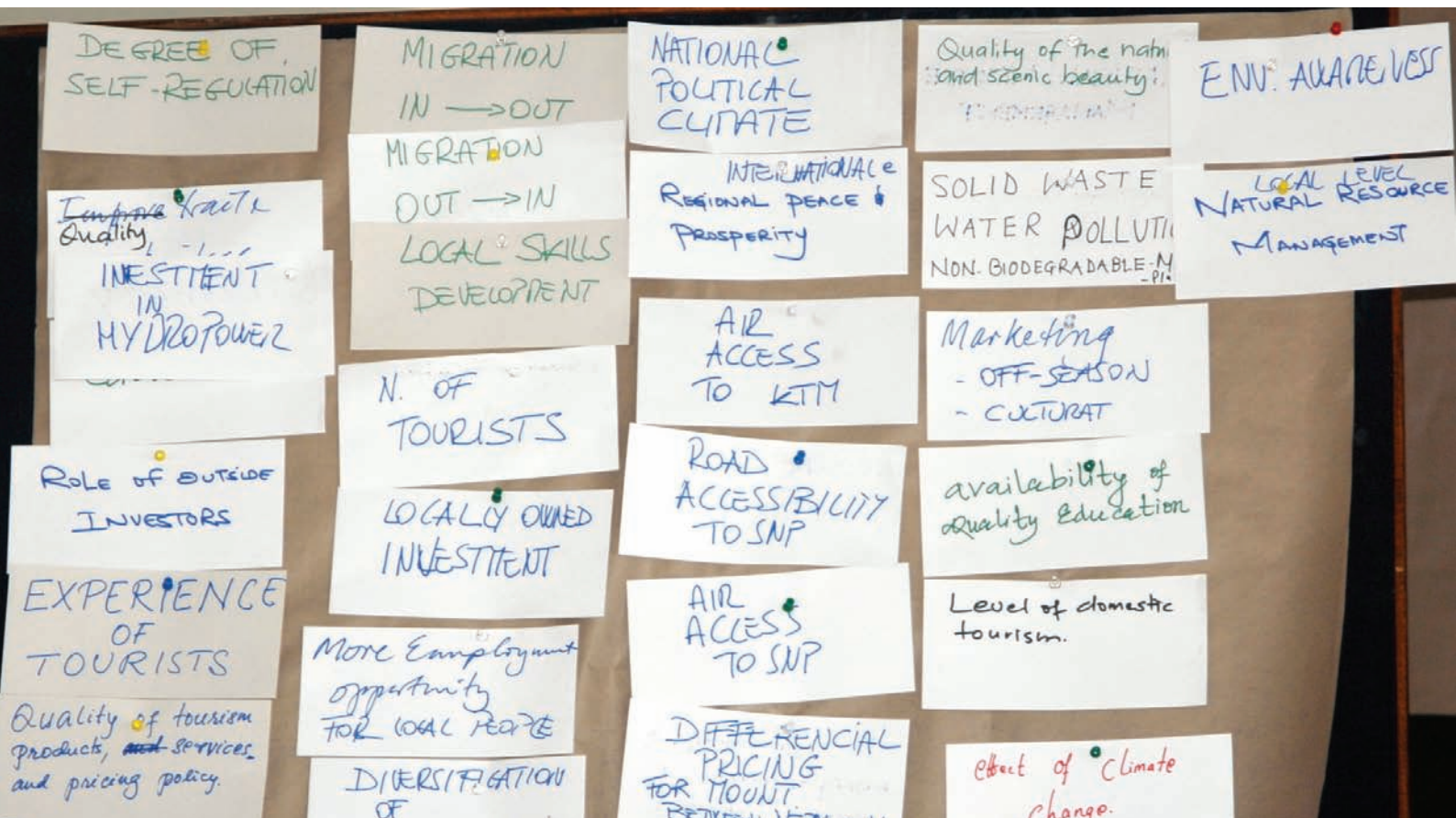


# Analysis of future scenarios for Sagarmatha National Park

## Scenario Planning as a participatory decision support tool



HKKH Working Papers

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### **About the HKKH working papers**

In the framework of the HKKH Partnership Project several technical papers have been developed by the four Partners and the Technical Team. Before being finalized and published, these documents require further collaborative work and review by a wide range of resource persons and stakeholders. The **HKKH working papers** is a selection of draft documents printed and distributed in a limited number to share the wealth of knowledge developed so far and stimulate feedback and debate.

For additional information and any queries, please contact the PMU at [info@hkkhpartnership.org](mailto:info@hkkhpartnership.org).

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# 1 Introduction

We propose to develop and pilot-test scenario planning (SP) within the HKKH workplan. This application will serve three general purposes:

1. test, with stakeholder participation, scenario planning as a soft system methodology: this is seen as part of the set of tools and applications to be developed by the HKKH project to support ecosystem management in the target areas;
2. support the overall design and development cycle of the HKKH DSS architecture;
3. address site specific problems and requirements, related to the management of natural resources of SNP, as identified during the initial project appraisals and better specified below.

This paper presents the rationale of this proposal as referred to the design of the HKKH project and the outcome of initial site specific appraisals; a definition of the scope of application of SP to management problems and stakeholders concerns within the SNP; an introduction to the proposed methodology; a brief summary of theoretical background on the methodology.

**This document is presented in the form of a discussion paper, aimed chiefly at eliciting response and feedback from HKKH project partners, counterparts and SNP stakeholders, to better define and agree on the scope of work and approach.**

## 2 Background

### 2.1 *HKKH project background and references.*

The HKKH project (ref: HKKH General Operational Plan) wants to develop decision support tools and experiences at a landscape level to support ecosystem management in the three project target areas, i.e.. the three protected areas of Sagarmatha National Park (SNP), Central Karakorum National Park (CKNP) and Quomolongma Nature Preserve (QNP) in the HKKH range.

The HKKH wishes to combine hard system methodologies with soft system methodologies and participatory approaches to natural resource management. In particular, the ongoing development of the project approach foresees that simulation modelling of landscape dynamics would assist stakeholder consultative processes in exploring alternative scenarios for the management of target landscapes.

The present document has been produced taking into consideration the following interim milestones reached in semester 1: the initial development of the system dynamics modelling component; reviews of the state of management and planning in SNP and CKNP, including initial site visits and consultations with park management authorities and stakeholders; an initial review of experiences and requirements for participatory methodologies in NRM and ecosystem management in SNP (CESVI, report in preparation).

This report cum proposal represents a preliminary project output, specifically related to the identification of participatory module components of the DSS toolbox (workplan element: A.1.4.10) and a proposal to develop a process of capacity building in participatory and community based tools for systemic PA/NR in subsequent phases of the project (workplan element: A.1.5.4).

### 2.2 *Sagarmatha National Park: which changes and which future ?*

Our initial review of literature on the SNP/Khumbu landscape (Daconto, 2004) highlighted the following key issues:

- a) There is very high ecological diversity, due to biophysical factors typical of high mountain ecosystems: altitude, slope, geomorphology/orography and rain-shadow effects. These factors combine to create a high degree of diversity in terms of micro-environmental conditions. The natural

resource base is often highly fragile and vulnerable to irreversible degradation.

- b) People have settled in the area for several centuries. Population size seems to be relatively stable over the last thirty years. Key livelihood strategies are middle altitude agro-pastoralism and high altitude agro-pastoralism, which often overlap in space. They represent highly sophisticated risk mitigation strategies and adaptations to landscape diversity and niche conditions. They are based on seasonal transhumance, movement of livestock at multiple elevations, agricultural cropping at multiple elevations and trade, which supplements local crop production with grains produced at lower altitude.
- c) Household decisions drive the broader livelihood strategies and produce a great variety of micro-adaptations, as function of: herd composition; livestock movements; seasonal cropping cycle; woodland management; grassland use; use of agricultural inputs (seed, fertilizer, labour); social arrangements affecting crop production (land tenure, communal institutions, economic differentiation, political power); cultural factors (crop and livestock preferences, religious prohibitions); level of commercialisation vs. subsistence goals.
- d) Household economies rely on a close integration of a wide range of resource management and production systems. This system integration is achieved through: material and energy flows through partially interdependent production sub-systems; production systems insisting on relatively small areas of land, especially for more intensive systems; sub-allocation of household labour inputs; and communal institutional mechanisms, which reinforce land use strategies and mitigate user conflicts.
- e) Social and ecological change in Khumbu has been the subject of a large body of research over decades. However, major uncertainty persists in our understanding of the extent and direction of change and causal factors. Recent in depth studies (Stevens, 1993) emphasize a gradual process of sophisticated anthropogenic change and adaptation, marked by key transitions, such as the introduction of potato in the 1850s and, since 1970s', the advent of mass tourism. External drivers of change also include the national policy context; government-led and/or development interventions in the management of the area and its resources; changes in the external economic environment, including political events which have altered patterns of regional trade and international tourism.
- f) The impact of population growth or tourism has raised major concerns in the past, shaped along the theory of the Himalayan environmental degradation (Ives, 2005). Early assessments of the ecological impact of tourism, which have influenced management interventions, have been often based on over-generalization or paucity of evidence and lack of adequate historical analysis and understanding of the local dynamics. Since the early 1990s, researchers have questioned this paradigm and delivered more nuanced assessments. Evidence suggests that certain ecological changes may be much older than previously thought and were produced by natural and human factors. On the other hand, ecological change and degradation more clearly linked to mountaineering and trekking seems more confined to the fragile alpine zone, than due to broader deforestation processes (Bayers, 2005). Additional tourism related ecological problems include surface water pollution; generation of solid waste; and forest degradation in lower areas outside the park boundaries (Stevens, 2003).
- g) Tourism has undoubtedly had a major and often positive impact on local livelihood. At the same time, it has changed the landscape and the society, through a complex web of effects mediated by the highly integrated local economy. A multitude of change agents (lodge owners, tourists of various typologies, herders, porters, etc.) are responsible for an ever changing array of actions which have multiple and cumulative effects on the landscape. Landscape effects are in turn complicated by the large diversity of micro-environments; a plethora of indirect impacts mediated by the resident population and its highly integrated and adaptive productions systems; and the combined effects of other external drivers of change. A review of tourism impacts (Rogers et al., 1999) concluded that "any objective appraisal of the impact of tourism in as remote, underdeveloped and fragile a region as the Solu-Khumbu must seek to balance very conflicting sets of evidence. Neither the issues addressed, nor the solutions that might be proposed are self-evident".
- h) Despite decades of economic change mainly driven by tourism growth, Solu-Khumbu's social fabric still appears significantly cohesive and with great capacity of self-organisation and initiative. On the other hand, the level of involvement with and impact by the tourism industry varies greatly across the park. While the valleys along the main routes have absorbed most of the growth, other valleys have

only received scant attention by tourists so far. Tourism has thus generated increased average wealth as much as marked wealth differentiation across the small population. It is difficult to predict the outcome of these complex dynamics of socio-economic change.

- i) If we want to grapple with system change at landscape level, we need to consider that future trends are likely to be affected by internal factors (e.g.: gradual change of and feedback to agriculture production systems and livestock strategies; further development of the local cash economy and the highly integrated local tourism industry; generational changes in lifestyle; development of power generation capacity and other local infrastructure; evolution and effectiveness of formal regulatory and traditional management over natural resources; etc.) as well as external drivers (change in the tourism industry and markets; political changes; policy frameworks; global changes affecting tourism markets and regional trade patterns; climate change; etc.).
- j) The analysis of plausible future trends of the above mentioned external drivers and their implications for landscape change appear of growing importance. Local tourism growth and process of global change are leading to a growing integration of areas such as SNP into the global economy. Typical effects in high mountain environments include resource use intensification, loss of resource management options and weakening of traditional institutional and social controls and feedback loops. This can cause increased vulnerability for these fragile landscapes insofar as mountain people loose options to adapt their livelihood strategies and spread their risks (Jodha, 2005). Therefore, reducing vulnerability, or increasing resilience of high mountain livelihoods needs not only better understanding of the internal factors which generate resilience; but also pro-active identification and seizing of novel opportunities, which may also be offered by globalisation, to increase the resilience of the system.

### **3 Scope of analysis of future scenarios for SNP.**

The key focus of the HHK project is to support park/area level management to come to grips with system changes at ecosystem level. Section #5 provides a brief overview of the rationale of the approach proposed herewith from a theoretical angle. Here we try to identify possible entry points and objectives from a more practical point of view.

In recent times, the Park management approach has shifted considerably. The preparation of the new Park Management Plan (MP) (DNPWC, 2006) combined with the Buffer Zone Management Plan (DNPWC, 2005) represent bold steps away from command and control forms of management, towards forms of collaborative management and devolution. They emphasize support to local economic development, through the development of the tourism industry, as well as local production systems based on natural resources (livestock, agriculture, forestry, handicrafts, etc.); local stewardship over natural resources (chiefly forests) as the key management strategy; development of local grassroot capacities and a governance system based on multi-stakeholder platforms; catalyzing local commitment to conservation on the basis of self-interest and self-regulation by the local tourism industry.

The emphasis on self regulation is crucial. The MP clearly stresses that approach to tourism management based on techno-centric methodologies (e.g., carrying capacity assessment, licensing quota, etc.) will not be acceptable. The document provides a highly articulate rationale for suitable management interventions, which need to be grounded in the appreciation that tourism is a highly sensitive subject for local people; it generates threats as well as opportunities for conservation; tourism management falls unavoidably within the mandate and concerns of a very wide range of stakeholders, from several government institutions to a large number of business entities, etc; any tourism management activity needs to be rooted in the local cultural and social realities; local stakeholders need to see immediate and real benefits from any such intervention, to ensure effective participation (DNPWC, 2006).

#### **3.1 Entry points to engage local stakeholders**

Our site visits and preliminary discussions with representatives from the Buffer Zone Committees (HKKH mission report, October 2006) did confirm the above statements:

- a) Local communities are intensely participating in park and BZ management through BZ Committees at various levels and CF User Groups. Virtually all households are linked to and represented in this governance structure through this network of grassroot institutions. The local consensus is to

strengthen this governance system, which could play a more decisive role in the management of revenues generated from the park and in channeling donor support, e.g., through the establishment of a Trust Fund.

- b) The strength of the local governance system has allowed them to weather down to some extent even a major and prolonged national strife over the last 10 years, minimizing problems in Khumbu, which has always remained accessible to tourists.
- c) Resource management is rooted in history, social and cultural factors of local people. BZ and CF management builds on traditional NRM systems (*rani ban, nawa*). Peer pressure is still very effective.
- d) Local stakeholders are not much interested in external projects. However these may play a role if designed to fit in the local context and avoid duplication of efforts. Too many projects have claimed success on paper but have delivered little impact on the ground. Projects must ensure adherence to local culture to have an impact and ensure sustainability and adaptability.
- e) The following concerns were highlighted as possible priority entry points for external support to park management:
  - i) Tourism management:
    - ⇒ Environmental impact of tourism, also in relation to rapidly growing number of lodges in certain locations, problems of infrastructure (sewers);
    - ⇒ Support to self-regulatory initiatives, such as the plan to establish blacklist of lodges to stimulate compliance with environmental guidelines.
    - ⇒ Assess return on investment in the tourism sector: what is the future outlook for the viability of these investments ? Ca. 15% of lodges are built by outsiders: these may be under looser community influence (locals can build and lease on private land).
    - ⇒ Tourism is rapidly replacing other traditional livelihood sources.
    - ⇒ Destination management (routes, flow, etc.) needs to be addressed.
  - ii) Strengthening of local conservation stewardship:
    - ⇒ Awareness raising among local people on resource management and conservation, especially forests. The growing wealth difference may hinder participation of sections of HHs in the governance structures.
    - ⇒ Strengthening of local CBOs: BZ Committees, CFUGs, and lodge owner association. These have received extensive training from TRPAP and WWF. However now external support is decreasing.
    - ⇒ The development of local education sector is essential to build human resources and ensure the long term capacity to manage natural resources; there is a need to help to assess the sustainability of the education system, in particular grant support for poor children.
  - iii) Local governance vs. state control:
    - ⇒ Clarification of and advocacy on legal issues, particularly to address interference and top down decisions by central Government, which has led to certain developments not welcome by local people, which have not been consulted (e.g., the new hotel built above Khumjung).
  - iv) Research:
    - ⇒ Extensive research has been carried out in SNP for decades. However local people do not know of results nor benefit from them. Too many researchers chase the same issues. People are tired of answering the same questions. There should be a local repository of research and data on local resources. Research priorities should be set according to local management priorities and involving local people.

Recent and ongoing park management support programmes, such as WWF work in the BZs and TRPAP, have provided local stakeholders and CBOs with extensive capacity development support in established practices of CBNRM, including participatory assessment techniques, institutional development of CBOs, management planning, etc.: these are reviewed more in detail elsewhere (CESVI, capacity building review in preparation). We propose here to engage local stakeholders, and particularly

the leadership of CBOs involved in the park and BZ governance, in an exercise of future analysis which would address the above listed needs and issues.

### **3.2 Entry points to support the SNP Management Plan**

The HKKH mission to SNP in October 2006 reviewed with DNPWC management the status of implementation of the Management Plan and the possible scope of support from the HKKH project. The proposal herewith focuses on three elements of the Management Plan, with a view to extending support to the implementation process led by DNPWC and local stakeholders:

- 1) Tourism management. We have briefly recalled above the management principles and approach advocated by the MP on the basis of the outcome of extensive appraisals and public consultations during the plan preparation process. The HKKH needs to adhere to those principles. The HKKH project does not have the mandate nor the resources to deal with intensive management processes at local level foreseen by the MP, e.g.: zoning, infrastructure development, etc. On the other hand, the HKKH project can assist in:
  - a) strengthening the capacity of local stakeholders to analyse the future outlook of the park;
  - b) strengthening their capacity to evolve and adapt suitable management measures;
  - c) identifying feedback loops within the local NRM system which would assist local stakeholders in guiding park management towards the goals agreed (e.g., priority setting for route development, infrastructure investment, visitor opinion assessment, self-regulatory guidelines, etc, all activities foreseen in the MP, which will require some level of strategic analysis)
- 2) Agro-pastoralism: the MP acknowledges that the traditional agro-pastoral strategies are still fundamental economic activities for a vast section of the population. On the other hand, the cash economy, tourism and the erosion of traditional management institutions are gradually changing the system through a complex process fraught with fundamental uncertainty on causal mechanisms. The MP does not contain prescriptive measures for this sector. It calls for the identification of options for and support to rural economic diversification; the establishment of a better and systematic knowledge base of the sector, through database development on human and livestock populations, research on wildlife-livestock conflict and implementation of practical mitigation measures; mitigate pressure on forest through demand-side management, alternative energy sources and awareness campaigns. We therefore propose an exercise which can:
  - a) engage stakeholders in the analysis of the future outlook of the agro-pastoral economy;
  - b) assist in identifying priorities for the above listed activities foreseen in the MP.
- 3) Research. The MP acknowledges the need to coordinate the work of a plethora of research organisations and scientists, which have been pursuing their own agendas in SNP for decades. The MP states that the SNP will develop its own set of policies and guidelines to promote scientific research, coordinate research activities and apply research results to management and planning. In addition, it states that, in consultation with DNPWC and other experts, SNP/BZ will develop an interim list of priority research topics. The Plan also acknowledges the need for long term research efforts on social and ecological change and the need to support park management through adequate monitoring of the impacts of management actions, which is a pillar of adaptive management. We propose that an exercise of scenario planning can assist SNP management and stakeholders to address these requirements of the MP through an analysis of the future of Solu-Khumbu. This would help in:
  - a) setting research priorities which are close to the management concerns of local stakeholders;
  - b) providing a platform to guide effective learning and long term monitoring, availing of the large resources and body of knowledge of the institutions and experts conducting research in SNP.

## 4 Proposed approach: scenario planning

We propose to address the above listed stakeholder concerns and requirements of the SNP Management Plan through an application of scenario planning. This is seen as a decision support tool based on a soft system approach, and able to integrate hard system assessments as well. The application to SP planning is experimental and consistent with the HKKH design and goals. We also assume that the process will be as important than the outcome, as better elaborated below.

### 4.1 Background: brief theory and evolution of scenario planning

Scenario planning was developed in military and business circles in the 1950s as a technique to deal with uncertainty in forward analysis of complex contexts. This technique is meant to identify and stimulate analysis around alternative (hypothetical) futures as a way of short-circuiting biased and entrenched views of the world and prepare for developments which could not be anticipated by simply extrapolating from past trends.

In this context, scenarios are not forecasts nor estimates. They are rather alternative, plausible future trajectories of change in a system. In the words of the Millenium Ecosystem Assessment, (2005) a “*scenario is a plausible, simplified, synthetic description of how the future of a system might develop, based on a coherent and internally consistent set of assumptions about key driving forces and relationships among key variables*”. Scenarios are described through narrative presentations, and may include qualitative or quantitative definitions.

Scenario planning techniques were developed by two main schools of thought (Bradfield et al, 2005):

- the *intuitive-logic school*: this model was first established by Shell. The general approach entails the development of narrative descriptions of alternative futures, based on intuitive logic and involving a range of stakeholders. A large number of experiences and models have since been developed, which cannot be coalesced in a unified methodology. The wide range of methodologies developed by various authors and groups, reflect the range of problem applications and practitioners which have evolved applied experiences.
- the *probabilistic modified trends school*: this refers to a range of experiences and models based eminently on quantitative and expert driven analysis: historical data (time-series) are extrapolated to generate possible future trends (probabilistic forecasts) and combined with expert judgements and narrative descriptions to build quantitatively determined alternatives, often involving computer modelling and proprietary methodologies and tools, to address possible future unpredictable factors. These applications typically aim at improving policy effectiveness in handling reasonably well defined problems (it has a narrower focus than the former model).

As Bradfield at al (2005) point out, the intuitive logic school is a flexible approach designed to guide a process of continuous learning and adaptation within organisations, which becomes the overall goal for the adoption of scenario planning techniques. Established practices mostly rely on internal expertise within the organisation/context; external expertise is brought in to facilitate the process, rather than to offer substantive expert advice. So called “remarkable people” with extensive sector specific experience can be brought in the exercise to open new perspectives.

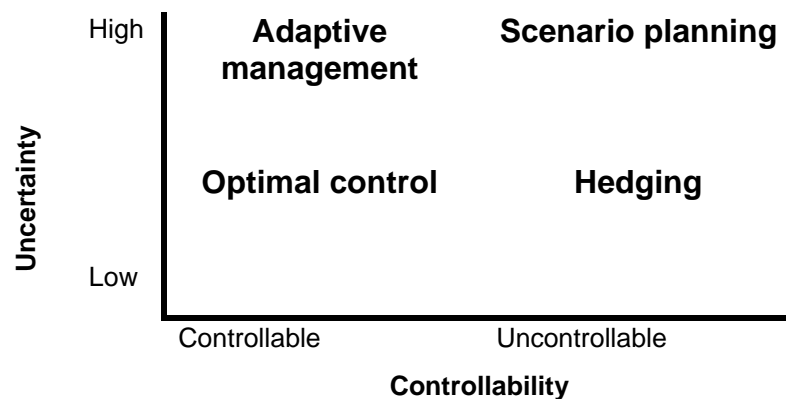
The approach is versatile and suitable to address a wide range of problem scales. It relies on a number of general techniques such as stakeholder analysis, brainstorming, simulation modelling, etc. These are used to structure coherently narrative and qualitative descriptions of future alternatives, e.g., through matrices which help to organise the information that constitute scenarios along key perspectives/parameters. Scenarios produced (typically 2-4) should be equally plausible and probable, internally coherent and logically structured. The narrative produced are evaluated for internal consistency and eventually used to assess alternative strategic options, to identify unforeseen events and implications and to recognise early warning signals of system change.

Scenarios in this approach are different from exercises of “*what-if planning*”, which produce forecasts of outcomes based on a range of assumptions. In scenario planning, individual scenarios do not have attached probabilities or estimates. However, it is assumed that elements of a given scenario may happen. Therefore, the purpose of the approach is not to devise “optimal scenarios”, but rather to assess system change over trends of key drivers, accommodating also unexpected but plausible surprises.

Managers can thus explore long term perspectives, escaping from pressing near term concerns; identify drivers of systemic change in their environment; identify future trends, opportunities and threats; question their assumptions about the environment which surrounds their organisation's operations and bring in the open ambiguities and uncertainty; test policies and options in face of surprises and unforeseeable events. SP can support through these experiences a process of organisational learning and continued review.

SP studies have been used for decades to study global change in business and security applications (see Appendix 2 for further resources and references). SP has been proposed particularly in contexts characterised by high uncertainties and driven by uncontrollable external drivers (Peterson et al., 2003), which are common in conservation practice (figure 1). In the environmental arena, SP has been applied to the study of global environmental change, such as in climate change related studies and, more recently, in the Millennium Ecosystem Assessment (Carpenter et al., 2005). The latter study involved analysis at global scale, as well as at sub-global (regional) scale.

**Figure 1. Appropriate application of scenario planning (Peterson et al., 2003).**



#### **4.2 Applications to socio-ecological systems at regional scale**

There is still limited experience in the application of SP to environmental analysis at regional and local scales. We summarise here two experiences as a way of providing practical examples about the application of SP to regional contexts:

1. Peterson et al. (2003) studied scenarios for the Northern Highlands Lake District, Wisconsin (see also Resilience Alliance, 2006). The geographical scope was a district of ca. 5,000 km<sup>2</sup>, with a population of ca. 90,000; the landscape is dominated by open water (lakes) which provides important ecological services, also to the local economy (tourism, fisheries). The area has been extensively researched by scientists over a long period. Main external drivers of change are climate change and human migration, affected by social and economic dynamics of the wider regional context. Ecological changes driven by anthropogenic factors have shaped the landscape for decades and determine its ecological vulnerability and capacity to provide continued services in the future. Migration and ecological vulnerability were identified as weakly controllable drivers of change, as well as fraught with fundamental uncertainty. A study team developed three alternative scenarios, which were plotted against axis representing the two key external variables. Scenario analysis was used to identify risks, areas of vulnerability, potential surprises and opportunities arising from the interactions of components of the complex socio-ecological regional system.
2. Bohensky et al. (2006) applied SP to the Gariep river basin: this is a very large catchments (665,000 km<sup>2</sup>) encompassing an extensive area of South Africa (including 40% of the population) and the whole of Lesotho, major agricultural and mining regions, large hydraulic projects, industrial, urban and rural areas. The study was delivered by a team of planners and researchers. The team reviewed the ecological services and history of the area and analysed scenarios over a 30year time span. The scenarios were drawn from the four global scenarios of the Millennium Ecosystem Assessment (in

turn based on global social, political and economic drivers) and adapted to the study scale and national context. Trends of each driver were identified under each of the four scenarios. The team analysed the implications of these alternative trends for a range of ecosystem services for each of the four scenarios: a simulation modelling application proved too complex and the team eventually settled for brief narrative descriptions, later illustrated through spider diagrams. The analysis of scenarios was used in particular to explore trade-off between ecosystem services and biodiversity resources under the different range of alternatives. This also helped highlighting different dynamics among sub-regions of the study area.

This preliminary review of experiences point out a number of lessons learnt and areas requiring further investigation and empirical studies:

1. The application of SP to these contexts has been mainly through academic exercises which have involved (mainly technical/scientific) experts. However, these experiences show little involvement of stakeholders outside experts and planners, nor a close relation with real world planning and decision making processes.
2. On the other hand, SP generally holds good potential as a basis for communication and stakeholder participation processes: intuitive analysis based on narratives does not preclude non technical participation; decisions and options can be discussed and observed from a range of perspectives and outside the straight-jacket often imposed by legal, institutional and management frameworks.
3. A clear identification of the management problem(s) at the outset helps to keep group discussions in focus and to pursue consensus on future uncertainty. Insofar as SP is used to explore broad future outlooks outside a problem solving approach, fundamental uncertainty risks marring the analysis, preventing the group to converge on its review of alternatives.
4. A problem-solving approach can also help catalyse stakeholder interest in the process. Stakeholders, particularly in contexts typical of semi-subsistence economies and developing countries, need to see tangible benefits deriving from planning studies to ensure meaningful and motivated participation. Approaches to achieve this goal need to be explored and a larger set of relevant experiences, if available, should be reviewed.
5. The above argument may well apply to contexts of crisis or where stakeholders face critical near term decisions. SP could theoretically be well suited to address those circumstances. However, immediate priorities and stakeholder conflicts could hinder participation in a process which is specifically designed to overcome narrow and near term perspectives and engage in broader enquiries.
6. Empirical evidence of SP benefits is still limited and anecdotal. The pilot studies reviewed call for more analysis and applications of SP in experimental contexts.

The issue of participation in SP process, as much as in any similar decision support processes, is not peripheral: since one of the main goals would be to change or broaden mindsets to build capacity to address future challenges and uncertainty, failing to engage stakeholders would be a fundamental waste.

The literature on SP reports similar issues for exercises in business contexts. For example, Burt and Van Heijden (2003) lists the following real world hurdles which may prevent effective participation by small and medium enterprises in SP exercises: managers are too concentrated in the day-to-day fire-fighting and sceptical of embracing processes inspired by "big theories" and facilitated by external consultants; they are focussed on their immediate business environment and its trends, rather than on the long-term and broader trends which will shape the wider business context in the future; they may simply not have time for that; organisational structures and culture may promote homogeneity in thinking, rather than a healthy diversity of points of view, which could help coping with future unforeseen developments; managers prefer forecasting (which cannot deal with uncertainty) and incremental change rather than exploring fundamental uncertainty, hence this strengthens "business as usual" mindsets; managers can be defensive and resist SP-type of explorations of the future and their assumptions, for fear that future opportunities or threats might expose their weaknesses; and they see decision-support as a tool or moment to optimise business and win over competition, rather than as an ongoing learning process.

The same study recommends therefore that SP needs to address the following requirements to be

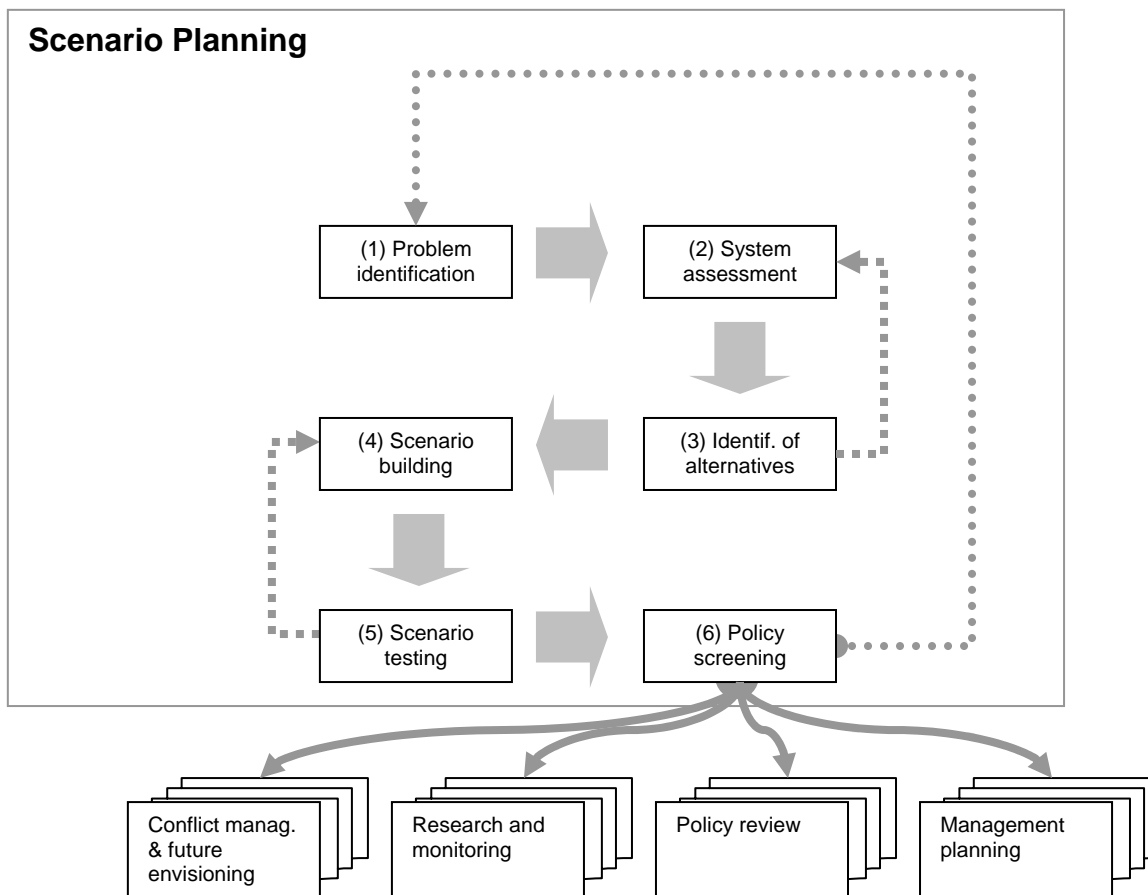
accepted and successful: it should have a clear purpose relevant to the client; SP practitioners need to have a trusting relationship with clients based on dialogue and understanding of their perspectives; the relationship should be built on a strategic analysis level, with the shared understanding of its importance for the survival and growth of the client, as well as of its process oriented nature.

Most of the considerations above may well apply, *mutatis mutandi*, to contexts of environmental analysis or conservation at regional scale. Planning or conservation institutions and their managers are ordinarily faced by similar challenges and constraints. The problem would be even more acute in contexts of participatory management of natural resources, where conflict, mediation, overlapping jurisdictions, grey policy frameworks and complex societal dynamics are parts and parcel of the decision making process.

### 4.3 Proposed methodology

We propose to develop scenarios through a process outlined in Walker et al. (2002), elaborated by Peterson et al. (2003) and Cumming (2005), schematically outlined in Figure 2 and further detailed below.

Figure 2. Scenario planning process.



The process involves the following six steps:

1. **Problem or goal identification:** This step entails the identification of a problem area relevant to stakeholders concern. It enables to focus the analysis on actionable points. E.g. how ecosystem goods and services could change and affect tourism in the national park over the next 10 years; or what is the vision agreed by stakeholders for national park management.

2. System description: ecosystems, institutions, people, dynamic relations among the system components.
3. Identification of alternatives:– identify plausible alternative ways the system could evolve in response to possible future events, based on the existing system structure and dynamics: predictable and unpredictable variables should be listed. The group should capture explicitly the major areas of uncontrollable uncertainty, that means unpredictable external drivers (e.g., climatic patterns, national economic growth, etc.). Controllable factors of uncertainty should rather be included as actionable elements within alternative scenarios.
4. Developing scenarios: Scenarios are built by adding external drivers and internal actions to the system dynamics and alternative paths identified in the previous steps. The outcome is the formulation of a text based representation for each alternative future identified, describing the future system configuration, linking the present state and events with future hypothetical states and events. The narrative description should be clearly and convincingly formulated, easily communicable and should keep a clear focus on the problem or goal identified in step #1. Each scenario must be provocative, i.e., able to trigger lateral thinking and bring attention to future unexpected opportunities and options for action. There is no blueprint to develop and write scenarios. A number of techniques can be used to develop analysis and narratives (e.g., writing fictional speeches of key figures) and to explore trends along identified alternatives (e.g., Delphi technique).
5. Scenarios appraisal and testing: each scenario is assessed for internal consistency, through a review of the plausibility of assumed actors' behaviour (e.g., through stakeholder participation); simulation modelling; expert opinion.
6. Policy screening: use scenarios to identify, (develop and) test alternative policies and management decisions and to formulate research and monitoring agendas. Scenarios are reviewed against one another, to trigger new perspectives on future plausible change and possible actions.

The exercise needs to be based on an iterative process, whereby, for example, identification of alternatives (step #3) may drive us to deepen our assessment of the system (step #2), or scenario testing (step #5) requires and interactive formulation of alternative scenarios, gradually refined for internal consistency.

The approach may suit a number of different goals, often very relevant to conservation efforts and complementary:

- i). To bring together stakeholders (e.g., park communities, experts, park managers, policy makers, etc.) to query respective assumptions, expectations and different world views and identify actionable issues and desirable future outcomes;
- ii). To test the outcome of existing or plausible policy frameworks vis-à-vis plausible future evolutions of the system;
- iii). To identify areas of uncertainties and lead research efforts towards them, in a manner relevant to stakeholder concerns and agendas;
- iv). To develop and test management frameworks, plans and options against plausible long term evolutions of the system in face of uncertain and controllable external forces.

#### **4.4 Organisational details**

The initial proposal is to assemble a <SP group> supported by a broader <reference group>.

The SP group should be responsible for detailed and focussed discussions along the path described above. In particular, it should identify variables and alternatives, formulate scenarios, test them, assembling and reviewing information generate by research and by the reference group work. The SP group should include both the HKKH Technical Team, and people with direct in depth knowledge of the area. These may include academics, SNP planners and local leaders. The SP group should include about 8-10 people overall (it could coincide with the Park Working Group in the HKKH project design).

The Reference group should be a larger group including a representative cross-section of local stakeholders, experts, planners. This groups (up to 30 people) should work through period workshops. Its role is to review the scenarios, with particular regard to steps #5 and 6.

Some or all the key events and sessions should be facilitated by an external facilitator. In addition, a suitable facilitation mechanism for the Reference Group should be confirmed after the first reviews of this proposal.

Tentative schedule:

1. Circulation, review and revision of this proposal among HKKH members and stakeholders (DNPWC, CBOs, WWF, etc.)
2. Confirmation of composition of the SP group.
3. preparation of support material and in depth case studies.
4. Intensive session of SP group (3 days):
  - o familiarisation with SP methodologies and examples
  - o steps #1-4 of SP process and production of first phase scenarios;
5. Reference group workshop (3 days):
  - o familiarisation with SP methodologies and examples
  - o presentation of first phase scenarios;
  - o initial review for consistency and policy screening (steps #5-6).
6. Intensive session of SP Group:
  - o Review of outcome of reference group workshop
  - o Revision of scenarios
7. Iteration.

#### **4.5 Linkages to other HKKH project components**

The SP application is proposed as a stand alone module in the set of tools to support system management within the SNP. It is specifically designed as a participatory tool and soft-system application.

In addition, the following linkages to additional HKKH project components are proposed:

1. The SP group should make progress on SP on par with the simulation modelling component. I.e., outcomes of the SP iteration can be used to refine the modelling assumptions and framework; and outcomes of the simulation modelling exercises can feed the iterative development of scenarios. A possible conceptual framework for this integration is presented in the following section.
2. At a later stage, assuming a useful outcome from the process proposed herewith in relation to the SNP specific scope/problems highlighted in section #2, SP outputs could be suitably adapted for public awareness raising for local stakeholders (drama, media, etc.) to share and broaden the impact of the exercise.

## 5 Scenario planning in the context of managing complexity in socio-ecological systems – a brief overview.

### 5.1 System analysis

Ecosystems change often not through linear responses, but through unpredictable and irreversible processes. Socio-ecological systems are inherently uncertain, unpredictable, non linear and complex. The paradigms of management of ecological systems are challenged by frequent failures and inadequacy to capture the complexity of landscape systems and forecast their outcomes. This complexity is heightened when considering socio-economic components active within the landscapes. Briggs and Stirzaker (2006) propose the following characterisation of complex systems vs. complicated systems:

**Table 1. Complicated systems and complex systems.<sup>1</sup>**

Complicated systems	Complex systems
<ul style="list-style-type: none"> <li>• Clear cause and effect</li> <li>• Understand system by studying the parts</li> <li>• System predictable: surprises considered undesirable, regarded as unfortunate, or eliminated</li> <li>• Findings at one scale believed to apply at all scales</li> <li>• Lags either not significant or exactly predictable</li> <li>• System or subunits treated as homogenous</li> <li>• Feedbacks either absent or predictable</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple drivers</li> <li>• Different ways to get to the same end point</li> <li>• Interactions and surprises expected and should be embraced</li> <li>• Varying effects at different scales: Often counterintuitive</li> <li>• Lags add uncertainty</li> <li>• Inherent variation over space and time essential to system function.</li> <li>• Feedbacks invariably present</li> <li>• Counterbalancing and reinforcing loops lead to multiple states</li> </ul>

Holling (2001) argues that there are two fundamental approaches to deal with complex socio-ecological systems:

- 1) to analyse different sub-sets of interactions of the system: each is analysed based on appropriate and relevant operational frameworks;
- 2) To identify those sub-sets of interactions which control the evolution and self-organisation of the system.

These two approaches partially reflect two different views of complexity. In the former case, complexity is the result of a random assemblage of processes each acting at a given spatial-temporal scale.

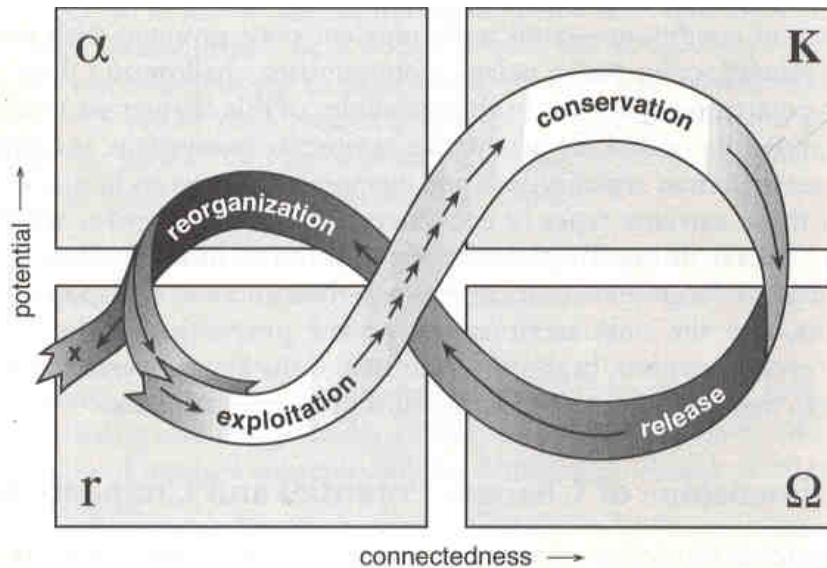
The latter approach sees socio-ecological systems as self-organising sets of processes controlled by a small number of critical processes. They are in a continued dynamic process of change. Internal controlling variables affect the adaptive capacity or resilience of the system, i.e., its vulnerability to sudden change which can break the controlling processes and move the system to a new state.

In this perspective, systems are not seen through a linear, cause-effect relationship, predictive paradigm, aimed at identifying (hypothetical) conditions of system stability and equilibrium. They are rather examined to identify those mechanisms which allow the system to absorb disturbances within a certain range, beyond which the system flips and reorganises itself (Figure 3).

<sup>1</sup> from Briggs and Stirzaker, 2006.

The system can exist in different alternate states. Transitions among states or configurations often present threshold effects. External controls or information generated externally usually do not have major impacts on the system configuration. This rather changes in reaction to stresses through complex behavioural (adaptive) responses (emergent properties) which lead to the reorganisation of the system components and their states. In this perspective, resilience is the key to ecosystem management.

**Figure 3. Holling's four-stage ecosystem renewal cycle.**



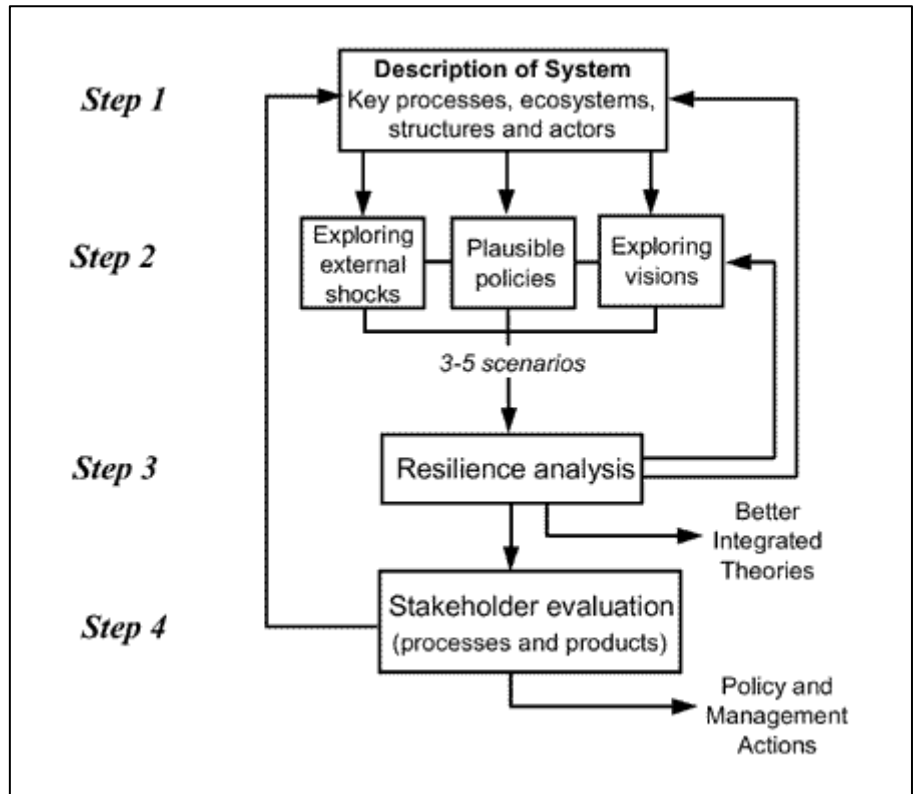
System management is therefore seen as an iterative process designed to improve the understanding of the system complexity and behaviour. This can be achieved through well structured trials pursuing clearly defined experimental goals. These are not set to constrain the system within a specific configuration, but rather to increase the heterogeneity and resilience of the system.

The proposal contained in this paper is inspired by the approach to the management of socio-ecological systems proposed by Walker et al.(2002), and summarised in Figure 4. The authors argue for an approach which handles inherent uncertainty as a given boundary of the system: we need to live within the system, rather than setting goals based on unattainable assumptions. In this perspective, ecosystem management hinges on strengthening the resilience of the system in case we wish to maintain it in its present configuration; or to undermine the system resilience if we wish to move the system configuration to a different state.

Their proposed framework is based on four steps:

1. System description through stakeholder participation: this step produces a conceptual model of the system based on the identification or definition of:
  - a. Spatial boundaries
  - b. Ecosystem services and values attached to them by stakeholders;
  - c. Ecosystem processes and change, speed of change and influence by internal and external variables;
  - d. Historical profile of ecological and socio-economic change at different scales and cross-scale effects;
  - e. Variables which control desired ecosystem services (usually, slow variables);

- f. Controllable and uncontrollable variables and uncertainty associated with them;
  - g. Institutional and legal factors and power relations which influence patterns of decisions by stakeholders.
2. Identification by stakeholders of possible future trajectories of the system: this step produces alternative future scenarios of system configuration (along the lines of the SP approach described above). This is to explore how ecological and socio-economic change would impact on the resilience of the desired configuration of the system/landscape to identify the uncertainty surrounding plausible future outcome of change.



**Figure 4. Resilience approach to the management of socio-ecological systems (Walker et al., 2002)**

3. Quantitative analysis of system resilience: in this step the conceptual model developed in step#1 and the uncertainty and dynamics explored in step #2 are tested (in qualitative and/or quantitative manner, e.g., through simulation modelling) to identify controlling variables at different scales, their speed, non linear behaviour of variables and threshold effects. These might be important in triggering transitions in the system configuration.
4. Participatory and integrated assessment of policy and management implications: in this step stakeholders evaluate the implications of a different set of policies on the resilience mechanisms identified in step #3. Hence policy options are identified, which can guide management towards the desired system goals.

This approach is still experimental and explorative in trying to avoid the pitfalls of traditional ecosystem management approaches. In particular, this approach is described as distinct from a typical decision analysis approach, as summarised in Table 2.

**Table 2. Decision analysis vs. resilience analysis<sup>2</sup>.**

	Decision analysis	Resilience analysis
<b>Goal</b>	Maximisation of utility functions (e.g., productivity) and minimisation of losses/regrets, achieving preferred state/configuration of the system.	Maintaining the ability of the system to cope with future stresses, through self-organising and learning capacity, averting switch to undesirable configurations of the system.
<b>Assumption</b>	<ul style="list-style-type: none"> <li>• Systems have a preferred/optimal state</li> <li>• We can cater for most assumptions</li> </ul>	<ul style="list-style-type: none"> <li>• SES may contain thresholds and can exhibit hysteretic and irreversible changes.</li> <li>• Probability distributions for key</li> </ul>

<sup>2</sup> Based on Walker et al, 2002.

	<p>in system description/ modelling</p> <ul style="list-style-type: none"> <li>• Key probability distributions can be identified</li> </ul>	<p>decision variables are highly uncertain;</p> <ul style="list-style-type: none"> <li>• Decision makers must make decisions based on imperfect knowledge, with limited resources.</li> <li>• Utility functions depend upon social context.</li> <li>• Market based valuations are usually distorted; neither they can capture many ecosystem services and goods.</li> <li>• Stakeholders hold preferences not only on policy outcomes, but also on the type of decision making (legitimacy).</li> </ul>
<b>(Potential) objectives</b>	<p>Guiding the system towards the preferred configuration, defined by target system parameters.</p> <p>Enhancing resistance to change.</p>	<p>Enhancing options and strengthening feedback loops that maintain the system in desired configuration, regardless of the path taken by system components.</p> <p>Re-establishing safe resource use options.</p> <p>When system is in undesirable configuration, reduce resilience of present configuration.</p>
<b>Approach</b>	<ol style="list-style-type: none"> <li>1. System description</li> <li>2. Identification of alternative policies</li> <li>3. Probability assessment of policy outcomes</li> <li>4. Selection of policy with best fit vs. utility function</li> </ol>	<ol style="list-style-type: none"> <li>5. System description through stakeholder participation</li> <li>6. Identification by stakeholders of possible future trajectories of the system</li> <li>7. Quantitative analysis of system resilience</li> <li>8. Participatory and integrated assessment of policy and management implications.</li> </ol>
<b>Techniques (examples)</b>	<ul style="list-style-type: none"> <li>• Integrated assessment and planning</li> <li>• Simulation gaming</li> <li>• Cost benefit analysis</li> <li>• Multi-criteria analysis</li> <li>• Forecasting techniques</li> </ul>	<ul style="list-style-type: none"> <li>• Adaptive management</li> <li>• Scenario planning</li> </ul>
<b>Limits in application to SES</b>	<ul style="list-style-type: none"> <li>• Many probability distributions are not known.</li> <li>• Large number of stakeholders which different utility functions (no single utility function).</li> <li>• Some stakeholders do not know their utility function.</li> <li>• Stakeholders change the system</li> </ul>	<ul style="list-style-type: none"> <li>• Growing body of theory but lack of management blueprints: most approaches are still experimental and some techniques have limited empirical assessments.</li> <li>• Highly demanding in terms of stakeholder processes.</li> <li>• Approach strongly context</li> </ul>

<p>while this is being analysed/forecasted, creating and reacting to new visions.</p> <ul style="list-style-type: none"> <li>• Real world decisions/policies are based on compromise, transactions, and short term perspectives. Optimal decisions are seldom applied.</li> <li>• Best tailored to improve efficiency in system phases of slow change, accumulation and growth. However may not account for gradual erosion of resilience and adaptability.</li> </ul>	<p>dependent.</p> <ul style="list-style-type: none"> <li>• In certain contexts, resilience may not be desirable.</li> <li>• In contexts where it is desirable, increasing resilience may generate costs in terms of productivity function.</li> <li>• Managers' attitude, institutional structures and processes, and policy frameworks are often based on command-and-control mindsets.</li> <li>• Policy outcome hinges on degree of shared understanding achieved among stakeholders: contextual factors may hinder this.</li> <li>• Most research evidence deals with system phases of stability and accumulation. Periods of turbulence less studied.</li> <li>• Threshold effects in SES poorly understood/identified.</li> <li>• Best tailored to increase resilience in face of stresses, crisis and turbulence.</li> </ul>
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## 5.2 Strengths of scenario planning in system analysis and decision making

Scenario planning has a distinct and critical role in steps #2 and 3 of the process outlined in the previous section. We also consider that the two approaches of resilience analysis and decision analysis outlined above are not necessarily mutually exclusive. While the fit of each approach may depend on context and they can fit better different phases of the adaptive cycle, an overall system management framework can benefit from elements of both approaches.

Therefore, the scenario planning exercise is proposed as an experimental step towards developing the overall decision support methodology and set of tools pursued by the HKKH; whereby the resilience analysis framework can provide a theoretical guidance to the broader system development..

At the same time, the SP exercise is proposed in its own merit as a methodology to assist SNP stakeholders in addressing practical problems and management objectives highlighted in section 3. Those problems and concerns are inherently fraught with uncertainty and require decisions based on long term perspectives, strategic analysis and mediation among multiple stakeholders. The decisions will likely be taken while stakeholders would keep changing their perspectives in response to context change and management interventions.

Chermack (2004) points out that decision failures are very common in dynamic decision making contexts (i.e., where the system changes while we make decisions). Besides technical errors, most failures are due to the inability to foresee novel factors. There are structural causes of this situation. Scenario planning can be a useful tool to help addressing these limitations of real-life decision making within complex systems (Table 3).

**Table 3. Advantages of scenario planning in dynamic decision making contexts<sup>3</sup>.**

Causes for unexpected decision error	Benefits of scenario planning
<p><b>Bounded rationality:</b> limits to human and organisational problem-solving capabilities. Decisions are typically taken based on partial and certain, but limited, information; they are broken down in sub-decisions; rules of thumbs gradually develop and prevail.</p>	<p>Scenarios can provide a vast amount of information in a detailed narrative format which can be easily remembered (hence more easily acted upon).</p>
<p><b>Tendency to overlook endogenous variables:</b> decision makers typically focus on exogenous variables to be acted upon, overlooking feedback loops within the system that keep re-configuring the system in response to external (exogenous) variables.</p>	<p>Scenarios can be integrated with system thinking and internal variables can be explicitly considered and built in models.</p>
<p><b>Stickiness of information and knowledge:</b> the transfer of information and knowledge (e.g., specialist expertise) has transactional costs.</p>	<p>Scenario development requires frequent and intense interactions through forums, thus providing a means to reduce transfer costs in building shared expertise.</p>
<p><b>Friction of information and knowledge:</b> Information and knowledge transfer is mediated by social values and interactions. Interactions among multiple individuals serve as check and balances in decision making, preventing errors. Expertise requires the accumulation of experience: therefore, friction is necessary. Removing friction (e.g., through automated processes) can increase decision failure.</p>	<p>Scenarios are typically formulated through interactions among multiple individuals /stakeholders, thus enabling early identification of errors.</p>
<p><b>Mental models, cognitive maps, policies:</b> Mental models are conceptual frameworks, often unconscious, through which people explain the world. Often they are the key and only drivers of decisions. Policies are formal statements of shared/agreed cognitive maps.</p>	<p>One of the core aim of scenario planning is making managers' mental models explicit (conscious) and modifying them through the development of shared understanding, testing of assumptions and polices.</p>

<sup>3</sup> based on Chermack, 2004.

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## APPENDIX-1: Additional resources

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Dr. Garry Peterson's page on Scenario Planning <http://www.geog.mcgill.ca/faculty/peterson/scenarios.html>

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GBN Global Business Network <http://www.gbn.com/>

As a worldwide membership organization, GBN engages in a collaborative exploration of the future, discovering the frontiers of knowledge and creating innovative tools for strategic action.

Millennium Ecosystem Assessment <http://www.maweb.org>

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Plausible Futures Newsletter <http://www.plausiblefutures.com/>

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## APPENDIX-2: Acronyms

AMS	Altitude Mountain Sickness
BZ	Buffer Zone
BZMC	Buffer Zone Management Committee
BZUC	Buffer Zone User Committee
BZUG	Buffer Zone User Group
CBNRM	Community based natural resource management
CBO	Community-based Organisation
CFUG	Community Forest User Group
CNR	Italian National Research Council
DDC	District Development Committee
DFID	Department for International Development
DGCS	Directorate General for Development Cooperation, Italian Ministry of Foreign Affairs
DNPWC	Department of National Parks and Wildlife Conservation
DPSIR	Driver-Pressure-State-Impact-Response
DSS	Decision Support System
EMM	Ecosystem Management Model
GIS	Geographical Information System
HH	Household
HKKH	Institutional Consolidation for the Coordinated and Integrated Monitoring of Natural Resources towards Sustainable Development and Environmental Conservation in the Hindu Kush - Karakoram - Himalaya mountain complex.
HMG	His Majesty's Government Organization
IMTP	Integrated Management and Tourism Plan
IUCN	World Conservation Union
LSA	Livelihood Strategy Approach
MAE	Italian Ministry of Foreign Affairs
MP	Management Plan
NGO	Non-Governmental Organisation
NMA	Nepal Mountaineering Association
NP	National Park
NR	Natural resources
NTB	Nepal Tourism Board
NTFP	Non Timber Forest Product
PPN	Porters Progress Nepal
PRA	Participatory Rural Appraisal
SCAFP	
SMC	School Management Committee
SNP	Sagarmatha National Park
SP	Scenario Planning
SPCC	Sagarmatha Pollution Control Committee
TAAN	Travel Agents Association of Nepal
TAR	Tibet Autonomous Region
TCP	thresholds of potential concerns
TRPAP	Tourism for Rural Poverty Alleviation Project
UNDP	United Nations Development Program
VDC	Village Development Committee
WAG	Women Awareness Group
WHS	World Heritage Site
WWF	World Wildlife Fund

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