

# Simple Principles for Guiding of Large-Scale Landscape Restorations



Dagmar Hagen<sup>1\*</sup> and Lars Erikstad<sup>2</sup>

<sup>1</sup>Norwegian Institute for Nature Research, P.O. Box 5685 Torgard, NO-7485 Trondheim, Norway

<sup>2</sup>Norwegian Institute for Nature Research, Sognsveien 68, NO-0855 Oslo, Norway

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**\*Corresponding author:** Dagmar Hagen, Norwegian Institute for Nature Research, P.O. Box 5685 Torgard, NO-7485 Trondheim, Norway, Email: dagmar.hagen@nina.no

## Abstract

Restoration projects are complex and especially upscaling of restoration represent challenges that must be solved in a multidisciplinary setting. To establish cooperation between the wide range of professions there is a need for “fixed points” of communication that allows for constructive dialogue and to prevent misconceptions. We have developed and tested four simple principles that are aimed for use throughout the restoration process and to be immediately applicable for “on-the-ground” interventions. They are designed to work dynamically in the dialog between all personnel involved in a project, such as project owners, contractors, authorities, and consultants. By organizing the dialogue towards the four simple principles it is easier to explain the link between goals, specific work procedures and how they are solved. The principles can also be used when the projects are evaluated. The article focuses mainly on the use of the principles for nature diversity and landscapes, but they are also used and intended for all professions involved in restoration projects.

**Keywords:** Ecosystem Restoration; Project Principles; “Green Training”; Multidisciplinary Integration; Natural Processes; Dialogue

## Introduction

The IPBES global report 2019 shows that 75% of global land areas are under heavy human pressure, and 20% of all species are in danger of going extinct. Land-use change, including mining, infrastructure development, agriculture, production of renewable energy, and urbanization drives land degradation, contributing to climate change, loss of ecosystems, landscapes, and put pressure on the supply of ecosystem services [1,2]. Ecosystem restoration has been pointed out as an inevitable tool to prevent and reverse landscape degradation worldwide [3], and the UN General Assembly has declared 2021–2030 to be the Decade of Ecosystem Restoration, aiming to massively scale up the restoration of degraded ecosystems [4]. The Kunming-Montreal Global Biodiversity Framework (GBF; COP#15) target 2 is to “ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration...”.

To meet these global restoration commitments the vision of restoration needs to expand [5], and integration and upscaling are two dimensions of particular interest. Restoration of land exists within a social [6] and multidisciplinary [7] context, and

socio-economic, political, cultural, and regulatory frameworks must be integrated in the formulation of restoration goals, planning and implementation of restoration activities [8,9].

Such global ambition implies there is also a need for upscaling from small-scale activities into large-scale landscape interventions [10]. It is vital to work hand in hand with natural processes identified in the landscape, not present solutions against these processes. This assumes a broad view of nature, including geodiversity as well as biodiversity over a large range of geographical scale [7].

Landscape restoration interventions are complex, and contain a diversity of actors and professions, scaling and disturbance level, confronting economic priorities, and variation in nature attributes. Successful restoration will require a consensus on restoration goals and wanted outcomes, and this is particularly challenging in large and complex projects [11]. Linking of scientific knowledge and traditional to ‘on-the-ground’ interventions is particularly important to achieve this upscaling [12].

To establish cooperation between the wide range of profes-

sions there is a need for “fixed points” of communication that allows for constructive dialogue and to prevent misconceptions. Based on a diverse portfolio of ongoing and completed restoration projects we have formulated some simple principles designed to work as a tool for dialogue between the relevant professions in large scale restoration projects. These principles are aimed for use throughout the restoration process (planning, implementation, evaluation; [13]). and to be immediately applicable for “on-the-ground” interventions. This paper explains these principles illustrated by examples from two landscape restoration projects and argue why they can be used in most large-scale projects independent on geography and type of land degradation.

### Materials and methods

During the period between 2003 and 2023 the authors have been deeply involved in several restoration projects of different scale, geography, and goals. We have observed some overarching challenges related to across discipline dialogue. During this work we have identified the need for a common ground and guidelines for discussing “on-the-ground” solutions where all available knowledge is acknowledged.

Two projects have been the core of our work, the restoration of a former military training area in alpine central Norway [10] and the removing and restoration of a coal mining settlement in Svalbard, high arctic Norway [7]. The findings and experiences from these two projects have been adopted and tested in smaller projects, mainly related to mitigation in renewable energy and road construction and have given useful input to the result [14].

In 1999 the Norwegian Parliament decided to close the 165 km<sup>2</sup> existing military training area of Hjerkin in the Dovrefjell area, and to restore the area for civilian use, future protection and “back to original” ecosystem and landscape quality [15]. The project was completed in 2020 and details about the project and its measured outcome has been described by Hagen et al. [10]. Topics of particular interest in these projects was the removal of undetonated explosives (to secure safety for workers and for future users), removing military infrastructure, mapping and handling any pollution, to restore for landscape and nature diversity and information and involvement with other users in the area.

In 2015 the Norwegian Parliament decided to close all coal mining activity in the Svea area in Svalbard, Norway, after 100 years of activity. According to the Svalbard Environmental Protection Act[16], the mining company is committed to remove all installations and waste and restore the area to its original condition. All cultural remnant older than 1945 is protected by law. The project will be completed in 2023, and more information about the background and implementation is described by Erikstad et al. [7]. Topics of particular interest in this project was to secure the cultural heritage, removing mining and settlement infrastructure, mapping and handling pollution, landscape and nature diversity

and the safety during operation in an extreme environment.

By following these two projects from the inside, as consultants during planning, formulating bids for construction companies, the implementation, and evaluation, we have identified some guiding principles that seems to promote good dialogue and implementation based on combination of scientific, applied, and local knowledge.

We were aiming for specific, short, and understandable statements, both according to linguistics and use of scientific terms. The first attempts from Hjerkin were to formulate the main principles, and test if they were applicable to the relevant actors, project owner, contractors, and consultants. These were further developed in the Svea project, involving project owner, contractors, public authorities, and consultants. During the planning phase, we systematically tested if all the topics of interest were able to operate along the same lines.

### Results

During the Hjerkin project, planning and initial implementation, we formulated four principles that was further tested, developed, and expanded in the Svea project. The principles were discussed with all involved parties in the projects, such as managers, authorities, consultants, and machine operators. All personnel working in the field with landscape restoration, had to participate in the course “Green training” [10] annually, to secure a common understanding of the area, restoration goals and procedures through all phases of the projects. For the machine operators this was of special importance as it gave them a tool to use their expertise systematically and creatively contribute to accomplish the restoration goals.

### The four simple principles are formulated as follows (Figure 1):

#### Principle 1 Promote natural processes and recovery (play with nature)

In ecosystem restoration it should be an overall goal to restore the relevant site-specific natural processes [17]. This is essential to secure the long-term functioning of the landscape attributes, nature diversity, and delivery of ecosystem services. In landscape restoration it is important to analyse the processes of the area in a broad sense, going from abiotic such as geological and geomorphological processes to biological processes such as habitat development and vegetation dynamics. This wide view is important for geodiversity and biodiversity, and because there is an intimate relationship between the abiotic and biological processes. Geodiversity in this respect can be regarded as a main supporting service for biodiversity. The balance and focus of the processes addressed will vary from area to area and it is therefore of great importance that the area in question is analyzed in detail to find the right balance to promote natural processes.

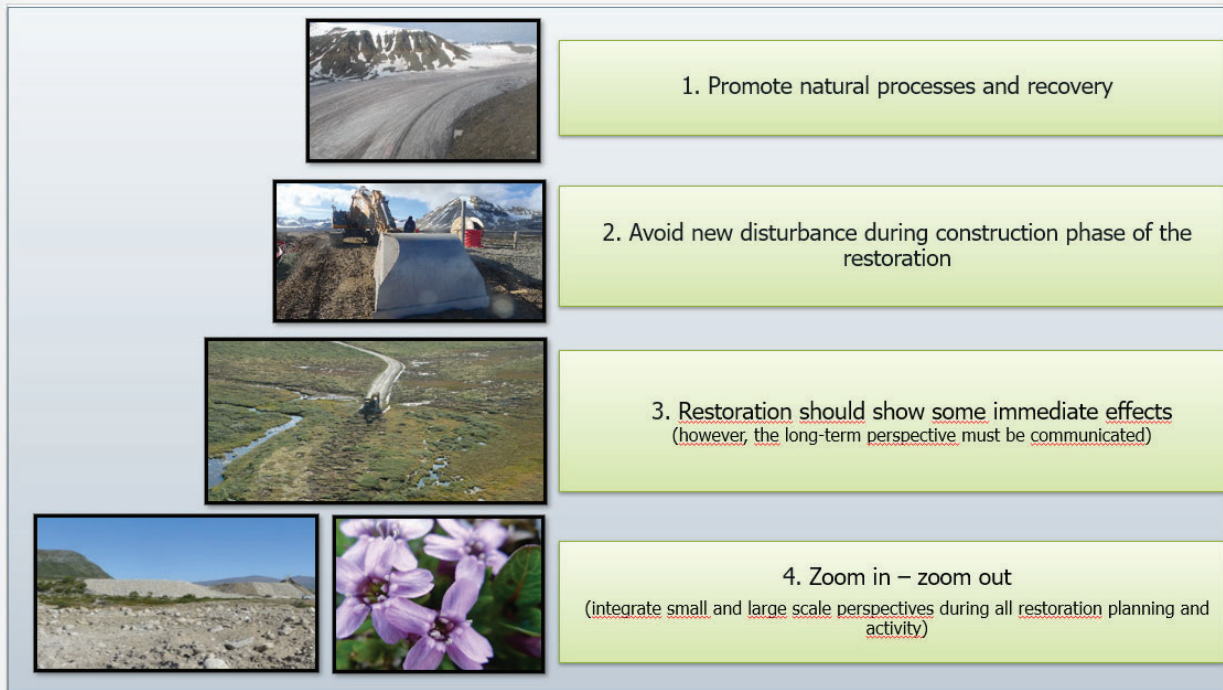


Figure 1: The four principles for communication during restoration projects.

**Principle 2 Avoid new disturbance during construction phase of the restoration (assess the risk)**

Restoration work in upscaled projects involves heavy machinery and many people. If managed and organized the wrong way, the restoration activity itself can be a threat and destroy important nature elements, such as vehicle tracks in undisturbed vegetation or oil spill in local ponds. In both case areas important natural values were identified. These might be small and local, and could easily be overlooked, and they can be a resource for the restoration outcome. Such as in the Svea project when small patches of vegetated areas can be a source for new vegetation establishment in the large, newly restored areas, holding sparse or no vegetation cover. The Hjerkin project initially held a separate principle of not to introduce alien species during the restoration. This was later regarded as covered by the formulation of aiding new disturbance, and therefore these two principles were merged in the Svea project. The issue of avoiding the introduction of alien species involved strong procedures for peoples and machines in cleaning and general conduct in both projects.

**Principle 3 Restoration should show some immediate effects; however, the long-term perspective must be communicated.**

The restoration of nature can be expressed as a two step process, the first being the immediate effects of the technical intervention, such as the machines removing roads and infrastructure.

The second step is the further landscape dynamics, geological processes and vegetation recovery that will form the site over time. The first step will be the preparation for the long lasting second step.

Nature restoration generally is expensive, and funding is achieved both through governmental and private channels as well as direct costs and resources used for the companies involved. To justify the expenses, it is important to show that the activity gives some immediate outcome to justify the use of resources and to motivate the actors and the public, by showing improved conditions. This can be demonstrated during the first step of interventions. However, it is also important that all people involved understand that recovery of nature takes time, and the second step of restoration can be short or even very long, depending on geographic, climatic, and geologic conditions. Dissemination of the knowledge of the area, the aims of the restoration and expected rates of recovery is therefore a central element for wide acceptance.

**Principle 4 Zoom in – zoom out (integrate small- and large-scale perspectives during all restoration planning and implementation)**

Nature restoration must focus on a range of geographical scales. It is important to build into the project a procedure that allow different scale perspective to be in focus simultaneously. This is demanding as humans tend to focus at one scale at the time.

During the planning phase of a project, when formulating restoration goals, the wider range of scale will be useful to plan for a cost-effective approach. In our case projects we have demonstrated the importance of the joint focus on the landscape scale as well as details. Focusing on the overall landscape scale will be essential to have an overall view of the progress, including the operations, the cost, and the time frame. However, forgetting about the details could result in poor quality for certain ecosystem elements vital for the long-term result of the project. Repetitive details are especially important as systematic errors can develop and cause large negative consequences, such as focusing on critical drainage patterns to restore wetland dynamics in the Hjerkin project. Focusing solely on a detailed scale may on the other hand cause increased costs that do not consider natural processes on larger scales that can be utilized to achieve high quality results. In the Svea project the restoration involve alluvial and avalanche fans abundant in the area, and it would be waste of resources to put heavy machines to work for recreating the wanted surface in too great detail. The river and avalanche processes will themselves secure much better results if they are allowed to work naturally.

In this paper we have focused on the use of the principles in the landscape and nature analysis. It was, however, given high priority to establish them in a multidisciplinary setting for all involved disciplines as far as possible. This can be illustrated by cultural heritage sites. These were identified and marked to avoid destruction by machines (Principle 2). These areas were also important for nature recovery, as they could hold vegetation cover important for further vegetation expansion. Three old, protected buildings were restored and will be used as research facilities in the future (Principle 1 and 3) and large-scale structures of the old mining processing systems were preserved and will be visible in the landscape as historical elements (Principle 4).

### Discussion

The four principles may seem very simple, almost naively formulated. Trying to follow them every day through all phases of a project may however be challenging. It is easy to focus on just the details at hand and forget that every piece of work is part of a larger puzzle that must be joined together. To make these principles work in practice depends on good communication and develop the system and space for this to develop. Our experience is that the principles operate in a constant two-way interaction as a contradiction to only disseminating scientific knowledge from consultants to the practitioners.

By organizing this dialogue towards the four simple principles it is easier to explain the link between goals, specific work procedures and how they are solved. This communication must include all parties and roles involved in the project, including the 'Green Training' as well as the daily dialog, and formal meetings on all levels of the organization. When mishap occur, they can be explained and shared, and it will be easier to learn from them and preferably to avoid problems later. The communication also seems

to create a common understanding and proudness in the project that has a positive effect on the total result, as all professions and parties understand the motives, priorities, and arguments from others. Complex projects will always need compromises, and by organizing the discussion along these common principles these compromises can be developed out of common understanding and a shared language. This shared language has also proved meaningful when the project is evaluated and designing monitoring programs.

We believe that these four principles can be applied to a large variation of restoration project in different geographic and ecological regions, and under different social and cultural conditions. However, the content and the involvement of specific disciplines must be developed and adapted for each project and related to project goals.

### Conclusion

The global restoration commitments call for upscaling and integration. This represent a challenge as restoration projects tends to be complex and involve knowledge from many disciplines and considerations by several project partners. We have developed an approach by formulating four simple principles for landscape restoration, and the contributions from this has been demonstrated in our case projects. The approach allows for a common language and therefore gives access to available knowledge in a multidisciplinary setting. It has especially proved useful in involving all parts of the project organization in creative solution-oriented dialogs by preparing for discussions and priorities during on-site operations. In this way it favors multidisciplinary agreements on solutions in the field to fulfil overall goals, it helps to keep focus and making priorities within complex projects and communicates the need for patience and thereby utilizes nature's own processes and it reduces conflict levels.

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### Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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