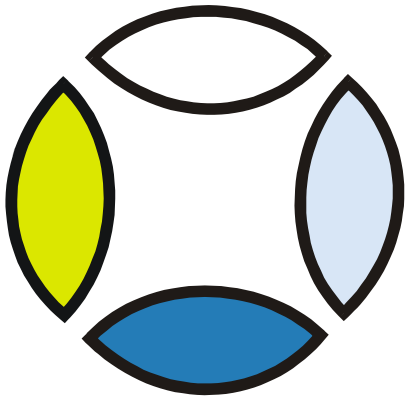
Runde Marine Station



A new marine research station at Runde, Norway

Prestudy on

project development, science networking and market

Report (abbreviated web-version) to

NORA

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Torshavn, Færøyane

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Prepared by the Runde Group

Runde/Ulsteinvik, Norway, 1st October, 2004

Preface

The island Runde on the west coast of Norway has for a long time attracted regular tourists as well as scientists interested in the natural environment on and around the island. On this background, discussions were initiated in the 1990's to establish a field station on the island that could provide services to the scientists as well as to other visitors and activities.

A local group of people (the Runde Group) occupied with this idea has worked informally on planning the station for several years. Then, in March 2003, an application for a pilot study was submitted to the Nordic Council NORA (North Atlantic Cooperation) programme with the aim to integrate Runde in a Nordic/West-Nordic network cooperation among other stations in this region with a similar scope.

The application was accepted in June 2003, with a tentative project time frame of 1 year. NORA underscored their interest to get the West-Nordic perspective considered. The municipality of Herøy to which Runde belongs, provided matching funding that otherwise was covered by the work of the project group itself.

The present report summarises the work performed during the project period, which according to the scope focussed on networking and science. Underway, other aspects and ideas came up that are touched upon in this report, but each will demand separate feasibility studies, to follow.

Ms Lis Hammer was our main contact person at NORA in Torshavn. Mr Sverre Mauritzen at the administration of Rogaland County provided valuable guidance in the process of preparing the NORA application. Ms Eirin Nyhus at the County of Møre og Romsdal was appointed as Norwegian project supervisor. Many others provided ideas and material to the project underway, and we give our special thanks in this respect to the ornitologists Alf O. Folkestad and Olav J. Runde and to those contributing presentations and written parts for the report; Johannes Post (HYDROMOD, Germany), Klaus Nygaard (Greenland Natural Institute), Morten Rash (Zackenberg, Greenland), Jan Sørensen (Kaldbak, Faroes) Hallor Halldorson (Sandgerdi, Iceland) of Stig Skreslett (Bodø College/Jan Mayen). Even Skoglund provided drafts for the station logo (see example on the 1st page).

Thanks are also due to all others involved in the project, especially those contributing to and participating at the project workshop held at Runde, 27-28 May 2004.

Runde/Ulsteinvik, 15 October, 2004

The Runde Group

NORA is organised under the Nordic Council of ministers

Føreord

Fugleøya Runde på Sunnmørskysten har lenge vore eit attraktivt reisemål både for ålminnelege turistar og for forskarar som er spesielt interesserte i naturmiljøet på og rundt øya. I lys av dette blei det på 1990-talet byrja diskusjonar om å etablere ein forskingsstasjon på øya som kan ivareta behova for tilreisande forskarar, og der også andre aktivitetar som kan støtte opp under reiseliv og næring vil kunne inkluderast.

Ei lokal initiativgruppe som har arbeidd uformelt med desse planene, søkte i mars 2003 det nordiske NORA (Nordisk Atlantsamarbeide) programmet om stønad til eit forprosjekt med fokus på å få Runde integrert i eit samarbeid med motsvarande stasjonar i vest-norden.

Søknaden blei innvilga av NORA i juni 2003, med ei tentativ tidsramme på 1 år. NORA ba i tilsegnsbrevet om å legge særskild vekt på det vest-nordiske perspektivet. Herøy kommune gjennom næringsfondet var velviljuge til prosjektet og bidrog med tilleggsstønad for å dekke inn deler av ein betydeleg lokal eigeninnsats som prosjektgruppa sjølv for øvrig stod for.

Foreliggande rapport oppsummerer resultata frå dette forprosjektet, som i tråd med søknaden har fokus på forsking og nettverk. Prosjektet har undervegs utvikla seg positivt også i fleire andre retningar som kvar vil innebere separate oppfølgjande vurderingar.

Kontaktperson hos NORA sekretariatet i Torshavn var Lis Hammer. Sverre Mauritzen i SAVOS-sekretariatet (norsk NORA kontakt) under Rogaland Fylkeskommune bidrog med råd og vink i søknadsprosessen, og Eirin Nyhus i Møre og Romsdal Fylkeskommune stod for oppfølgjinga av prosjektet frå norsk side. Mange ellers bidro med innspel og idear undervegs. Vi rettar i denne samanheng særskild takk til ornitologane Alf O. Folkestad og Olav J. Runde, og til deltakarane som bidrog med presentasjonar, diskusjonar og skriftlege innspel til rapporten; Johannes Post (HYDROMOD, Tyksland), Klaus Nygaard (Grønlands naturinstitutt), Morten Rash (Zackenberg, Grønland), Jan Sørensen (Kaldbak, Færøyane) Hallor Halldorson (Sandgerdi, Island) og Stig Skreslett (Bodø DH/Jan Mayen). Even Skoglund har laga fleire forslag til stasjonens logo (sjå døme på framsida).

Vi rettar til slutt takk til alle andre innvolverte, og særleg til dei mange som bidrog til og deltok på workshop på Runde 27-28 mai 2004.

Runde/Ulsteinvik, 15. oktober 2004

Prosjektgruppa

NORA er organisert
under
Nordisk Ministeråd

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For the full report, pls. contact: lars.golmen@niva.no.

Summary

The island Runde on the west coast of Norway is a well known tourist attraction, mainly for its bird rock with tens of thousands of sea birds. This bird rock is the southernmost in Norway, and by far the most readily accessible. The waters surrounding the island host a large variety of fish and other marine species on which the birds feed, and the flora on the island is unique in many respects.

Many scientists visit the island to observe the wildlife and this fostered plans some years ago to establish a marine field station on Runde to serve the visitors and also to co-ordinate or enhance other activities. A pilot pre-study was launched in 2003 to evaluate the market possibilities for a station, logistics requirements etc. The study was supported by the NORA secretariat of the Nordic Council of Ministers, with co-support from the Herøy Municipality, Møre og Romsdal County and the local group behind the plans who also co-ordinated the project and completed this report.

The study focussed on possibilities for extended co-operation among West-Nordic stations (mainly the Faroes, Iceland and Greenland) and Norway, i.e. Runde. Facts regarding marine field stations in these countries and elsewhere in northern Europe were analysed with the aim to suggest synergies with Runde and findings with a potential are presented in the report. As part of the project an international workshop was arranged at Runde in May, 2004, that included participation from Norway, Denmark, West-Nordic countries, Germany and Japan.

The project documents that Runde holds a great potential as a site for multi-disciplinary and international marine research including ornithology, oceanography, marine biology and botany. By establishing adequate modern facilities the station will become attractive both for Norwegian, Nordic and European scientists and other users. Some of the major findings are,

1. A field station at Runde will be very useful for science and monitoring covering the fields of marine physics, marine biology, ornithology and terrestrial botany, and the interrelations between these.
2. Runde is an optimum site for establishing environmental monitoring on a broad range of parameters and to build high-quality data and long time series which are becoming increasingly important in society.
3. The station should assist in bringing science to the public, and also to inform about the environment, culture and history of Runde and the surrounding region.
4. The station should host oil a national spill contingency facility with the purpose to wash contaminated sea birds collected around Runde and elsewhere on the coast.
5. It is recommended that the Runde station be connected to Norwegian, Nordic and European networks among field stations and marine research programmes.

The study further recommends that the station is established as an environmental centre with the four functions: environmental monitoring, environmental research, information and visitor centre, and oil spill contingency for contaminated sea birds.

The activities at the station will create spin-off to the regional industry and small businesses, including tourism. Additionally, the station can inspire to creative thinking and new business development in fisheries, aquaculture and maritime industries.

In order to bring the plans from the drawing board to reality it is recommended to establish a public limited enterprise through which required detailed design projects and financing can be run.

Samandrag

Fugleøya Runde ligg ytterst mot havet på Sunnmøre. Øya er kjent for fuglefjellet der det hekkar store koloniar av lundefugl, havsule, krykkje og andre sjøfuglartar. Dette er det sørligaste fuglefjellet i Norge. Øya er lett tilgjengelig samanlikna med andre fugleøyar lenger nord.

Runde ligg i eit svært produktivt havområde. Like ved øya finn ein viktige gytefelt for sild, torsk og mange andre viktige fiskeartar. Silda kjem inn frå Norskehavet og torsken kjem heilt frå Barentshavet for å gyte ved Runde.

Runde er interessant for forsking både på havmiljø, marin biologi, vegetasjon og planter og fugl men det har til no blitt lite forska i dette området. På dette grunnlaget har ei lokal gruppe teke initiativ for å legge tilhøva til rette for auka forskingsaktivitet på og ved Runde, ved å etablere fasilitetar som skal kunne brukast av forskarar og universitet i Norge og resten av Europa.

Initiativet har fått økonomisk støtte til forprosjekt frå Herøy Kommune, Nora og Møre og Romsdal Fylkeskommune. I forprosjektet har ein samla inn opplysningar om feltstasjonar i Noreg, Norden og Europa. Ein har gjennomført ein workshop med deltakarar frå Noreg, Færøyane, Danmark, Island, Grønland, Tyskland og Japan. Workshopen ga mykje informasjon og mange idear. Prosjektgruppa har og besøkt ein stasjon i Irland, diverse forskingsinstitusjonar, offentleg forvaltning og finansierings-institusjonar i Noreg.

Nokre av dei viktigaste konklusjonane frå forprosjektet er:

1. Ein feltstasjon på Runde vil vere nyttig for forsking på havmiljø, klimaendringar, marin biologi, fugleliv og botanikk.
2. Det vil bli lagt vekt på innsamling av miljøinformasjon for ei rad viktige parametrar, og høg kvalitet på data vil etter kvart sikre lange og gode tidsseriar som nå er svært etterspurt.
3. Formidling av forskingsresultat og informasjon om miljø, kultur og historie bør vere ein viktig funksjon for stasjonen.
4. Oljevernberedskap i form at etablering av stasjon for vasking av oljeskadd sjøfugl kan bli ein viktig funksjon for stasjonen.
5. Stasjonen må vere knytt opp mot norske, nordiske og internasjonale nettverk.

På basis av desse konklusjonane har ein kome fram til at stasjonen skal definerast som eit miljøsenter med fire funksjonar,

1. Miljøovervaking
2. Miljøforsking
3. Senter for miljøinformasjon
4. Beredskap for vask av oljeskadd fugl

Aktivitetane på stasjonen vil gje ringverknader i lokalt næringsliv, særleg innan reiseliv. Men også innafor næringar som fiskeri, fiskeoppdrett og maritim utstyrsproduksjon vil stasjonen kunne inspirere og påverke til næringsutvikling.

Rapporten konkluderer med at det er godt mogleg å få etablert ein marin feltstasjon på Runde og tilrår at det blir stifta eit aksjeselskap som skal stå for det vidare arbeidet med å realisere prosjektet.

1. Introduction

This chapter provides an overview of the background and the purpose of the prestudy. Additionally, some key facts about Runde and an introductory presentation of the plans for the research station are given.

1.1 About Runde

The island Runde (**Figure 1**) on the west coast of Norway (near Aalesund) has about 150 human inhabitants, along with myriad seabirds, of which about half-a-million nest in the cliffs on the western side. The flora and fauna and the beautiful scenery above and below the water attract several thousand visitors annually, of whom many are specialists in various fields of the natural sciences; others come for scuba-diving, and yet others merely as tourists.

The seas around Runde have a very rich marine flora and fauna, with species typical of both northern and southern Norway, as well as species found throughout Norwegian waters. This area therefore has the richest and most diversified coastal fishery in Norway, with the local community of Herøy being top in earnings from fishing. The reason for the marine variety and richness is a combination of topographic and climatic factors, in itself a basis for local studies and monitoring.

The Norwegian Current carrying warm salty water of North Atlantic origin has a marked influence, causing the highest winter temperatures to be found along the Norwegian coast. In addition, the Norwegian Coastal Current brings less saline nutrient-rich water which sustains the marine food chain. These conditions are very likely to change in the near future due to climate induced global change, which in turn will affect marine life and seabirds etc.

During the last few decades the island lost many jobs in farming and fisheries due to the restructuring of these industries nationally. The island population dropped from a peak of around 350 in 1955 to presently less than 150. Thanks to the bridge that was completed in 1982, there is now a larger regional labour market within commuteable distances, and this compensates for some of the lost jobs. Still, there is a high demand for new enployment opportunities on the island itself, and also in the Herøy municipality.

In 1994 ten fixed positions at the Runde pilot station suddenly were removed when the station was relocated to Aalesund, further inshore and away from the shipping lanes. In 2000 the lighthouse was fully automated, leaving 4 local attendants out of work. Another 3-4 fixed teaching positions were removed from the island when the primary school closed down in 2002. Altogether, about 15-20 long-established, state-paid positions were removed in the course of just a few years from 1994, with no attempt of any replacement or re-employment.

Oil and gas production are inexorably approaching Runde, and a gas terminal (Ormen Lange terminal, Aukra) is being established about 100 km to the north-east. This and the risks associated with the steadily increasing traffic of large oil carriers from north-west Russia for the European market represent a potential threat to the fauna of Runde. Locally, there is a growing need to serve visitors in a professional way, as well as to maintain a local oil spill contingency (dispersants, special facilities for washing contaminated seabirds etc.).

These are some of the factors behind the plans to establish a field station on the island, as described in the present report. From a local perspective, the most important purpose of the station is to generate

some new jobs, to create spin-off activities on the island and in the region, to stimulate creative thinking and help bringing additional optimism to the local community.

1.2 Project scope of work

The pilot study programme in 2004 as supported by NORA and co-sponsored by the Municipality of Herøy and the County of Møre og Romsdal held the following key items and elements:

- Project focus on Nordic/N. Atlantic contacts and partnership, and initiate project development,
- Evaluate Runde station and its role in a network, in special view of local/regional coastal monitoring and resources, and the prospects of marine research and development in general where Runde has the potential to place itself strategically both in a Norwegian, Nordic and N. Atlantic context,
- Prepare a preliminay draft cost estimate for on-site constructions, infrastructure and running costs,
- Prepare a preliminary overview over customers and incomes based on likely activities at the Station, according to different scenarios with associated risk assessments, including future alternative use of the infrastructure under a different scheme/philosophy, and
- Consolidate contacts with the Municipality of Herøy and the surrounding region, Møre og Romsdal County and relevant Norwegian state institutions.

Table 1 indicates the time frames for different on-going and planned activities. The symbol ▌ indicates a major milestone or report.

Table 1. Overview of the major activities within the prestudy and design period, 2004-2005.

	Activity	2004				2005				2006
		I	II	III	IV	I	II	III	IV	
0	Preparations, proposals, 1990-2003									
1	Prestudy, market, customers etc (this report)									
2	Establishing an organisation									
3	Market analysis, Business Plan									
4	Plan for Science and monitoring									
5	Plan for the bird washing station									
6	Plan for the visitor centre									
7	Other activity/business plans									
8	New proposals and funding applications									
9	Design study and detailed planning									
10	Building applications and approvals									
11	Financial structuring and consolidation									
12	Continued customer visits									
13	Local soliciting, consolidating (municipality)									
14	Site construction, ground work									
15	Begin constructions									
16	Construction period									

Present time: ▲

Figure 1. Aerial photo of Runde seen from the SW. The bird rock is in the forefront. Aalesund to the far left and Ulsteinvik to the right. Photo/© Harald Valderhaug.

All these items were covered in the present pilot-study and are described in this report. Due to time and resources constraints, it was not the intention to perform any in-depth analysis for every item. On the other hand, new issues, aproaches and possible activities at the Station emerged in the course of the project, which are described in this report as well. Design and economic analyses, market analysis and science planning will continue.

1.3 Some facts about Runde

Runde island is quite well known both nationally and internationally, mainly because of the bird rock but also for several historical reasons and as a landmark for fishermen and mariners. The pilot station on the island that was moved to Ålesund in 1994 had a 300 year long history. The Runde lighthouse was established in 1769 (the fourth oldest lighthouse in Norway). The discovery in 1972 of the treasure from the sailship "Akerendam" belonging to the Dutch East India Company that sank off Runde in 1725 brought a lot of new attention and visitors to the island. Table 2 summarizes some information about the island.

1.3.1 Getting there

Runde is relatively easily accessed. A bridge connects Runde to the national road grid (**Figure 2**) and the travel time to the nearest airport is just about one hour. Bergen and Trondheim may be reached overnight with the daily Coastal Steamer calling at Torvik, 15 minutes by car from Runde. Unless arriving by boat, Runde may be considered as an endpoint destination, with no through-traffic. Still, various travel routes and regional destinations may be combined going to or from the island.

Table 2. Some key facts about Runde.

Geographical location	West-Norway, 62° 20'N, 05° 35'E, 25 km SW of Aalesund. County of Møre og Romsdal, Municipality of Herøy,
Communication & accessibility	Bridges to the nearest islands. 15 min drive to Fosnavaag, adm. center of Herøy. 30 min drive to Ulsteinvik, 1.5 hr drive to Aalesund, 2 hrs to Aalesund airport, 15 min drive to catch the N or S-bound Coastal Steamer "Hurtigruta".
Population	Ca 150 - declining
Employment sectors	Fisheries, farming, tourism, shops, seaweed harvesting, pursuits school, diving centre, café.
Previous employment	Pilot station 1700-1995, Runde lighthouse 1769-2002, Runde primary school 1860-2002.
Tourism and attractions	Significant visiting by Nordic and European tourists and scientists
Education	The Christineborg Leirskole (outdoor pursuits school): primary school classes (age 12-15) from all over Norway come to stay for ca 1 week, learning about the wildlife, flora, fisheries etc.
Accomodation	Runde Camping og Vandrerheim: http://www.runde.no Goksøyr Camping: http://noreg.as/telt/info/1532 Diverse private accomodation (bed and breakfast)
Boat trips	Several daily trips around the island from Runde harbour, also from Aalesund, Fosnavaag and Ulsteinvik
Diving	Runde Diving Centre: www.runde-dykkesenter.com
Bird life	Southernmost bird cliff in Norway, ca 0.5 mill seabirds. 70 different nesting species, 240 species observed. See more on: http://www.runde.no
The sunken Dutch S/S "Akerendam"	Sailship bound for Indonesia that sank off Runde in March, 1725 with 300 men, all perished. Remains accidently discovered in 1972 by sports divers. 500 kg in silver and 20 kg in gold coins plus other treasures were recovered. www.aegir.no/akerendam.htm
Terrestrial flora	Very rich and diversified flora, with several rare species.
Marine life	Exceptionally rich and diverse biodiversity. 160 pelagic fish species registered. Rich fisheries year-round. High abundance of algae and seaweeds.

1.3.2 Tourism at Runde

Tourism at Runde has a fifty year or longer history. In the beginning there was little or no local support or infrastructure for the visitors, but during 1960-1970 several small businesses and services were established. Today Runde can offer a variety of services such as

- Camping,
- Bead-and Breakfast type accommodation (vandrarheim),
- Motel and private accommodation,
- Café,
- Scuba diving centre,
- Regular boat trips to the bird cliff and seal colonies etc,
- Sports fishing, and
- Overnight stay at the old Runde lighthouse.

The number of tourists increased steadily from 1960 to 2000 when around 100,000 people visited annually. Since 2000 the number seems to have declined somewhat for various reasons including the international situation. For 2004 the estimated number of visitors were ca 80,000.

These significant figures imply a great potential for further exploitation by offering more services and products - only a fraction is so far exploited commercially. And additionally, the number of visitors may probably be increased significantly in a controlled manner e.g. by expanding the visiting season and without increasing the ecological footprint and environmental stress on the island.

1.4 The Runde Station- main goals and activities

It may be fruitful to start the study by describing the main goals for the Station. This presentation will be quite fragmented with parts possibly not compatible with each other, being out of scope or outdated by the time of the completion of the Station. The Runde Group already learned that things are changing as the process moves forward, with a tendency that the number of new items and ideas are exceeding the number of items rejected or abandoned for one reason or the other.

The **main goals** can be itemised as follows,

1. Perform and and administer long term monitoring of the surrounding environment,
2. Provide facilities for visiting scientists,
3. Contribute to new developments with local industries, culture and tourism,
4. Inform and educate the public and local industry about the marine environment, and
5. Raise the public awareness about the linkages between man and the environment in general.

Figure 2. Map of Runde and the area nearby.

Additional explanation about the purposes and goals/subgoals:

- The Runde Group envisages the Station to become a regional and national focal point and an integral part of environmental monitoring in Norway
- From the environmental side, Runde is a key site for investigations, and the Station will on this fact attract visitors also from Europe and overseas
- The Station shall be integrated in Norwegian, Nordic and European networks
- The Station will particularly be a Norwegian point-of-contact for similar stations in West-Norden
- The Station will provide permanent positions for a certain number of staff, and in this way provide new employment opportunities to Runde and Herøy
- The Station will create local spin-off with mutual benefit for jobs, services and business
- Most employed staff will be recidents of Runde
- Additionally, the Station will provide temporary employment for local residents as well as visitors from West-Norden and elsewhere
- The Station will gradually expand on its activities, also to include spin-off and businesses not directly related to the original scope
- The Station will attract people from the region with higher education that historically did not find employment opportunities there
- The Station shall be modern with sophisicated equipment for sampling and laboratory work
- The Station will be a landmark site for promotion of sustainable use of energy and resources and pollution abatement
- The Station will secure that the environmental footprint left on Runde by the increasing number of tourists will be kept at a safe and sustainable level
- The public part of the Station will have its own internet site on which information will be disseminated
- The Station will become a national/Nordic centre for handling and curing oil-polluted birds
- The Station will become an attractive site for companies and organisations, public/private/ to arrange special seminars, workshops etc.
- The Station set the local/regional agenda by arranging topically dedicated conferences or seminars
- The Station will become attractive for schoolchildren as well, by offering them free membership and subscriptions of newsletters and reports, and let them view on the internet the recovery of birds they may have 'adopted'

The station should have a permanent staff (seasonally dependent). The infrastructure for the marine and scienctific activities should among else include offices for visitors, wet/dry labs, a vessel suitable for observations, an ROV for surveys, and equipment for sampling and diving. Scientific users of the station are initially thought to be from regional and national agencies and universities in Norway, but certainly there is a much bigger market when considering the Nordic countries and the EU.

It is anticipated that the station may serve other purposes than mere research and environmental monitoring, thus attracting other types of users/visitors. This in turn will imply additional requirements for equipment and buildings.

1.5 Global setting

There are numerous reports and speach notes referring to protocols on the protection and monitoring of the marine environment (see the reference list for a limited extract). Underlying documents are voluminous, covering topics such as safe food, health of the ocean, sustainable fisheries, species and habitat protection, pollution control and abatement, and climate changes.

Additionally, many organisations are harvesting the market for informing and educating the public about the ocean and coastal habitats, marine protection etc.

The local Agenda 21 following the 1992 Rio Summit, was aimed at bringing the global issues down to the local level, to establish local actions towards a sustainable future. Many constructive follow-up activities materialized during the 1990's, both on the local and national level (in Norway and elsewhere).

It may seem, however, that the focus on environmental and climate issues has somewhat declined during he last couple of years. Other issues have enterred the arena of policy and public attention (in Norway) such as economy, IT, cultural and social development and welfare, age pensions and fight against terrorism.

On the other hand, several crucial elements actually affecting the mere survial of the modern society are now gradually brought onto the attention of the policy makers and public stakeholders.

Global population growth

- Increasing, expecting to reach 8+ Billions within 2010. Lot of attention paid to this issue 20-40 years ago, but not in recent decades, partly for "politcial" reasons
- Associated food scarcity to be expected, if no counteractions

Climate change

- Global CO_2 emissions will increase by 60% by 2020
- Temperature increase of 2-3 ^{o}C within next 50-100 years.
- CO_2 increase in atmosphere to double within 100 years.
- pH in ocean waters to decrase by 0.2 - 0.4 next 100 years- possibly with huge marine biological consequences

Powerty and ethnic/religious conflicts

- Muslim terrorism to discourage globalisation, and encourage local food production, including fisheries
- Powerty is a global issue, seemingly eternal and permanent in some regions
- Powerty still is a relative quantity, but not necessarily increasing globally
- Food supply expected to rely even more on marine harvesting

Declining reserves of petroleum

- Ever increasing energy demand, + 1-2 %/yr globally, + 60% by 2020

Petroleum production declinging

- Supply shortage, production per capita peaked in 1978 at 2.3 liters/person/day
- Global production will be declining from ca 2005

Species and habitat loss

- As the human influence expands, habitats are constantly under pressure

These different topics are all considered and monitored by international bodies. The list of counteracting mechanisms, however, seems to get shorter and shorter as time progresses.

The Runde Group hopes that by the present incentive to bring attention to those issues also on the agenda locally.

1.6 Science and society

The coastal communities in West-Norway are all part of the West-Nordic region which also includes Greenland, Iceland and the Faroes. The communities are founded on harvesting the ocean with associated maritime industries and activities. All are relying on a clean and predictable ocean rendering marketable products to customers. This poses increasing demands on producers and vendors about the status and the sustainability of harvesting and production.

The Runde Station will serve the purpose to monitor the coastal waters and the life forms that it nourishes, and thus provide data and information to the regional environmental status, and background information for ecological management as well as fisheries.

Over the last couple of decades, the bulk of scientsists in ocean disciplines as well as other fields have gradually turned away from field work and sampling in the real environment to the "virtual" environment created by simulations with numerical models that mimic nature more or less exactly. The ecosystem models are commonly based on equations that mirrors and replicates real observations or data, but not necessarily providing the understanding of the actual underlying physical, chemical or biological processes and interaction.

The tide seems recently to have turned in favour of more field-orientated research, partly to get new data for model validation/calibration, but also to give the scientists at least a minimum census of the environment they are studying. Furthermore, there is more appreciation also among funding agencies of the value of long time series of natural phenomena.

Figure 3. Runde, not only steep cliffs. Photo shows intertidal flats on the east side of the island. Photo: L. G. Golmen (2004).

Public managers and bureaucrats as well seem to rest their evaluations and decisions mostly on their own imagination of the environment they are set to control, displaced from the real nature. These groups of people will also need a regular update and correction of their imagination in order to provide sound policy guidance and government. And they will probably be grateful for being offered such opportunities.

Such change in education or science policy will definitely demand increased field-orientated support and services, not only for specialists and scientists but also for public officers, school teachers and even politicians.

1.7 Factors in favour of the Runde Station

The vision for the Runde Station is founded on the likely assumption of sustainability by the optimal mixture of the following assets (see also later chapters):

- Ideal siting in terms of a clean environment with a richness in ecology,
- Modern, state-of-the-art infrastructure, information communications and equipment,
- Good accessibility for visitors,
- A certain baseline history of field observations and time series,
- Locally based founders and local/regional sponsorship,
- A Nordic and international network of collaborative scientists and stations,
- A plurality of work activities, not only science to ascertain economic soundness,
- Local and regional backing, enthusiasm and sponsorship,
- Backing from maritime industry,
- National and Nordic/EU backing,
- Professional management, and
- Dynamic business planning to enable rapid restructuring and adjustment to new realities and possibilities.

In light of the above, the activities at the Runde Station cannot be only locally based, but must also be spun into a wider context of international cooperation on ocean environmental science and monitoring, plus additional, non-scientific activites. For the science part, the Station will provide not only the minimum necessary facilties for visitors, but state-of-the art, adequate infrastructure to attract the new generation of scientists that are born into the information society with all its facets of rapid communication and information exchange, computer models, sophisticated equipment for sampling and monitoring and laboratory analyses.

The vision for the Runde Station is built to consider also the previous aspects and sociological trends. The Runde Group still realises that some existing marine stations are presently suffering from a lack of funding and some have even closed down or are running on a low-effort budget. The latter may be a result a previously declining interest in field research as mentioned above, with a certain inertia or phase lag causing impacts to be felt only now. Those stations suffering may have been estblished based on time-limited funding from a certain programme or project, left on their own to survive on other activities afterwards. Other statons may have been established merely for teaching purposes, not for their unique siting or ecology, but commonly located near the institutions, close to the cities where these are situated. This may imply “suburbal” type surroundings, polluted water and declining/impacted biota rendering these stations less interesting for observations and monitoring.

On the contrary, other stations are running steadily or are experiencing an upswing, partly through restructuring their strategy and business plan and adjusting to new market opportunities.

1.8 Research and monitoring around Runde

Runde belongs to the geographical region (County) Møre og Romsdal which is described as the industrial SME region of Norway, with pluralism, adaptability and innovation as central factors behind a century of industrial experience and success.

Key industries are fisheries, shipping incl. offshore, fish processing, ship building, maritime gear and equipment and furniture. Next in importance is tourism that presently is experiencing a significant growth, various consulting activities and transportation (road/sea). State and municipal employment is significant as elsewhere in Norway but is below the country average.

In terms of R&D (research and development) Møre og Romsdal used to be an outpost, until the 1970's when district colleges were established in Molde (business, transportation/logistics, IT), Volda (language, humanoria) and Aalesund (nautical and technological maritime fields, aquaculture). Some elements of environmental sciences may be dealt with e.g. at Møre Research AS in Aalesund, but to a limited extent, mainly for the purpose of fisheries and acuaculture research. The region is undersupplied in terms of higher educational institutions (**Figure 4**), relying on the main universities, especially those in Trondheim and Bergen. The region is below the country average for the percentage of higher education among the population.

The links to Trondheim (Technical College of Norway and University of Trondheim) are by tradition very strong, especialy due to the teaching of technical engineering curricula there, where the craftsmen from the district quickly could pick up new technologies to implement in the local industry. In this way, there was no tradition to build up local teaching expertise or research in other related fields, such as in environmental engineering, renewable energies and environmental protection which are particularly relevant for Runde.

1.8.1 Monitoring programmes

The Norwegian coastal monitoring programme was initiated in 1990, triggered by the toxic algal blooms in the late 1980'ies and the following efforts to reduce nutrients' emissions from Norway and the other countries bordering the North Sea. The programme is lead by the Norwegian Institute for Water Research (NIVA) with assistance from the Institute of Marine Research (IMR). Funding comes from SFT (the State Pollution Control Authority). A number of loctations (stations) along the coast from the Swedish border to the Sognefjord are visited repeatedly to monitor the marine flora and fauna (algae, hard bottom, soft bottom etc) by sophisticated methods. So far there is no such monitoring north of the Sognefjord. There are on-going discussions to extend the programme northwards along the coast, and if this happens, Runde might be a key candidate as a permanent site. The programme has revealed serious changes in the flora/fauna, such as the denuded hard bottom along the Skagerrak coast. The observations are summarized in annual reports.

Monitoring of sediment contamination is performed in the JAMP (Joint Monitoring and Assessment) programme within OSPAR. NIVA is responsible for the annual sampling and reporting. The sampling sites are harbours and fjords with documented problems from municipal or industrial effluents and parameters include toxic heavy metals and organometal constitutents. Several locations are sampled in Møre og Romsdal, including ship yards in the Runde region. Funding is mainly from SFT, with some contribution from the industry.

The Institute of Marine Research (IMR) monitors seawater temperature, salinity and oxygen at selected locatons along the coast. This important programme started ca 1930 and includes sampling every 2 weeks. The nearest stations to Runde are Bud ca 100 km northwards and the mouth of the Sognefjord, ca 200 km southwards. Usually data becomes available 1-2 months after sampling and quality control. IMR also samples some fjords in Møre og Romsdal during the fishery cruises every autumn (typically during October-November). Data include hydrography and oxygen in the semi-enclosed deep water basins of the fjords. The nearest fjords to Runde are the Vanylvsfjord and Ørstafjord and data availability is usually after a few months, or upon request. IMR aditionally runs the 'Svinøy section', a hydrographic section from Svinøy ca 300 km into the Norwegian sea across the inflowing Norwegian Atlantic Current. The sampling frequency is once every 3 months, and results are presented in the annual reports from IMR. This section has since 1995 been covered also by

current measurements by the Geophysical Institute at U o Bergen, with data available usually a few months after recovering of the moorings. IMR also surveys the major fish species along the coast, with sampling around Runde usually every year for cod, herring etc. and measures temperature and salinity along the coast from 2 vessels in the Hurtigruta fleet.

Monitoring of toxic algae are performed for a selected number of stations along the Norwegian coast, including the Breisund near Aalesund. This monitoring is primarely for the shellfish and fish farming industry, but weekly shellfish warnings are also posted on the web and in newspapers as a public service. This programme is run jointly by NIVA, IMR and OCEANOR with sponsorship from the State food control authority.

Additional sampling in the marine environment is done in connection with monitoring of fish farms, typically by the MOM procedures. This monitoring is paid for by the fish farm owners and is under the auspicies of the County environmental administration (County Sheriff). Several private small companies and the College in Aalesund (or Møre Research) perform such monitoring. The results are usually not easily accessible as they are considered a property of the fish farm. This monitoring is also of limited value for background data as the sites usually are either at or close to the farms. These investigations, however, may hold the potential for building more systematic inventories etc provided they are standardized and performed regularly.

The larger towns in Møre og Romsdal are subject to monitoring of the recipients for municipal outfalls, typically once every 5 years, coordinated by the County environmental administration. Such monitoring may be accompanied by special investigations in connection with technicalities of the outfalls, and are typically performed by NIVA or larger consulting companies like Veritas or OCEANOR. The results are available (published) usually 1-2 years after sampling. Similar sampling is performed sporadically for other outfalls and towns but this is usually under strict budgetary constraints so do not provide any data of general value.

Some conclusions may be derived from these facts:

- The marine nature environment in the whole of Norway is not monitored adequately,
- The region around Runde is only sparsely monitored, with little or no data available in real time or on a timely basis,
- Monitoring is mainly near population centra and mosty for pollution reasons,
- Present monitoring does not cover the full demands for basic climate, water quality, species and habitat monitoring,
- Present monitoring is usually not nature or science driven, and is controlled by personnel and budget limitations, and
- Personal restrictions imply limited travel, with “1 day excursions” to sampling sites as guiding - no overnight travel.

1.9 County and local environmental management

On a county level, the County Sheriff (Fylkesmannen) in Molde has its division for Environmental protection, acting regionally on behalf of the Ministry of Environment in Oslo. This division also coordinates the environmental and wildlife monitoring on county level, including the surveillance of the birdlife at Runde. After the Rio Summit meeting in 1992, the Government provided funding for

every municipality in Norway to appoint their own officer (miljøvernleiar) specially devoted to local environmental issues, with enforcement of national legislation and regulation and Agenda 21 (Rio follow-up) as important work tasks. Around Y2000 the Government cut their funding support for these positions, leaving it up to the municipalities to decide wether they would continue to support these positions from internal budgets. This resulted in many municipalities abandoning these particularly devoted officers, or incorporating their activities with other positions, commonly municipal engineering. Herøy municipality presently has the latter form of arrangement.

1.10 A future Møre og Romsdal University

There are plans to establish a new university in Møre og Romsdal, basically to be founded on the existing three district colleges in Aalesund, Volda and Molde. Norway presently has four universities; Oslo, Bergen, Trondheim and Tromsø, with the affiliate university classes UNIS at Longyearbyen, Svalbard. Recently, Stavanger succeeded getting the fifth university, to be established shortly. For Møre og Romsdal, the prospects are presently (Aug. 2004) unclear, as discussions among the Colleges did not lead to any consensus so far. At any rate, there is a certain minimum teaching capacity that needs to be established, including four different curricula at the PhD level.

The Runde Station could become an important infrastucture element in a future university especially if decisions are made to expand on teaching in the natural and evironmental sciences. Discussions about co-operation with the district college in Aalesund were made as part of the present study (January 2004). This college is founded an the marine and maritime activities in the region and gives bachelor degrees in marine biology and industrial seafood processing. Other fields are seafarming and marine biotechnology. The plans for Runde will be coordinated both with the Aalesund college and with the process to establish the regional university.

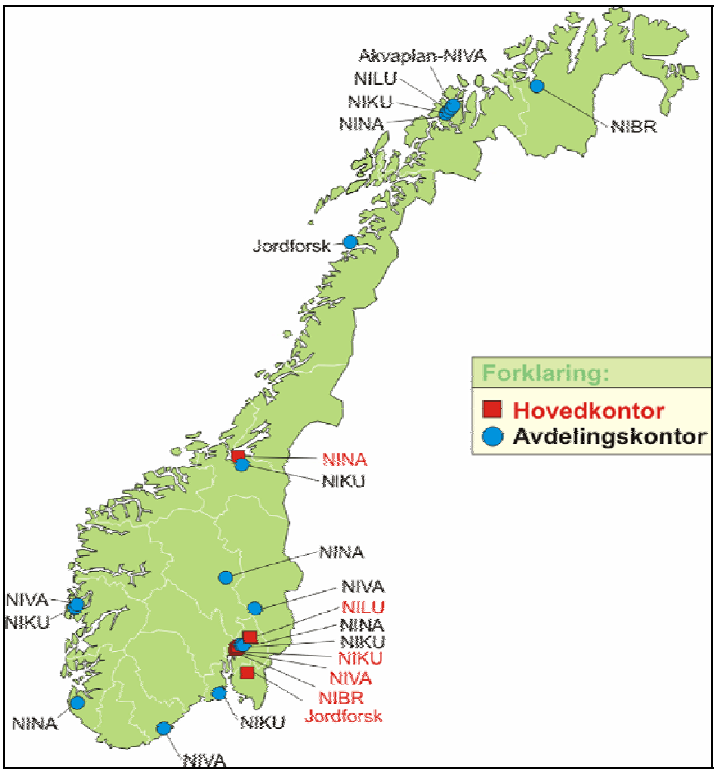

Figure 4. Map showing location of the major environmental research institutions in Norway. The location of other academic institutions follows the same pattern, i.e. sparse density in NW Norway.

2. Project proposal and activities

2.1 Project proposal

A local group had been discussing the idea of a marine field station at Runde for several years. In order to get a prestudy started, an application was submitted to the Nordic Council's NORA (North Atlantic Cooperation) secretariat. The purpose of the proposed study was to prepare a description of the planned Station and analysing the possibilities to build network co-operation with existing stations in West-Norden.

The application to NORA was submitted in March, 2003 and approved in June 2003, with a tentative project time frame of 1 year. The municipality of Herøy to which Runde belongs, and the county of Møre og Romsdal subsequently provided matching funding that otherwise was covered by the work of the project group (Runde Group) itself.

2.1.1 NORA

NORA- Nordic Atlantic co-operation - provided the base funding for the present project. NORA is a regional collaborative initiative financed by the Nordic Council. The region of interest encompasses the Faroes, Iceland, Greenland and West Norway. The secretariat is located in Torshavn, Faroes. NORA supports regional studies to promote cooperation and development wirthin the region, by funding pilot studies, workshops etc. See. www.nora.fo.

2.2 Project activities

A list of major activities and work items trough the project period is given below. Activities included several meetings with potential sponsors, stake holders and users as well as with public and political persons/bodies. The overview describes briefly the outcome of some of the meetings. Full meeting reports were made from most meetings, and those are available upon request.

An important element of the project was the productive international workshop held at Runde in May 2004 to develop the plans further. The discussions and conlusions from this workshop constituted an important input to the present project report.

2.2.1 Meetings

Internal meetings
The group of people (Runde group) involved in the Runde initiative have held 6 internal planning meetings during the project.

Meetings with local and regional administration
The Møre and Romsdal Regional County administration was asked to supervise the project on behalf of NORA. Four meetings were held with representatives from the county when the Runde project has been discussed both with politicians and with the administration.

Three meetings were held with the Herøy Municipality administration. The goals of these meetings have been to inform the administration about our plans and to discuss how Herøy can contribute to the process of establishing the Runde Station, and to discuss the planning of the building site.

The Runde Group also had one informal meeting with leading politicians in Herøy, and two meetings with the The Nature Conservation officer in Ulstein Municipal administration. Ulstein is the neighbour community of Herøy.

The majors and chief executives of the six municipalities (communes) near Runde/Herøy have established a regional board (Regionråd) in order to promote cooperation between these communities. The Runde Group gave an introduction to the board in March 2004.

Meetings with the Runde community
A briefing meeting was arranged in March 2004, to inform the residents of Runde about the plans for the station at Runde. The plans were all positively received.

Local land-owners were informed individually and through discussions with their association.

Meetings with Universities, Colleges and Research Institutes
There was one meeting with the Aalesund University College. An informal agreement with this college was made about cooperation and with an agreement that The Runde Station should be linked to this college.

One meeting was with representatives from the University in Trondheim (NTNU). During the meeting it was discussed how to cooperate, especially in the fields of biology on seabirds and terrestrial studies of vegetation.

Representatives from The Norwegian Institute for Nature Research (NINA, www.nina.no) were in one meeting especially concerning sea-brid monioring but also about other wildlife. This Institute is responsible for the annual monitoring of seabirds in Norway.

Nils Roar Hareide visited the Sherkin Marine Station in Irleland in September, 2004 (see report in Chapter 3).

Dr Olav Johannessen Runde, keeper at The Museum of Stavanger met at Runde to discuss the plans. He have volunteered to compile scientific literature on Runde and the surrounding area, and to establish a database on this.

One meeting was with the Norwegian Meteorological Institute. The main subject of the meeting was to discuss establishing a local meteorology station at Runde in cooperation with the institute. Such discussions have continued.

Lars G. Golmen met with representatives for the University of Hawaii, PICHTR (Pacific International Center for High Technology Research) the Japanese institute RITE (Research Institute for the Innovative Technologies of the Earth), MIH (Mitsubishi Heavy Industries) and other Japanese entities in Tokyo on 6-7 October 2004. The plans for the station were presented and discussed with emphasis on opportunities renewable energy research and fiheries/aquaculture (new species/concepts).

The plans have been discussed informally with representatives from all major universities in Norway and with other institutions and companies like the Institute for Marine Research in Bergen, Aanderaa Instruments and NORTEK, producers of maritime equipment.

Meetings with Norwegian Government bodies
The Runde Group had one meeting with Directorate of Nature conservation in Trondheim, and one meeting with the Research Council of Norway in Oslo.

Financial Institutions
One meeting has been held with "Inovasjon Norge" in Aalesund. Contacts have also been made with the local bank in Herøy.

2 meetings were held with an autorized accountant to discuss the funding and financial mechanisms, company structure, possibilities and liabilities etc.

Meetings with stakeholders and potential customers/users will continue throughout 2004, along with meetings and discussions directly related to the technical and financial aspects of the establishment of the station.

2.2.2 Dissemination

A press release was issued prior to the workshop.

Several articles appeared in the regional newspapers about the workshop. Also, the plans were described prior to this.

An article about the station plans was printed in the European issue, July 2004, of the Challenger Wave (British Challenger Society - Golmen and Skreslet (2004)).

Several Powerpoint presentations and notes have been produced for meetings etc.

The present report constitutes a summary of the main findings and activities during July 2003 and 2004.

2.2.3 Other activities and products

Workshop
An international workshop was held on Runde 27th to 28th May 2004. (See section 6).The workshop was very successful and has been an important tool in network building, developing the idea and spreading information on the project.

Science Plan for Runde
A science plan for Runde is in preparation. Several institutions and persons have been asked for contributions. The plan is briefly descrtibed in this report.

Business Plan
A business plan has been drafted, and will be developled further. Pieces of the plan are found inserted in this report.

Logo for the station
Work is ongoing to create a logo for the station and the holding company. Mr Even Skoglund has provided several drafts, among which we chose one for this report (front page). Mr Skoglund has previously designed logos for several municialities and counties, based on generic techniques and heraldic symbolism.

3. Marine stations in Norway and nortern Europe

It is expected that the Runde Station will enter a certain existing "market" in Norway (possibly Norden) for traditional services related to environmental monitoring and teaching etc. Although it is expected that this market will grow significantly in the future, some competition or overlap with other stations is likely to occur. The Runde Station will be founded on the favourable conditions at and around the island, which to some degree are site specific or are common to the local region only, so overlap or duplication with other stations can be minimized. It will be a central element in the planning to follow to minimize overlap, and simultaneously, to build partnerships and networks with other stations for sharing of infrastructure, data and research funding.

3.1 Stations in Norway

The University of Oslo has its Station for Marine Biology at **Drøbak** in the Oslo fjord (**Figure 5**). It has a fixed staff of 1-2, performs a certain form of monitoring, and teaching for university students and colleges. It is also open to the public.

Figure 5. The biological station at Drøbak near Oslo.

The university of Bergen had two major marine field stations in the vicinity of Bergen, at Herdla and Espegrend. Herdla was completely closed down around 1980. **Espegrend** at the Fanafjord near Bergen had it's activities greatly reduced when the Institute for fisheries and marine biology were relocated from Espegrend to the High Tech Centre (HIB) in Bergen in 1994. At Espegrend, there are now only some facilities left for mesocosm experiments, storage of equipment, and some labs for sporadic use. No regular monitoring is performed.

The University of Trondheim has the **Biological Station of Trondheim** at Brattøra, close to the city (**Figure 6**). It was established in 1900. The Station has a 45' vessel, R/V "Harry Borthen" for sampling and measurements particularly in the Trondheimsfjord. This station obtained status as a Large Scale Facility for a period in the 1990's and went through significant upgrading. The Station is an integrated part of the biological institute at the university (NTNU). The university in Trondheim also has a field station at Sletvik in Agdenes where some university courses are tought, with up to 45 students plus teachers.

The University of Tromsø has a station at **Kårvika** on Ringvassøy which is mostly used for for aquaculture purposes.

The University classes of Svalbard/Svalbard University **UNIS** conducts pure field research, process studies and teaching in the fjords around the archipelago. The activities are covering many aspects of marine field science, with the common baseline of an high-Arctic, cold environment.

Figure 6. The biological station in Trondheim. The building is from 1990.

The Institute of Marine Research in Bergen has a station for aquaculture research at **Austevoll** (100 km S of Bergen) and the coast centre **Flødevigen** near Arendal on the south coast (**Figure 7**). Austevoll performs misc. research on aquaculture and also does some monitoring for own purposes mainly. The Institute of Marine Research Flødevigen performs significant environmental monitoring and marine research, mainly in the local region and in the Skagerrak. Flødevigen was founded in 1882, and it is one of the oldest marine research institutions in the country, and in Europe. The station has been active in a wide range of marine research topics, and in particular, has played a leading role in aquaculture and releases of juvenile marine fish to the sea. Research at Flødevigen concentrates on topics concerning the plant and animal resources of the coastal zone. The station has presently a staff of 27 people, most of them are scientists.

Figure 7. The Research station at Flødevigen near Arendal in southern Norway.

The Norwegian institute for water research, NIVA, has its **Solbergstrand** station near Drøbak in the Oslo fjord. It is mostly devoted to project based experimenting on pollution impacts/effects and aquaculture, and has a fixed staff of 2-3. NIVA itself performs significant monitoring and research connected to the coastal zone and has a staff of marine scientists and engineers of about 75.

Other stations:
Sogndal District College has an aquaculture station in the fjord nearby.

At Averøya in Møre og Romsdal there is another aquaculture station owned by the Agricultural college at Ås, near Oslo.

In Kabelvåg, Lofoten, Coastcare is a fairly new institution owned by both local private companies and public institutions that helps to bring together people of different background and intentions within the maritime sector in the region. See: http://www.coastcare.no.

In Måløy, Sogn og Fjordane county, plans exist to establish a centre for fish farming (Nasjonalt havbrukssenter). A pilot study started in 2003, with a 250.000 NOK funding from the Directorate of Fisheries. The infrastructure (new building in Måløy) will have an estimated cost of 80 Mill NOK.

At Rørvik in Vikna, Nord Trøndelag county, the "Norveg" centre was officially opened by Harald, the king of Norway in June, 2004. This is a centre for coastal culture and development, with a museum display as a central element. The centre is a regional "tusenårssted" reflecting the millennial scale cultural heritage. The cost of the centre was 60 Mill NOK, funded by private and public bodies.

Additionally, there are other smaller, long-existing stations (e.g. Svanhovd and Alta in Finnmark) that are established for specific purposes and may not be permanently manned and that are not oceanographic or "marine".

A new station is planned to be established at Jan Mayen. Plans for this were presented at the Runde workshop in May, 2004, and an extract of the plans is presented in the Annex.

3.1.1 Science centra

Science centra in Norway are a different type of institutions that so far are established in a few locations mainly in the largest cities. These are aimed at informing the public about natural science in general. The prime reason for establishing these centra is the decline in interest in natural sciences among the younger population- resulting in reduced numbers of studens at colleges and universities within engineering, mathematics and other "hard" curriucla. In fact, most marine science diciplines face the same decline in interest, in favour of more popular, less fact-oriented and more individually oriented careers (typicaly media, music, entertainment, travel etc).

These centra are mainy based on permanent funding from the Norw. Res. Council. They have their own web site: www.vitensenter.no.

There is yet no such centre established in Møre og Romsdal. The Runde Station will include several items and activities that are relevant for science centra and may thus qualify to become one in the future.

3.1.2 Other marine research infrastructure in Norway

Norway is equipped with a number of seagoing research vessels, of which most are run by the Institute of Marine Research in Bergen. Flødevigen and the Biological Station in Trondheim have their own medium-sized vessels. the University of Tromsø has one big vessel and some smaller. The Univeristy of Oslo owns the R/V "Trygve Braarud" mainly for inshore sampling.

The coast directorate and the coast guard also as ha significant fleet of vessels, that on occasions can be rented for scientific purposes. The navy have their own research vessels.

3.2 Nordic countries

3.2.1 West Nordic stations

Several of the west Nordic stations and institutions were represented at the workshop held at Runde in May, 2004, as part of the present project. These were the Sandgerdi Station in Iceland, Zackenberg

Station and the Natural Institute in Greenland, and the Kaldbak station in the Faroes. Descriptions of each station/institution are given in the Annex.

3.2.2 Marine field stations in Sweden

The main marine field stations in Sweden are currently administrated under the three centres for marine research, in Gothenburg, Stockholm and Umeå, respectively. Originally, the stations were single entities, established by individuals or by a mother institute usually at the regional university. In 1989, the Swedish Government decided to form the three marine centra as umbrella organizations for various marine institutes in each of the main marine research communities, of which Gothenburg were the strongest. As a consequence, the field stations became entities under these centra, along with other infrastructure, vessels etc.

Currently there are four main field stations; Christineberg Marine Research Station at the mouth of Gullmaren and Tjärnö Field Station near Strömstad under the Gothenburg marine center, the Askö laboratory at Trosa outside Stockholm and Norrbyn in Umeå. Additional smaller stations are located at Bornö, Klubban and Lysekil (Havsfiskelaboratoriet) on the west coast. The field stations have developed differently, from locations for mere research activities, to a broader spectrum of activities, including marine environmental monitoring and public information.

Christineberg went through substantial renovation in the 1990's with 60 Mill SEK invested during 1992-94. It presently receives direct annual funding of about 1-2 Mill SEK from the Marine Center. Activities span pure research (52%), university education (8%) miscellaneous activities (23%).

Tjärnö also expanded significantly in the 1990's, partly based on EU funding and partly on local/regional funding. Presently pure research constitutes about 38 %, education 39% and other activities 23% of the total activity. The station receives direct funding approximately as Christineberg. Tjärnö and Christineberg combined account for about 30% of the total research activities (staff) at the marine faculties of Univ. of Gothenburg.

The Askö Laboratory field station was established in 1961 under the institute of Zoology, Univ. of Stockholm. In the mid-1980's Askö hosted about 20 doctorates of doctorate students, and about 20 technical staff. About 1/3 of these worked full-time at the Laboratory. After the establishment of the Stockholm Marine Center ca. 1990, Askö was reorganized to become the institute of system ecology under the university. The station was renovated and furnished with new vessels and equipment, and buildings for teaching, courses and laboratories. Presently there is a permanent staff of about ten people at Askö, both academic and technical. It receives 6.1 Mill SEK annually from the university to cover parts of the annual budget which is about 15 Mill SEK.

The newest station in Sweden is the Norrby Laboratory outside Umeå in Bothnia, established in 1979. It hosts all marine related activities at Univ. of Umeå, including those of the Agricultural University's marine/fish research. Norrbyn is the station contributing most to regional and local environmental monitoring. The staff counts about 12 man-years, evenly divided among technical, teaching and research.

All major stations in Sweden have their own vessels, some have several at their disposal.

3.2.3 Stations in Denmark

There are only a couple of purely "marine" stations in Denmark.

At Knudshoved Odde (south Sjælland) a site is set up to monitor the landscape and sea level changes particularly in relation to climate change. Emphasis is on geology and natural geography, and the site between the Baltic and the Great Belt has been appointed as a geological area of significance by

Danish authorities. Study topics include interaction between coastal development and sea-level changes.

The Skalling Laboratories on the west coast of Jutland (in Esbjerg) is a subsidiary of the institute of Geography at U of Copenhagen. This laboratory is manned year-round and is equipped with misc. sampling equipment for water and sediment analyses. There is a laboratory, library, group study room, kitchen and five study rooms for overnight stay of 7-8 guests/scientists. A 30 feet boat belongs to the station. There is another station at Ho, affiliated with the Skalling Laboratories, which is used for teaching at undergraduate and graduate level. It is also a logistics' base for studies in the Wadden Sea intertidal areas.

The Risö National Laboratory is a large institute under the Ministry of Science, Technology and Innovation. It has some marine related facilities. The study topics are mainly in the technology sector, with emphasis on new energies like wind.

The Bornö oceanographic station north of Gothenburg in Sweden is partly owned/run by the Niles Bohr Institute and performs extensive measurements and investigations. Daily hydrographic measurements have been performed since 1931. The station has laboratories, computer network, electronics lab and a catamaran boat for sampling etc. There is accommodation space for about 20 visitors.

The Denmark International Study Program has no infrastructure as such, but administers courses and field studies in marine ecology with sampling of species etc. Tours are organized to go on cruises and visit research centra, also abroad.

The North Sea Centre in Hirtshals is a Danish centre providing research, development, consultancy services, and technical support to public and private institutions and companies within the fisheries and aquaculture sectors. The North Sea Centre is a private foundation. The centre was founded in 1979 by the City Council, the Industrial Development Council, the Fishermens Association, and the Association of Local Tradespeople in Hirtshals. The centre was officially inaugurated in 1984. The erection of the Centre was financially supported by the EU Regional Development Fund. The Centre offers facilities to research institutions, private companies and organisations related to the fishing industry, with laboratories, offices, test facilities etc. There is, however, no marine station in the present context like Runde attached to the centre.

3.3 Other north European stations

There are a number of field stations elsewhere in north Europe - it is beyond the scope of the present report to give an overview of all those. Several stations are registered as part of the MARS network. This network is a foundation for Europe's marine laboratories, scattered over many countries, and that serves as a forum and as an interest group vis-a-vis the managers of European research, including the European Science Foundation in Strasbourg and the Commission of the European Communities in Brussels. Its members are located all over Europe, along the shores of the Atlantic, the North, Irish, Baltic and Adriatic Seas, and the Black and Mediterranean Seas. See www.marsnetwork.org.

The MARBENA cooperation for marine biodiversity is another relevant European network or project that includes marine stations. The objectives of the MARBENA project are (see http:// www.vliz.be/ marbena/) to create the infrastructure for marine biodiversity research in Europe, by creating a pan-European network of marine scientists; improve the science by cataloguing the existing expertise and infrastructure, by defining and prioritising the issues at stake; provide an intellectually attractive environment for young scientists and a discussion forum.

MARBENA helps to raise the awareness on the issues at stake and enlarge the visibility of marine biodiversity research in Europe: to communicate with EU policy makers and politicians (presentation of marine biodiversity issues at the European Platform for Biodiversity Research Strategy meetings), to liaiese with global organisations and programmes, and to disseminate of information to the public at large.

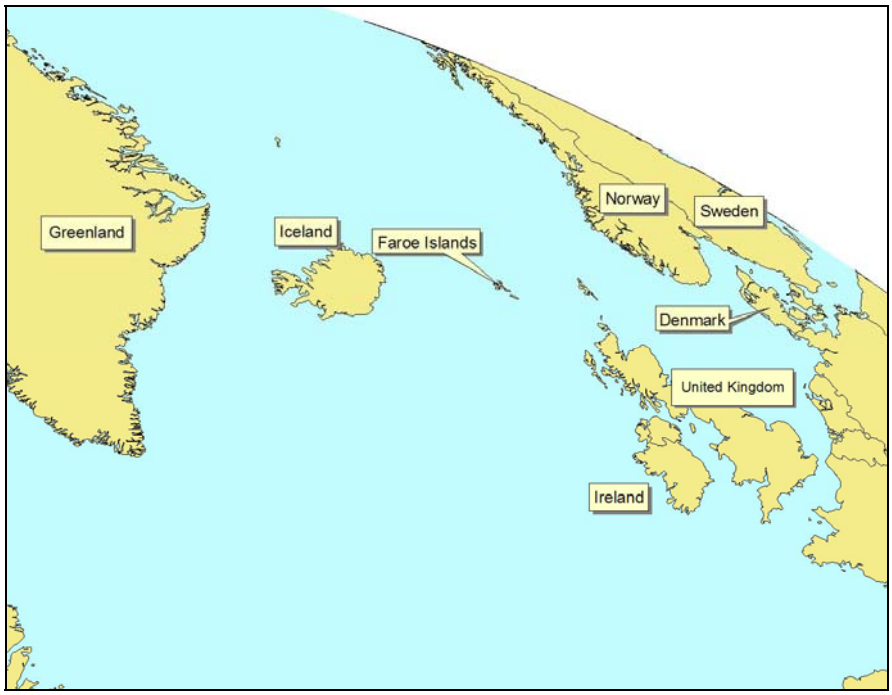

Figure 8. Map of the NE Atlantic, in a West-Nordic perspective.

3.4 The Sherkin island marine station in Ireland

The Sherkin station has similar background and setting as Runde and therefore we present some more detailed information about this station which was collected during a visit there in September, 2004. Sherkin may serve as a case for some of the start-up activities at Runde.

The station is situated at the north-west corner of Sherkin Island, about 2 km off the SW coast of Ireland and offshore from the village of Baltimore. Sherkin Island is one of approximately 15 islands in the Roaring Water Bay. The station complex now consists of five laboratories, together with archives and library buildings.

3.4.1 History and scope

Matt Murphy and his late wife Eileen started a holiday centre for children on Sherkin Island in 1971. This centre ran up to 1990. The Sherkin Marine Station was established in 1975. In the first years field courses for students was an important activity. These courses were carried out in cooperation with Universities in Wales, Holland and England.

The station has up until now been totally private owned without any state funding for research. The only way to fund the research activity was to have volunteer biologists to undertake the work. Since 1976 there has been 450 volunteers working at the station.

According to Matt Murphy the main purpose of the work today is to perform long time monitoring. There are always variations in nature and to be able to understand the variability it is necessary to

have long time series. Teaching and education are still activities according to the basic ideas of the founders of the centre.
The station so far organised 34 conferences and workshops. The topics have covered the environment, fisheries, toxic dinoflagellate blooms and sponges. Twenty six proceedings has been published since 1985.

A programme was set up to give children in the primary school knowledge of what is in the sea and how the animals live and protect themselves. The station has developed a package containing many items such as posters, colouring sheets and books, handbooks. The programmes are sponsored by different companies.

Figure 9. Sherkin Marine Centre, laboratories and meteorological station. Photo by N. R. Hareide (2004).

3.4.2 Monitoring and sampling

Meteorology
Rainfall, temperature and sunshine have been recorded since 1974.The data is sent monthly to Met Eireann in Dublin. In 2004 an automated meteorological station funded by Met Eireann was established (**Figure 9**).
Rocky shore surveys
The Rocky Shore Monitoring Survey has been running from Sherkin since 1975, with 69 stations surveyed annually on Sherkin and neighbouring islands. In addition 7 stations on Sherkin are visited monthly from April to October. From 1995 the programme was extended to Cork harbour, increasing the number of sites to 146. A new book about these surveys," The Ecology of The Rocky Shores of Sherkin 1980 -2000" (Bishop 2003) was published in 2003.
Phytoplankton Survey
Since 1978 phytoplankton populations have been surveyed. Permanent stations are visited every 12 days from April to November. Samples are taken from different depths down to 50 meters at each station and temperature and salinity readings are also measured.
Zooplankton Survey

In 1979 a monitoring project was begun to study zooplankton in a manner similar to the phytoplankton survey. The zooplankton is collected from the whole water column with nets.

Otter survey
Surveys have been carried out in 13 of the years since 1981. The area investigated is the Roaring Water Bay. The survey involves traversing the coastline and mapping tracks and signs of otters to establish the distribution of areas utilised by otters.

Diving surveys
During the years since 1975 the station has collected data from many diving surveys in the Roaring Water Bay. In 2000 it was decided that research will concentrate on specific, defined areas of interest. Three surveys have been designed, that will cover different habitats.

Bird survey
Since 1975 birds have been regularly studied and detailed breeding seabird surveys have been carried out on all the island of Roaring Water Bay. On Cape Clear island a bird monitoring station was established ca 1930 and is now run by Sherkin.

Sponge Survey
Two surveys were carried out in 1981 and 1983, by Miss Shirley Stone and the Natural History Museum in London.

Rock pool survey
Rock pools are very much a part of the rocky shore ecosystem. In 1995 to 1998 surveys in the Roaring Water Bay and along the west Cork Shoreline was carried out.

Sandy Beaches
A study of macro fauna on sandy beaches began in 1996 and is still ongoing. Core samples are taken and the species identified.

Mudflats
In 1980 Dr Tony Walker undertook a seasonal survey on the macrofauna in part of the Kinish Harbour mudflats on Sherkin. In 1990 the work was repeated.

Insects
Over the years the insects of Sherkin and other islands in Roaring water Bay have been surveyed. Colleopetra (beetles) are the major collection at the station. Surveys on butterflies and moths have been carried out at Sherkin since 1977. The number of species discovered according to groups are 25 for butterflies, 266 for macromoths and 108 for micromoths.

Terrestrial Flora survey
In total 608 flowering plants (including hybrids and subhybrids) have been found in Roaring Water Bay. The data have been collected since the station was started but there was one major survey in 1997. The results are published in a book issued by the station.

Seaweed survey
A long term project to measure the seaweeds off the SW coast of Ireland was started in 2000.

3.4.3 Infrastucture and collections

LIBRARY
The library at the marine station is numbering over 100,000 items of books, journals, reprints and other material. The books and journals are computer indexed and have been divided among five buildings. The reprint collection now contains over 5000 items.

PHOTOGRAPHIC COLLECTION
The station has a major collection of photographs and slides

HERBARIUM
A unique herbarium is housed at the station.The collection contains flowering plants, mosses, fungi, Llchens and seaweeds.

REFERENCE COLLECTION
A collection of approximately 4000 specimens are stored at the station.
Over 30,000 preserved water samples containing phytoplankton, hundreds of specimens of insects are also stored at the station.

3.4.4 Publications

Books
A beginner's guide to Ireland's seashore. (1999) ISBN 187049296X. 208 pages. Contains photographs of 125 animals and plants. Ireland's Marine Life - a world of Beauty. ISBN 1870492757. Ireland's Bird Life - a world of Beauty. ISBN 1870492757. The Wild plants of Sherkin, Cape Clear and adjacent Islands of West Cork. ISBN 187049862.
Reports
Different reports on birds fisheries ahs been published during the years.
Colouring books and other material for children
Colouring books birds, plants and flowers has been published. This has been a great success.
Newsletter
The "Sherkin Comment is published four times per year".

Figure 10. Sherkin Marine Station, the Library. Photo by N. R. Hareide (2004).

3.4.5 The future of the station

The goal for the station is to continue the work on publishing the environmental newspaper, book publishing, organising environmental conferences and visiting schools to inform children.

After 25 years the results of the long term monitoring work really has started to show its potential. The time series worked up on Sherkin can be important for the study of long term variations in the environment. This work need to be continued and will be increasingly important.

The work is based on the long term commitment of the Murphy family and the voluntary biologists. But the funding has always been on short term. It has therefore been a constant struggle to fund the station. The station's strategy is to work on a low cost basis. This has made it possible to survive during difficult periods. The station has therefore not been vulnerable for the short term thinking of politicians and those who funds environmental research.

The station has, however, increased its survey programme during the last years. The libraries and collections are growing and need to be maintained, along with the buildings. Matt Murphy is now 70 years and is still responsible for the daily work at the station.

Figure 11. A part of the Sherkin station's laboratory. Photo by N. R. Hareide (2004).

4. Proposed activities at the Runde Station

The list of activities at the station as outlined in the beginning of the present pilot study had an emphasis on marine science and monitoring. During the study and workshop additional suggestions came up which are described in subsequent chapters. Still, the "baseline" list of activities as follows, remains fairly unchanged at the termination of the prestudy,

- Environmental monitoring,
- Marine food-chain studies,
- Climate-change related studies,
- Process-studies- physics and biology,
- Mariculture (with cooperation with local industry),
- Marine bioprospecting (algae, sponges etc),
- Renewable ocean energies (cooperation with local industry),
- Visitor centre - environmental information,
- Cources and seminars (environment, fisheries, other),
- Hosting visiting scientists during their "sabatical" leave,
- Library and archive incl. local environmental information,
- Oil spill contingency, i.e. washing of contaminated seabirds,
- House and hub for small spin-off businesses, SMEs etc, (related/non-related), and
- Servicing visitors at the station (offices/labs, computers, equipment etc).

The key users (customers) of the Station were initially planned to be primarely universities, research institutes and colleges (and possibly networks between these) - both Norwegian and Nordic. The present strategy also includes integration with EU and overseas' institutions, programmes and projects. The EU has recently formulated its "European strategy on marine research infrastructure" (publ. Academy of Finland 6/03) where Runde is well fited. Timely inclusion of Runde in existing networks for field stations such as MARSnet is envisonaged. Runde has the possibilites to become a key site in the development of the European marine monitoring and climate and marine resources research in the Norwegian Sea as well as to serve domestic strategies for coastal monitoring and development (west Norway).

Environmental Monitoring	**Visitor centre**
• Meteorology, waves, sea • Marine biology & fisheries • Birds • Terrestrial flora/fauna	• Library • Offices • Public services • Information
Oil Spill Contingency	**Science**
• National bird washing centre • Storing of equipment • Accounting for contaminated birds	• Field experiments and research • New energies testing • Testing new marine equipment • New species, bioprospecting etc.

Figure 12. Schematic overview of some proposed activities at the Runde Station with a tentative main division into four segments.

The station is meant to satisfy the growing demand for marine monitoring and research in a region where significant revenues from harvesting the ocean species actually are made. The Station may

aditionally be used to fulfil or support Norwegian strategies or programmes for ocean or coastal research already underway [(Stortingsmelding nr 12, 2002 "Rent og rikt hav", "Kystsoneforsking – for verdiskaping og mangfold"- programplan NFR nov. 1993), "Nasjonal Agenda 21, Nasjonal handlingsplan for bærekraftig utvikling" (tillegg til Nasjonalbudsjettet 2004) og nytt NFR-program for marin forsking-2005-2014 (in prep)].

The west-Nordic dimension was particularly focused on in the prestudy. Supporting and encouraging documents in this respect are the recent reports to the Nordic Council of Ministers (NMR): "Vest-norden i det nordiske samarbejde - redegjørelse", (NMR 2003), "Planer og budget for 2004 framlagt av generalsekreteraren", (NMR, juni 2003). The vision of the NMR is that Norden (the Nordic countries) through enhanced cooperation shall become an internationally leading and attractive region for research by 2010 (Norden i Veckan 3/11 2003).

4.1 Environmental monitoring and protection

4.1.1 Background

We take for granted that some basic assumptions about monitoring will become very relevant for Runde. Environmental monitoring will generally become more and more important in the future society and more and more integrated both with academia and environmental & resources management. The same bodies will increasingly demand high quality data for their models, teaching and assessments. In this context, Runde is an ideal, key site for vertically integrated monitoring: seabed, sea, sea surface, intertidal zone, and land.

Long-term monitoring of essential parameters within meteorology, oceanography, flora and fauna will be an important building pillar of the Runde Station. Some monitoring of the birdlife at Runde is already performed, but the potential for increasing the scope, quantity and quality of this monitoring is large. This is especially interesting in a context of West-Nordic co-operation on joint marine monitoring in the NE Atlantic.

We already learned a lot from descriptions of the on-going monitoring at other stations such as the Sherkin Station in Ireland (Para. 3.4), the West-Nordic stations as presented at the Runde workshop and in the Annexes, and from established Norwegian monitoring. This will provide important guidelines on which parameters to focus on, on procedures and on designing joint implementation.

There is a growing demand for high-quality data from long-term time series especially for climate-related studies. Only after perhaps several decades of voluntary sampling have such series gained public and governmental acknowledgement and support. The Norwegian government (the Research Council) has brought attention to the importance of such series, which also imply a stimulus to begin new series of essential climate and eco-system parameters, with international co-operation.

4.1.2 Monitoring the physical and chemical environment

This monitoring should include meteorology, oceanography (sea-state, currents), water quality and pollution. The means of performing this will be by autonomous instruments and methods as much as possible but must be supplemented by traditional sampling from vessels at intervals. Baseline monitoring can be supplemented by short-term special experiments on the same parameters. Calibration is a key element in maintaining long time series, and will be on the top priority list at the Runde Station.

Monitoring of sea-state (waves) is envisaged to be done by moored wave buoys (or bottom-mounted equipment) with real-time data transmission to Runde. There data will be calibrated and controlled, before being disseminated on the internet along with meteorological data and observations suitable for frequent updates. Such data will be valuable not only for scientists, but also for the local fishing fleet

and for coastal navigation. Also, ocean monitoring by use of satellite data are included in the plans (chlorophyll, ocean colour and temperature, sea state etc).

4.1.3 Flora and fauna

Monitoring the flora and fauna under water and on land in an adequate and a systematic manner will be very important, and also very challenging in terms of planning and required resources. The monitoring will as minimum include birds/seabirds, marine biology including hard bottom fauna, algae and seaweeds; zoo- and phytoplankton, fish, sea-mammals and terrestric flora. Plans are in preparation to describe the monitoring in each field in detail. The monitoring must go hand-in-hand with scientific sampling and experiments, as mentioned previously.

4.1.4 Marine reserve monitoring

We mention the topic of marine reserves specifically, as it may become of special relevance to Runde. The unique flora and fauna on Runde was protected as a nature reserve in 1981, and the birdlife has been under some form of protection/monitoring since the mid-1950'ies as a bird sanctuary. Monitoring is by a local attendant, as well as by the county sheriff and ornithologists. The protection and monitoring stops on the beach where the sea begins, i.e. there is practically no monitoring or protection of the marine life around the island, from which the sea birds are so dependent.

Table 3. Categories of protected areas, according to IUCN (International Union for Conservation of Nature and Natural Resources).

Category	Purpose
Ia	Strict nature reserve/wilderness protection area
Ib	Wilderness area
II	National park
III	Natural monument
IV	Habitat/species management area
V	Protected landscape/seascape
VI	Managed resource protected area

The sea grounds around Runde have been considered for certain kinds of protection, ultimately as a marine reserve. If this is politically realistic or not is presently uncertain, but the trends both internationally and in Norway are in favour of establishing such reserves (Sobel and Dalgren 2004). **Table 3** shows distinctions between various forms of reserves, from the most protected (category I) to the less protected ones. If some kind of marine protection is implemented, the Runde Station could become an important element in the required monitoring, accounting and reporting.

4.2 Scientific activities

Runde is by nature an ideal site for many scientific experiments and observations within marine meteorology, oceanography, fisheries and marine biology. As previously explained the major drawback is the lack of a minimum kind of infrastructure to support such activities. The travel distance to users on the continent and other universities in Norway and Nordic countries may prohibit or limit the very short time visits, but as explained, the island can be reached quite comfortably and quickly either by air, sea or road.

A true field devoted observational scientist should spend minimum 25% of his time in the field, 25% in the lab, 40% in his office and maximum 10% in administrative meetings and science seminars. To achieve this, it is a prerequisite to have available the best possible solutions for field support, laboratories and offices, which are among the basic goals for the Runde Station.

There is definitely a connection between 'marine monitoring' and 'marine science', monitoring can in some circumstances be science on its own. But usually science comes as a spin-off from long-term monitoring, and that is why we make the distinction between the two disciplines. At any rate it is essential to start the monitoring of key parameters immediately, and to build the baseline for follow-up scientific studies, climate-oriented studies and environmental assessments. Science may also mean experimental work, instrument development, technical research and development connected e.g. to the maritime industry, and dedicated, one-time sampling.

In this paragraph we describe briefly some of different scientific fields that we presently see as relevant for Runde. The process of designing the station and developing the programmes must be open for new suggestions both from the scientific community, the industry and public administrations. The science is worked on further in the Science Plan (Runde Group 2004b, in prep.).

4.2.1 Field observations and experiments

Under this segment we think of experiments that can be performed by visitors over a short time period with sophisticated equipment, possibly supplemented by longer-term measurements and sampling performed automatically by instruments or by the staff at the station. These experiments will be 'science'driven' with emphasis of testing hypotheses, validating existing models and theories and most of all with the aim to gain (non-predictive) new knowledge about the marine environment.

Possible scientific topics within 'coastal studies' are numerous. For the physical/chemical disciplines it can mean such as marine meteorology, air-sea interaction, shoreline erosion, wave breaking, wave-interaction with topography, current shear in the benthic layer (wave damping by seaweeds), sand movement under shifting waves and currents, shoreline morphological changes induced by climate, onshore sea spray fluxes etc. and seasonal differences among various parameters.

From a biological point of view, within the context of the Runde Station, scientific experiments can involve sampling and dissemination of specific taxa in the laboratory, temporal observations on the seabed of benthic fauna e.g. by time-lapse cameras, collection and analyses of specific animals for extraction of specific enzymes, and cultivation of specific species in pens or in tanks on shore. The interplay between the changing physical environment and biology should be interesting study topics as well. Studies of the marine food-chain and its connection with the local seabird migration pattern will be essential study topics, and will be linked to the long-term monitoring.

It is envisaged that the washing station for oil contaminated birds will become an important platform also for scientific experiments on methods of treatment, testing of new procedures and accounting for survivals etc. So this washing station will itself give significant spin-off in terms of science.

4.2.2 Field testing

Due to the location and the wind and wave exposure, Runde will be an ideal site to test different kind of maritime equipment, measurement and power systems and fishing gear. The tests can be supervised by staff at the Station. It is necessary that such tests do not harm the local environment, or imply unneccessary audio-visual disurbances. Tests can be performed from seabed or subsurface installations, possibly with cable connection to shore, from moored surface buoys. Also, tests in the breaker zone or on shore is envisaged, e.g. for controlled anti-corosion tests, strenght and endurance tests etc.

4.2.3 New energies

The reserves of fossil fuels are declining world-wide with prices increasing and the potential for hydro-electricity is almost fully exploited in Norway. This has driven the introduction of renewable

energies also for connection to the grid in Norway, even though the major investments and developments are done in other countries, especially in the EU.

Several technologies are now economically competitive, such as wind and biomass. Wind turbines have been installed on locations on the coast of Norway (e.g. on Smøla, Utsira), and new 'wind-parks' are being planned. Some environmental concerns have been raised against the construction of the large turbines, claims include noise, landscape disturbance and disturbance of bird migration. This will probably exclude Runde and the neighbouring region from becoming wind turbine sites.

Norway supported some wave-power research in the 1980-'ies (while Denmark successfully supported wind power and Sweden bio-mass fuels). The wave power generators and concepts were tested but facilities were closed down after a couple of years, due to lack of commitments from the government. Internationally, the developments of wave power have continued, e.g. in Scotland and Ireland, and the Norwegian government has also opened the door for research on such energies. Runde and the surrounding region has a wave climate that should be optimal for testing and installing wave power stations.

By merging of maritime expertise among the local industry with international developers and Norwegian/Nordic scientific and commercial expertise, there is a great potential for developments of new concepts, and where Runde could become a suitable test site. The Runde Group already has a wide international network on renewables, which also include other areas such as heat pumps and OTEC and which also hold a great future potential in the global market. The EU FP6 has many options of supporting development of renerwable energies, through joint projects and networks.

4.2.4 Science Plan

The basis and the details about the scientific activities at Runde is outlined in the Draft Science Plan that is in prepration. This plan describes the important environmental issues today, why hese have to be considered for the Runde region, and how this can be accomplished especialy through Nordic and wider networking.

4.3 Bird washing facility

4.3.1 Oil spills and seabirds

Oil spills may result from accidental ship collisions or groundings. These are dramatic events that can release large volumes of oil into the environment, and these releases may result in the deaths of large numbers of seabirds. For instance, when the Exxon Valdez ran aground in Alaska in 1989 more than 30,000 dead birds were recovered, though it is estimated that the spill killed more than 300,000 birds. Off Runde we have witnessed two major ship accidents during the last 15 years, namely the 'Arizan' and the 'Sonata'. Both of these were bulk carriers and not oil tankers. The volume of oil that entered the environment was therefore limited compared with the big oil tanker accidents such as Prestige and Exxon Valdez.

A new situation is now developing. Large volumes of oil are increasingly being transported in large carrieres from northern Russia along the Norwegian coast. It is expected that in average one tanker will pass Runde per day, and this situation will probably last for several decades ahead.

More oil enters the oceans from ships that deliberately release oily wastes than from well-publicised accidents. It is illegal but many ships release their bilges to save the cost of pumping this in tanks on shore when they reach port. This is referred to as chronic oil pollution. The open sea off Runde is tempting for the coastal vessels to release waste oil when passing there instead of the more sheltered inner lead. Runde is also exposed to the oil released from the offshore going vessels because the island is near the offshore ship lanes. This pollution most probably kills several thousands sea birds every

year. Many of the bird species at Runde live most of their life at the open sea and come into Runde only for breading. This makes these birds extra exposed to oil pollution. Often we see reports that oil polluted birds have drifted ashore in the region around Runde.

When seabirds come into contact with even a drop of oil, it mats their feathers and allows frigid seawater to penetrate the waterproof external feathers and soak the downy, insulating feathers beneath. With their 40 ^{o}C bodies exposed to the cold water, the birds burn their fat reserves trying to maintain body heat and eventually perish. In the North Atlantic, an oiled bird most probably is dead within a couple of days after contamination. Canadian Studies (www.marinepollution.gc.ca) have shown that 74% of the dead birds recovered from the beaches of southern Newfoundland between 1994 and 1999 had been killed by oil.

4.3.2 Saving contaminated birds

During the last years we have witnessed accidents where polluted seabirds have been tried rescued by ordinary people with no skills in the subject. This has not been successful. Experts are divided in the view of rescuing oil polluted seabirds. Some say that it is possible and useful and others say it is of little use because too few birds can be saved. The natural response of people is to try to save polluted birds. This was also the case when the bulk carrier 'Rocknes' capsized near Bergen in January, 2004. Only after 4-5 days was an infrasructure established for washing the polluted birds. This was quite late and there were also no trained people available to do the job.

It is important to underline that wildlife rehabilitation should be performed only under the guidance of experienced professionals and supervised by veteranarians.

Training is crucial to the success of any emergency preparedness plan. It ensures that staff involved in response and recovery work has the skills to perform tasks safely and effectively. Training also helps team members from various organizations and levels of government to learn how to work well together.

At Runde we plan to arrange courses and train people to collect, and wash oil polluted birds. We will build a network of people who has the skills needed for this work.

4.3.3 Contingency for seabird rescuing at Runde

The Directorate of Coastal Directorate (located in Aalesund) has the responsibility for maintaining and upgrading the oil spill contingency in Norway. Figure 16 shows a map of the local oil spill contingency area. There is, however, no plans for organised rescuing of oil polluted birds. The Runde station therefore wants to organize a contingency for this (also including sea mammals) which will include,

- Collecting and accounting for oil polluted birds/animals from shore and offshore,
- Human killing of birds with no hope for survival, and
- Washing and recovering polluted birds with prospects for survival.

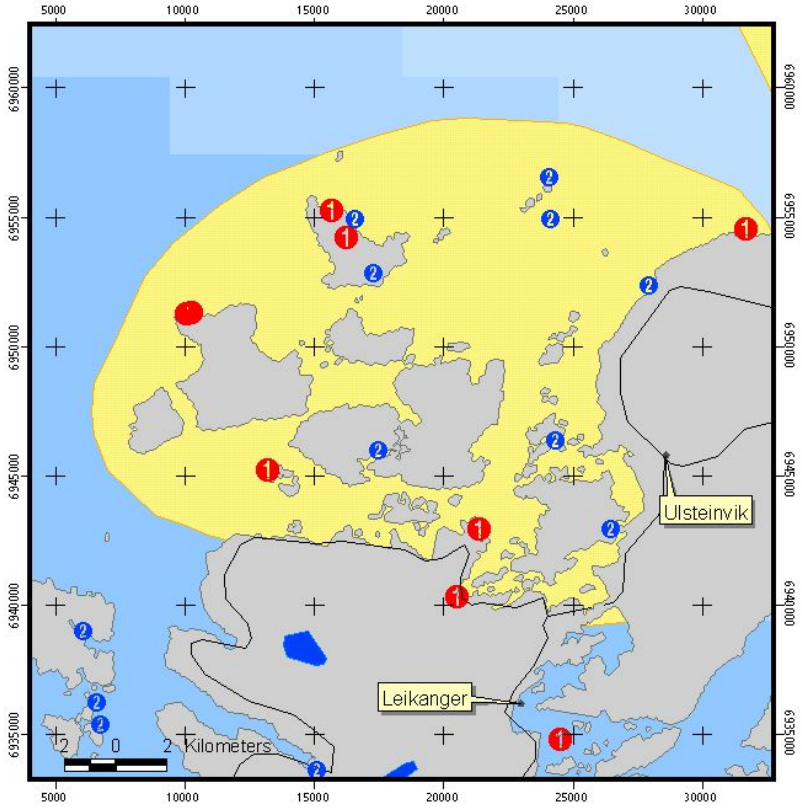

Figure 13. The regional oil spill contingency area. Runde has several hot-spots (seabrids, mammals).

Bird washing station - Sequential Procedures

The complete cleaning of a single bird or mammal may require the diligent efforts of three to five people, and as much as 150 gallons (570 litres) of water. The process can take up to an hour.

Equipment and infrastructure

- Hall for storing birds dry and warm between examination and washing
- Washing room
- Freezing room for food
- Heated storage room for washed birds
- Outdoor facilities for recovering birds
- Swimming pond for recovered birds
- Equipment for cleaning water and energy saving by wastewater heat exchange

There are websites that explain about the procedures for cleaning of seabirds such as www.oil-spill-web.com.

Capacity

- The station should have a capacity of rehabilitation of 1000 birds from a major type oil spill (3 months in captivity).
- Water supply: 2000 litres of 40 °C water per hour
- Feed: Storage of 2 tons of feed (sand eels, krill and herring)

The washing facilities will be combined with the wet labs on the biological station. The lab has to be dimensioned accordingly.

Area

The recovery station will work on national level and can take animals from all Norway. The communication to Runde makes it possible to bring birds to the station by land or sea freight within 24 hours from most of the country. From the more remote locations the animal has to be sent by air.

4.3.4 Sensitivity mapping

When identifying potential impacts from spills, it is important to know about the environment where a spill might occur. Maps with up-to-date information on environmentally sensitive areas, and on seasonal considerations affecting key physical, biological and cultural resources are essential in such assessments.

The Runde Station will on regular basis survey the area around Runde and map the distribution of birds. This information will be important in assessing the sensitivity to oil spills. Also the oceanographic and meteorological data collected at the station will improve the risk sensitivity analyses for the area.

4.4 Visitor Centre

The station will host a visitor information centre which can be made to fit various demands and ambitions. Runde is an important site that deserves a modern centre with advanced displays and interactive tools. As the weather can be quite bad even during summer, the centre in such situations will serve as an alternative to actual visits to the bird rocks by sea or on foot. Furthermore, such a centre will also become attractive to other visitor groups like elderly or physically disabled people, families with small children etc. The centre can also become a in-door supplement or back-up to existing regular activities at the existing outdoor pursuits school.

The purpose of the visitor centre will be to inform about birdlife, environment and culture on Runde and the adjacent islands. Also, practical information will be provided, about travel, destinations, tours etc. The centre is proposed to have the following functions:

- Exhibition,
- Restaurant,
- Craft shop,
- Tourist Information.

It will be possible to spend time et any of these facilities without necessarily visiting all. The exhibition will show models of birds, photo gallery, video and web cameras transmitting live from the bird cliffs during the nesting season and from the life underwater close to the cliffs. Data on meteorology and seastate will be displayed on-line on monitors. During the off-season, films and pictures from the peak season can be shown.

Information about the long tradition of piloting and about the lighthouse will be presented. The histories of the S/S 'Ackerendam' and M/S 'Arisan' that both were shipwrecked near Runde will also be told.

The history and natural environment of Runde and Sunnmøre will be presented and the centre aims to inform visitors of some of the social and economic factors which have had an influence on the development of communities in this area. The visitor centre may also provide facilities for hikers and sailors to shower and to change their clothes.

On some longer term, the centre can be transformed into a technically more advanced **science centre** as well, with may possibilities for displays, virtual tours underwater, computer model simulations, video etc. This will be particularly attractive to young people and school classes from the neighbouring region and elsewhere.

4.4.1 Conferences, seminars

The station will be based on hosting groups of specialists and regular school classes. It must thus have as a minimum an auditorium that can fit 20-25 people (regular school class). In order to attract other users and larger groups, the auditorium should be significantly larger (for 80-100 people), and have modern equipment (sound, light, video, presentations etc). In this way, the station will significantly increase its market potential, to include seminars for larger companies and public institutions that certainly will want to locate such internal events provided the facilities are adequate. A scaling factor for the size may be two full bussloads of visitors (80-100 people).

Figure 14. Exhibition on Skellig Visitor Centre, County Kerry, Ireland. (from http://www.skelligexperience.com).

Such activities will also require facilities for serving lunch, possibly dinner. Accommodating such visitors is presently not within the plans - nearby hotels in Fosnavaag or Ulsteinvik can still serve this purpose. On the long term, however, Runde should have its own hotel to host regular visitors, groups and also for the specialists working at the station.

5. Natural marine resources

5.1 The physial environment

The nearest sea grounds around Runde have depths of 40 -90 meters. The shelf stretches offshore about 50 – 60 nm. The continental slope (Storegga) goes down to the deep water in the Norwegian Sea. From Runde a system of deep fjords runs about 100 km inwards, with depths exceeding 600 m. Most of the sea grounds and shores are quite exposed, but some sheltered shallow waters are also found close to Runde. According to the following table, the deep water in the Norwegian sea is found less than 100 km from Runde. Except for Andøya outside of Tromsø, Runde is the location in Norway with closest proximity to the deep water resources.

Table 4. Shortest distance from Runde to different depths on the shelf slope to the NW.

Slope isobath (depth)	Horizontal distance from Runde
200 m	60 km
400 m	70 km
600 m	78 km
800 m	86 km
1000 m	102 km

The oceanographic and climatic conditions are the basic factors behind the rich flora and fauna found at Runde and in the surrounding area. The sea is heavily influenced by the inflowing warm and salty water in the Norwegian branch of the North Atlantic Current. This results in the region having the mildest winters in Norway, with only infrequent and short-lasting snowfall and freezing. The Norwegian coastal current adds fresher water with high nutrient content to the mixture on the shelf.

The climatic factors vary on different time scales, causing accompanying changes in biota as well. The North Atlantic Oscillation (NAO) is a commonly used index expressing climatic shifts on annual-to decadal scales in the region (**Figure 15**). Quite probably, this variability is also reflected in the short-term changes in marine and terrestrial life at Runde, although such connections are so far not doccumented due to the almost complete absence of systematic monitoring.

Likewise, the trends associated with anthropogenically induced global change will likely affect the environment at Runde. In fact, changes may already go on, un-noticed due to the lack of systematic sampling and monitoring. A key site like Runde with it's complex ecosystem may be especially vulnerable to climate change and the consequences thereof. This in turn, may have great influence on the recruitment of commercial fish, thus affecting directly the catch and revenues in the fisheries.

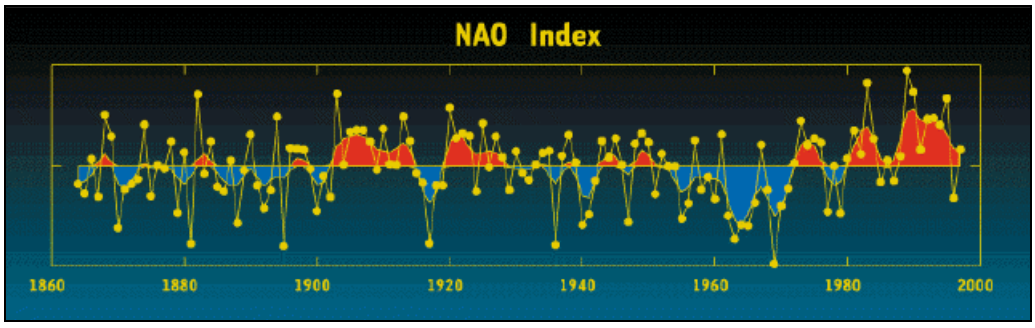

Figure 15. The North Atlantic Oscillation (NAO) index, expressing the magnitude of the difference in air pressure between the Azores high and the Icelandic low.

The sea around Runde thus is an intgegrated and important part of the ecosystem of the Nordic seas (the Nordic Mediterranean). Simultaneously, the area is also part of the North Sea and the seas around Scotland and Shetland Isles as the Norwegian Atlantic Current and the Norwegian Coastal Current (**Figure 16**) carry nutrients, eggs and larvae originating there. Pelagic species such as mackerel also migrate all the way to Runde from west of Ireland.

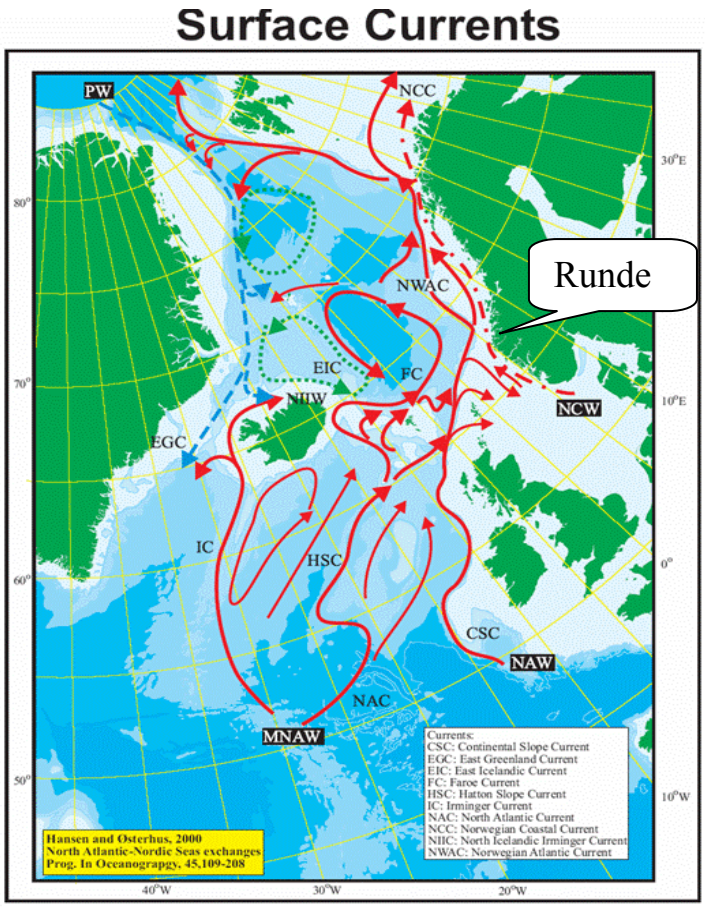

Figure 16. Major currents in the NE Atlantic and Nordic seas. Source: Svein Østerhus, Geophysical institute, UoBergen.

5.2 Fishery resources

The shelf is the main spawning ground for Norwegian Spring spawning herring (**Figure 19**). This fish stock is one of the most abundant in the North Atlantic. The herring is a plankton feeder and links the great primary production in pelagic waters in the Norwegian Sea to the food web along the Norwegian coast. The herring spawning off Runde has therefore a great impact on the most important fish stocks along the Norwegian coast. Haddock and saithe have their main spawning grounds in Norwegian waters on the shelf off Runde. The North East Atlantic Cod also comes all the way from The Barents Sea to spawn off Runde.

The eggs and larvae from the spawning off Runde are transported northwards by the Norwegian Coastal Current and the Gulf Current and thereby, the offspring are distributed along the Norwegian Coast and The Barents Sea. The spawning off Runde, most probably has a big impact on the whole ecosystem in The North East Atlantic, north of Runde. As an example it can be mentioned that the weight of the herring row spent off Runde in a normal year amounts 500,000 tons which in comparison is more the weight of the total Norwegian population (4.3 mill)

Storegga is the only known spawning ground for Blue ling in The Norwegian Sea Basin (**Figure 20**). In this highly productive area a deep water coral reef is found and the area has been an important fishing ground for ling, tusk, saithe and Atlantic halibut for generations. Beside Bleiksdjupet (North Norway) Storegga is regarded as the most productive slope area in Norwegian waters. The relative short distance from the coast to Storegga makes this area the most ideal place to study the ecology of cold water coral reefs, and the ecology of the cold deep water (< 0° C). The deep fjords that cut from Runde into the mainland are filled with Atlantic water. They are divided from the Norwegian deep sea by a sill (**Figure 17**) and therefore can be regarded as isolated deep water ecosystems. The species composition in these fjords is quite different from the offshore slope. The main species are Roundnose Grenadier, argentines and rabbit fishes.

The shallow areas between Runde and the neighbouring islands are inhabited by different shallow living species such as brown crab, lobster, pollock etc. A local stock of coastal seals has its territory around Runde.

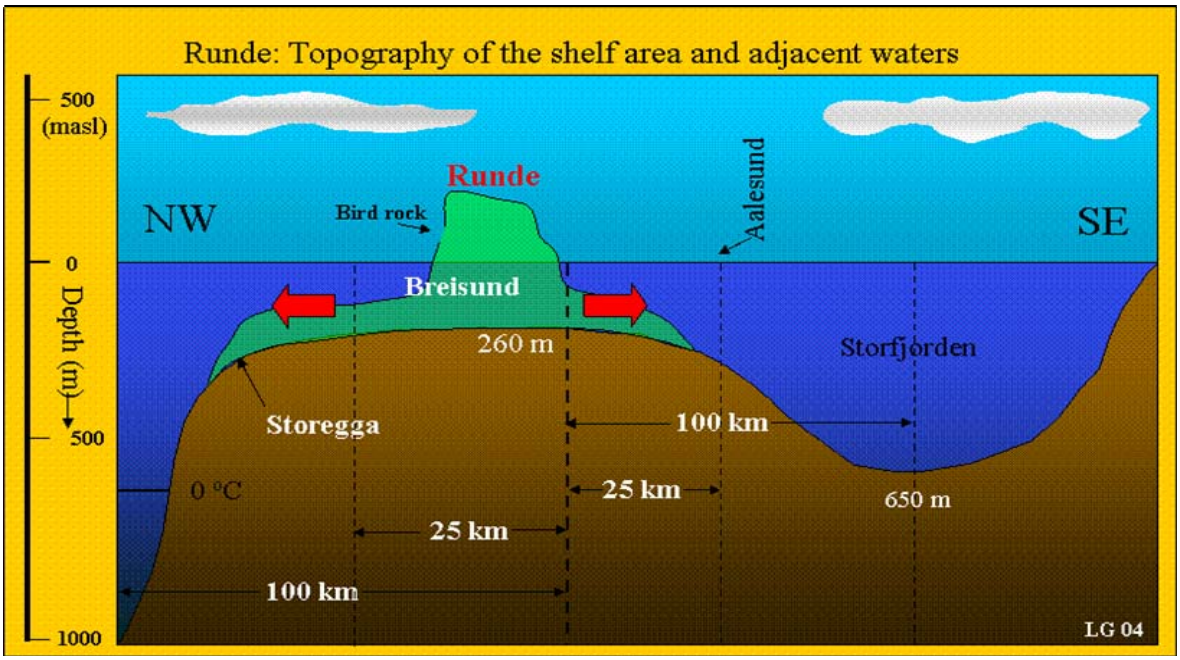

Figure 17. Topographic section of the shelf area and adjacent waters. The sill depth to Storfjorden is about 260 m through the passage Breisundet north of Runde.

5.3 Sea weed harvesting

Kelp trawling is conducted along the Norwegian coast from Rogaland to Møre. The main harvested species are sugar kelp (Laminaria saccharina) and Oar Weed *Laminaria hyperborean*. Total catch per year is 160,000 tons. The export value is estimated to 0.5 billion NOK. The main products are sea weed powder and extracts. At Runde there is also a small local Industry on oar weed. The stalk of these plants are dried and later used for medical purposes.

The harvest is regulated. The grounds for kelp trawling are divided into sub areas and each area can only be harvested once every 5 years. The area off Runde is one of the main trawling grounds for kelp in Norway.

Studies have shown that seaweeds play an important role as nursery areas for many fish species. Therefore the seaweed also play an important role for seabirds that feed on 0 and 1 group fish.

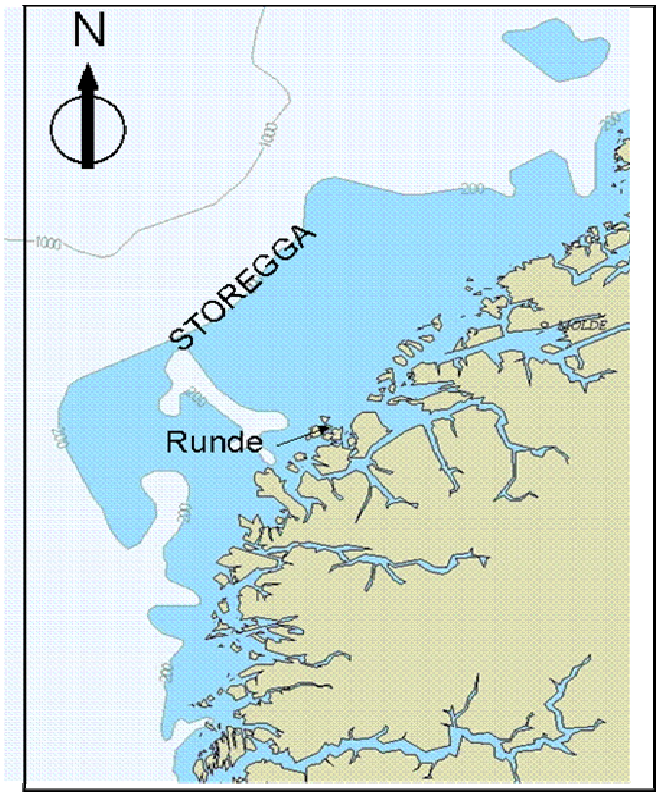

Figure 18. Runde and surrounding waters with the wide shelf and Storegga.

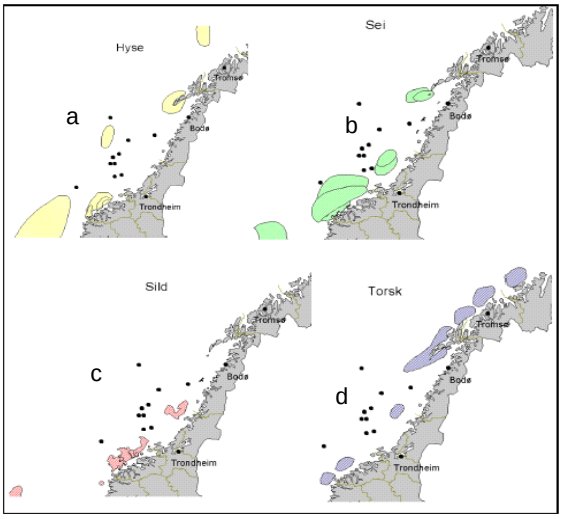

Figure 19. Spawning grounds for haddock (a), saith (b) herring (c) and cod (d) in Norwegian Waters (Source: Institute for Marine Research, Bergen).

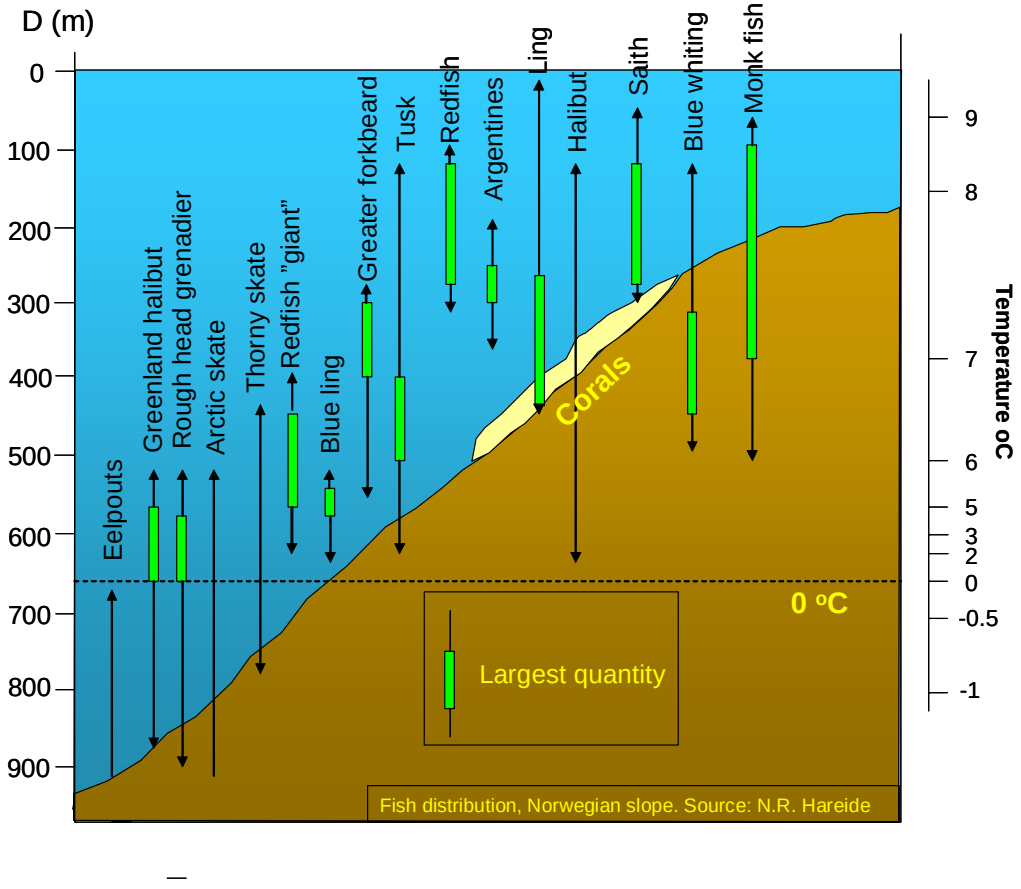

Figure 20. Species composition and distribution by depth and temperature at Storegga.

5.4 Sea-birds

The seabirds at Runde and adjacent areas are of national and international interest. They are an important link between terrestic and marine food chains. This makes the seabirds good indicators of changes in the marine environment. The seabird community is well known and described elsewhere.

6. NORA workshop at Runde, May 2004

A central element in the project was the assembly at Runde for a West-Nordic workshop during May 27-28, 2004. This included invited foreign participants from field stations in Greenland (Natural Institute at Nuuk and Zackenberg Station), Kaldbak Marine Station in the Faroes, Sandgerdi Marine Station in Iceland and representative of the planned station at Jan Mayen. Also, participants from the institute HYDROMOD in Germany and the FUJI Research Institute in Japan participated. HYDROMOD coordinated the project proposal for the coordination of European field stations "FIESTA" submitted in March, 2004 to the EU infrastructures programme. In this proposal the Runde Station was included as a case.

Aditionally, the workshop had attendants from local and regional public sectors, representatives from local businesses and other observers. About 40 people attended in total.

The workshop was acknowledged by the Norwegian Ministry of Environment as a **"Green Days" event**. Green Days are dedicated to Natura 2000, the European network of protected sites based on EU legislation to protect the most seriously threatened habitats and species across Europe (Habitats Directive).

The objective of the Green Days is to improve the understanding and acceptance of Natura 2000 at local and regional level. Green Days shall underline why a European approach to nature conservation is needed and what this really means.

6.1 Workshop programme and participants

The programme of the workshop is listed in Annex A. 2 full days were devoted specifically to presentations and discussions. Additionally there were some side and social arrangements that included a press briefing on Day 1 (with several newspapers, radio and TV present), guided tours around the island by boat and a hike to the cliffs, two dinner receptions plus follow-up for those staying on a while at Runde after the workshop.

Annex B gives a list of workshop attendants. There were about 40 registred attendants. It was a key issue to welcome also local residents, to keep the local community informed.

Annexes C-G present in short form the other stations.

Annex H describes the "FIESTA" proposal on improving the sustainability of field stations in Europe.

6.2 Media attendance

Local, regional and national media were informed about the workshop through a press release and were invited to a specific media session during lunchtime on Day 1. The invitation brought several

media to Runde, inlcluding national TV (NRK), regional and local newspapers. The coverage (same day on TV) gave good coverage of the workshop, its West-Nordic attendance and perspective.

6.3 Workshop summary and recommendations

According to the information provided at the presentations and during the interim and final discussions the following list of summary items is presented. A complete summary of the final discussions on Day 2 is presented separately in the next section. The workshop focussed on the West-Nordic perspective, which is only a part of the total scope for the Runde Station. Still, other aspects were also brought into the discussions that the Runde Group will benefit from in the further planning.

Summary items:

The Runde Station will fit well into a west-Nordic network of marine monitoring including Faroes, Iceland, Greenland, Jan Mayen. This will include regular sampling and observation of key species (e.g. zooplankton, seabirds) and other parameters (climate related).

The Runde Station which is in the planning phase, has a unique opportunity to fit its scope to explicitely enhance West-Nordic co-operation.

Runde and the surrounding region has a common heritage shared with the other stations- this can form a basis of activity expansion beyond mere natural science (e.g. cultural heritage studies, language, tourism).

Runde Station should consider the history and experiences made at the other stations, to avoid possible pitfalls, and minimize non-sustainable activity overlap or duplication.

Some stations, also in other parts of Europe, are suffering from a decline in funding to maintain activities. Runde must study the realities behind this and reform its activity- and business plan accordingly.

It was noted that some stations are started on the basis of a single project (BIOFAR, BIOICE) which provided funding and customers/users for a certain time period, beyond which the station was more or less left on its own. Kaldbak had suffered from this, and had been through a period of low activity. Recently, a new strategy to cooperate with the Natural Museum in Torshavn rendered successful, with new activities/tasks now at Kaldbak. Sandgerdi station in Iceland, likewise, had recently gone through a period of restructuring, successfully opening more to the public as well, to secure the future.

The **Greenland Institute of Natural Resources** in Nuuk (West Greenland) started as a marine Station where scientist could visit from abroad. It was decided to move the Greenland Fishery Institute and the Greenland Environment Institute to Greenland and merge them together in the early1990's. This made a great change for the Marine Station which was incorporated into the new national institute. The Marine Station is still used as accommodation for visiting scientists. In addition the former Marine Station the Institute has an annex that can host visiting scientists in 5 flats and 8 rooms. Annex F gives some more information about this center.

Zackenberg Station
In 1997 the ecosystem research and monitoring facility at Zackenberg, located at Young Sund in East Greenland. Zackenberg is owned by Danish Polar Center. In addition to individual research projects and programmes a comprehensive environmental monitoring is operating at Zackenberg. The station is available for use all year, pending special arrangement, but currently it is open and staffed for a 100-day period from late May to early September.

Zackenberg Station can accommodate up to 16 researchers at any time. The maximum annual capacity is c. 1600 researcher days. The visiting scientists are charged for using the station. Zackenberg Station has a diverse long-term monitoring programme, called Zackenberg Basic which has three elements:

BioBasis (monitoring the dynamics of selected biotic ecosystem parameters), Climate Basis (monitoring climate and river water discharge) and GeoBasis (monitoring dynamics of the abiotic environment). The main thrust of operating permanent monitoring is to secure the provision of long time series of background ecosystem data from a High Arctic area. Besides, data from the monitoring programme are used free of charge by researchers working at Zackenberg Station. See Annex D for supplementary information.

From the Icelandic experience (Sandgerdi), it was noted that local public and political support was essential in the decision phase or the location of the Station, when Sandgerdi was competing with 2 other sites. Runde should take a note of the importance of local support and backing.

According to the views from the other Nordic stations Runde Station is destined to become a success provided a scheeme of procedures are followed in the further planning and establisment phase. This includes a strategy to 1) estabish a West-Nordic marine monitoring strategy and 2) Include Runde in this strategy.

6.3.1 Workshop discussion high-lights

The minutes of the final discussions were made by Johannes Post from HYDROMOD, Germany. The minutes are reiterated here, with some minor amendments.

Preliminary goals for the planned research field station on the island of Runde as expressed by the Runde-Group at the beginning of the workshop are:

- Information of the public (guests, visitors, tourists) about the island and its surroundings
- Provide activities like field courses and participation in field work to the public
- To establish a library informing about the island, it's surroundings and the related research activities
- Perform experimental work on the island and within the surrounding waters
- Establish oil spill contingency e.g. a bird washing facility
- Provide a suitable infrastructure for scientists, students, school classes and guests

The workshop presentations about existing Nordic field stations and about the planned EU-project FIESTA or its follow-up should provide additional aspects and ideas on the possibilities of future activities for the planned research field station on Runde island.

The following list is an unsorted summary of major contributions to the discussions held at the end of the first day and at the end of the workshop. In general there were two main topics, which were focused on during these discussions:

1. The research and scientific co-operation which the future field station should focus on.
2. Collection of ideas what kind of additional activities of the field station could be worthwhile to be considered to keep the field station and it's staff economically stable on a long run.

1. <u>Research Activities and Co-operation</u>

- The research programmes of the NORDIC field stations (incl. Runde) with respect to topics like global change or bio-diversity should consider and even refer to European and global research and monitoring programmes.
- The Nordic field stations could well co-operate on a basin scale (North Atlantic).

- A more general suggestion was, to study the human impact and interaction with ecosystems regarding global challenges like climate change, bio-diversity, pollution, etc.)
- A very urgent and important task of the Runde field station could be the sampling of zoo plankton (also under the aspect to start with long-term time series).
- Another important set of parameters, which in general is interesting - not only for the work on Runde - is Meteorology. A very soon start of sampling/measuring meteorological parameters was recommended.
- It was mentioned that in the near future 7 regions for bio-diversity studies will be established in Norway. One of these regions could be the area of Runde.
- It was suggested that the Runde-group should start as soon as possible (already next year) with sampling and measurements on a low cost base (sampling of zoo plankton, meteorological measurements, bird monitoring on sea, etc.) This could be done even without an existing field station. However, nothing was said about the important aspect of financing this starting work.
- It was mentioned that recently an EU-project has started (has been proposed?), for which zoo plankton sampling sites in the North Atlantic are needed. Contact person for this project is Dr. Wolfgang Greve from the "Biologische Anstalt Helgoland" in Germany. (This institution belongs now to the "Polar-Research-Institute Alfred Wegener" in Bremerhaven.)
- One of the main topics of the field station must be the monitoring and study on the sea birds of Runde and of course on the feeding grounds of the sea birds, the surrounding waters. And even more important, the interaction and the interdependencies within the system.
- Field and laboratory experiments should be one of the major research tasks of the field station (e.g. experiments on air-sea-interaction).
- The co-operation of the Nordic field stations was mentioned. The Runde-group should get in closer contact with these field stations and find out, whether it is possible to join research and monitoring projects, which these field stations are already working on.
- In the next future there is proposed to to lay an expensive cable network within the Runde area for seafloor monitoring (ESONET) from which Runde could benefit (data etc).
- Short time series on water temperature and salinity carried out in the harbour of Runde are already existing since 1999. These measurements must be continued and could easily be extended by meteorological measurements carried out with a permanent meteorological station within the vicinity.
- There has been a dramatic decline in bird species (not only at Runde) during recent times. The Runde group should inform the public at the one side and the responsible minister at the other side about this severe development and provide suggestions concerning studies on this issue.
- It was mentioned, that every environmental risk assessment must include bird studies.
- For the planning of future research and monitoring within the Runde area it is necessary that a kind of inventory about existing studies and data sets must be carried out.
- Regarding studies on the ecosystem around Runde and also with respect to regional oil defence activities it is necessary to develop physical and ecological models. However, it was stated that the existing data base for such models might not yet be sufficient.
- Due to the fact that close to the Norwegian shore line the water depth is increasing already at a short distance it was suggested that the development of a three-dimensional physical model might be important to provide information of oil spill spreading if the pollution source (e.g. a sunken tanker) is in very deep waters. Such problems recently occurred with the 'Prestige'-disaster.

- It was highly recommended that studies on the stomack content of sea birds should be carried out to know more about the interaction between the sea birds and their food supply from the sea. In this context it was mentioned that Runde is an excellent place to study the food chain in such a highly productive area.
- Another issue could be the study on the interaction between the highly productive Runde area and adjacent regions.
- It was mentioned that the University of Bergen intends to develop models on the basin scale in co-operation with the neighbouring countries. It was recommended to the Runde group to get in contact with the people involved.
- It was suggested that the field station should be involved in a large number of national and international research programmes and experiments (e.g. GOOS, etc.).

2. Additional Activities of the field station and more practical aspects

- The Runde field station should provide (field) courses for school classes (about 20 people).
- The field station should start as soon as possible with bird watching activities. Already next year even when the field station does not yet exist.
- It is important to integrate the knowledge and experience of local people for the establishment and for the running of the field station.
- It was mentioned that it is important to participate in European programmes and projects like the ARI (Access to Research Infrastructures; Large Scale Facilities) which worked under the FP5. Similar programmes/projects should be also available in the FP6 (e.g. the research infrastructures programme under which the FIESTA-project has been proposed.
- The planned bird washing facility can be only one of several activities. However, it should even be considered to do some R&D-work on this facility to improve it's efficiency. The psychological aspect of such a facility is quite important. It was mentioned that the group should be aware that people might overestimate the possibilities of such a facility in the real case of a severe oil spillage.
- It was suggested that not only a bird washing facility could be belonging to the field station but also a regional oil spil combat centre responsible for the management of the regional oil spill defence. Additionally oil spill spreading programmes focused on the regional scale could be implied.
- Furthermore it was discussed that, in co-operation with the regional ship building industry, some new spill combat techniques suitable for local fishing vessels could be developed.
- The field station should also include a visitor information centre, which even could include a museum about the island and it's specialities.
- Additionally it was suggested, that the field station should provide apart of the research facilities like laboratories and offices also conference facilities which could be hired by guests (e.g. universities, companies, etc.)
- The field station also will provide services like field courses for interested guests and student groups. It should also include some accommodation and lab space for guest scientists.
- One important issue is to inform the public about the capabilities and the work of the field station to generate the interest of potential visitor clients.

- It was learned from one of the presentations that oil companies could provide funding to the field station establishment or even for the permanent budget demand.
- To maintain a high quality of research and services the field station should have a scientific and a technical advisory board. Furthermore to maintain good communication and contacts to the funding bodies/institutions the major funding bodies should be integrated in a steering committee.
- It was recommended that for sustainability reasons the permanent staff in general should be out of the region to enable them for a long-term employment at the field station.
- It should be tried to establish the Runde field station as a university institution or at least in close co-operation with a university.
- The field station should be integrated in different networks (e.g. network of Nordic field stations, European field stations)
- One of the main tasks of the field station should be the gathering of samples and data and maintain the gathered time series on along run.
- It was mentioned that monitoring of nature is getting more and more important and pure science/research is getting less important.
- A feasible approach to introduce Runde and it's research and services to the public and especially to the politicians could be the suggestion/presentation of four joint Norwegian marine field stations covering the entire marine sector of Norway. The importance of these 4 field stations could be underlined by the planned co-operation with the other Nordic field stations around the North Atlantic basin.

7. Users and customers

7.1 Environmental monitoring

Environmental monitoring has been a central element in the plans for the Runde Station since the beginning although the detailed description of such monitoring is not yet in place. It is also assumed that this activity will bring a certain income to the Station, both regular and on a project basis.

In terms of monitoring at/from the Runde Station a distinction between various types of users and stakeholders may be made. Users of the Station and the data and information it will produce may not necessarily be there physically, but may subscribe to regular data from the area e.g. via internet, ask for specific sampling/samples, or ask for specific experiments or tests to be performed at the Station by the fixed staff. Visitors are necessarily also present physically for a certain period of time, and will require specific services and equipment according to their demands.

A following tentative list of types of visitors/customers for monitoring (see also **Figure 21**):

Academia:

- All Norwegian universities
- Universities in Europe, possibly overseas ones as well
- Research institutions
- District colleges
- High schools teaching env. sciences

Env. management & protection (Norway):

- Norw. State pollution control (SFT)
- Meteorological institutes
- Institute of Marine research (IMR-Bergen)
- Fisheries Directorate
- Coastal Directorate
- Directorate for Nature conservation (DN)
- Norwegian Institute for Nature Research, NINA
- Norwegian Institute for Water Research, NIVA
- Norwegian Institute for Air Research, NILU

Private sector:

- Oil companies
- Maritime industry
- Fishing companies/owners
- Newspapers, journals

7.2 Field science

We defined field science tentatively as dedicated field sampling, field experiments and field testing of hypotheses, equipment and new enery generators (Chapter 4).

It is envisaged that the users and customers for science will come from the same communities as for monitoring (see Para. 7.1), but with more emphasis on industry, especially for testing.

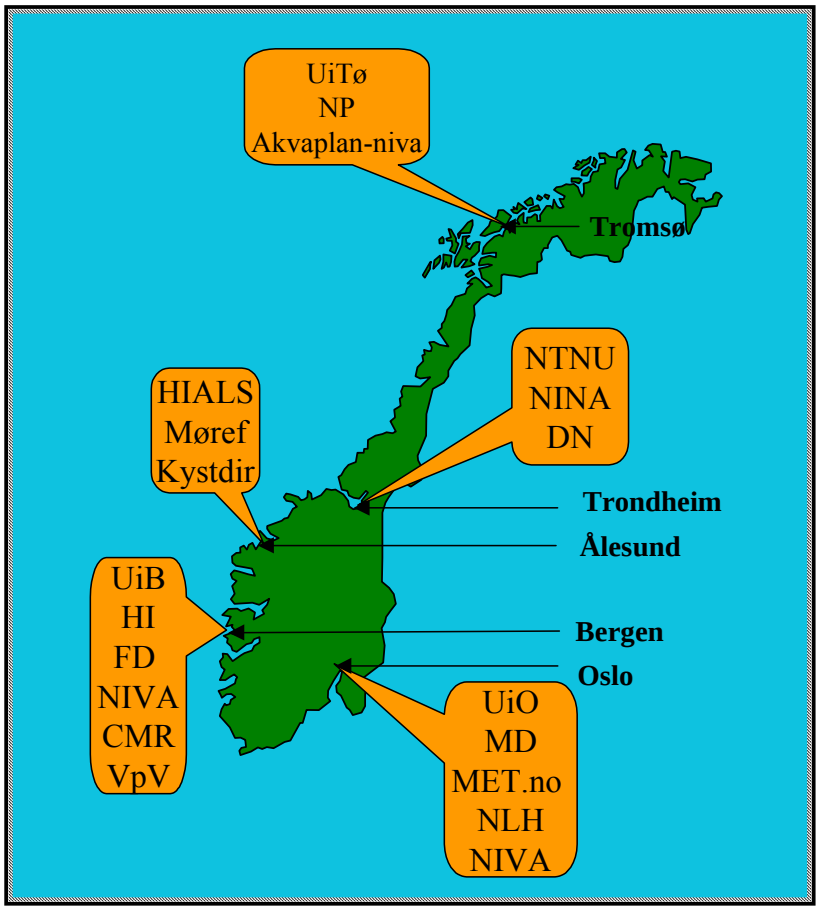

Figure 21. Location of possible domestic (academic) users for field science and education.

7.3 Oil spill contingency

The oil spill contingency as described previously, will primarily be to handle oil-contaminated birds. This activity should be supported by the government by covering the basic running cost for building and maintaining the contingency. In the case of a real accident, where many seabirds are brought in from the same accident, payment for the expenses must be covered by the ship owner of the insurance company, with state guarantees and upfront payment.

Besides the treatment of actually contaminated birds, the washing facilities will also attract industry and scientists interested in doing tests on chemicals and washing methods etc, and this new group of users will also imply an additional source of income.

7.4 Visitor centre

7.4.1 Regular tourist visitors

The majority of visitors at Runde are specially concerned about the environment, are interested in nature and wildlife and have a certain expectation of what they want to observe or experience. Runde has the potential to offer these visitors more, and also attract more visitors of this kind. International investigations have shown that such tourists are quite selective in terms of selection of visiting sites. They may have their own networks and information channels through associations etc, and words about good services and experiences at Runde will spread quickly, free of charge in terms of marketing.

The primary assets of Runde in this context are comparatively good accessibility by most means of transportation, and the broad spectrum of study subjects which is competitive with almost any other site. Provided the potential accompanying these assets are made known and visible, the range of products and services for visitors may be expanded significantly by still maintaining environmental sustainability. This will include a visitor centre and visitors actively taking part in practical observations, species counting and monitoring etc.

The existing businesses as well as the Runde Station will benefit from increased activity within this sector both at Runde and in the neighbouring region.

7.4.2 Special cources and education

The visitor centre should be sized and equipped to comply with requirements of hosting school classes and larger groups of people for special cources and teaching. These groups can be from secondary school and up to the university level, and also from non-academic environments. There is already a significant market even within Norway and the Nordic countries for this, and with the continental Europe as an additional market and income source.

Field courses for university students in the disciplines zoology (birds), marine biology and botany will be organized by the station in cooperation with the interested universities and colleges. The goal is to arrange 3 courses annually in each field. Accommodation for the professors will be provided at the station and the students will be accommodated in local youth hostels.

7.4.3 Conferences, seminars

The Visitor Centre will be the natural host for dedicated conferences and seminars, in cooperation with the other sections of the Station. The users may be industy employees or management, and staff at public and private institutions. Conferences can be accompanied by guided tours on/around the island, and special information sessions by the permanent staff at the station. Such conferences should preferrably be held outside of the peak season for visitors, and many will be fascinated by visiting Runde also during winter, e.g. to experience a real storm.

The conference capacity should be minimum ’two busloads’, i.e. 80-100 people for one-or two day seminars. This will require state-of-the art equipment and a modern auditorium, plus adequate toilet facilities, restaurant and sufficient parking area.

7.5 Brief assessent of the market and income potential

The Runde Station and its subsidiaries will be run as a private company, owned by private investors, private companies, colleges, universities and public and governmental bodies. The activity at the station shall create a surplus that enables the station to be able to support itself economically.

Once the Station is established, running costs must be covered by external funding supposedly from a variety of sources. It is therefore important to assess the potential for incomes before starting the detailed planning, and the present study forms an initial part of this assessment. A Business Plan is being prepared as a separate document which will deal with the custormers, cost and income aspects in detail.

According to the outcome of the present Nordic (NORA) project, funding from the Nordic Council and the EU can begome significant financial elements. The Nordic Council can fund specialist cources e.g. under the NorFa programme. This will be for scientific meetings/courses, mostly under the “Visitor Centre” but also under the monitoring and science sections.

On the Nordic arena there are already a variety of EU financed programmes and projects involving different regions, such as the INTERREG programmes (see example in **Figure 22**). It is envisaged that Runde can make a significant contribution to such programmes, as a neutral link between regional and local institutions and buinesses.

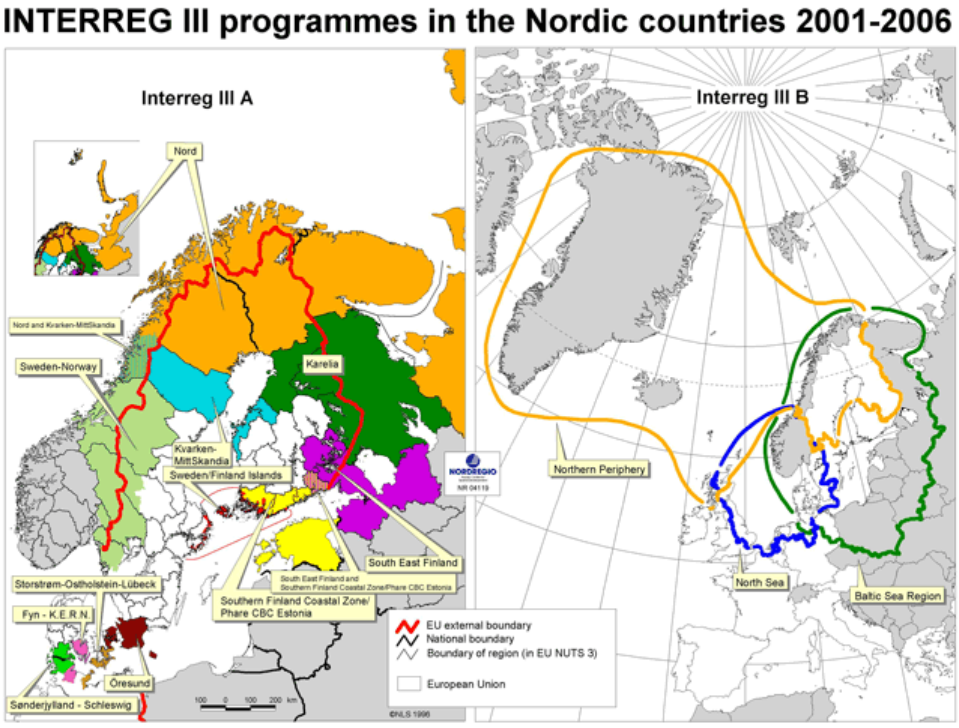

Figure 22. Map showing the EU financed regional programmes in the Nordic region where Møre og Romsdal county (and possibly the Runde Station) might qualify as partner. Several other programmes include different sub-regions.

So according to the above there certainly are sources out there that can provide funding for the activities at Runde, provided these are suited to the demands of the research programmes and by government administrators etc. The Business Plan will treat this in more detail.

7.5.1 Environmental monitoring

Environmental monitoring can be run either on a voluntary basis, as a part-paid for activity or as a fully funded activity. It can be partly viewed upon as a marketing issue for the Station, rendering more PR and various other business spinoff. In the science communities, voluntary efforts usually go hand-in-hand with funded ones, and it is anticiapted that the same will apply for Runde. The Station must show willingness to sponsors to cover parts of the associated cost.

7.5.2 Provision of research facilities

The basic business idea for the Runde station is to provide research facilities to Universities and Research Institutes. The scientist will stay on Runde for shorter or longer periods and they will pay for accommodation, food and other services such as boat hire etc.

7.5.3 Oil spill contingency

Especially the bird populations on Runde are vulnerable to oil spills. The station will establish facilities and human a capacity for washing contaminated birds. The station can take birds from whole

Norway as part of the national oil spill contingency. This activity should be funded by the government or oil companies. There will be a group of trained people ready to do the work when there are contaminated birds coming in. There is a need for an annual contribution from the government for being on readiness for washing polluted birds. In addition there should be in paid a fixed sum per washed bird.

7.5.4 Visitor centre

Runde is already attractive for tourists. It is however a need for more information to the visitors about natural history, local history and environment. This makes the basis for the visitor centre and tourist information. The number of visitors to Runde is estimated to 70 – 80,000 per year. Many of these are interested in nature and environment. We expect that at least 20% of the visitors (15,000) will visit the Visitor Centre complex. And we expect half of them (7,500) to visit the exhibition and the restaurant.

The Visitor Centre should be for both adults and children with a focus on natural history and the marine environment. The science displays will both be interested for tourism, local people and for education. The centre will be open for public most of the year. We expect to have 7.500 visitors at the exhibition during the tourist season.

Courses and excursions for primary and secondary schools wil be arranged by the Visitor Centre. The station will develop special courses for children. The goal is that every pupil in the region shall visit Runde at least one time during their time in primary or secondary school. We therefore estimate this marked to be approximately 1200 pupils per year for one day excursions (see **Table 5**). There is already developed a webpage for school children visiting Runde, (bt Mr. Arne Sten Christiansen, see http://itstudent.hivolda.no/~chrisar/PBI/index.htm), but it needs to be further developed.

Table 5. Number of pupils in primary and secondary schools in communities with less than 2 hours travel from Runde.

Community	**Total number of pupils** (ca.)	**Estimated visitors annually**
Hareid	750	65
Herøy	1200	120
Sande	370	37
Ulstein	1000	100
Vanylven	500	50
Volda	1250	125
Ørsta	1400	140
Ålesund	5000	500
Sula	1000	100
Total	**12470**	**1247**

7.5.5 The section for accommodation

The station will have 8 rooms for visiting scientists. We expect the rooms to be fully occupied during the bird hatching season April to August. (5 months). The most interesting period in the sea is between January and May, when the bulk of the Atlanto Scandic Herring and the North Artic Cod stocks are spawning off Runde. The autumn is a more quiet time which would be excellent for scientists that need a quiet place for writing. We expect the accommodation capacity will be approximately 60% utilised during the year. If there is unutilized capacity during the summer, rooms will be hired out to tourists.

7.5.6 The office section

The office section is planned for 10-15 people, in total 10 offices. We expect to have 4-5 offices occupied during the whole year by local small consulting enterprises and national research institutes. The remaining offices will be available for visiting scientists. We expect to have 80% of the office space booked per year in average.

8. Building requirements and infrastructure

As part of the pilot project an nitial design study must be performed, that includes alternative sites, spatial reguirements, infrastructure, equipment and building(s). In the present prestudy project, only an outline of each element will be presented. The design study for the Station is only in it's initial stage and the information given below must be read in view of this fact.

8.1 Total capacity and general requirements

8.1.1 Accommodation

According to thre assessments of initial demand, the station must provide accommodation for 10-12 people in single rooms. The rooms will be of basic hotel standard with its own bathroom, a double bed, writing desk and TV. The accommodation section will have separate entrance. All rooms will have spectacular view.

8.1.2 Offices and other rooms

The pre-assessments made shows that the station must provide office accommodation for 12 people, both in single offices and in open-plan office. Each workplace will have telephone and data line.

Computer room, printers and copying
This can accomodated in one room, and needs special attention with regards to power supply and cable network. Wireless networks are now common, and will help reduce the cost of installations.

Meeting room
This room can be used by the staff and guests for lunch etc. Facilities for presentations on overhead and Power Point, as well as basic kitchen facilities must be provided.

8.1.3 Laboratories and other special rooms

Wet lab.
In this lab, all the "dirty" work is done. Washing of birds, gutting fish etc. This lab should have its own entrance. There should also be a carport where you can drive in samples and birds. The lab will have wardroom, toilets, shower and resting room with basic kitchen facilities.

Dry lab
This lab will house the work on microscopes etc.

Workshop
A small workshop for maintaining the building and equipment.

8.1.4 Stores

Freezing stores
The store should have capacity for storing 3 tons of food for birds.
In addition there should be capacity for 1 ton of different samples etc.
Cold Store
This store is will be used for storing fresh samples of fish and other animals.
Stores for birds
This store should be heated when necessary. It could be used for storing different types of equipment but should be operative for storing birds within a few hours.

8.1.5 Visitor centre

The centre will be divided into 5 areas,

1) Exhibition,
2) Restaurant,
3) Craft shop,
4) Tourist Information, and
5) Auditorium.

There will be free access to the craft shop and tourist information, The entrance to the visitor centre is the tourist information hall where tickets can be bought for the exhibition and the video show in the auditorium. The Restaurant and the Craft shop should be open for all visitors.

The Restaurant and the Auditorium should be able to be separated for conferences etc.

8.1.6 Library

The library will contain all reports books etc that are collected at the station or produced by the station. It needs to be close to the office area.

8.1.7 Collections

The station will build up its own collections. These collections will therefore gradually need more space. It is therefore necessary to plan for the future need.
The collection will contain:

- Photographic collection
- Herbarium containing flowering plants, mosses, fungi, Lichens and seaweeds
- Reference collection containing phytoplankton, zoo plankton, fish, etc. etc.
- Stuffed birds

8.2 Summary about spatial requirements

Table 6 summarises the initial spatial requirements as calculated based on a conservative assessment of activities the first few years. This corresponds to approximately 720 m^2, not included outside facilities, parking space etc.

Table 6. Areal and spatial requirements for various activities.

Buildings and Infrastructure			
	Number of rooms	**Size per room (m^2)**	**Total (m^2)**
Accommodation			
Rooms	10	16	160
Corridors	1	25	25
Kitchen and TV room	1	15	15
Total accommodation			200
Office section			
Offices	8	12	96
Computer room, printers and copy machine	1	12	12
Meeting room	1	16	16
Corridors	1	30	30
Total offices			154
Laboratories			
Wet lab.	1	20	20
Dry lab	1	20	20
Workshop	1	10	10
Stores	1	15	15
Freezing stores	1	5	5
Cold Store	1	5	5
Stores for birds	2	20	40
Corridors	1	20	20
Toilets and wardrobe	1	15	15
Total lab and stores			150
Visitor Centre			
Exhibition	1	40	40
Restaurant +kitchen	1	60	60
Craft shop and Tourist information	1	25	25
Auditorium	1	30	30
Office	1	7	7
Toilets and wardrobe	1	15	15
Total visitor centre			177
Library	1	20	20
Collections	1	20	20
Total collections			40
Total			**721**

8.3 Siting

Discussions are pending with the municipality about siting alternatives, of which the stone quarry close to the harbour (**Error! Reference source not found.** and **Figure 24**) is a likely alternative.

Figure 23. The harbour area of Runde. The arrow shows a likely site for the Station at the abandoned quarry. Photo/©: Harald Valderhaug.

8.4 Existing or new buildings?

There are several buildings at Runde that can be used by the station, provided they are available for sale or rent. Some of them are shown in **Figure 25**. The old warehouses can be rebuilt to offices and labs. These warehouses are situated in Runde harbour which is a national fishing harbour. If the main activity in the harbour is going to be other activities than fishery, there is a risk that the harbour will loose its status. If so happens, the state will maybe not pay for the maintenance cost for the harbour an that will be a great loss for the community.

It is, however, possible to convert one of the buildings to wet lab or store, if this is not done permanently. There is a need for storing sampling equipment and to use one of the warehouses will be a good solution.

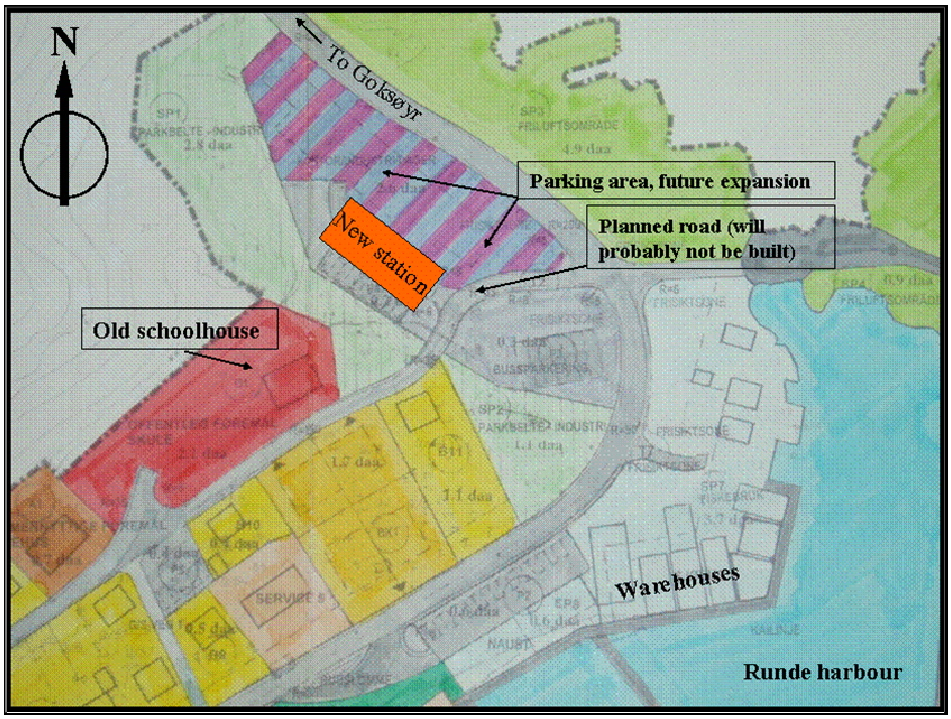

Figure 24. Regulatory map of the part of Runde where the station may be located.

Figure 25. Some of the warehouses in Runde harbour. Photo by N R Hareide (2004).

The local primary school (**Figure 26**) was refitted five years ago, it is well maintained and belongs to the local community. It is no longer in use as a school but serves as a community hall. There are three classrooms and a gym. This building will be excellent for teaching student classes and for seminars, if made available for the purpose. The workshop at Runde in 2004 was held in this building.

The idea of using old buildings for the Station has been discussed and some possibilities seem to exist. The cost of converting old houses into a modern lab will according to architects be about the

same per square meter as for building new buildings. The Group has therefore found that the best solution will be to build a new building which will contain:

- Accommodation
- Offices
- Lab and Stores
- Oil spill contingency for birds
- Visitor Centre
- Collections
- Tourist information

The schoolhouse will be hired for:
- Teaching classes
- Workshops and seminars.

A warehouse will be hired for:
- Storing sampling equipment
- Equipment for the boat
- Processing fish and samples
- Diving equipment

It is also an option to hire service from the local diving centre which is situated in the harbour.

Figure 26. The former primary school, a possible location for some activities at the station. The workshop in 2004 was held in this building. Photo by N R Hareide (2004).

Runde harbour is the only place where there is year-round shelter for boats, and where there is already some useful infrastructure. So the best location for the Station's vessel and some infrastructure will necessarily be at or near the harbour. Also, the major building should be in the vicinity of the harbour for practical reasons. There are no vacant sites in the harbour area that satisfies the areal requirements, including free space for future enlargements. But the harbour can host a new harbour house for the Station.

A likely site for the station is the abandoned rock quarry some 100 m north of the harbour, behind the old fish warfs. The Municipality of Herøy is already doing some preliminary judgements for this site which partly is owned by the major landowners of Runde. Discussions wit the landowners association indicate there are no objectives against releasing this site for the actual purpose.

8.5 New building and other required (new) infrastructure

The new building(s) needs to have a high technical standard, emphasizing modern, environmentally friendly solutions, including use of renewable energy and energy recycling. As there will be frequent boat surveys into the surrounding sea, access to a fish warf/harbour house preferrably with a floating pontoon quay is important. This purpose may possibly be served by an existing sea-side building - if not, a new building must be raised. The boat (or boats) should have the capacity to be able to conduct surveys in shallow waters, in moderately rough seas, with sampling and diving equipment. Sampling further offshore may require a larger boat - possibly hired locally or from the Coast Guard. Regular sports diving as well as guided boat tours will be handled by existing businesses (the diving centre and private boat owners).

A physical separation between the "science" part, the oil spill contingency part and the public part is envisonaged. Barriers, however, should be moderate to allow for free passage of personnel and exchange of information, "open day" type arrangements and sharing of some of the infrastructure.

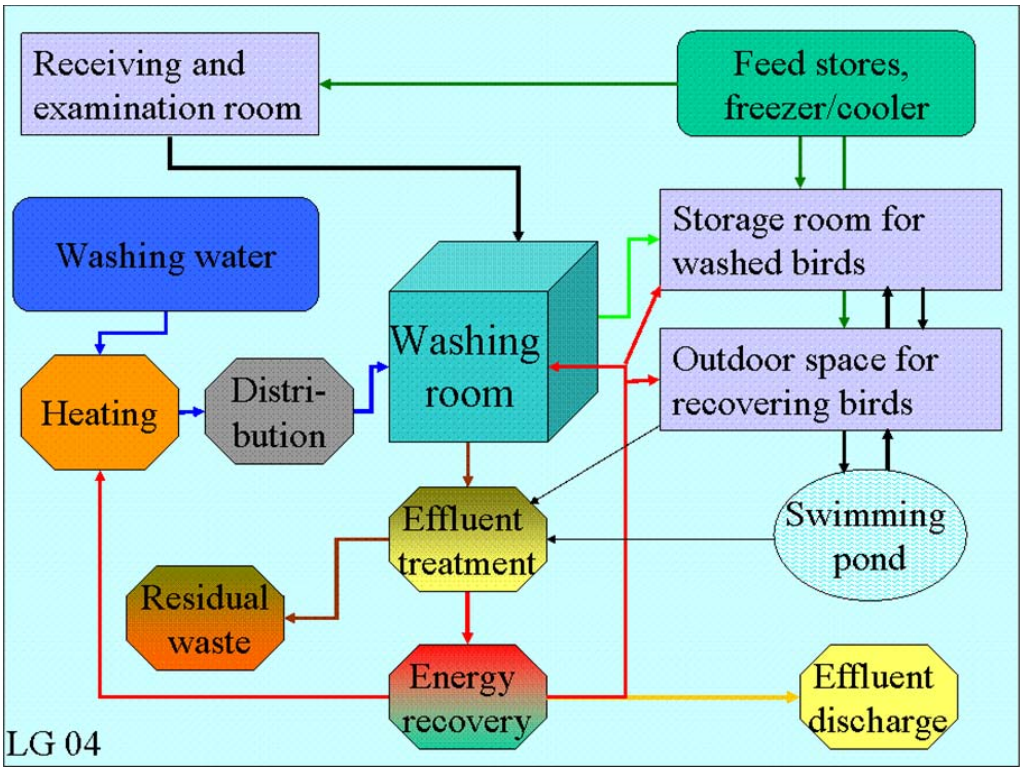

Figure 27. Schematic diagram showing major elements of the oil spill contingency for bird washing.

8.5.1 Special equipment

The station will be equippled with best available technology (BAT) for waste water treatment. A special, closed-cycle, zero-effluent installation has been tentatively offered by a local producer of water treatment plants for ships, cruise liners etc., to be installed at Runde as a demo plant.

The station will also have equipment for energy saving and heat recovery from effluents.

8.5.2 Vessel

The station when up and running must have it own vessel for sampling, deployment and recovery of equipment, and for excursions etc. (**Table 7**). We anticipate a sea-going 10-12 m boat suitably equipped to be sufficient for regular operations. The boat must have a minimum cruising speed of 20 knots, in order to be able to bring guests directly to nearest ports or airports in a short time (< 1 hr).

We expect the vessel to be occupied 110 days per year. The type of vessel needed is a commercial fishing boat, that can work both offshore and in shallow water. Some specifications are given in **Table 8**. The vessel will be manned by one person who will work 6 man months per year on board.

It is also possible to hire vessels to work for the station. There are three vessels at the island licensed for carrying passengers, and there are both private and commercial fishing vessels that could be hired for different purposes like surveys far offshore.

Table 7. Main activities for the vessel.

Activity	Days
Monthly oceanographic survey on fixed stations	25
Bird survey once a month	15
Field courses for students	10
Deploying and retrieving scientific equipment	5
Cruises for tourists	15
Transport of personnel and visitors	10
Project work for Research Institutes	15
Other	15
Total	110

Table 8. Specifications for the vessel.

Length o.a.	10-12 m
Speed	20-30 knots
Passengers	8 people
Equipment	Hydraulic winch
	GPS
	Ecco sounder
	Communication equipment
	Extra safety equipments
	Sampling equipment

9. Management and risk

9.1 Organisational management

The detailed design studies are planned to commence 1st half of 2005, with construction commencing in 2006.

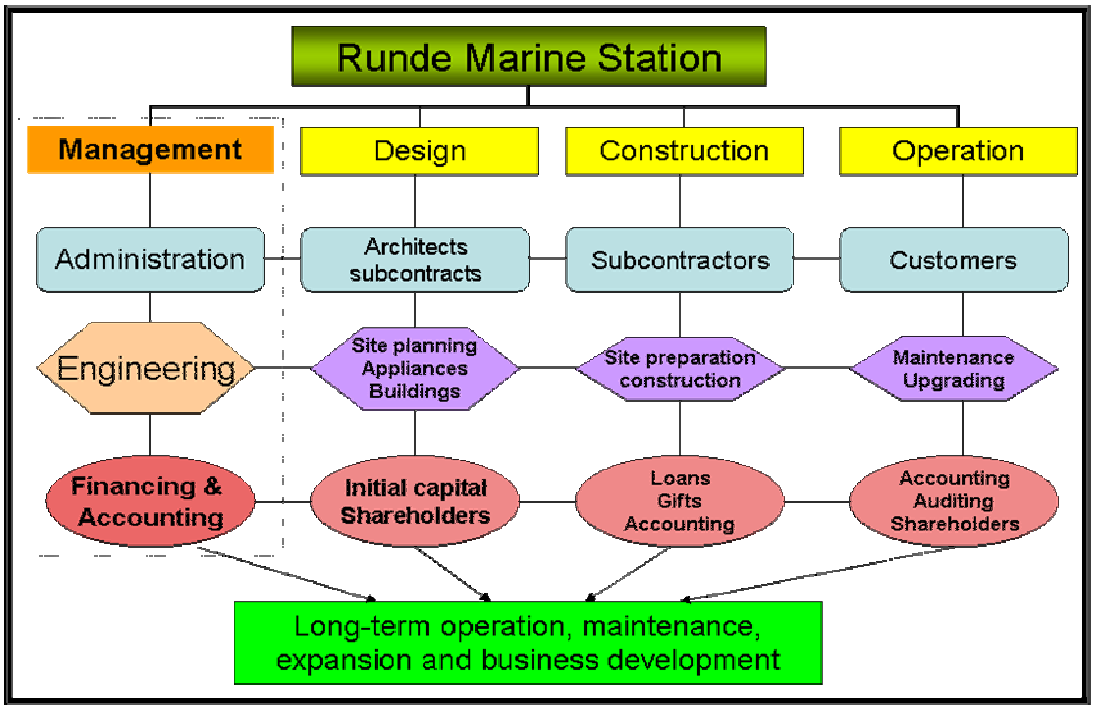

Figure 28. Tentative organisational chart for the three phases of the project.

Figure 28 shows a tentative organogram for the design, construction and operation phases. Stringent management will be needed both for initial design and construction of the station. For the funding, there will be a mix between private, equity and public financing, with different coverage according to the project phase and type of expenses.

The project (station) may be formally organised in different ways, of which a foundation (public or private) and a PLC (public limited company) are probably the most relevant. The PLC alternative seems like the best option, in terms of initial capital requirements, risk handling, investor opportunities, public acceptance and common established admistrative procedures. It it feasible at a later stage to convert a PLC into a foundation, but the reverse is quite difficult.

The station will be best managed by establishing a parent company with different subsidiaries according to the specific activities (e.g. bird washing station, visitor centre). Each company shall have good management and strict reporting and auditing. In order to secure progression and sustainability it is recommended that the parent company is controlled by the Runde Group which already invested significant private resources in the pilot studies. The group in total holds significant expertise in business, project and personnel management besides long time experience within marine and social sciences.

9.1.1 Business plan

The business plan for the station (in prep.) will include the following chaptes,

1. Description of the station & activities
2. The different services/products
3. The market for services/products
4. The production
5. Economy
6. Financing
7. Organisation

Each item will be critically scrutinised

9.1.2 Initial cost sharing

The present study is part of the necessary intitial design studies that need to be continued on a more detailed level. **Table 9** outlines a cost sharing sceeme during the design phase, with 1 ½ years duration. Other funding sources will be sought as well.

Table 9. A possible scheme for cost and efforts sharing for various activities in the planning and design phase, 2004-2005.

Year	Financing/effort	Activity/project
2006	Diverse	Kick-off construction
2005	Own, Herøy3	Loan applications
2005	Own, Herøy3	Support applications
2005	Own, Herøy2	Financial plan
2005	Own, Herøy2, County2	Budgeting runing ph.
2005	Own, Herøy2, County2	Budgeting constructn.
2004-05	Own, Herøy1, Herøy2, County2	Conduct plan
2004-05	Own, County1, County2	Plan for monitoring
2004-05	Own, Herøy2, County2, EU	Plan for info. centre
2004-05	Own, Herøy1, Herøy2	Plan for tourism
2004-05	Own, NORA1, NORA2, NRC	Science Plan
2004	Own	Founding enterprise
2004-05	Own, County1, NORA1, NORA2	User-contacts
2005	Own, Herøy1, County2	Personnel plan
2004-05	Own, Herøy 1, County1, County2	Equipment demand
2004-05	Own, NORA1, Herøy1, County1	Market analyses
2004	Own, Herøy1, County1	Area plan
2004	Own, NORA1, Herøy1, Cou-1	Nordic networking
1990-2003	Own	Iinitial planning

9.2 The Risk of Failure

Any enterprise including newly established SMEs constantly face a certain possibility or risk of economic failure, so also for the Runde Station. In the sector of public or semi-public entities such as museums, aquariums, hotels, visitor centra and various cultural centra in Norway there is a

significant record of bankrupcies, equity loss and refiniancing shortly after start-up. It may seem like the intial budgets and income estimates were too ambitious or optimistic in many cases. Centra relying on a certain number of visitors to secure the annual income frequently face a decline in visitors after a couple of years that in the best case puts constrains on their economic freedom, and subsequently may force them to close down. The latter may be a consequence in situations where there are few or no alternative possibilities or even strategies to secure incomes. Commonly, these projects were initiated by local enthusiasts but further organized with strong political participation and auditing free of personal engagement.

There are certain potential pitfalls even in the planning and design process that must be considered in order to reduce the risk of failure of the initial stage of the project when the personal human capital and effort are the essential investments. Factors such as loss of personal enthusiasm and momentum, conflict of interest and different opinions among the founders, loss of political backing and momentum and loss of initial funding for design studies, market analysis etc. might force an early stop.

Certainly, the market analysis as well as the economic analysis and initial budgeting should be critical and with the alternative conclusions of a unsustainalbe project as a possible outcome. In this way, the risk of loss of initial investment capital will be minimized. From the experiences made so far, from the impressions about the market possibilities, by the persisting enthusiasm among the founders, by the political and economical backing obtained, and by the fact that the project is well underway the risk of an early failure seems diminishingly small.

Evaluating the risk of failure of the station once it is running should be the more central element in the assessments to be made especially by donors, sponsors and providers of loans and venture capital as well as for those institutions that decide to spend time and resources at the station. Such failure, we assume, essentially will be a result of lack of income and loss of equity, resulting in insolvency and possibly bankrupcy. It must be up to those entities to make their own, independent assessments. In this report, the planning group only wants to express that those issues have been considered, and that the plans will be made to minimize the risk, as outlined below.

9.2.1 Minimizing risk

The following elements will be central to minimize the risk of failure and loss of capital:

- Thorough planning and design studies, including SWOT analysis,
- Modesty in the design and areal requirements,
- Multi-stage project with a sober start-up,
- Early development of alternative strategies and uses in case of failure,
- Buildings' and infrastructure flexibility (multi-purpose),
- A constant marketing that also encompasses new opportunities,
- A business conduct based on several complementary income sources,
- Flesibility among the staff (task-sharing, rotation, part-time empl.),
- External audits and board expertise by persons approved by the founders and sponsors,
- Baseline financing as public or private donations to reduce the amortisation load, and
- Best possible loaning and payoff conditions.

9.3 Further work

The Runde Group will continue on the following activities, autumn 2004 and onwards:

1. Financing: Liaise among potential local industrial sponsors,
2. Financing/market: Meet with oil company representatives,
3. Market: Continue West-Nordic networking, autumn 2004,
4. Market: Visit Sandgerdi Station in Iceland and Kaldbak, Faroes, Nov-Dec 2004,
5. Market: Arrange user meetings with institutions in Bergen and Oslo-autumn 2004,
6. Design: Make a complete technical design for the Station,
7. Design: Complete evaluations about the siting,
8. Planning: Update the business plan.

9.4 New actions, 2004/2005

- Meet with County officials in Molde, autumn, 2004
- Form a parent/holding company for the Runde Station
- Decide on the name of the Station (English and Norwegian)
- Design a logo for the station - (and decide on company name)
- Draft a Science Plan for Runde
- Establish a meteorological station at Runde
- Establist the internet site for the Station, and begin promotion via this
- Draft a co-operative agreement with the District College in Aalesund
- Meet with EU infrastructure officers in Oslo and Brussels
- Visit existing bird washing fascilities in England and Holland
- Promote Runde towards the plans for a regional university
- Incorporate the West-Nordic cultural heritage aspect in the plan
- Establish a temporary company office at Runde
- Perform an architectual concept and design study
- Complete the areal plan/floor plan
- Complete a new project application to NORA to continue network building in W Norden
- Complete a research project application to the EU for networking/regional integration
- Complete application to domestic funding sources (municipal/county/state level)

10. Background literature

The list contains references to reports, studies, press releases etc that have been mentioned or refered to in the report. The list may not be complete and may also include relevant literature that was not explisitety mentioned in the report. Please consult the authors for specific information on the application of the references.

Academy of Finland 2003: European strategy on marine research infrastructure. Academy of Finland Rep. 6/03, 42 p

Atkins, S. 2004. Marine Nature Conservation and Sustainable Development. Marine conservation (Marine Comservation Society, UK), 22-23.

Bartlett, A. A. 2004: Thoughts on Long-Term Energy Supplies. Scientists and the Silent Lie. Physics Today, American Inst. of Physics, July 2004, 53-55.

Bishop 2003: The Ecology of The Rocky Shores of Sherkin 1980 -2000.

Bonnet, D. and C. Frid 2004: Seven copepod species considered as indicators of water-mass influence and changes: Results from a Northumberland coastal station. ICES journ. Mar Science, Vol 61, 485-491.

ESF 2002: Integrating Marine Science in Europe. European Science Foundation, November 2002, 148p.

European Commission 2002a: Towards a strategy to protect and conserve the marine environment. Communication from the Commission to the Council and Parliament, 52 p.

European Commission 2002b: Research infrastructures 2002. Volume A. Rep. EC rep., 231 p.

Europaparlamentet 2003. Bætekning om kommisjonens meddelelse - Frem mod en strategi til at beskytte og bevare havmiljøet. Memo, EU, 7 mai 2003 A5-0158/2003.

Fisken og Havet 2004: Havets Miljø 2004. Rapp. Fisken og Havet, særnr. 2-2004, Havforskings-instituttet, Bergen, 120 s.

Fiskeridepartementet 2004: Enklere hverdag. Modernisering og forenkling i fiskeri og kystforvaltninga. Statusrapport, Fiskeridept. Oslo, august 2004, 20s.

Forskning.no 2004: Økoturisme til besvær. Artikkel i Forskning.no, Mars 2004.

Fridleivsdottir, S. 2003: Why is a regional concept important today and in the future? An example from the field of Sustainable Development. Speech, S. Fridleivsdottir, Icelandic Minister for the Environment and Nordic Co-operation. Intnl. seminar on Regional co-operation - the Nordic Experience, June 2003, Sofia, Bulgaria.

Fylkesmannen i Møre og Romsdal 2003: Fylkes delplan for inngrepsfrie naturområde.

Golmen L. G. and Skreslet S. (2004) Two new Nordic research facilities off western Norway and on Jan Mayen? Ocean Challenge Vol 13, No. 2.

Hansen, B., S. Østerhus, D. Quadfasel and W. Turrell 2004: Already the day after tomorrow? Sciene, Vol. 305, 13. Aug. 2004, 953-954.

Herøy kommune 2001: Næringsplan 2001-2005. Notat, Herøy kommue, 10 s.

Kystverket 2004: Utredning av konsekvenser av skipstrafikk i området Lofoten-Barentshavet. Rapp Kystdir/SFT Mai 2004, 12 s.

Ludviksen, S. 2002: Et rent hav avgjørende for sjømateksporten. Press release form the Norwegian minister of fisheries, Mr S. Ludviksen, 14. March, 2002.

Lynam, C. P, S. J. Hay and A. S. Brierley 2004: Interannual variability in abundance of North Sea jellyfish and links to the North Atlantic Oscillation. Limnol. Oceanogr. Vol. 49(3), 637-643.

Mare Cognitum 1993: Mare Cognitum. A science plan. Science plan for research on marine ecology of the Nordic Seas. A regional CLOBEC program. Rep. Inst. Mar. Research, Bergen, 162 p.

Miljøverndepartementet 1999: Vern og bruk av kystsona. Tilhøvet mellom verneinteresser og fiskerinæringane. Tilråding frå Miljøverndepartementet 18 juni 1999. St. Meld. nr 43 (1998-99),82 s.

Miljøverndepartementet 2004: Miljøvernforvaltningens kunnskapsbehov 2006-2010- utkast september 2004.

Møre og Romsdal Fylkeskommune 2000a: Fylkesdelplan for strand- og kystsona 2001-2004. Rapp. Fylkeskommunen, 12 s.

Møre og Romsdal Fylkeskommune 2000b: Strategisk Næringsplan for Møre og Romsdal 2001-2004. Del rapport: Alternativ energi i næringsutvikling, Del rapport: Reiseliv.

Møre og Romsdal Fylkeskommune 2003: Regionalt utviklingsprogram for Møre og Romsdal 2004. Handlingsprogram for strategisk næringsplan.

NATURE 2004: Divers net information for sea conservation website. Nature, Vol. 430, 5. Aug. 2004, p 601.

NIVA 2004: Årbok 2003. Norsk inst. for vannforskning, Oslo, 72 s.

Nordisk Ministerråd 2002: Evaluering av Nordisk Ministerråds institutioners rolle for nordisk samarbejde på området uddannelse, forskning og IT. Nord. Ministerråd, København, APN 2002:750, 65 s.

Norges forskningsråd 2001: Styrking av naturvitenskapelig grunnforskning gjennom bedre samordning melom fagmiljøene. Rap. fra dert nasjonale fakultetsmøtets Norgesnettgruppe. Rev. versjon. april 2001, 67 s.

Norges forskningsråd 2002: Marin overvåking. Rapp. utarb. av Nasjonalt Råd for operasjonell marin overvåking og varsling. NFR, Oslo, 57 s.

Norges forskningsråd 2003: Kystsoneforskning - for verdiskaping og mangfold. Rapp. Norges forskningsråd, oktober 2003, 37 s.

Norges forskningsråd 2004a: Lange tidsserier for miljøovervåking og forskning. Viktige marine dataserier. Rapp. N.r 3/2004, NFR, Oslo, 53 s.

Norges forskningsråd 2004b: Havbruk 2020. En Foresight analyse. Rapp. NFR, 170 s.

Rogers, C. J., S-H Wang and D. H. Bromwich 2004: On the role of the NAO in the recent norteastern Atlantic Arctic warming. Geophys.. Res. Letters, Vol. 31, L02201, 4 p.

Runde Group 2004a: Runde Marine Station- Plans. Memo, February 2004, 7 p(in Norwegian)

Runde Group 2004b: The Runde Marine Station. A Science Plan. Draft document, August 2004.

SCIENCE 204. Saving Scripps. Science, Vol. 305, July 2004, 167-168.

Sobel, J.A. and C. P. Dalgren 2004: Marine Reserves. A guide to science, design, and use. Island press, Washington, 383 p.

Stenseth, N. C., G. Ottersen, J. W. Hurrell og A. Belgrano 2004: Marine ecosystems and climate variation. Oxford Univ. press, New York, 252 s.

Svendsen E. 2002: The Amoebe Plan; A Model-based and data-driven operational Ecological Biomass Estimator. Rep. Marine Res. Institute, Bergen, 250 p.

Vetenskapsrådet (Swedish Research Council) 2004: Utvärdering av centrum för marin forskning. Redovisning av ett regeringsuppdrag. Rapp, Vetenskapsrådet, Stockholm, July 2004, 41 s (Draft).

Some of the workshop participants, May 2004.

Appendix A. Workshop programme

Wednesday 26th May 2004

Time	Item
	Arrival of participants. Meet in the School House for information and accommodation. Contact persons: Hans Petter Runde Mobile (47) 97681620 Lars Gunder Golmen Mobile (47) 95185985 Greta Garnes Mobile (47) 99629178 Nils-Roar Hareide Mobile (47) 41291107
19:00	Boat trip around Runde island
21:00	Informal reception

Thursday 27th May

Time	Item	Delivered by
10:00	Welcome & introduction	Mayor of Herøy Arnulf Goksøyr
10:15	Presentation of Runde and the background for the workshop	The Runde Group
11:00	Zackenberg Station - establishment of a modern research station in High-Arctic Northeast Greenland - Ecological Research Operations - the most extensive ecosystem monitoring programme in the Arctic'	Director Dr. Morten Rasch Denmark
11:45	Presentation of Greenland Institute of Natural Resources.	Director Klaus Nygaard Greenland
12:30	Lunch Press Conference	Local Cafe
13:30	Presentation of Sandgerdi Marine Centre. University of Iceland	Halldor P. Halldorson Iceland
14:15	Presentation of Biofar Research Station, Kalbak, Faroe Islands	Director Jan Sørensen
15:00	Research on Jan Mayen Island in relation to the ecology of the Nordic Seas. – Presentation of the planned research Station on Jan Mayen	Dr. Stig Skreslett
15:45	Tea/coffee break	

16:00	Brain storming and discussions: What have the stations in common and how can they serve each other for mutual benefit? What can they contribute to marine and environmental science and monitoring?	Convenor: Klaus Nygaard Rapporteur: Johannes Post
16:30	Closing day 1	
17:30 - 20:00	Guided hike to the bird cliffs	Alv Ottar Folkestad
21:00	Dinner (informal)	

Friday 28th May

Time	**Item**	Delivered by
10:00	EU-FIESTA-Project: "An integrated design study to enhance the sustainability of European Field Station infrastructures."	Johannes Post HYDROMOD Service GmbH Germany
10:30	Review of Research and monitoring activities at Runde	Alv Ottar Folkestad
11:00	Runde Information Centre Presentation of a master project in architecture. NTNU Trondheim	 Siri Lycke Kolstad
11:30	How can West-Nordic Marine Stations prosper through mutual cooperation? What are the Nordic/West-Nordic incentives to achieve this? Which national, Nordic and international programmes are available for establishing infrastructure and for funding field stations?	Convenor: Klaus Nygaard Rapporteur: Johannes Post
12:30	Lunch	Local Cafe
13:30	Discussions Group sessions Draft a joint statement with an action list	
15:00	Closing	

Appendix B. Workshop participants

Name	Institution
Bang, Christoffer	Høgskolen i Volda
Devold, Terje	Ålesund Reiselivslag
Folkestad, Alv Ottar	Ulstein kommune
Folkestad, Are	Nanseninstituttet
Gilstad, Mona	Vega kommune
Gjelseth, Svein	Herøy Næringsforum
Gjerde, Gunn Berit	Møre og Romsdal Fylke
Goksøyr, Arnulf	Herøy kommune
Goksøyr, Knut Asle	Goksøyr Camping
Goksøyr, Øystein Østensen	
Gustavsen, Bjørn	Runde Dykkesenter
Haddal, Kåre	Jets Vacuum AS
Halldorson, Halldor P	Sandgerdi Marine Center, University of Iceland
Huus, Rolf	Runde Grendalag
Jakobsen, Paul	Runde Grunneigarlag
Kolstad, Siri Lycke	NTNU
Mauritzen, Sverre	Vestlandsrådet / NORA
Nygaard, Klaus	Greenland Institute of Natural Resources
Nyhus, Eirin Roaldsen	Møre og Romsdal Fylke
Pareliussen, Ingar	NTNU
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