 14: Conventions and protocols specifically important for the military:

- **The Hague Convention IV** (1907) regulates the means and methods of warfare relevant for the environment; article 22 states that "the right of belligerents to adopt means of injuring the enemy is not unlimited".
- **The Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict** and its two Protocols (1954 & 1999)
- **The 1972 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological and Toxin Weapons and on their Destruction (BWC)**
- **The Convention on Certain Conventional Weapons or Inhumane Weapons Convention (CCW).** Established in 1980, the preamble of this convention states that "it is prohibited to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment". Article 2(4) of the CCW Protocol III additionally prohibits "making forests or other kinds of plant cover the subject of an attack by incendiary weapons except when such natural elements are used to cover, conceal, or camouflage combatants or other military objectives, or are themselves military objectives"
- **The Chemical Weapons Convention (CWC),** which entered into force in 1997 with the main purpose to ban the use, development and production of chemical weapons.

However, the most relevant international environmental agreements regarding the military are the 1949 Geneva Conventions and the 1976 ENMOD convention (box 15).

Legal frameworks are also brought forward by international organisations other than the United Nations. Relevant to the context of this publication are NATO-policies and regulations. In 2011, NATO's Military Committee presented its updated document MC 469/1 on "NATO Military Principles and Policies for Environmental Protection". It aims to integrate environmental protection into all NATO led military activities, while consistent with operational requirements.

In 2014, NATO's Military Committee Joint Standardization Board (MCJSB) also updated their Joint NATO Doctrine for Environmental Protection During NATO Led Military Activities (see Annex 3).

Being a NATO Standardization Agreement, this specific doctrine for NATO led military activities provides guidance in environmental planning for all military activities. This means how commanders should apply an Environmental Management System as a tool to avoid or minimize environmental damage, and to incorporate environmental risk management throughout the overall planning and operation of military activities (box 16).

Box 15: ENMOD Convention

One major convention operating is the 1976 United Nations Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, which was preceded and adopted by Resolution 31/72 of the United Nations General Assembly. An additional protocol following the Convention is the Geneva protocol I of 1977, which is considered the most important international legal mechanism on military and the environment:

Protocol I relates to the Protection of Victims of International Armed Conflicts as well as the protection of the environment as such. The Protocol includes two provisions, which deal directly with the dangers that modern warfare represents for the environment. Rules that have been formulated from these provisions are Articles 35(3) and 55:

Article 35 : Basic rules
It is prohibited to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long term and severe damage to the natural environment.

Article 55 : Protection of the natural environment
1. Care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare, which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population.

Participants of a three day conference in 2015 to develop a strengthened environmental security policy in Afghanistan. It was organised by the Afghan Ministry of Defence and attended by more than 100 Afghan leaders, in addition to international partners.

Box 16: Environmental management of Camp Holland (Tarin Kowt, Uruzgan)

The Task Force Uruzgan constructed a well for their own water supply; this well tapped groundwater from aquifers deeper than those where the local population takes it water from, in order not to negatively impact water supply (systems) of the local communities. Wastewater from Camp Holland is treated so that it meets Dutch standards before being released into the natural environment. Wetland birds can frequently be observed at these places, indicating the acceptable quality of the wastewater after treatment.

Greater Flamingo Phoenicopterus roseus at Pocharam lake, Andhra Pradesh, India. The greater flamingo was recently declared one of Afghanistan's Protected Species and is an important wetland bird for the country.

The World Trade Organization (WTO)
Supervises and deals with the rules of trade between nations at a global or near-global level, and provides a framework for member states to negotiate and formalise trade agreements, and to settle trade disputes. In conflict situations, the WTO has played important roles in banning import and export of natural resource products (such as diamonds or timber), to tackle the issue of export income being used to fuel on-going violent conflicts.

International conventions with environmental provisions

One of the best known environmental conferences is the 1992 United Nations Conference on Environment and Development (or "Rio" Earth Summit), where three major agreements were adopted: Agenda 21, an international plan of action for sustainable development; the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCC). These and other conventions are not specifically aimed at military operations but are of relevance for the military sector as a whole. A summary can be found in box 17.

As the institutional international atmosphere is subject to constant change and dynamics, it is of importance to regularly update on on-going issues and debates. A current issue of importance is the Human Rights discussion, which is developing plans to integrate people's right to a healthy living environment (referring to the right of access to healthy ecosystems and their products and services). This is clearly reflected in the 2015 Sustainable Development Goals (See graphic below).

The 17 Sustainable Development Goals, following United Nations Resolution A/RES/70/1

Box 17: Other relevant international conventions

- **The World Heritage Convention**, established in 1972 with the aim to protect the world's cultural and natural heritage sites, which are sites that are depicted as of significant value to humanity. Heritage sites around the world are frequently threatened by violent conflict situations.

- **The Convention on Biological Diversity (CBD)** that entered into force in 1993. It has three main objectives: to conserve biological diversity, to use biological diversity in a sustainable way and to share the benefits of biological diversity fairly and equitably. The CBD has adopted the Ecosystem Approach as the appropriate way to achieve its goal. As natural resource bases are under high pressure in times of violent conflict (destruction, overexploitation, pollution) the CBD recognizes the importance to comply with CBD standards in regions of conflict.

- **The Convention on International Trade of Endangered Species (CITES)** entered into force in 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Typically, illegal trade in CITES-species is facilitated by the anarchic situations during conflict. International armies deployed in peace support operations have occasionally been reported to buy trophies (e.g. Ivory in Central Africa) and life-specimens of animals and plants (e.g. snow-leopards in Afghanistan) on the CITES list.

- **The Bonn Convention or Convention on Migratory Species** is an intergovernmental treaty that aims to conserve terrestrial, marine and avian migratory species throughout their range. As migratory species depend on large-scale transboundary natural resources, they are highly vulnerable to conflict-affected areas whereby their migration routes may be blocked and essential sites for their biological cycles may be destroyed.

- **The Ramsar Convention** is an international treaty for 'wise use' and conservation of wetlands around the world. It provides a framework for national action and international cooperation on this subject. Countries signing this convention must designate at least one wetland site for inclusion in the Ramsar list of wetlands of international importance.

Step 4: Adaptive management

Introduction

Especially during and after violent conflicts, authorities may be confronted with chaos and will need to rebuild a proper and sustainable community management structure. This can be a great challenge, as chaos situations are conducive for corruptive and unsustainable practices to continue or develop to the detriment of the people's resource base and future (box 18).

Box 18: Afghanistan and its need for institutional restructuring for environmental security

In 2003 UNEP concluded a strong need for Afghanistan to re-establish post-conflict management institutions to rebuild livelihoods, in particular with regard to environmental security. The combination of war, civil disorder, lack of governance and drought caused negative impacts on Afghanistan's natural resource base due to improper management during these times: this resulted in widespread desertification, erosion, and unsustainable water management practices. For Afghanistan's rural population, who traditionally provide for their living through mixed crop and livestock farming systems and nomadic pastoral systems (the Kuchi-people), these impacts on natural resources threatened their traditional lifestyles.

During the years of conflict, traditional 'kareze' irrigation systems had run dry because of the construction and operation of deep wells that were installed to cater for the short-term need for irrigation water for the displaced population. As a consequence, ground water tables fell, depriving the traditional 'kareze' systems of their water supply. Local farmers could no longer irrigate as they used to, which resulted in volatile disputes over access to water.

According to UNEP one of the first crucial issues for Afghanistan to tackle is to improve and rehabilitate its current water resource management systems. Traditional local water systems should be restored and improved. This should be done within the framework of a coherent integrated national strategy for water.

Please note:
ALWAYS STAY AWAY FROM BRIBERY OR OTHER PERVERSE PRACTICES THAT CERTAIN STAKEHOLDERS (OFTEN THE ONES IN POWER) MAY TRY TO INVOLVE YOU IN!

The description of expected possible impacts and the design of measures to compensate, correct or mitigate negative impacts of military operations, are dealt with in step 4.

Checklist step 4

Plan your COA, considering the following:

Positive and negative impacts. Of course the positive ones should prevail, but negative ones may be avoided, mitigated or compensated. For instance, is it really needed to drive a military vehicle right through a farm field, or may you as well go around it? And if you have to drive through it, are there funds available to compensate the affected farmer?

On-site and off-site impacts. Primary stakeholders have a tendency to overlook, forget or even deny the interests of off-site or absentee users. This may lead to frustrations and possible new conflicts. For example, if you decide to assist with the construction of a barrier dam that controls water flows, make sure that you involve the downstream users in the operating of this new infrastructure so that their interests will be integrally considered.

Impacts during and after (re-)construction. An illustrative example: Transport of military personnel or of building materials is a temporary activity with locally important risks for public health (dust, accidents). Rerouting of transport routes may mitigate this.

Direct and indirect (induced) impacts. New developments usually attract people, especially in a poor and insecure environment where desperate people will seize every opportunity to make a living. This may bring all kind of effects: economic activities but also bars, prostitution, diseases, depletion of rare natural resources by the enlarged community, etc. Without sufficient attention, some of these developments (e.g. bars, prostitution) may even directly impact military operations negatively. Table 4 in Annex 1 provides more detailed guidance.

A road constructed in Uruzgan, Afghanistan, that at the same time strenghtened an irrigation inlet

Which elements of the ecosystem will be affected by helicopter transport?

Agriculture in Afghanistan

Background to step 4

To analyse the potential impacts of proposed activities, it is convenient to go over step 1, 2 and 3 again:

1. What elements of the ecosystems will be affected by your activity? Go by the different components as described under step 1 and imagine if and how they might be affected. For this, you may want to cut up your planned activity in individual actions: Transport, on-site construction activities, temporary housing, feeding of construction workers, etc.

2. What users have you identified that depend on these resources (step 2)? How do you estimate that these impacts will be: positive, none, or when negative: negligible, manageable or substantial. In case that negative impacts could be substantial, there are multiple way of dealing with this:

- Consider cancelling the proposed activity. When planning an intervention, it is important to consider whether this intervention may carry such a serious risk that it may lead to substantial and irreversible negative results that may even enhance the conflict that you are supposed to settle. In such cases, it is better to redesign the activity in order to keep all future options open. In situations where you identify potential negative impacts and the interests at stake are essential for the survival of the local societies, apply the precautionary principle: don't go forward with the implementation of the possible intervention.
- Adapt your scheme with mitigating measures (fundamentally altering the proposed scheme) to prevent as much as possible negative impacts, or
- Identify compensatory measures for those target groups that will be negatively affected.

Always prefer structural measures above temporary ones such as buying people out. In these cases, most people spend their money rapidly on consumptive uses and will be worse off and frustrated once the money is finished.

In case you feel that you have identified a very important negative impact for which you do not feel properly qualified to oversee all the ins and outs, you can make an appeal within your chain of command for qualified experts, either within the armed forces or outside as you may have identified them under step 3 already.

3. What are key factors that determine the implementation of sustainable resource use and management during and after conflicts? Find out what are the most appropriate institutions to negotiate with and to associate to the implementation of the proposed activities. Think of government agencies with the appropriate mandate for supervision, coordination and monitoring, (local) enterprises and NGOs with the right technical, social and economical expertise for your needs, but think especially also of the users themselves and their organisations (e.g. farmers cooperatives), and their traditional management organisations and regulations.

The strengthening of local management institutions is crucial as is the creation of awareness about the integration of natural resource management in society reconstruction. This will create a sense of ownership for the investments made in particular through participatory management practices.

Don't implement measures yourself for which there are appropriate local organisations and experts to execute the planned activity. Once you have done step 1, 2 and 3, step 4 logically fills in the gaps. Table 4 (Annex 1) elaborates an example.

GLOSSARY

Aquifer
An aquifer is an underground layer of fractured or permeable body of rock, sand or other material that contains groundwater and allows water to move through it. They can occur at varying depths. The water can be extracted using well or by pumping it up. Shallow aquifers are easy to exploit and are easily replenished by rainfall. If water is taken faster than the well can replenish, it may run dry.

Convention on Biological Diversity
The Convention on Biological Diversity (CBD), known informally as the Biodiversity Convention, is a multilateral treaty. Its objective is to develop national strategies for the conservation and sustainable use of biological diversity. It is often seen as the key document regarding sustainable development. (Source: Wikipedia)

Ecosystem
An ecosystem is a community of living organisms (Animals, plants, microbes) together with the non-living components of their environment (air, soil, water) and their interaction as a system.

Ecosystem Services
The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth. (Source: UNEP. 2003. Ecosystems and Human Well-being: A Framework for Assessment. Chapter 2 Millennium Ecosystem Assessment.)

Precipitation
Any form of atmospheric water that is released from clouds and falls under the influence of gravity. Main forms of precipitation are rain, snow and hail. Fog and mist are not considered precipitation.

Precautionary Principle
When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. (Source: www.precautionaryprinciple.eu)

Rapid Ecological Assessment
A methodology based on the 12 principles of the ecosystem approach, allowing a quick analysis of the three subsystems: resources, resource users and resource managers.

Subsidiarity
The principle of subsidiarity is that social and political issues should be dealt with at the lowest level possible that can organise their resolution. An example is a village chief resolving a land ownership issue between two of his villagers, instead of having the national land planning department start a consultancy project to look into it. The central authority should only play a supporting role to the village chief, instead of a management one.

Stakeholder
The Project Management Institute defines a stakeholder as ‘an individual, group, or organization, who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project’. For example, if you want to place a dam in a river, the stakeholders will involve the

groups currently using the river downstream as well as communities upstream who may gain specific advantages from this dam.

Wetland
A wetland is an area of land that is saturated by water. This can take place permanently or seasonally, creating a specific wetland ecosystem. Characteristic for this ecosystem is the presence of aquatic plants and a high biodiversity. Some main types include swamps, marshes and bogs. Wetlands deliver essential ecosystem services; they can be used to purify wastewater and can reduce flooding by working as a sponge.

LIST OF ABBREVIATIONS

ASCOPE	Areas, Structures, Capabilities, Organisations, People, Events
CBD	Convention on Biological Diversity
CCOE	CIMIC Centre of Excellence
CIMIC	Civil-Military Co-operation
COA	Course of Action
FAO	Food and Agriculture Organization of the United Nations
GTZ	German Agency for Technical Cooperation
PMESII	Political, Military, Economic, Social, Infrastructure, Information
SA/SU	Situational Awareness / Situational Understanding
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change

Component	Quality aspects	Quantitative analysis	Possible observable trends	Information Sources (a/o)
Abiotic components **Landscape** Geomorphology / geology	Identification of larger landscape units: Mountains, valleys, plains, rocks, lakes, rivers, etc. Connectivity; geological substrates (faults)	Mapping of these units	Are there large scale man-made changes (e.g. dams); risk of natural catastrophes (e.g. earthquakes)	Own observations; maps, satellite and aerial photography; Local resource persons (especially for trends)
Climate, weather, air quality Temperatures Precipitation Wind conditions Humidity Air condition	Coldest and hottest seasons/ months Wet and dry seasons; Wettest and driest months; Main periods of strong winds Periods of high and low humidity Chemical/ nuclear elements; soot particles concentration; dust	Average temperatures over the seasons Actual precipitation over the seasons Actual data on wind speed Actual data over the seasons Actual data smog, soot, dust	Frequency of extreme events; Climate change indications; Intensity of human activities that lead to air-pollution; changes in complaints about smell	Meteorological data; Extrapolation of national data for the local situation; Local resource persons (especially for trends)
Hydrology Surface water Ground water	Periods of high water tables/ peak flows and of low water tables/ base flows/ no flow; Presence of fresh-, brackish- or salt water; Nutrients/ pollution (chemical, bacteriological, sediment load) Fresh-, brackish- or salt water; Nutrients/ pollution (chemical, bacteriological, sediment load)	Presence of lakes; Seasonal flows of rivers and streams (Peak- and base flows); water table heights over the seasons; Groundwater table depths; Water yield of wells; Presence of different aquifers.	(Dis-) appearance of permanent water sources; Change in base flows; Frequency of flash floods; Changes in groundwater tables.	Hydrological data (ground- and surface water table heights); Local persons (esp. for trends and off-season information); Interpretation of indicators for humidity (e.g. cracked clay, vegetation, trees)
Soils Soil-types/ Texture Soil chemistry/ Fertility Soil origin/ Geology	Sand, loam, clay, peat and combinations; Position in the landscape (e.g. on slopes, valley-bottoms); Signs of erosion (e.g. gullies, dust storms); Location of good soils for farming; Cropland/fallow land ratio; Salt indicators (e.g. crusts, sometimes in combination with water logging). Parent rock material; (e.g. Volcanic rocks and alluvial soils are relatively fertile) Mineral wealth	Results of soil analysis Presence of oil, diamonds, copper, etc.	Increase/decrease in erosion; Trends in crop yields; Increase in saline soils and/or waterlogged areas; changes in cropland/fallow land ratio indicating loss of soil fertility; Are these resources causing or prolonging conflict?	Test the “greasiness” of a soil sample by wetting it. The greasier it feels, the more clay and loam it contains; Soil maps; Farmers know where the better soils are located; Atlases.

Component	Quality aspects	Quantitative analysis	Possible observable trends	Information Sources (a/o)
Biotic components **Flora and vegetation**	Presence of remnants of flora and vegetation; Presence of special elements like Red Data Book Species, forests; Condition of special biotopes like forests, grasslands, mangroves, sea grass beds, fresh water lakes, etc.	Extent of vegetation units; Location of Red-Data book species.	Decrease/increase of key vegetation types and plant species (e.g. forests, endemic species); Signs of overexploitation (e.g. unpalatable species and bare soil in relation to overgrazing); Presence of invasive species.	Own observations; Local resource users (especially farmers and herdsmen, but also traditional medicine experts); Atlases, maps, satellite photography, etc.; Protected areas information; Flora's, identification keys; Red-Data Book (national and international)
Fauna	Presence of natural fauna, in particular vertebrates (wild mammals, birds, reptiles, amphibians, fishes); Presence of special elements like Red Data Book Species, raptors, large predators; Presence of pest species.	Extent of home ranges of wild animals, in what environment are they found; Animal numbers; Migration patterns/ seasonality of presence of wild animals; Location of reproduction sites (e.g. nesting, fish- spawning areas).	Disappearance / appearance of key-animals like Red Data Book species, Large predators and raptors; carrion eaters; Endemic species; Changes in key-habitats like reproduction sites.	Own observations of key groups like birds of prey, amphibians, large predators, butterflies, (sightings, tracks, noise, etc.); Local resource users (hunters, fishermen, herdsmen); Survey results; Atlases, maps, etc.; Protected Areas information; Field guides; Red Data Book (national and international)
People	Population distribution; Quality indicators of people's life: Diseases, hunger, social disruption, etc.	Demographic data on population: Numbers, sex ratio, age classes.	Indication of deteriorating (or improving) standards of living for the population as a whole and for different groups. Urbanisation, emigration/ immigration.	UNDP's human welfare index and background information; Population Statistics; (Elderly) citizens

Categories of users and values	Socio-Economic characterization of users	Use of ecosystem components by users	Major sources of information
Agriculture/ farmers **Horticulture/ gardeners** Special attention to: • Women • Youth • Minority groups • Absentee stakeholders e.g. downstream water users	Input: • Number and categories of farmers/ farming families (e.g. subsistence farmers) • Average farm size; • Access to credit; • Land ownership; • Modern inputs: Fertilisers, mechanisation, pesticides; • Knowledge, extension and training; • Risk management; • Integration with animal husbandry: use of manure, animal traction, fodder Output: • Processing facilities/ enablers; • Storage; • Marketing: traders and markets	• Major farming areas; • Major irrigation schemes with indication of reservoirs from where water is taken; • Soil- and water conservation measures (e.g. terracing); • Crops grown: Cash crops/ subsistence Growing seasons Yields per ha and per region Occurrence of pests and plagues Noticeable impacts on soil, water, air, flora and fauna	Farmers, farming family members; Extension services; Traders; Agricultural statistics; Country profiles (e.g. of UNDP, World Bank); Development NGOs; Maps, atlases, satellite photography.
Livestock keepers Settled ranchers Nomadic tribes Special attention to • Women • Youth • Minority groups • Absentee stakeholders as nomads are absent from certain areas during part of the year	Input: • Number and categories of livestock keepers (e.g. nomads, ranches) • Herd size; • Access to grazing land; • Categories of animals (cattle, sheep, goats, camels, horses, pigs, poultry, etc.); • Animal health/ veterinary services; • Extension and training; • Risk management, e.g. in case of drought; Output: • Milk and meat (quantities); • Live animals; • Processing of livestock products/ enablers: milk based, meat based, wool and/or leather • Marketing of these products • Role of livestock as a rural banking facility;	• Drinking places for livestock; • Quality of drinking water; • Seasonal grazing areas and camp sites, seasonal use of shrubs and trees for fodder; • Presence of areas where no livestock can be kept because of lack of water, prevalence of diseases or other. Impacts on nature: e.g. aerosols/smell/ nitrogen deposition, overgrazing around water holes, burning forests to promote grass growth	Farmers; Extension services; Traders; Agricultural statistics (may be biased because of tax evasion by cattle owners); Country profiles (e.g. of UNDP, World Bank); Development NGOs; Administration of veterinarians (especially also for animal numbers); Maps, atlases, satellite photography.
Forest users Timber and wood Non timber forest resources (NTFPs)	Input: • Number and categories of forest users • Forest concession agreements; • Hunting licenses and other permits for non-timber forest products (NTFPs) Output: • Capacity of saw mills; • Markets for timber: local, national and int.; • Importance of NTFPs for local livelihoods; • Markets for wildlife products (meat, trophies) and quantities involved; • Importance of firewood and charcoal: local use, trade to urban centres; • Use of revenues of timber; • Processing of medicinal plants, for what use and markets;	Forestry: • Forest areas; Village forests; Major species that are exploited for timber or fire-wood; • Reforestation practices. Hunting: • Number of hunters and poachers; • Species mostly hunted for meat or trophies; • Commercialization of wildlife products; • Presence of game ranches. Medicinal plant collecting, wild food plants, building material (e.g. bamboo): • Plant species; • Trade and trends in commercialization Impacts: • Signs of overutilization (e.g. decreasing spe cies quantities available on the market); • Deforestation rates.	Forest dwellers, hunters etc., Forest concession holders; State Forest services; Agricultural statistics; Country profiles (e.g. of UNDP, World Bank); Conservation and development NGOs; Maps, atlases, satellite photography.

Conservation related uses Protected areas Tourism Recreation Scientific research	Inputs: • Number and capacities of hotels, campsites Output: Categories and numbers of tourists: • Sightseeing, hunting tourism • National / international tourists	• Location and categories of Protected Areas; • Location of major tourist attractions and recreational sites; • Location of (long-term) scientific research/ monitoring plots. Impact on local livelihood: • Access to resources from Protected Areas; • Employment opportunities; • Impacts on cultural values.	Maps, atlases, satellite photography; Tour operators; Forest and wildlife departments; Universities and research stations; Conservation NGOs; Country profiles (e.g. WB, UNDP)
Fisheries Artisanal coastal fisheries Industrial marine fisheries Fresh water fisheries Fish ponds/ shrimps ponds	Input • Number and categories of fishermen; • Access to fishing gear; • Type of fishing gear; • Access to fishing grounds, fish and shrimp ponds; • Access to credit; Output: • Quantities of fish landed/ produced; • Processing of fish (smoking, drying, etc.); • Marketing: Traders and markets	• Place of major fish spawning areas; • Major commercial fish species; • Place of fish cultivation and fish ponds. Impacts: • Signs of overfishing (e.g. decreasing quantities available on the market); • Impacts of fish/shrimp cultivation on water quality.	Maps, atlases, satellite photography; Fishermen; Fisheries departments; Conservation and development NGOs; Country profiles (e.g. WB, UNDP); Fisheries statistics;
Industrial uses Energy (hydropower); Food and beverages industries Extraction industries/ mining Transport sector: terrestrial, navigation and aerial; Others	Input: • Import of production material • Logistics for the production process • Number and categories of users (e.g. employees) Output: • Profitability and feasibility • Export and sales • Markets	• Location (i.e. of major reservoirs for energy production, industrial plants, mines); • Use of raw material derived from natural resources (water, air, soil, wood, ore). Impact of industrial uses and waste management on water, air and soil	Annual reports of the industries; Ministries of industries, energy and mining; Economic statistics; Maps;
Settlements and infrastructure Housing Roads and other infrastructure	Input: • Demographic figures Output: • General characterization (i.e. trading centre, administrative centre)	• Location of major settlements, roads and other infrastructure; • Use of local natural resources (water, air, soil, wood, fiber, animals, etc.). Impact of uses and waste management on water, air and soil	Local resource persons; General statistics; Maps;
Cultural values	Input: • Major religions and number of believers; • Cultural heritage characteristics; Output: • Religious and cultural events/ festivals • What do people identify themselves with (e.g. landscape, heritage sites, art, religious items, etc.)	• Location of major cultural and religious assets (e.g. from sacred landscape elements to religious buildings, museums etc.); • Use of ecosystem components for cultural purposes: e.g. bathing in sacred rivers. Impact of cultural uses on quantity of plants & animals	Local resource persons; Historical descriptions; Maps;

Institutions	Key-persons	Key policy documents, regulations and legislations	Sources of information (a/o)
Institutions representing the modern state			
Authorities with the final responsibilities for decision making on integrated development	N.B. Collect info about the power base of the following persons: • Local: Majors, councillors of municipality • Provincial: Governors, provincial councillors • National level: Head of State, Prime Minister, Parliamentarians	It is useful to know what documents exist and where they can be found. Including: • National, regional, local development strategies • Annual development plans	National Documentation Centres, National databases, Newspapers, Internet, Etc.
Technical departments and government agencies dealing with natural resources and their exploitation: • Agriculture Department • Livestock Department • Water Board • Forestry Department • Fisheries Department • Energy Department • Tourism & Recreation Dept. • Mining Dept. • Etc.	Refer to the results of step 2 to make sure that no persons with management institutions that address the interests of key-resource users are missed. Identify the representatives of each sector at the local/ provincial level.	• Strategic sector plans • Annual (work) plans • Sector laws: Land laws (cadastre and other) Water laws and regulations Forest laws, Fisheries regulations, Mining codes, Etc.	National Documentation Centres, National databases, Newspapers, Internet, Heads of Department, Legal Advisors, Etc.
Traditional authorities and informal powers			
Traditional powers, e.g. representatives of the nobility	N.B. Collect info about the power base of the following persons: Village heads, clan heads, tribal foremen, leaders of nomadic tribes, war lords	Are traditional authorities, their policies and regulations recognized and by whom? Are there written documents to prove claims on land-, water and other rights? N.B. Some of these traditional authorities may have a religious status.	Documentation Centres, Data bases, Newspapers, Internet, Heads of Department, Local resource users,
Traditional functionaries charged with natural resource management	E.g. Chef de Terre (Africa), Murhabs (Afghanistan) N.B. Some of these functions may be religiously defined.		Sociologists reports and studies, Documentation Centres, Resource persons from Government agencies, NGOs, Local resource users

Step 3: Framework for analysis of institutions and policies (continued)

Institutions	Key persons	Key policy documents, regulations and legislations	Sources of information (a/o)
Moral authorities			
Religious leaders	At village and at supra-village level: Imams, Marabouts, Lama's, Reverends, Priests, Shamans, but also Monks, Nuns, hermits, etc. N.B. Collect info about the power base of these persons and the denomination they represent.	Sacred books and their interpretation as documented;	Sociological and cultural studies; Resource persons from NGOs and Government agencies; Historical data; Local people;
Teachers/ gurus	Local heads of school. N.B. Koranic school teachers (Marabouts) have a religious function. Some Gurus may have followers that treat them as Saints.	Written statements by the persons or their followers	Sociological and cultural studies; Resource persons from NGOs and Government agencies; Historical data; Local people;
NGOs	Board members, Directors and Presidents of NGOs; Field staff at village level	Policy documents characterizing the NGO, with long-term vision, mission and mandate of the organisation	Annual reports; NGO-staff; Local inhabitants; Resource persons from government agencies;
Economic powers (see also step 2)			
(Large) enterprises	Directors; Field managers;	Policy documents with a profile of the enterprise, its objectives, vision, etc.	Directors; Local people; Annual reports; Local representatives of the enterprise;
Cooperatives	President and Director of cooperatives	Policy documents with a profile of the cooperative, its objectives, vision, etc.	Local representatives of the cooperation; Local members of the cooperative;
International community			
(International) donors	National Director/coordinator and local representatives; Project Leaders; Programme Officers; Supervisors e.g. at Embassies;	Country profiles (in case of World Bank, UNDP for instance); Country programmes specifying orientations like sectors and areas of intervention, criteria for projects, etc.; Project Documents;	Annual reports/ progress reports; Project staff; Local partners (NGO, Government agencies, local population)
Intergovernmental institutions and international agencies	Directors/ coordinators/ representatives of institutions; project leaders; programme officers	Legal documents and country profiles/programmes of these organizations that deal with sectors relevant to the area of study.	Annual reports/ progress reports; Project staff; Resource persons from government agencies; Local partners (NGO, Government agencies, local population)

Activity	Characterisation of impact
Reconstruction of an irrigation inlet work. If necessary, activities should be cut-down in a chain of individual actions	**During construction** **After construction** On-site direct impacts Off-site direct impacts Indirect/induced impacts

The following table provides guidance for a qualitative estimation of the potential impact of planned interventions.

Positive and negative impacts on			Possible measures
Resource component (Refer to step 1)	Resource users (Refer to step 2)	Involved institutions (Refer to step 3)	

The following table facilitates understanding of how to use table 4. It is filled in with a fictive case of small-scale irrigation improvement. The information given does not pretend to be complete, it is only provided as an example.

Activity	Characterisation of impact	Positive and negative impacts on			Possible measures
Reconstruction of an irrigation inlet work	**During construction**	Transport: Air: Dust, exhaust fumes Soils: Use of roads	Public health: respiratory problems because of dust; Risk of accidents.	Contractor; Min. of Public Works; Min. Public Health; Min. Irrigation; Traditional Water managers;	Rerouting of transport; Wetting the road surface; Road safety measures;
		Quarry for sand and gravel	Landscape affected; Stagnant water (proliferation of water-born diseases); Risk of collapse;	Contractor; Min. of Public Works; Min. Public Health;	Landscaping of quarry after use;
	After construction On-site direct impacts	Water diverted into irrigation channel; Improved agricultural production; Pollution by agro-chemicals; Transport for trading of surplus production;	Improved livelihoods for farming families; Increased risks of water-born diseases; Drainage and water logging problems; Risks of salinization;	Min. of Public Works; Min. Public Health; Min. Irrigation; Min. Agriculture; Traditional Water managers; Farmers and farmers organisations;	Improve drainage;
	Off-site direct impacts	Reduction of water down stream;	Down stream water users	Ministry of Irrigation;	Water management master plan needed; Consultation of down-stream users.
	Indirect/induced impacts		Quarry may be used as waste dumping site	Municipality;	Waste management

ANNEX 2: THE 12 PRINCIPLES OF THE ECOSYSTEM APPROACH

In order to give you some ideas about what kind of situations you may be confronted with, the following text may be of help. It is based on the 12 principles of ecosystem management as endorsed by the Convention on Biological Diversity.

Principle 1
The objectives of management of land, water and living resources are a matter of societal choice.

Even in non-democratic societies, the authorities in power somehow will have to consider the opinion of their population especially where the basis of their livelihoods will be concerned. It is therefore important to make sure that all relevant strata of the society have been consulted before implementing an activity that affects the resource base. That may not always be easy, and sometimes even impossible, as in the case of trying to consult women in the Pashtun lands of Afghanistan about what would be their preferred intervention. A notorious example is from Afghanistan where deep-wells have been constructed at the request of some powerful landowner without consulting nearby communities that irrigated their lands from Karezes systems. These underground irrigation channels tap the groundwater in the foothills of the mountains, to lead it to their land. By the deep well, so much water is extracted that groundwater levels fall and the karezes run dry. A whole community suffered that way because of the greed of one man. Sadly enough in that situation, there was no local authority strong enough to correct the situation.

Principle 2
Management should be decentralized to the lowest appropriate level.

In this case it is useful to make a distinction between the strategic decision making and the operational one. Strategic decisions are usually taken at the higher, often provincial or national level. It deals for instance with the distribution of water or other inputs to the different parts of the country. Within that policy framework, operational users take their day-to-day decisions about where to graze the animals, to water the lands, to collect firewood, etc.. Military interventions can address both levels. The strategic one is especially of relevance where unequal access to resources may cause friction and conflicts. It may be time-consuming to address this, as it often demands a lot of study, consultations and negotiations. In the mean time actions may have to be taken at the grass-root level in order to give people a decent living again.

Principle 3
Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

These are the off-site effects that are mentioned in step 4. They may be local, as in the above example of the deep well, affecting kareze systems in Afghanistan, but they may also extend over larger areas, affecting relations between different countries. It has been predicted that the 21st century would witness “water-wars” in particular in the Middle East where the Jordan, Euphrates and Tigris Rivers cross a volatile area where water is a sparse commodity. But that does not exclude other regions, like between India and Bangladesh, or in the Okavango River Basin in Southern Africa where Namibia threatens to tap a large proportion of the River to water the town of Windhoek, thereby depriving the Okavango Delta in Botswana of much of its life-giving annual inundations. So far, governments have behaved responsibly, solving water disputes at the conference table instead of with armed forces.

Principle 4
Recognizing potential gains from management there is usually a need to understand and manage the ecosystem in an economic context.

Any such ecosystem management programme should:
a. Reduce those market distortions that adversely affect biological diversity;
b. Align incentives to promote biodiversity conservation and sustainable use;
c. Internalise costs and benefits in the given ecosystem to the extent feasible.

Ecosystems provide products and services such as clean air and water, but also wood and bushmeat. These are getting scarcer and therefore are becoming more economically important although it is often not easy to put a money tag on them. In all cases, it is important that people that invest in the proper conservation and management of their resources also get the benefits of their efforts. This means that we must ensure that their interests are explicitly considered and that preferably they participate in decision taking. Too often we have seen that common property goods used by the poor, get an economic value and consequently are taken over by the powerful, leaving the poor even more destitute of anything of value. Wetlands for instance have been considered long time as waste lands, until it was realised that they are very productive in terms of fish, fodder and –after reclamation - of food. Hunters and fishermen, but also nomadic herdsmen have been marginalised as a result of the reclamation of these common lands. Such a disrespect of their traditional rights usually leads to a free for all mentality, where everything is taken that can be got, and where depletion and extinction becomes the rule. Modern challenges may not always be tackled with traditional medicines, but even within a changing world, respect of traditional management may lead to more sustainable use, improved livelihoods and less conflict.

Principle 5
Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

This is the nucleus of the conservation of the resource base, on which not only individual persons, but also entire communities depend. Healthy ecosystems continue to provide products and services that we need, and in order to keep them healthy, it is important to keep them complete. Indicators of ecosystem health are the provision of the ecosystem services themselves (clean water, buffering flash floods, etc.), but also if the elements of the end of the food chain can still be observed, such as birds of prey and vultures. The disappearance of these birds as a result of inappropriate use of pesticides was an important indicator that ecosystems in Western Europe were not in good shape and people’s health was at risk a/o through the high level of pesticides in food and drinking water.

Principle 6
Ecosystems must be managed within the limits of their functioning.

It is not an overstatement to say that when ecosystems collapse, the society that depends on its products and services will eventually collapse as well. Inappropriate land-use will cause loss of soil fertility and erosion, leading to a rural exodus and erosion of traditional power structures in these areas while at the same time the swelling mass of urban poor contributes to instability and insecurity in the townships and slums where they settle. Inputs may increase the outputs from man-made ecosystems, but that can only be done on a sustainable basis when the additional production permits a sustainable input delivery.

In reconstruction work, one is not likely to be confronted with conversion of an ecosystem like in the case of reclamation of wetlands for irrigation. It is likely to be more a matter of ecosystem restoration (like tree planting) in order to regain important ecosystem services. Nevertheless, it may sometimes make sense to verify if the area in which the military operate has not been subject to a recent conversion in ecosystems that may not have been properly maintained. In Northern Cameroon for instance, restoration of part of the Logone floodplain after large-scale reclamation for rice growing, has brought back valuable grazing lands, opportunities for fishing and even traditional rice growing, where the modern rice-growing scheme continues to suffer from mismanagement demanding continuous financial inputs to keep it going. In Mauritania, the restoration of the Senegal Delta after the closure of the Manantali and Diama Dams, brought back Acacia forests and Sporobolus swamps important for local cottage industries, mangroves important for shrimp fisheries, dry season grazing opportunities and an ideal habitat for many migratory birds from Europe. This win-win development helped to lower tensions in this conflict sensitive region.

Principle 7
The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

What is the right scale for the management of land, water and living resources? For pragmatic reasons it is simply the scale on which the actual management has the mandate and the power to operate. If you deal with farmers, than you have to decide about the feasible things to do at their level. If obstacles are then identified that involve higher levels of management, a provincial authority or a water board, these obstacles will have to be addressed at the provincial or river basin scale. (This principle is therefore very much related to principle 2).

Winning the hearts and minds demands short term, convincing results, which may not always be easy to achieve. Reconstruction of a resource based local economy often takes much time. Take the example of poppy in Afghanistan: In order to push back the role of poppy in the local economy, one has to find an alternative that gives equally good financial returns with less problems and risks. Although such alternatives exist, these are not introduced overnight. During the years to develop the alternatives, one has to provide other income generating activities, for instance Food for Work programmes to restore farming systems (irrigation, forests) or even off-farm activities like infrastructural development.

Principle 8
Recognising the varying temporal scales and lag effects that characterise ecosystem processes, objectives for ecosystem management should be set for the long term.

Remember: a destroyed bridge may be rebuilt even after 50 or 100 years, but a wetland, a rain forest or the population of the last Mountain Gorillas in the Great Lake Area of Africa once lost, is lost forever.

Reconstruction activities should always keep in mind the long-term sustainability. In extreme cases such as when high numbers of refugees have to be lodged and fed, it may be defendable to temporarily overexploit local resources in order to relieve the suffering and to buy time to find more sustainable solutions. An example how short term interests adversely affected long term use of living resources comes from the response to the Tsunami: In Sri Lanka, in order to get the economy quickly restarted, contractors pushed the rubble of the collapsed houses into the sea. This destroyed a fish reproduction site on which much of the local fisheries depended.

Principle 9
Management must recognise that change is inevitable.

Societies change, and ecosystems do that too. Do not try to bring back the old ecosystem. Restoration will help you to return to a properly functioning system delivering wood, clean water, fertile land, products and services we need. Don't be trapped by the notion that "in the past everything was better". It probably was not, especially not where environmental stress might have been one of the causes of conflict.

Principle 10
The ecosystem approach should seek the appropriate balance between, and integration of conservation and use of biological diversity.

There is no reason to deny that the relation between conservation and development may give rise to conflicts every now and then. The installation of Refugee camps on the edge or even inside some protected areas in Central Africa, are well-known examples. However, as ecosystems provide the base of living for all organisms including human beings, synergy between the interests of conservation and development often is possible requiring some creative thinking and abandonment of dogmatic attitudes branding the other side as "fundamentally wrong". Sustainable use is the answer in many (not all) situations: "What pays, stays" provided proper management structures are in place to avoid overexploitation and extinction and to ensure equitable access for the poor.

Principle 11
The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

This principle is very much covered by the first 3 steps of the Rapid Ecological Appraisal described in this document. Insecurity and distrust may make it difficult to gather traditional and local knowledge in the field, but with good interpreters and "hearts and minds activities" attitudes may change quickly. Practitioners are found among government agencies, NGOs and sometimes private enterprise. Scientific information may be old or new, but it helps us to understand the ecosystems and farming systems in which we operate, and to design appropriate measures to improve livelihoods, to reduce impact of military operations and to win the hearts and minds.

Opportunities may exist in which military operations offer options to improve the local situation at the same time, for instance when roads have to be protected against flooding, or when bridges have to be put across a river: Environmental concerns may indicate better places for future development options.

Principle 12
The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

This publication in itself is proof of this principle whereby the military sector is fully involved with ecosystem management. But it is an appropriate moment at the end of this publication to remind the military involved with reconstruction work during peace support operations, that they should leave as much as possible to the appropriate institutions, organisations and agencies to do the reconstruction and development works in the area where the armed forces operate. When the security situation is such that the military will have to do these activities by themselves because the others are simply not available, then they still have to do this in such a way that the civil partners can take it over from them as soon as the situation permits it. Therefore, all military interventions in the civil realm of reconstruction should always be developed in consultation and association with the partners from the civil society: Government, NGOs, Private sector and local users groups.

ANNEX 3: FURTHER READING

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PICTURE SOURCES

Pag 9. Soldiers discussing with farmers about their irrigation practice (Afghanistan). Photo credits: Piet Wit
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Pag 14. Legal Forest exploitation in Liberia. Photo credits: Hubert Blom
Pag 15. Sahel grazing in the Senegal valley, Mauretania. Photo credits: Piet Wit
Pag 16. Somali refugee camp in Eritrea. Photo credits: Pixabay
Pag 18. Patrol through the fields in Afghanistan. Photo credits: Pixabay
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