The Norwegian Millstone Landscape

Millstones are among the most widespread and abundant artifacts from the past. They can be seen at farms, in gardens, in dry-stone walls and along streams long after the mill itself has disappeared. We intuitively know that there are many stories behind these well-crafted objects that have been so central in mankind's history; however, most of these stories are lost. Particularly this applies to the 'life' of the millstone before it was put to use: the history of extensive quarry landscapes, craftsmanship, quality measures, millstone trade – aspects that collectively form a rich cultural landscape. This project seeks to shed new light on the physical and historical aspects of these multi-faceted landscapes through comprehensive surveys and interdisciplinary research.

1. Relevance to the call

The Norwegian Millstone Landscape focuses on the historical narrative of quarrying, processing and trade of specific stone resources crucial to the production of the most fundamental food, flour. The shaping of extensive cultural landscapes by millstone quarrying provides a rich historical record of the social, economic and political processes that surrounded food production for over 1500 years. Moreover, the consumption of millstones at local, regional and international scales represents conduits in the evolution of trade and social networks that grew around the millstone quarrying industry, and that define an *'extended millstone landscape'*. Today, the socio-cultural and economic values of these millstone landscapes are at best greatly underestimated or, at worst, completely unknown. Undertaken by an interdisciplinary research team comprising the disciplines of geology, archaeology, history and landscape geography, this project addresses the proposal call by developing methods for characterisation and reconstruction of the Norwegian millstone landscapes as a narrative that links the past with the present in a common heritage. The broader objective is to provide heritage authorities with information and interpretation necessary to encourage local preservation and promotion of these landscapes as key socio-cultural and economic resources.

2. Aspects relating to the research project

2.1. Background and research questions

Quarry areas for production of rotating millstones are among our largest industrial landscapes from the past and represent one of our longest-lasting extractive industries. These landscapes form important windows into the utilization and trade of natural resources, but at the same time their size and time depth pose big challenges in cultural heritage management. Outside Norway, millstone landscapes have received considerable attention over the last years by virtue of historic significance and as resources for local development and awareness.

Rotating millstones were introduced in Norway around the 5th century, e.g. at Ullandhaug near Stavanger where they occur together with the old saddle quern, both types based on local rocks [1]. The first documented industrial-scale production of millstones appears a few centuries later at Hyllestad. Other large quarry areas were established in Saltdal, Vågå, Brønnøy and Selbu, while smaller quarries appeared throughout the country (Table 1). A characteristic feature of the Norwegian quarries is the utilization of various mica schists, apparently in marked contrast to millstone quarries further south in Europe.

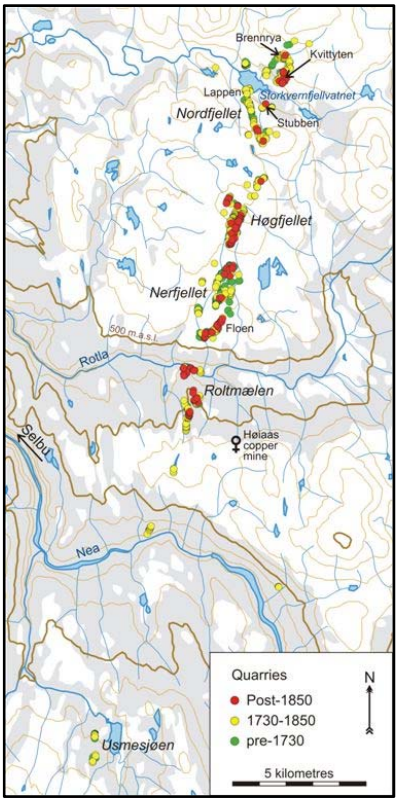
Only in Hyllestad and Selbu have Norwegian millstone quarry landscapes been subject to more than cursory studies. At Hyllestad, on the west coast of Norway, millstone production lasted for more than 1300 years before it ceased around 1930. The historical significance was rediscovered in the sixties [2], and later marine archaeology studies identified several harbours for mill-

Viking Age quarry at Hyllestad

stone shipment [3]. Excavations show that the quarrying started about AD 700 or earlier, with a peak between the 12th and 14th centuries and only small production thereafter [4]. A recent survey by NGU has identified approximately 500 quarries [5], adding new perspectives on changes in production practice through time [6]. Since 1995, efforts in the local community along with interdisciplinary research have re-established Hyllestad as a 'millstone community', and several educational and promotional activities have put the site on the tourist map.

Selbu, located in interior central Norway, is of particular interest in view of the significant amounts of written records that provide insight into 19th century millstone production [7, 8]. The historical records have maintained interest and knowledge of this history in narratives of the Selbu community, and this knowledge was essential for archaeological excavations of quarry settlements in the 1970s [9]. Recently, a survey by NGU and archaeologists from the county administration has identified and documented ca.1000 quarries in addition to numerous settlements, providing new information particularly on the previously unacknowledged early periods (16th -18th century) [6].

Millstone quarry landscape in Selbu



Recorded millstone quarries of different ages in Selbu

Table 1. Known millstone quarry areas in Norway

AREA	COUNTY	ASSUMED AGE	REF
Hyllestad	Sogn og Fjordane	7th - 20th C	4,5,17
Selbu	Sør-Trøndelag	16th - 20th C	6,7,8,9
Vågå.	Oppland	Medieval – 19th C	13, NGU
Saltdal	Nordland	11th C - ?	11,12,15,17
Brønnøy	Nordland	Medieval – 19th C	14,16,17
Lierne	Nord-Trøndelag	17th – 19th C	NGU
Stjernarøy	Rogaland	Medieval	NGU
Sel	Oppland		13
Stange	Hedmark	Post-reformation	17, NGU
Sigdal	Buskerud	16th – 17th C	17
Tysvær	Rogaland		17
Skånland	Nordland		17,10
Lyngdal	Vest-Agder		17
Lindesnes	Vest-Agder		17
Førde	Sogn og Fjordane		10
Elsfjord	Nordland		10
Fauske	Nordland		10
Sørfold	Nordland		10
Nordfold	Nordland		10
Hamarøy	Nordland		10
Balsfjord	Troms	Post-reformation	10
Tranøy	Troms		10
Hemnes	Nordland	Post-reformation	10
Meldal	Sør-Trøndelag		17, NGU
Meråker	Nord-Trøndelag	Post-reformation	NGU

Current research in Hyllestad and Selbu is largely focused on technological developments of quarrying. Assessing chronologies for the histories of the Hyllestad and Selbu landscapes is still problematic, and the low relative precision of ^{14}C ages for post-medieval objects is particularly challenging.

In Saltdal [11], a limited excavation recently gave an 11th century ^{14}C age [12]; elsewhere in Norway work is limited to brief accounts in annuals of local history groups etc. [e.g., 13, 14, 15, 16] and in some cases records in the *Askeladden* database [17]. Several smaller sites have been subject to limited survey through regular NGU database work. Based on the latter, preliminary geological characterisation studies at NGU (unpubl.) indicate that at least the most significant quarry landscapes will be distinguishable in future provenance studies.

Although we have achieved some insight into some of these production landscapes, the greater story of Norwegian millstone production is yet to be told, in terms of how social, cultural and economic transformations of historical significance in Norway and Europe were reflected in the ebb and flow of production, use and trade of millstone products across the region. For instance:

- To what extent can the rise, decline and relocation of millstone quarrying in Norway, over time, be linked to changes in grain production and the move towards 'industrialised' food production?
- Do geological features (quality) have important impact on the 'rise and fall' of millstone landscapes, and can that be linked to the changes mentioned above?
- How can the distribution of millstones from different quarry landscapes in different periods shed light on trade patterns in Norway and abroad?
- To what extent do abrupt changes in millstone production and trade reflect significant historical events, such as war, plague, famine, profound political/ideological change?
- Can the often common techniques in millstone production across Europe be a reflection of technological transmission and cultural contacts being made via quarry workers and the millstone trade?
- Can the cultural value of the Norwegian millstone landscapes be articulated in a general way that can aid in assessing significance on a local, national and global scale?

2.2. Objectives

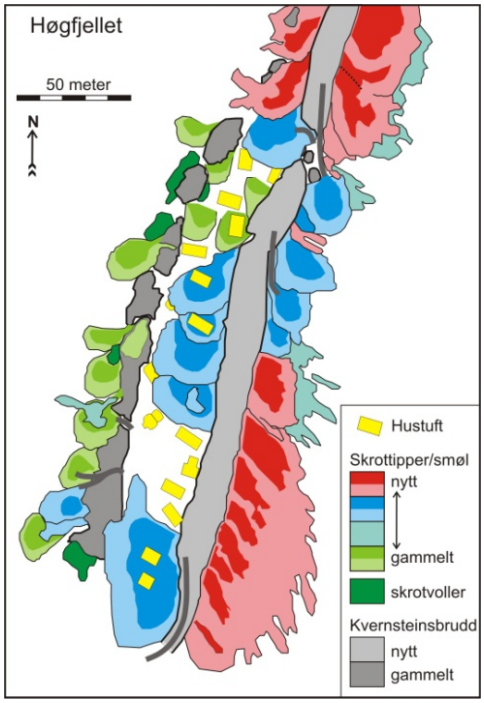
Our primary objective is to *develop methods for characterisation and reconstruction of the Norwegian millstone landscape as a historical narrative of human interaction with a specific stone resource crucial to the production of our most fundamental food, flour.* Main components in this approach are *1) Identify geological, archaeological and historical elements of the quarry landscapes, their time depth and patterns of evolution; 2) Analyze the distribution and use of millstones from different quarry areas through time; 3) Develop an overall perspective on millstone landscapes as historical complexes in order to articulate cultural values and historical significance.*

2.3. Approaches, hypotheses and choice of method

Based on the knowledge and challenges outlined above, we anticipate that

- *millstone landscapes have particular features in common that can be identified and analyzed through interdisciplinary research, and are untapped sources of knowledge about social and technological changes in the Norwegian society, and*
- *elements that collectively compose a millstone landscape can be synthesized to form a platform for future articulation of significance and landscape values.*

Within the framework of these hypotheses and the European Landscape Convention (see below), our objectives will be accomplished through three research perspectives organised as components (Work Packages) of an integrative, interdisciplinary project. *The Physical Millstone Landscape (WP1)* focuses on the variety of quarry areas in Norway, their common and diverse physical features (incl. geology and archaeology) and time depth. This study is symbiotic to a study of the distribution and trade of millstones – *The Extended Millstone Landscape (WP2)* – focusing on temporal and spatial distribution patterns of millstones (consumption). The third approach – *Millstone Landscape Values (WP3)* – links up results from the *micro- and meso-perspectives* of WP1 and WP2 to apply macro-level analysis in approaching landscape values and significance at the local, regional and international level.



Provisional map of 'time-layered millstone landscape' in Selbu

WP1: The physical millstone landscape

Subsidiary goal: *Identify the geological, archaeological and historical elements of Norwegian millstone quarry landscapes and analyze their time depth and patterns of evolution*

Methods and activities:

Quarry landscape surveys: Characterization of the landscapes in a geological perspective: why and how the resources were utilized. Use of established mapping and survey methods for physical characterization of the landscapes, including bedrock geology, quality of millstone rock types, terrain morphology and physical conditions for rock extraction, with particular emphasis on 'the resource as the arena of exploitation' [18]. Ground-based LIDAR laser scanning technology (NGU equipment) for 3D modelling of key quarry areas. Identification and documentation of elements that collectively comprise the character of a millstone quarry landscape, including extraction areas, working areas, spoil heaps, transport routes and settlements. Assessment of relative and absolute chronologies, spatial relationships, schemes of characterization and property-related GIS databases, building on methods developed for quarry landscapes in general [18] and the Hyllestad and Selbu millstone landscapes in particular [5,6], incorporating historical sources if available. Targeted small-scale archaeological studies in quarries and associated settlements, for dating of different phases in the quarrying history and for insight into the material culture and the social organization of quarrying. ^{14}C and dendrochronological dating.

Millstone craft studies: Studies of craft techniques through interpretation of tool marks on quarry walls and artifacts. LIDAR technology for detailed 3D modelling and documentation of tool marks. Reconstruction of techniques through new approaches for studying tool marks, particularly by defining unique steps in extraction and manufacturing, and through experimental archaeology in cooperation with Norwegian Crafts Development[1] and Torbjørn Løland, Hyllestad.

WP2: The extended millstone landscape

Subsidiary goal: *Identify and analyze the distribution and use of millstones from different quarry areas through time and implications for interpretation of the quarry landscapes*

Methods and activities:

Provenance methods: Development of time- and cost-efficient methods relevant for provenancing of the Norwegian millstone types. The large number of artifacts require on-site determination of provenance by visual inspection, supported by thin section microscopy and geochemical analyses (XRF, SEM and ICP-MS) if required. Practically all known Norwegian quarries utilized varieties of mica schist. Hence they can be distinguished from most quarries elsewhere in Western Europe. On the other hand their large similarities pose challenges for distinguishing the Norwegian quarries from each other. A pilot study at NGU demonstrates that the major millstone quarry areas have distinctive characteristics based on texture, mineralogy and geochemistry, which together serve to determine the provenance of millstone artifacts with high precision, in some cases also the origin within the individual quarry landscape.

Artifact, trade and distribution: Identify the source of Norwegian millstone artifacts in archaeological collections in Norway, Denmark and the British Isles. Priority is given to collections that provide significant input to the overall distribution pattern throughout the period of rotating millstone production, including time-specific collections (e.g., Iron Age collection in Stavanger, Medieval collections in Bergen), collections giving a large time depth (e.g. Trondheim, Tårnby in Denmark) and remote collections (e.g. from former Norse settlement in the

Hyllestad millstones found in a shipwreck

[1] A project that is already started in the Hyllestad quarries will be integrated in the present project.

British Isles). Some written sources address the distribution of millstones in Norway; most important are the old governmental records [10] and local merchant archives in Selbu. From the above study of artifact source and distribution, the aim is to investigate the trade networks for Norwegian millstones across Western Europe, particularly during the Viking and Medieval Period.

Stone quality/ milling technology: As milling technology changed significantly across time, it is important to understand how such changes impacted on the demand for specific stone qualities. Studies of written sources combined with petrographic studies of millstone types may elucidate how the changes are reflected in the evolution of the quarry landscapes, production and craft techniques.

Early handmills: A specific focus will be put on the transition from the saddle quern to the rotating handmill in the Early Iron Age. The collections at the Archaeological Museum in Stavanger, containing both types from the same periods, indicate large diversity in shape and rock material when compared to later periods. Studies of the craft techniques and rock types used will develop perspectives both from a technological viewpoint and from patterns of change in agrarian practise.

WP3: Millstone landscape values

Subsidiary goal: *Develop an overall perspective on millstone landscapes as historical complexes in order to articulate cultural values and historical significance*

Methods and activities:

WP3 links up results from WP1 and WP2 to give a broader perspective on landscape values and society. Extracting historic narratives and establishing key concepts for articulating millstone landscape values, it aims at providing methods for assessing significance of millstone landscapes.

Historic narratives are extracted from historical sources combined with archaeological evidence, comparing data from different quarry landscapes and periods, and from projections of 'historic complexes of millstone production' that reflect technological innovation and social and cultural transformations across time. Reconstruction of 'time-layers' and identification of periods of change will be particularly focused on.

Students reconstructing old hewing techniques at Hyllestad

Articulating landscape values: **Historical values** may be seen from an 'expert perspective' – using macro-level analyses ('concepts of landscapes') for understanding the broader, historical context of the Norwegian millstone landscapes and their connections to other places and events of historical significance. **Community values** (cultural, aesthetic, economic etc.) can be seen through perspectives from The European Landscape Convention[1] [see also 19,20] viewing cultural resources within their broader context rather than as 'archaeological sites'. **Historic Landscape Characterisation** (HLC) is a key methodology in terms of understanding the historic character of an area through its time-depth. The principles of this method, particularly in terms of moving away from site-based or single-period focus, is relevant to how we assess multi-period transformations of quarry landscapes.

Significance of millstone landscapes can be assessed by assigning key values to the physical remains that project the meaning and importance of a quarry landscape and its components, contextualizing these values within key criteria of scale, importance, uniqueness and representativeness, and

[1] The European Landscape Convention defines landscape as "an area, as perceived by people, whose character is the result of action and interaction of natural and/or human factors". The Convention obliges signatory states to establish procedures for the participation of the general public, local and regional authorities and other interested parties in matters concerning landscape.

using the UNESCO concept of 'outstanding cultural landscapes' for assigning criteria of 'global significance' [21] of particular applicability to millstone landscapes.

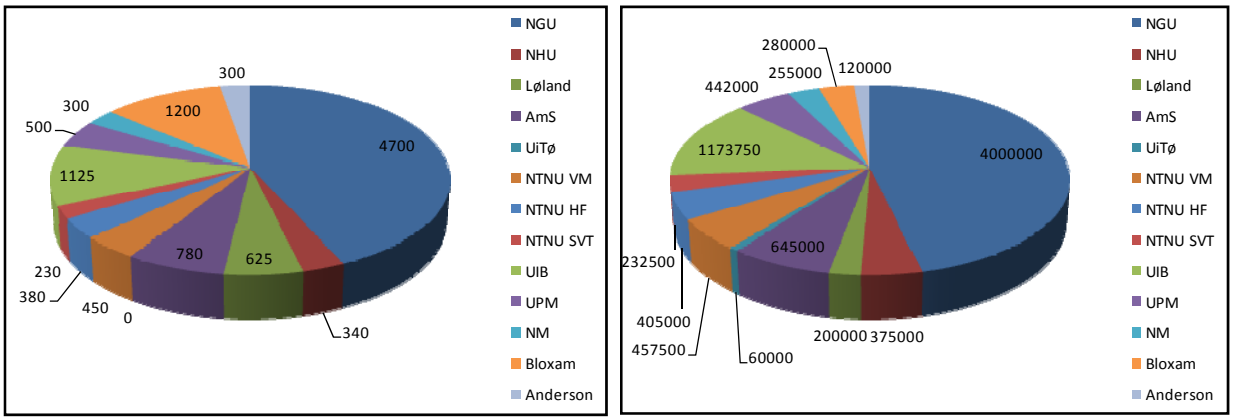
2.4. The project plan ►See application form for details

The three Work Packages involve small interdisciplinary teams, constituting also the thematic lines that lead to scientific publication from the project. From each activity, one or several reports will be published on the web to ensure open distribution of the data and to facilitate continuous monitoring of the achievements (see Table 2). For example, short reports will be published for each site survey. Plans for management, decision-making and dissemination (including deadlines for mandatory dissemination products – 'deliverables', and goals for scientific and popular publication) are described below. Most data collection in the project will take place during the first two years, thereafter focus will be on publication and mandatory dissemination products.

Table 2. Project plan covering research tasks (red), and management and communication (blue). Responsible institution is indicated for each task. R=web reports

		2009			2010				2011				2012
Work Plan	**Activity**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**
WP1	Quarry landscape surveys		NGU	R				R				R	
	Millstone craft studies		NHU/Løland								R		
	Archaeological case studies		NTNU/UiB					R					
WP2	Provenance methods	NGU		R									
	Artifact studies	NGU							R				
	Trade and distribution studies		UiB/NTNU						R				
	Stone quality/milling technology				NGU/NTNU				R				
	Early handmills		AmS								R		
WP3	Historic narratives	NTNU					R						
	Landscape values		NTNU									R	
	Significance of millstone landscapes	Bloxam							R				
Management and communication	Periodic reporting				R				R				R
	Board meetings												
	Project web		WEB										
	Workshops												
	International symposium												
	Field workshops												

2.5. Budget ►See application form for details



Distribution of efforts (hours) pr partner (left) and costs (right)

2.6. Project management, organisation and cooperation

The project is based on a group of project members *(partners)* that reflects its interdisciplinary approach (see table 3). The organisation takes advantage of interdisciplinarity through a cross-institutional *consortium, a steering committee* and a NGU-hosted *management team* (see below), and scientific quality in separate research fields through divided responsibility for the main activities. Important vehicles for communication and collaboration between the disciplines will be a series of field workshops, annual workshops, and a web-based discussion forum.

Hosting institution is NGU, which is responsible for provenance methods, characterization of the geological resources and general surveys of all quarry areas. NGU has good knowledge and professional infrastructure on GIS and databases, geochemistry and petrography, and LIDAR 3D scanner. NGU has a wide experience with millstone landscapes in Norway, and with quarry sites and quarry landscapes in general in Norway and abroad. NGU is coordinating an EU FP6 project: Quarry-Scapes: Conservation of ancient quarry landscapes in The Eastern Mediterranean [22], which ended in 2008 and will give important input to the millstone project.

The Consortium (main partners) [1] ►See application form for details:

1) NGU
2) The Norwegian University of Science and Technology (NTNU), Faculty of Arts (HF)
3) NTNU, Museum of Natural History and Archaeology (VM)
4) NTNU, Faculty of Social Sciences and Technology Management (SVT)
5) University of Bergen (UiB), Dept. of Archaeology, History, Cultural Studies and Religion
6) Archaeological Museum in Stavanger (AmS)
7) Norwegian Crafts Development, Maihaugen (NHU)
8) Université Pierre Mendès, Grenoble, France (UPMF)

Table 3. Project partners and area of knowledge/research relevant to the project. Associated partners in blue.

	Gurli Meyer, NGU	Tor Grenne, NGU	Tom Heldal, NGU	Øystein Jansen, UiB	Kalle Sognnes, NTNU-HF	Lisbeth Prøsch-Danielsen, AmS	Ingvild Øye, UiB	Tim Anderson, UPMF	Lars Stenvik, NTNU-VM	Bjørn Helberg, UiTø	Elizabeth Bloxam, UCL	Åsa Dahlin Hauken, AmS	Aud Mikkelsen Tretvik, NTNU-HF	Michael Jones, NTNU-SVT	Alain Belmont, UPMF	Hans-Jørgen Wallin Weihe, NHU	Lise Andersen, NM	Torbjørn Løland, consultant
Geology	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■
Archaeology					■	■	■	■	■	■	■	■	■					
History						■		■	■	■	■			■	■	■	■	
Landscape studies					■	■	■	■	■	■	■	■	■	■	■	■	■	
Ethnology														■	■	■	■	
Archaeometry	■	■	■	■		■				■								
Stone crafting techniques	■	■	■	■				■	■		■					■	■	■
Database, GIS	■	■	■															

The hosting institution and the partners collectively cover geology, archaeology and landscape archaeology, cultural history, industrial history, cultural landscape studies, landscape geography, historical geography, landscape values, craft techniques, archaeometry and ethnology. Three to five MSc students will be connected to the project. Parts of a PhD study (Irene Baug, UiB) on millstone distribution and trade networks will be coordinated with the project. Associated partners include Nordjyllands Historiske Museum (NM), Tromsø Museum (UiTø) and Torbjørn Løland (consultant on craft techniques).

Individual guest researchers: Dr. Elizabeth Bloxam (archaeologist, presently Institute of Archaeology, University College London – UCL) contributes with articulating values and significance of quarry landscapes, seen both from an international perspective and in the wider framework of historic and pre-historic stone and mineral production sites. Timothy Anderson (archaeologist, presently UPMF), contributes with his significant insight in millstone production technology, surveying methods and patterns of distribution and trade in a European perspective.

The international network includes outstanding researchers in millstone related fields with connections to the 'Moleriae - association européenne des villes meulières' (www.moleriae.eu), 'Meulières.eu - Atlas des carrières de meules de moulins en Europe' (millstones.eu – European millstone quarry database) (http://meuliere.ish-lyon.cnrs.fr/), LARHRA Rhône-Alpes Laboratory of Historical Research, and TIMS (The International Molinological Society). Central in connecting the international network to the project is a planned coordination with the international congress *Mill-*

[1] NTNU: Norwegian University of Science and Technology; UiB: University of Bergen; UiTø: University of Tromsø

stones; research, protection and value assessment of a European industrial heritage, which will be arranged together with the third project workshop in Bergen, 2011.

Norwegian networks include an established 'millstone communities' network supported by the Norwegian Association of Local and Regional Authorities (KS) and the Norwegian Directorate of Cultural Heritage, together with regional and central cultural heritage authorities. These will be included in the ongoing project work and will be invited to workshops.

Decision-making and consortium agreement: NGU will manage the project through a *management team* of three persons: Dr. Gurli B. Meyer (*project director* and coordinator of WP2), Prof. Tor Grenne (coordinator of WP1), and senior geologist/leader of NGU's Dimension stone team Tom Heldal (coordinator of WP3). The *steering committee* consists of the *project director* and one person appointed by each of the consortium institutions (NGU, NTNU, UiB, AmS, UPMF and NHU). The board will have regular meetings, first time by project kick-off and later during the annual workshops. Possible conflicts, withdrawal, questions of ownership to project data etc. will be managed according to a *consortium agreement*.

3. Perspectives and compliance with strategic documents

3.1. Compliance with strategic documents

NGU has a national responsibility for developing and maintaining databases for mineral resources in Norway. The Dimension Stone team at NGU is responsible for information about building- and utilitarian stone in Norway. Many of these deposits have historical values, and NGU is the institution that possesses the most comprehensive knowledge of historical and pre-historical stone quarries in Norway. Research on the extraction, use and characterization of stone are priorities in the team's research strategy. An institutional agreement between NGU and the Directorate for Cultural Heritage will incorporate future collaboration on quarry sites.

3.2. Relevance to society

Direct/short term application/use of results: The surveys will be openly and directly applicable for incorporation into cultural heritage registration systems such as Askeladden database. A number of new municipalities will be provided with background and knowledge for future development of the sites and for participation in relevant networks. The project will generate immediate research results that add new perspectives to understanding the history of our ancient stone-extracting industries.

Medium and long term use of results: The project will contribute significantly in putting millstone landscapes on the map and create a foundation for a professional environment around them. It will generate new ideas for management and articulation of values of millstone landscapes in particular, but also of other quarry landscapes and industrial landscapes in general. The project will provide valuable input for Norwegian participation in international networks and planning of world heritage sites on millstone production. New knowledge is also central to the wide audience represented by the many local history groups and other parts of 'the interested public'.

3.3. Environmental perspectives

The project has no potential ramifications for the external environment.

3.4. Ethical aspects

The project does not violate common ethical values. It does not involve experiments or personal data and will not harm humans, animals or nature. Sampling and excavations will involve museums and county archaeologist and will adapt to the Norwegian Cultural Heritage Act. The scientific work, data and results produced by individual partners are regulated according to the guidelines published by the National Committee for Ethical Research in Science and Technology (NENT)[1].

[1] Lov om behandling av etikk og redelighet i forskning @ http://www.lovdata.no

3.5. Gender equality and gender perspectives

The hosting institution, NGU, is consciously working towards gender equality, and the strategic plan for 2008-2012 seeks to motivate women to apply for and take responsibility in leading positions. The project director is female and has attended a course in leader motivation for women. The project management team is aware of the responsibility for gender equality and has worked toward equality when composing the group of scientific partners. The Norwegian partner institutions have similar assignments for gender equality, also in the recruitment of MSc and PhD students.

4. Communication with users and utilisation of results

4.1 Communication with users

Main user groups: Involved municipalities, regional and national cultural heritage authorities, museums, the 'interested public', 'millstone communities' in Norway and abroad. The project aims to be open and inclusive, and will act as a meeting place between national and international researchers, cultural heritage management and the local communities. Good communication with the local communities will be particularly emphasized, since these will be the future 'care-takers' of the sites. The most important meeting places for a broad communication will be the web site, field workshops and the annual workshops, but knowledge-sharing activities among the local communities will also be actively promoted in the project. A new network of 'millstone communities' supported by the Directorate of Cultural Heritage is an important channel of communication.

4.2. Dissemination plan

The dissemination plan (Table 4) aims at four main target groups:

- the scientific community (peer-reviewed journal publications, proceedings)
- cultural heritage authorities (professional journals, databases, reports)
- the general, interested public (atlas, web, popular science articles, public lectures)
- the 'millstone communities' (field workshops, web, web reports, atlas, public lectures)

Product	Targeted audience	Amount	Achievement by project end
DELIVERABLES			
Web site	S,H,G, L		10000 visits
Site reports, download on web	S,H,G, L	10	100%
Thematic reports, download on web	S,H,G	7	100%
Workshops	S,H,G	3	100%
Workshop proceedings (finished after project)	S, H	1	50%
Site databases	H	10	100%
Atlas of Norwegian millstone landscapes	S,H,G	1	50%
Craft training courses	H,G	3	100%
NFR progress reports	ADM	3	100%
OTHER DISSEMINATION			
Scientific peer-reviewed Journals	S	5	40%
Professional journals	H	5	50%
Popular science journals	G	5	50%
Forskning.no	S,H,G	3	100%
Public lectures	S,H,G, L	5	100%
Short courses, production techniques	H, G, L	4	100%
MSc thesis		3	100%

Table 4. Dissemination plan. Deliverables: mandatory dissemination and reporting products. Other dissemination: measurable goals for scientific and popular publication. S=scientific audience, H=heritage professionals and authorities, G=general audience, L=local communities

A key entrance to the project is a designated *web-site hosted by NGU*, which will be accessible within the first three months of the project. The site will be gradually built out with news, reports and maps/terrain models/displays of studied sites. *Site reports* (aimed at a broad audience) will be published on the web shortly after field work. Similarly, *thematic reports* about more general subjects will be published regularly on the web. Geographic *databases* from each investigated quarry

landscape are important in the management of the cultural heritage sites. Two of the annual workshops will be combined with consortium meetings; the third workshop will be combined with the international bi-annual conference *Millstones; research, protection and value assessment of a European industrial heritage. Proceedings* from that conference will be published in the aftermath of the project. The comprehensive data compiled by the end of the project will form the basis for a planned *Atlas of Norwegian millstone quarries*. Short courses on ancient millstone production techniques and dissemination strategies for schools and local communities will be carried out in four 'millstone communities' based on the experiences made in Hyllestad; Torbjørn Løland will be responsible for this dissemination activity.

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