

OECD project

Supporting the Contribution of

Higher Education Institutions to Regional Development



Final Self-Evaluation Report

Trøndelag (Mid-Norway Region)

January 2006

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List of terms

English/Norwegian terms:

Explanation:

Institutions:

Aetat	Official labour exchange
Confederation of Norwegian Business and Industry (NHO) <i>Næringslivets hovedorganisasjon</i>	Main social partner for the employers
County Governor's Office <i>Fylkesmannen</i>	Regional tier of Norwegian government
National Database for Statistics on Higher Education <i>DBH - Database for statistikk om høyere utdanning</i>	Operated by the Norwegian Social Science Data Services (NSD) for the Ministry of Education and Research
<i>Folkeuniversitetet</i>	Adult Education Association
Innovation Norway <i>Innovasjon Norge</i>	
<i>Leiv Eiriksson Nyskaping AS (LEN)</i>	Offers seed capital, technology transfer services, business counselling and incubator facilities.
Mid-Norway Chamber of Commerce <i>Næringsforeningen i Trondheim</i>	
Ministry of Education and Research <i>Kunnskapsdepartementet</i>	
Ministry of Local Government and Regional Development <i>Kommunal- og regionaldepartementet (KRD)</i>	
Museum of Natural History and Archaeology <i>Vitenskapsmuseet</i>	The Museum is part of NTNU
NIFU-STEP	Norwegian Institute for Studies in Research and Higher Education – Centre for Innovation Studies.
Nord-Trøndelag Research Institute <i>Nord-Trøndelagsforskning (NTF)</i>	
Nord-Trøndelag University College <i>Høgskolen i Nord-Trøndelag (HiNT)</i>	
<i>Norges Bank</i>	The Central Bank owned by the Norwegian State.
Norwegian Agency for Quality Assurance in Education <i>Nasjonalt organ for kvalitet i utdanningen (NOKUT)</i>	Government agency for the evaluation and accreditation of tertiary education, and the recognition of international higher education qualifications
Norwegian Confederation of Trade Unions <i>Landsorganisasjonen i Norge (LO)</i>	Main social partner for employees

Norwegian Association of Higher Education Institutions <i>Universitets- og høyskolerådet (UHR)</i> Norwegian School of Management <i>Handelshøyskolen BI</i>	The interest organization for public higher education institutions.
Norwegian State Educational Loan Fund <i>Statens lånekasse for utdanning</i>	Provides loans and scholarships to those taking higher education.
Norwegian University of Science and Technology <i>Norges teknisk-naturvitenskapelige universitet (NTNU)</i>	Second-largest university in Norway. Located in Trondheim, Central Norway
NTNU Technology Transfer AS (NTNU TTO)	
Queen Maud's College of Early Childhood Education <i>Dronning Mauds Minne (DMMH)</i>	Offers special education for pre-school teachers
Research Council of Norway <i>Norges forskningsråd (NFR)</i>	Government agency for the funding and evaluation of research in higher education and the institute sector
The Royal Norwegian Society of Sciences and Letters <i>Det Kongelige Norske Videnskabers Selskab (DKNVS)</i>	
SINTEF	Independent research institute. Largest in the Nordic countries
SIVA	The Industrial Development Corporation of Norway
Statistics Norway <i>Statistisk sentralbyrå (SSB)</i>	Central bureau of statistics
Storting <i>Stortinget</i>	The Norwegian Parliament
Student Welfare Organization <i>Studentsamskipnaden i Trondheim (SiT)</i>	
Sør-Trøndelag University College <i>Høgskolen i Sør-Trøndelag (HiST)</i>	
Technology Transfer Offices (TTO) <i>Teknologioverføringskontor</i>	Owned by HEIs to assist in converting scientific ideas into industry products, patents, etc.
City of Trondheim <i>Trondheim kommune</i>	Municipality and main urban centre in Trøndelag.
Mid-Norway European Office <i>Trøndelags Europakontor</i>	
Universities and Colleges Admission Service <i>Samordna Opptak</i>	

Other terms:

Act relating to Universities and University Colleges

Universitetsloven

Centres for Research-based Innovation
Sentre for fremragende innovasjon (SFI)

Centres of Excellence
Sentre for fremragende forskning (SFF)

Competence Reform
Kompetansereform

Database on Higher Education in Norway (DBH)
Database for statistikk om høgre utdanning

FORNY

Government White Paper
Stortingsmelding

Higher Education Institution (HEI)
Høyere utdanningsinstitusjon

Industrial College Initiative
Næringsrettet høgskolesatsing

International Student Festival in Trondheim
(ISFiT)

Knowledge Promotion Reform
Kunnskapsløftet

Norwegian Centres of Expertise (NCE)

Public support system
Virkemiddelapparat

Professional and vocational education/study
programme
Profesjonsutdanning

Quality Reform
Kvalitetsreform

Regional Development Plan
Felles fylkesplan

Regional Action Programme
Samhandlingsprogrammet

Research-based competence brokerage
Forskningsbasert kompetansemekling

Large-scale Research Council programme to stimulate industrial research and international competitiveness.

Large-scale Research Council programme for basic research by groups of international excellence.

Reform aimed at documenting and valuing skills

Official statistics on HE operated by the Norwegian Social Science Data Services (NSD) on commission from the Ministry of Research and Education.

Research Council of Norway programme to promote research-based innovation and commercialization from R&D institutions (incl. HEIs)

Research Council programme to stimulate HEIs to engage in knowledge transfer to regional industry.

New educational reform in 2006 at primary and secondary school.

Large scale programme to develop regional industry clusters. Funded by Innovation Norway, SIVA, NFR

Key national institutions are the Research Council of Norway, Innovation Norway and SIVA.

Engineering and nursing are examples of such study programmes.

Reform of Norwegian higher education responding to the Bologna Process

Joint plan for the Nord- and Sør-Trøndelag Counties and the City of Trondheim 2005-2008.

Annual action programme under the Regional Development Plan. Developing regional partnerships is the key strategy.

Research Council of Norway programme to fund competence brokerage from R&D institutions (incl.

SkatteFUNN	HEIs) to industry Tax rebate arrangement for companies with R&D projects
Specialized university institutions <i>Vitenskapelige høyskoler</i>	Higher education institutions at university level with the right to award doctoral degree in one particular field of science
START	Student Organization promoting innovation. Organizes Venture Cup in cooperation with Innovation Norway.
<i>Trøndelag</i>	The name of two counties in Mid-Norway or Central Norway. Both English terms are used.
Universities <i>Universitet</i>	Higher education institutions offering PhD studies in a number of scientific areas
University Colleges <i>Høgskoler</i>	Higher education institutions located in all counties offering studies primarily at bachelor's level, but with an increasing number of master's (and even PhD study).
Upper Secondary Schools <i>Videregående skoler</i>	
Vocational training <i>Yrkesfagutdanning</i>	Combination of Upper Secondary School education and on the job training to become e.g. an electrician or a social educator.

List of references

White papers and policy documents at national level

A new regional policy – for different regions. Globalization changes the conditions for regional growth. Norwegian Ministry of Local Government and Regional Development, 2005. http://odin.dep.no/filarkiv/251071/brosjyre_om_regionalpolitikken_pa_engelsk.pdf

Commitment to Research. Summary in English: Report no. 20 to the Storting (2004-2005). http://odin.dep.no/filarkiv/241984/Sammendrag_engelsk.pdf

From Idea to Value. The Government's Plan for a Comprehensive Innovation Policy. Ministry of Trade and Industry, 2003. <http://odin.dep.no/archive/nhdvedlegg/01/10/fromi033.pdf>

Innovasjonsløftet. Regjeringens innovasjonspolitik, tilstandsrapport, Nærings- og handelsdepartementet. (The Government's Innovation Policy. Status Report. Ministry of Trade and Industry, 26 August 2005.)

Local government in Norway. Information brochure. Ministry of Local Government and Regional Development, 2004. http://odin.dep.no/filarkiv/221808/H-2155_Local_government_in_Norway.pdf

St. meld. nr. 20 (2004-2005) om Vilje til forskning, Undervisnings- og forskningsdepartementet (White Paper No 20 (2004-2005) Will to Research. Ministry of Education and Research).

St. meld. nr. 22 (2004-2005) om Kultur og næring, Kultur- og kirke departementet (White Paper No 22 (2004-2005) Culture and Industry. Ministry of Culture and Church Affairs).

St. meld. nr. 25 (2004-2005) om Regionalpolitikken, Kommunal- og regionaldepartementet (White Paper No 25 (2004-2005) On Regional Policy. Ministry of Local Government and Regional Development).

St. meld. nr. 35 (2001-2002) Om rekruttering til undervisnings- og forskerstillinger i universitets- og høyskolesektoren, Undervisnings- og forskningsdepartementet. (White Paper No 35 (2001-2002) Quality Reform. On recruitment to education- and research positions in the university and university college sector. Ministry of Education and Research)

St. meld. nr. 36 (1998-1999) om prinsipper for dimensjonering av høyere utdanning, Kirke-, utdannings- og forskningsdepartementet. (White Paper No 36 (1998-99) On Principles for Dimensioning of Higher Education. Ministry of Education and Research).

St.prp.nr 1 (2005-2006) for Utdannings- og forskningsdepartementet (Report no 1 (2005-2006) on the National Budget for the Ministry of Education and Research)

Plans and Policy documents at regional level

Felles fylkesplan 2005-2008 - Kreative Trøndelag (Regional Development Plan), adopted by Sør- and Nord-Trøndelag Counties and The City of Trondheim in October-November 2004. The plan was adopted by Royal decree 7 October 2005 (Ministry of Environment). <http://www.trondelagsradet.no>

Samhandlingsprogram 2005, 2006(Annual Action Programme for the Regional Development Plan).

Kunnskapsbyen Trondheim og byintegret universitet og høyskole. Saksframlegg til Trondheim bystyre, oktober 2005. (The Knowledge City Trondheim and City Integrated University and University College. Policy document for discussion in the City Council, October 2005)

HEIs' strategic plans and other documents

Budget Documents to the Ministry of Education and Research 2004-2006 from each institution (HiNT, HiST and NTNU) which contains the HEIs' annual report 2004, plans for 2005 and budget proposals for 2006.

HiNT - Strategisk plan for Høgskolen i Nord-Trøndelag 2005-2008 (Strategic plan for the Nord-Trøndelag University College 2005-2008)

HiST – Strategisk plan for Høgskolen i Sør-Trøndelag 2005-2010 (Strategic plan for the Sør-Trøndelag University College 2005-2010).

HiST 2020 ...? Fem kapitler om HiST sitt forhold til NTNU – sett fra høgskolen. En utredning fra Omdalutvalget, Trondheim, juni 2005. (HiST 2020...? Five Chapters on HiST's relationship to NTNU – seen from the University College. A report from the Omdal Committee, Trondheim, June 2005)

NTNU – Strategi for NTNU mot 2010 – kreativ, konstruktiv, kritisk (Strategy for NTNU towards 2010 – Creative, Constructive, Critical)

NTNU 2020 Internasjonalt fremragende. Rapport fra Hestnesutvalget II, NTNU, Trondheim 2005. (NTNU 2020 International excellence. Report from the Hestnes Committee II, 2005)

The English web sites of the three HEIs:

NTNU - <http://www.ntnu.no/indexe.php>

HiNT - <http://www.hint.no/hint/international>

HiST - <http://www.hist.no/english/>

Research papers

Arbo, Angell, Ringholm: En plan som ikke var planlagt? Evaluering av felles fylkesplan 2005-2008 for Trøndelag. Delrapport 1. Norut NIBR Finnmark, Report no 8, 2005. (A plan which was not planned? Evaluation of the Regional Development Plan 2005-2008 for Trøndelag).

Arnesen, Åse Clara: Nyutdannedes regionale tilpasning. En analyse av bosettingsmønstre og arbeidsmarkedstilpasninger blant nyutdannede kandidater. NIFU Report No 7, 2003 (Graduates regional adaptation. An analysis of settlement patterns and labour market adaptations among newly graduated candidates).

Braadland, Thor Egil: Elementer I en felles innovasjonspolitikk for Trøndelagsfylkene. STEP working paper A-01. Oslo 2001. (Elements of a common innovation policy for the Trøndelag counties).

Braadland, Thor Egil: Innovasjon i Sør-Trøndelag. STEP report R-04, Oslo 2001 (Innovation in Sør-Trøndelag) (Innovation in Sør-Trøndelag).

Bull, Ida (editor): Trøndelags historie. Grenda blir global, 1850-2005. Volume 3, Tapir akademisk forlag, 2005. (The history of Trøndelag. The rural community turns global, 1850-2005).

EuroFutures AB 2005-05-31: ProMidNord/SÖT – en förstudie (A pre-study commissioned by Sundsvall, Östersund and Trondheim municipalities (SÖT), to map background variables and the role of the cities as regional motors).

European Innovation Scoreboard: <http://trendchart.cordis.lu/scoreboards/scoreboard2005/index.cfm>

Gjelsvik, Martin and Tommy Høyvarde Clausen: Verdiskapingsevnen i norske storbyregioner. Report from Rogaland Research, Stavanger, RF 2003/144. (The wealth creation ability of large urban centres in Norway)

Gjelsvik, Martin og Ann Karin T. Holmen: Verdiskapingsevnen i norske storbyregioner. Report from Rogaland Research, Stavanger, RF - 2004/178. (Wealth creation in Norwegian large urban centres).

Gundersen, Frants: FoU og innovasjon i norske regioner. Statistics Norway (Statistisk Sentralbyrå) Report no 26, 2002. (R&D and innovation in Norwegian Regions)

Halvorsen, Thomas; Hubak, Marit: Når forskningsmiljøer skal gjøre butikk. En analyse av bedriftsetableringer fra fem FoU-institusjoner i Norge. Report no STF38, SINTEF Teknologiledelse 2002. (When research communities do business. An analysis of the entry of firms from five R&D institutions in Norway)

Haraldsen, Tone; Fyging, Simen Kristian; Overvåg, Kjell and Power, Dominic: Kartlegging av kulturnæringene i Norge, - økonomisk betydning, vekst- og utviklingspotensial (Mapping of Culture Industry in Norway – economic impact, growth and development potential), Eastern Norway Research Institute (Østlandsforskning), Report No 10, 2004.

Hatling, L: Innovasjon i Nord-Trøndelag. STEP report R-03. Oslo 2001. (Innovation in Nord-Trøndelag).

Langørgen, A, M. Mogstad and R. Aaberge (2003): Et regionalt perspektiv på fattigdom. Økonomiske analyser 4/2004, s. 28-39, Statistisk Sentralbyrå. (A regional perspective on poverty, Statistics Norway)

Kammerman, S.B., M. Neuman, J. Waldfogel and J. Brooks-Gunn (2003): Social policies, family types and child outcomes in selected OECD countries. OECD Social, employment and migration working papers no. 6, OECD, 2003.

Karlsen, James: Mindre byers rolle for regional utvikling. Project report no 23/2004, Agderforskning. (The role of small towns' in regional development, Agder Research Institute).

KOU 2004: Sterke regioner. Forslag til ny regioninndeling av Norge. Oslo: Kommuneforlaget (Municipal White Paper. Strong regions. Proposal for a new division of regions in Norway)

Selstad, Tor: Landselsanalyse Trøndelag 1930-2030. Trøndelagsprosjektet, NTNU, Høgskolen i Lillehammer 2000 (Regional analysis Trøndelag 1930-2030. The Trøndelag project. NTNU, Lillehammer University College)

Selstad, Tor: Trøndelags romlige utvikling. Historier og scenarier 1930-2030. Acta Geographica Serie A nr. 3. Trondheim 2002. (The spatial development of Trøndelag. Stories and scenario 1930-2030.)

Selstad, Tor: Regionenes tilstand. ØF-Rapport nr. 07/2004. Østlandsforskning 2004. (The state of the regions. Eastern Norway Research Institute 2004)

Spilling, Olav, Steinsli, Jartrud: Evolution of High-technology Clusters: Oslo and Trondheim in international comparison. Research Report 1/2003. BI Norwegian School of Management.

Sæther, B., J. Mønnesland, K. Onsager, K. Sørli og P. Arboe (2000): Høgskolenes regionale betydning, NIBR prosjektrapport 2000. (The University Colleges' regional significance)

Waagø, Sigmund (editor): The Role of the University in Economic Development, an Analysis of Six European Universities of Science and Technology, NTNU Report from the Research Group on Entrepreneurship and Innovation, May 2001.

Ytrehus, S. (2004): Fattige barn i Norge. Hvem er de og hvor bor de? Fafo-rapport 442. Oslo (Poor children in Norway. Who are they and where do they live? Fafo research foundation, Oslo)

Preface

The Trøndelag region represents Norway in the OECD project “Supporting the Contribution of Higher Education Institutions to Regional Development”. In 2004, Sør- and Nord-Trøndelag Counties and the City of Trondheim developed a Regional Development Plan as an instrument to further develop regional collaboration, - cultural and economic development in all parts of the region. The HEIs are playing a key role in realizing the vision of a “Creative Trøndelag. Where everything is always possible”.

In the Trøndelag OECD project:

- We have had the opportunity to systematically investigate the engagement of the HEIs in the region and assess where we have our strengths and weaknesses, and where we see opportunities and threats in the future.
- We have also reflected upon what we can learn from previous projects when we are to design efficient mechanisms for collaboration between regional partners. There is clearly an unused potential for more collaboration, not least between the HEIs and the private sector. Better coordination within the regional public policy and support system and longer term commitments would enhance the capability of HEIs in regional engagement.
- National and international competition in research and education is increasing. It is in the interest of our region that the HEIs in the Trøndelag region succeed. The Knowledge City Trondheim is on the regional agenda triggered by the ongoing strategic processes at NTNU/SINTEF and HiST towards 2020.

The main strategy of the Regional Development Plan is to strengthen the collaboration between regional partners and key stakeholders. The extent to which we have succeeded, and whether we are doing the right things or not, are fundamental issues which we hope that the Peer Review Team will address during their visit scheduled for 13-18 February 2006.

In order to facilitate comparison between the 12 OECD case studies, the Trøndelag self-evaluation report is structured according to the topics and questions suggested in the OECD project outline. The descriptive parts are based on contributions from the working group and steering group members, key staff members of the participating institutions and available written material. Roald Sand a researcher from Nord-Trøndelag Research Institute was engaged to provide statistical data. Stewart Clark, Adviser, Student and Academic Division, NTNU has been responsible for the English editing. The working group has had several separate meetings and six joint meetings with the steering group. In the joint meetings priority has been given to discussions of the self-evaluation process in general and the SWOT analysis and conclusions in particular. The pre-review visit 19-20 December 2005 was a constructive preparation for the final report and the review visit.

Regional steering group

Ms Merethe Storødegård, Regional Director Trøndelag, Confederation of Norwegian Business and Industry (chair)

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The regional partners - Sør- and Nord-Trøndelag Counties, the City of Trondheim, NTNU, HiST and HiNT – appreciate the keen interest of the Ministry of Local Government and Regional Development and the Research Council of Norway who respectively have contributed NOK 300 000 to the OECD project in Trøndelag. The Ministry of Education and Research has supported the project through the participation of the HEIs. The total budget for the regional study and follow-up activities is estimated at NOK 1.7 million. The regional partners are prepared to finance up to NOK 1.1 million, including the partners' own work and travel expenses.

OECD peer review team

The regional partners look forward to the review visit and the recommendations from the members of the peer review team:

Professor Markku Sotarauta, Research Unit for Urban and Regional Development Studies, University of Tampere (lead evaluator)

Dr Clair Nauwelaers, MERIT, Maastricht University (international expert)

Mr Magnus Gulbrandsen, Senior Researcher, NIFU STEP (domestic expert)

Mr Patrick Dubarle, Principal Administrator, Territorial Reviews Division, OECD (team coordinator)

Chapter I. Overview of the Region

What constitutes a region? In Norway, there are probably more than a dozen ways of defining a region. There are for instance 19 counties, 11 diocese and 5 health regions. This complicates regional coordination. The local and regional structure and division of functions will be evaluated, and it is the aim of the new Government to develop larger regions by 2010. A Central Norway region is likely to emerge, based upon some form of identity with Trøndelag.

Regional Development Plan 2005-2008 – Creative Trøndelag. Where everything is always possible

The Regional Development Plan is the first *formal* joint regional development plan across county borders in Norway. The Trøndelag plan highlights six areas where regional partnerships and actions are encouraged. The areas were selected following input from the regional stakeholders. Special attention is given to the actions and projects selected in the *Annual Action Plans*. The six areas are listed below with examples from the regional action plans.

Prioritize wealth creation and innovation

- Develop strategies for the culture and entertainment industry in Trøndelag.
- Ensure the further development of Mid-Norway Film Centre.
- Setting up an agency with the task to attract companies and talents to Trøndelag (Innflagging Trøndelag).
- Develop a regional research and innovation strategy (RIS) and arenas for innovation and commercialization.
- Market the region in London, Amsterdam and Copenhagen and strengthen the scheduled air services with these cities.
- Develop a strategy for the marine sector (Trøndelag Marine Forum).

Coordinate research and education policy

- Strengthen relations between R&D environments and industry.
- Strengthen vocational training and recruitment to science.
- Realize the e-Trøndelag programme.

Better utilization of Food from Trøndelag

- Develop the company "Oi! Trøndersk mat og drikke" as a joint instrument for the green and blue food sectors
- Consider establishing a national competence centre for the shell/mussel food industry.
- Work to make Trøndelag the most important aquaculture region in Norway (or even in the world).

Prioritize energy for the future

- Keep on working for a future gas pipeline in the Trondheim Fjord to provide energy to industry and the development of a gas power plant without CO₂ emissions in Skogn.
- Expand the use of sustainable energy sources – small-scale hydropower, wind power and bioenergy.

Developing the infrastructure

- Ensure that the region obtains its share of the national infrastructure funding (e.g. road-building).

Trøndelag as a good place to live

- Art and culture are fundamental in order to create sustainable communities where people want to live.
- Exploit the museums as arenas for entertainment and finance new museums in Stjørdal and Berkåk.
- Collaborate with Jämtland (Sweden) to become a leading region for sustainable development.
- Exploit the environmental expertise in Trondheim better.
- Strengthen Trondheim as a national church centre and develop the pilgrimage tradition.
- Establish a South Sami Centre at Snåsa, Nord-Trøndelag.

In 2004, the Nord- and Sør-Trøndelag Counties and the city of Trondheim adopted a joint plan for regional policy; The *Regional Development Plan* is first of all a tool to meet the challenges Trøndelag is facing relating to increased international competition and rapid technological change. Regional partnerships are encouraged to realize the development plan, and the OECD project is one of the

partnerships, which was addressed in the first Regional Action Plan. In this self-evaluation report, the Regional Development Plan is used as a reference on regional policy when we discuss research, education, culture and environment, as well as capacity for regional engagement.

Historically, the days of glory for Trøndelag were in the Middle Ages. Trondheim was founded in 997 and was the Norwegian capital and religious centre for several hundred years. When Norway got its Constitution in 1814, the population of Trondheim was equal to that of Oslo. Oslo became the capital, but the first Central Bank of Norway was placed in Trondheim. Trondheim has also later played an important role in the nation building process. The crowning and blessing of Norwegian kings have taken place in Trondheim and it was an important symbolic act to locate the Norwegian Institute of Technology in Trondheim in 1910.

In terms of wealth creation, Trøndelag is characterized by the development of one strong city – Trondheim – surrounded by predominantly rural districts with small towns and rural centres. In 1875, Trondheim was the third largest industrial area in Norway. One hundred years later, the industrial sector in Trøndelag had fallen below the national average despite the region hosting the nation's leading technology research environment. The current employment figures are marked by an overrepresentation of public services and knowledge-based enterprises (NTNU, SINTEF etc.) in Trondheim. The primary sector and industry based on natural resources dominate the rural districts. There is extensive collaboration between the knowledge producers in Trondheim and enterprises in Trøndelag, but not much more than with enterprises in other regions. NTNU has the role of a national institution.

1.1 The geographical situation



The Central Norway Region (Trøndelag) in this report is defined as the counties of Sør-Trøndelag and Nord-Trøndelag. The region covers about 40 000 km², with Trondheim as the main city.

Distances in Norway are vast, and it is a 7 hour trip by car or train from Trondheim to Oslo. However, flights are frequent and it takes less than an hour by plane to Oslo or Bergen, and two hours to Stavanger or Tromsø. There are direct scheduled flights to Copenhagen, London and Amsterdam.

Trondheim is the 3rd largest city in Norway with 155 000 inhabitants. Oslo and Bergen are larger. The region has 401 000 inhabitants, which makes it the 4th largest in Norway, after the Oslo, Bergen and Stavanger regions.¹

¹ Further information on the relative development of Norwegian regions is given in the White Paper on Regional Policy (2004-2005) and a report by Tor Selstad, Eastern Norway Research Institute, 2004 (Regionenes tilstand).

Internal settlement structure

The region is sparsely populated. In Sør-Trøndelag there are about 14 inhabitants per km² land, and 76 % of the population lives in urban centres (1 % below the national average). In Nord-Trøndelag there are about 7 inhabitants per km² land, and around 55 % of the population lives in urban centres.

Trondheim is the main city of the region, with 39 % of the population in the region. Other urban centres in the region are Steinkjer, Stjørdal, Levanger, Verdal and Namsos – all situated in the county of Nør-Trøndelag and with populations from 13 000 to 20 000. In addition Rørvik with 3000 inhabitants, is a small centre north in Nord-Trøndelag. In Sør-Trøndelag County the largest centres in addition to Trondheim are Orkanger, Hommelvik and Melhus with populations from 10 000 to 8 000 inhabitants respectively. In addition there are two small centres in the south of the region, Oppdal and Røros with populations between 3 000 and 4 000.



There are regional buses between these centres and the other centres in the region. There are also railway connections to Oslo and Nordland County. In addition to the Trondheim airport, Værnes, there are small airports in Røros, Namsos and Rørvik with two daily departures to and from Trondheim.

Higher education provision

Trondheim is the regional centre in terms of settlement (39 % of regional population) and higher education provision (90 % of HE provision). Five HEIs are located in the city (29 000 students):

- NTNU - Norwegian University of Science and Technology (19 500 students)
- HiST - Sør-Trøndelag University College (8 000 students)
- DMMH - Queen Maud's College of Early Childhood Education (private foundation, 700 students)
- BI Trondheim – Norwegian School of Management (private foundation, 700 full-time students in Trondheim, 9 000 nationally)
- Folkeuniversitetet – Adult Education Association (private organization, 10 000 students nationally in higher education)

In Nord-Trøndelag, Nord-Trøndelag University College (HiNT with 4 900 students) is the key provider of higher education with campuses in the towns of Namsos (600), Steinkjer (1500), Levanger (2 600) and Stjørdal (170).

The Adult Education Association (Folkeuniversitetet) in Trøndelag is present in many districts in Trøndelag: Grong, Innherred, Namsos, Nærøy/Vikna, Overhalla, Røros/Holtålen, Snåsa, Stjørdal, Selbu, Rissa, Orkdal and Trondheim. Nationally, 10 % of the Adult Education students take courses at higher education level. Such courses are generally offered in cooperation with university colleges, among them HiNT and HiST.

1.2 The demographic situation

Over the past 20 years, Trøndelag has grown at a slower pace than other comparable regions. In 2005, 8.7 % of the Norwegian population lives in Trøndelag compared to 9 % in 1986.

For many indicators, it is relevant to distinguish between Sør- and Nord-Trøndelag. The general picture is that Sør-Trøndelag with its urban centre Trondheim, follows the national average on most demographic indicators. Nord-Trøndelag scores below the national average on demographic variables such as immigration and age structure. Statistics on age structure, emigration and immigration, health and well-being as well as levels of deprivation are provided in Annex I, Tables I.1 to I.5.

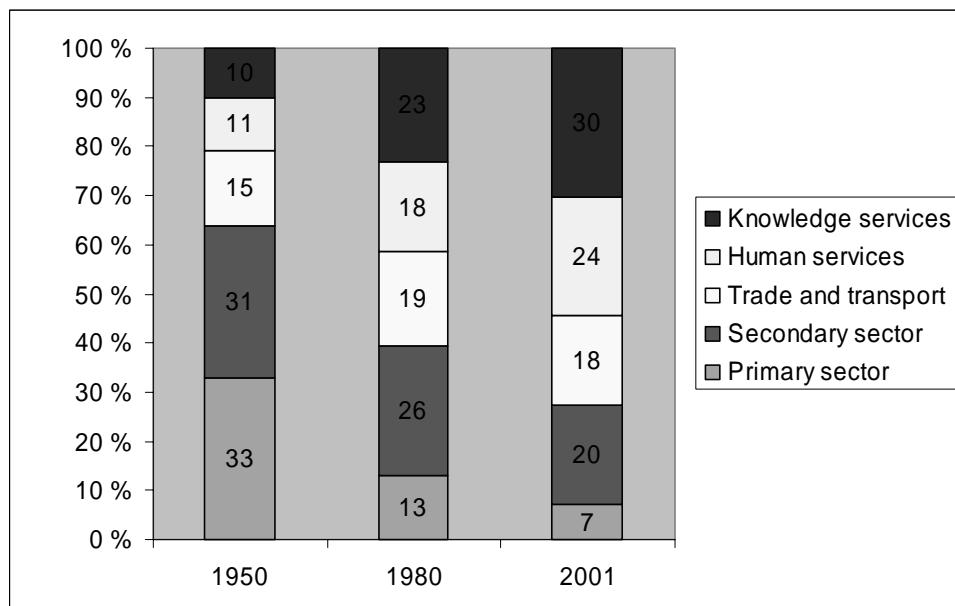
Over the past twenty years, Trøndelag follows the national pattern of *increased participation in higher education*. The share of the population with a college or university degree increased from 11 % in 1983 to 23 % in 2004. The *participation levels* in Nord-Trøndelag are significantly lower than in Sør-Trøndelag or the national average. This is primarily explained by the differences in the industrial sectors and the localization of the university in Sør-Trøndelag. See Annex I, Tables I.6 to I.8 for statistics on regional participation in higher education.

1.3 The economic and social base

Detailed statistics on industrial sectors in Trøndelag are provided in Annex II. A brief impression of the employment patterns in the region is given in Table 1.1 which is taken from the new three-volume *Trøndelag History*, which was published in 2005. This work was initiated by the counties and NTNU, and co-sponsored by regional industry.

Table 1.1: Changes in employment patterns in Trøndelag 1950, 1980, 2001

Source: 'Trøndelags historie', volume 3, p. 394, author of chapter: Professor Ola Svein Stugu, NTNU.



Knowledge services: communication, banking and finance, insurance, public administration and defence, research and education, culture.

Human services: hotels and restaurants, renovation, health and social services, personal services

Trade and transport: commodity trade, inland transport, sea transport

Secondary sector: industry, mining, construction and building, energy and water supply

Primary sector: agriculture, forestry, fisheries

The *service sector* is the fastest growing one in Trøndelag as well as nationally. This is partly explained by the general welfare development and the growth of the public service sector, and partly owing to new service industry developments. HE-sector employment in Sør-Trøndelag is above the national average (Annex II, Table II.7).

Within the region, Trondheim is the main centre for trade. However in a national context, employment in *trade and transport* is not particularly high in Trøndelag (Annex II, Table II.1).

The *secondary sector* for Trøndelag is about the national average. The three most important areas in terms of employment are the construction and building industry, the food and beverage industry, and the pulp and timber industries. All these are more significant in Trøndelag than the national average (Annex I, Table I.9). Processed products accounted for 70 % of the exports from the region in 2004. Fisheries products from the aquaculture industry accounted for another 27 % of the exports. (Annex II, Table II.6). Oil and gas exports from the fields off the Trøndelag coast are not part of the region's statistics as the various company headquarters are elsewhere.

With the presence of NTNU and SINTEF in the region one might expect that *high technology* industry held a particularly strong position in the region. But this is only partly the case. Trøndelag is at the national average in medium- and high-tech manufacturing. In high-tech services, on the other hand, Sør-Trøndelag benefits from the technology environment in Trondheim (see Annex II, Tables II.3 to II.5).

The relative share of the population engaged in the *primary sector* has declined markedly in Trøndelag as well as nationally. However, compared to the national average (3.5 %), the primary sector remains strong in Trøndelag outside of Trondheim. In Nord-Trøndelag, 9.7 % of the working population is engaged in agriculture, forestry and traditional fisheries, in Sør-Trøndelag, 4.2 % (see Annex II, Table II.1).

Innovation indicators

On the EU innovation scoreboard (2005), Norway ranks 16th of the 33 countries listed. This is mainly due to poor performance on the application of innovation, scoring for instance as low as 21 % of the EU average on high-tech exports. Norway is also characterized by low levels of business R&D (87 % of EU average) and below average on IPR. Some of this is probably due to Norway's industrial structure which largely is characterized by the exploitation of natural resources.

Nationally, Trøndelag performs well on several of these indicators. In 2004, for instance, 8.8 % of all *patents* registered by the Norwegian Patent Office came from Trøndelag (Annex II, Table II.15). R&D spending in private business, the institute sector and HEI measured per capita, is well above the national average in Sør-Trøndelag (Annex II, Table II.11). R&D spending in Nord-Trøndelag is very limited.

The EU classifies Norway as a highly developed country with one of the world's highest per capita GDP. In a national comparison, the *GDP* in Trøndelag is 87 % of the national average (Annex II, Table II.21). This is connected with the high share of employment in the primary and public sectors in the region, - sectors with traditionally lower income than in the secondary and private sectors.

Norway performs well on most innovation drivers apart from the *supply of science and technology graduates*. This is, however, one of Trøndelag's strongpoints, producing 76 % of the chartered engineers (NTNU) and 17 % of the engineers (HiST/HiNT) in Norway, 2004 (see Section 4.2.2). The region benefits from good access to science and engineering graduates; In Sør-Trøndelag, 6.3 % of the adult population holds a science or engineering degree (Annex II, Table II.7).

1.4 Governance structure

1.4.1 The structure of central, regional and local government in the region

Norway has a two-tier system of local government. There are 19 counties at regional level and 434 municipalities at local level. In Trøndelag, there are two counties and 49 municipalities.

At county level, there are the county authorities (fylkeskommune), which since 1976 have been governed by a directly elected County Council. The county governor (fylkesmann) and his/her office represent the central government in the region. The responsibility for financing public services is shared between the central government, regional authorities and municipalities. The county governor's office has the role of controlling the activities and production of services from the county bodies and municipalities.

Resourcing public services - taxation

The responsibility for macro-economic development rests with the Storting, the Government and the Central Bank. It is a national aim to offer citizens a high level of public services with equal standards wherever they live in the country. There is therefore a high degree of redistribution of income between municipalities and county authorities. The economic framework for the local and regional authorities is thus largely decided by the State in the annual national budgets.

The main sources of local and regional revenue are government grants, local taxes and fees. Most of the government grants are distributed as a per capita grant. In addition, government income is redistributed taking into account differences in population density and demographic structure. Municipalities draw 33.5 % from central government grants and 44 % of their income from net tax revenues, whereas counties obtain 67 % from central government grants and draw 26 % of their income from net tax revenues.

The central government grants are partly general, partly earmarked. The balance between the two types of grant is a matter of debate. Earmarked grants enable the government to compel the local and regional authorities to implement the policies, which are given priority by the government and the Storting. The general grants on the contrary are free revenues in that the local and regional authorities can spend them according to their own priorities.

Division of responsibility – local, regional and central level

The division of responsibility between local, regional and national levels has changed considerably since 1976 when the system with directly elected County Councils was introduced. The counties have since lost important tasks. Care for the elderly and disabled was transferred to the municipal level in 1988, and in 2002, the central government took over the responsibility for the hospitals and specialized social service institutions. Today, upper secondary education is the single most important task for the counties (65 % of their expenditure). The other key responsibility is related to regional development. This responsibility is attended to in regional planning, management of regional policy instrument and service production, international work and cultural heritage management.

Table 1.2: Division of responsibility between administrative levels

Responsibilities	Municipalities	County Authorities	Central Government
Economic development	- Local planning (land use) - Agricultural issues - Environmental issues - Local roads and harbours	Regional development: - county roads/transport - regional planning - business development	- National roads, railways - Taxation - R&D funding etc. - Sector policy
Education	- Primary and lower secondary school (age 6-15) - Nurseries/kindergardens	Upper secondary school (age 16-19)	Higher education
Health and welfare	- Primary health care - Care for the elderly and disabled - Social services/assistance		- Specialized health services (Hospitals was a county responsibility until 2002) - Specialized social services (e.g. institution for drug abuse)
Cultural provisions	Municipal institutions Project funding	Regional development: - culture (museums, sports) - project funding	National institutions and project funding

Source: Local Government in Norway, Ministry of Local Government and Regional Development, 2004

1.4.2 What powers are available to local and regional authorities in relation to economic and social development?

In Norway, we usually distinguish between wide and narrow district policies. In wide district policies the Government influences development through economic framework conditions and sectoral focus as in transport and communications, education policy, agricultural- and environmental policy, and health policy. The narrow district policy includes selected areas such as loans/support for firms and business development, support for rural development and regional development.

Financial inducements to business

Funds available for regional development come from various sources and are channeled through several public institutions. On behalf of the Ministry of Local Government and Regional Development, the county authorities manage two regional policy instruments:

- The *regional development funds* are used for adaptive measures, joint projects and municipal business development funds. About half of the funding is used for business-oriented purposes. The budget for the regional development funds in 2005 amounted to NOK 33 million in Sør-Trøndelag and NOK 45 million in Nord-Trøndelag.
- *Innovation Norway*² manages business-oriented instruments such as loans and grants, start-up grants, incubator scholarships for business-oriented development programmes. Differentiation in payroll taxes based on district policy criteria is no longer authorized (European Commission legislation). Enterprises previously benefiting from reduced payroll taxes are instead compensated by industry oriented development funding channeled through Innovation Norway. Such funding amounted to NOK 28 million in Sør-Trøndelag and NOK 32 million in Nord-Trøndelag in 2005. This was twice as much as the year before.

In 2005, the total amount of regional development funds amounted to NOK 72 million in Sør-Trøndelag (of which NOK 67 million was earmarked grants from the central government and NOK 4 million was placed in the municipal development fund) and NOK 133 million in Nord-Trøndelag (of which NOK 79 million was earmarked from the central government and NOK 7.5 million was channeled to the municipal development fund).

² Innovation Norway has taken over the functions of the Norwegian Industrial and Regional Development Fund (Statens nærings- og distriktsutviklingsfond (SND) as of 1 January 2004.

Innovation Norway also manages national policy instruments from the Ministry of Local Government and Regional Development, the Ministry of Trade and Industry and the Ministry of Agriculture:

Table 1.3: National policy instruments operated by Innovation Norway

	Sør-Trøndelag	Nord-Trøndelag
Transport support	2004: NOK 6.7 million	2004: NOK 12.5 million
Rural development funds	Framework 2005: NOK 18.3 million	Framework 2005: NOK 31.0 million
Public development and research contracts	2004: NOK 4.9 million	2004: NOK 0.8 million
Industrial development and research contracts	2004: NOK 10.0 million	0
National development measures	2004: NOK 2.9 million	2004: NOK 0.8 million
Various central government development programmes	Food, forestry 2004: NOK 12.3 million	Food, forestry, reindeer 2004: NOK 5.4 million
<i>SkatteFUNN</i> in collaboration with the Research Council of Norway ³	2004: NOK 78 million in tax deductions	2004: NOK 39.7 million in tax deductions
<i>Structural measures for fishing fleet</i>		2004: NOK 3.3 million

SkatteFUNN is a new tax rebate arrangement with the objective to increase research and development work in Norwegian industry. To qualify for tax rebate an enterprise must have tax liability in Norway. It is a requirement for tax rebate that the enterprise collaborates with an approved R&D institution. In 2004, applications for such tax rebates from enterprises in Sør-Trøndelag amounted to NOK 438.6 million and NOK 106.5 million in Nord-Trøndelag. This illustrates the interest in the new arrangement and the costs related to R&D projects in the private sector. Approved *SkatteFUNN* projects represented a tax rebate of NOK 78 million in 2004 for enterprises in Sør-Trøndelag and NOK 19.5 million in Nord-Trøndelag. After the arrangement was introduced in 2002, enterprises in Sør-Trøndelag obtained a tax rebate of about NOK 400 million and NOK 80 million in Nord-Trøndelag. The R&D institutions in the region, particularly SINTEF and NTNU, have been very active partners nationwide under the new *SkatteFUNN* regime. See Section 3.2.3.

Acquisition of land and property

Both local and regional authorities can acquire land and property for public and private purposes. Expropriation is subject to local government decision and must be in accordance with the adopted local development plan.

Provision of vocational education

The counties are responsible for the provision of vocational education at upper secondary school level, while this is a central state responsibility at higher level with the HEIs as instruments for vocational education.

There are 25 upper secondary schools in Sør-Trøndelag County, of which 11 are situated in Trondheim. In addition, there are 4 private free schools. Sør-Trøndelag County has enough capacity to cover the total demand (10 200 pupils admitted in the autumn 2005), there is thus a direct competition between the public and private schools. The private free schools admit about 1200 pupils. The number of pupils in each school varies between 100 and 1100. All schools outside of Trondheim have a wide offer of vocational and general studies, whereas in Trondheim some of the schools primarily offer general studies. In Nord-Trøndelag there are 12 upper secondary schools and 2 private free schools (Total number of 5 500 pupils autumn 2005).

³ The Research Council of Norway (Norges Forskningsråd) has regional representatives in the counties. Key funding programmes are described in Section 3.2.3.

As of the autumn 2006, the new Knowledge Promotion Reform (Kunnskapsløftet) will be introduced. The upper secondary school structure will consist of 12 educational programmes: three general programmes of study and nine vocational programmes of study leading to a specific occupational competence or to a certificate of apprenticeship/craft certificate.

The *vocational programme of study* covers a combination of two years of school and a two-year apprenticeship. At any point in time there are approximately 2 000 apprentices in Sør-Trøndelag and 1 300 in Nord-Trøndelag. Each year, 1 000 new apprentice contracts are signed in Sør-Trøndelag and 480 in Nord-Trøndelag. However the demand from enterprises and limitations in training capacity in certain fields means that more than hundred youths are unable to obtain an apprentice training-place and must finalize their training in school. 80 % of the running apprentice contracts are administered by the 33 apprentice training offices in Trøndelag (Opplæringskontor). These offices coordinate apprentice training in the member enterprises in specific vocational fields.

1.4.3 What influence, if any, do local and regional authorities have over the provision of tertiary level education and research and development?

Local and regional authorities have no formal powers over the provision of tertiary level education and research and development. However, universities and university colleges participate in regional partnerships and contribute to the identification of regional challenges and what could be their contributions to the region.

In the current county development plan this issue is specifically addressed in the chapter that considers a coordinated research and education policy which is part of the overall concept of “Trøndelag the most creative region in Europe”. When this regional plan is approved by the Government it will also implicitly apply to the HEIs even though there is no funding allocated to such measures.

The county authorities may however negotiate with HEIs and contribute financially to the establishment of courses, staff and research contracts.

What influence, if any, do local and regional authorities have over national policy with regard to tertiary level teaching and research?

Before the 1994 merger of 98 former regional colleges into 26 State university colleges, the county authorities appointed representatives to the regional college boards. From 1994 to 2001 the County Councils could nominate external members of both University College Boards and to the Boards of the Universities. This county influence was abandoned by the Act related to Universities and University Colleges of 2001.

Local and regional authorities have no direct influence over national policy, but through political networks and actions their influence can be substantial. One example is the decisive impact the local and regional authorities in the county of Rogaland and the city of Stavanger have had in bringing the University College up to full university status as the University of Stavanger in 2005.

What are the principal drivers in relation to national territorial development policy as these have an impact on the region and what place does higher education have in these policy developments?

The basic driving forces in Norway and in the relations between Trøndelag and national development policy are probably the same as elsewhere in Europe: political and technological changes that result in changes in the general levels of welfare in society. The technological evolution is particularly linked to developments in information and communication technology with more advanced products and more demanding consumers. The opening of the global economy with lower geographical barriers and increased and greater access to knowledge is another basic driving force. In a competitive situation where regional creativity, business and local expertise have to develop their own special advantage, the universities and university colleges can play a decisive role as suppliers of knowledge.

Chapter II: Characteristics of the Norwegian Higher Education System

2.1 Overview of the national system of higher education

2.1.1 What are the dominant characteristics of the national higher education system?

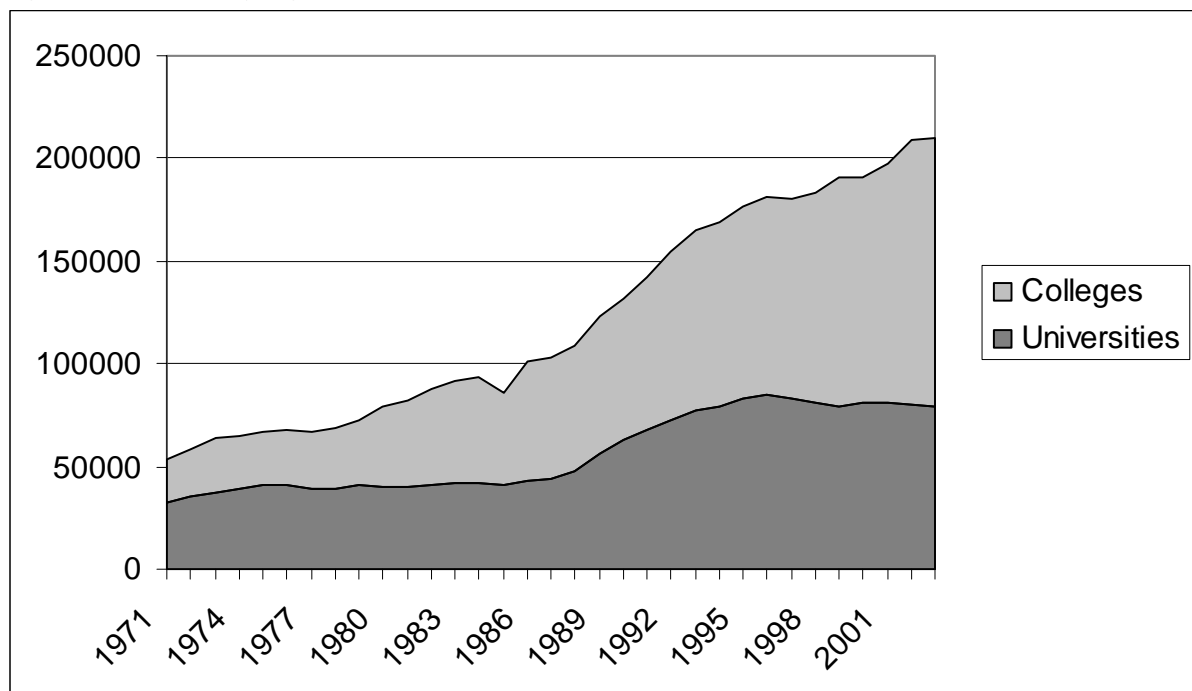
In this chapter the main features of the Norwegian higher education system are described.⁴ The basic characteristics of the Norwegian higher education system are related to the public nature of Norwegian tertiary education. The largest part of the student population attends public institutions without tuition fees. These HEIs enjoy a relative high share of public funding. With the exception of the Norwegian School of Management (BI), the 25 private HEIs with public approval are small institutions with only a few hundred students each.

As of 1 August 2005, public and private HEIs are regulated by the same Act relating to Universities and University Colleges. Following the policies of the Bologna Process, both public and private programmes of study lead to bachelor's, master's and PhD degrees (see Annex III, Figure 1 on the general structure of Norwegian HE).

The overall size of the higher education system and changes over the last ten years

Like all the other OECD countries, expansion in higher education in Norway has been very strong since the late 1950s. The traditional universities and specialized university colleges first expanded. Then a regional college system was developed to cope with increased demand for personnel with professional training and undergraduate degrees. Between 1993 and 2003, the university sector stabilized, while student numbers at the university colleges grew by 31 %.

Figure 2.1 Number of registered students 1971 – 2003



In this figure, “Universities” includes both the four pre-2005 universities as well as the specialized university institutions. No distinction is made between public and private institutions.

⁴ Source: NIFU-STEP report for the OECD review of tertiary education in Norway 2005.

Since 2003, the popularity of the universities seems to be increasing, while some university colleges have had problems recruiting enough students. This has particularly been the case in subjects where the university colleges compete with the universities for the same students – e.g in classical university disciplines and technology.

The Norwegian higher education system is scaled to provide higher education for about one half of each age group. Table 2.1 shows the overall size of the Norwegian higher education system, with close to 210 000 students. In addition there are about 22 000 Norwegian students abroad, most of them taking whole degrees there. Favourable public student loans and scholarships make this possible.

Compared to most other countries, a relatively low proportion of the students attend universities (34 %). 47 % of the students prefer to take a shorter or more professionally oriented degree, often closer to home at one of the university colleges.

Female participation in higher education has increased by 26 % from 1993 to 2003. 65 % female participation in university college education is first of all explained by the academic profile whereby teaching, health care and social work are key areas. But women also dominate in the university (55 % females). For further details, see Annex III, Table III.3 Students by gender and institution.

Norwegian students are relatively old compared to the UK for instance. Students typically enter higher education at age 18/19 after graduation from upper secondary school or at age 19/20 for males who have to do their military service. The age structure in higher education reflects this situation and only half of the students in higher education are less than 25 years old. 28 % of the students in universities are between 25 and 29 years old. At the university colleges, one will find many adult learners. This explains why 28 % of the students at the university colleges are more than 35 years old (see Annex III, Table III.4 Students by age and institution).

Differences in the academic profile are also reflected in the distribution of staff between the higher education institutions. The research mandate of the universities is reflected in the relatively high number of staff members and a student-staff ratio of 5 to 1. University college staff on, the other hand, have on average 11 students each to teach (see Table 2.2).

Table 2.2: Students and staff in higher education institutions, 2003.

Source: Statistics Norway and National Database on Higher Education

	Students			Staff	
	Number	females	distribution	numbers	distribution
Total	209 770	60 %	100 %	24 608	100 %
Universities	71 252	55 %	34 %	13 375	54 %
Specialized university institutions ⁵	8 352	50 %	4 %	2 202	9 %
University colleges	98 315	65 %	47 %	9 030	37 %
Other colleges (police, etc)	1 421	38 %	1 %	-	-
Private colleges	30 430	57 %	14.5 %	-	-

Data analysis performed at a national level to establish the demand and supply of different types of higher education ‘product’

Relevant data on the supply and demand for higher education are collected by Statistics Norway and by NIFU-STEP. An extensive data analysis was made in connection with the White Paper No. 36 (1998-99) On the Principles for Dimensioning Higher Education; Statistics Norway made projections towards 2010 for the supply and demand of higher education in general and specifically in key professions in healthcare and social care, teaching and engineering.

⁵ Including the Academies of Fine Art

Following the White Paper, a Government appointed commission,⁶ discussed what national policies should decide the supply of different types of higher education. The supply and composition of educational programmes at each institution had traditionally been decided at national level, although taking into account regional needs. The Committee recommended that the capacity in higher education to a greater extent should be determined locally by individual demand and the needs in society. The Committee's recommendations were largely followed by the Ministry.

Today, based on data from Statistics Norway and NIFU-STEP, the Ministry uses the annual National Budget to define each institution's minimum capacity in professional education and general studies. The institutions are responsible to exploit their minimum capacity, and the Ministry may redistribute capacity between institutions if over a period of time it is not fully exploited. To take engineering as an example, 60 study places in engineering were redistributed between the university colleges in 2005. HiST obtained 20 of these places. In the National Budget for 2006 the Ministry proposes to close down the minor engineering programmes at two of the university colleges, including HiNT. The Ministry alerts that further rationalization of the structure may be called for following the next national evaluation of engineering education. If HiST can take over the capacity at HiNT, it is perceived that the Ministry's proposal would strengthen the regional education system as a whole.

In order to enable the institutions to meet changes in demand, the delegation of authority was part of the Quality Reform of Higher Education in 2003 (St.prp.nr. 35, 2001-2002). The HEIs were authorized to set up new educational programmes and redistribute capacity between programmes within the minimum capacity determined by the Ministry. Certain quality standards, however, were required (see NOKUT below).

The basic governance of and regulatory framework for the higher education system

The Act relating to Universities and University Colleges regulates the activities of private and public higher education institutions in Norway, and defines the activities of the Norwegian Agency for Quality Assurance in Education (NOKUT). The HEIs are given a high degree of autonomy regarding organizational matters, course portfolio and staff recruitment:

- The Act regulates the governing system at institutional level, i.e. the composition of the Board and the responsibility of Rector. Below the institutional level, the HEIs have a high degree of autonomy to decide the internal organization.
- The HEIs may set up limited companies and use any surplus profit to support their core activities. It is also worth noting that the universities may own and sell property to finance maintenance, construction or purchase of other property. The university colleges, on the other hand, normally rent their buildings from the State.
- According to the Act, the Government grants institutional status and decides which degrees and vocational education an institution can offer. Within the degrees and vocational education the institution is accredited for, the institutions are authorized to themselves decide which subjects and courses it will offer (§§ 3-2 and 3-3). Contrary to the universities, the university colleges are dependent on accreditation and approval by NOKUT in advance if they are to offer new educational programmes above bachelor's level.
- The HEIs themselves decide the composition of their academic staff. The Board or a subordinate body at Faculty level may advertise academic posts and appoint new academic staff. Peer review of academic qualifications is mandatory before the appointment to academic posts, but interviews and trial lectures are recommended, according to the Act. It is worth noting that in Norway, associate professors can be promoted to full professors if they are deemed qualified, subject to a national assessment procedure.

The Act sets academic standards for the various types of higher education institutions. NOKUT is to evaluate if for instance a university college can qualify to become specialized college or obtain

⁶ NOU 2000:14 Frihet med mening. Mjøsutvalgets innstilling. (Norwegian Official Publication 2000: 14 Greater Freedom. Report from the Mjøse Commission.)

university status. The status of an HEI is relevant for its public mandate and institutional autonomy. University colleges for instance are dependent on NOKUT approval if they are to set up new master's degree programmes. Such approval is not required for the universities. It is not known, yet, to what extent the change in academic status will have budget implications in the longer run.⁷ The institutional status has become a strategic issue in Norwegian higher education.

Higher education funding system

All the public higher education institutions are dependent on *public funding* which is laid down in the Ministry's annual budget and decided by the Storting. The budgeting system has been changed during the last years towards less detailed allocations and more freedom for the institutions. The funding system has at the same time become more incentive oriented. The new funding system allocates funds according to a formula based on a combination of a basic component and components based on results in education and research:

- The *basic component share* of the total budget allocation is higher for the university colleges than for the universities and is to finance education, research and third stream activities.
- The common *incentive based part* of the budget model redistributes budget resources between the HEIs:
 - The education incentives are related to candidate production. The political objectives are to stimulate the HEIs to adapt their education programmes to market needs and encourage the development of international quality in research.
 - The research incentives are related to production of doctoral candidates, scientific publications and projects funded by the European Commission/EU and the Research Council of Norway. A common redistribution model for research (including also the university colleges) was first applied in 2006.

Dissemination is, the third core activity of the HEIs, and the Ministry is currently investigating how a future budget model may provide incentives for such activities. The Ministry will take into account recommendations on possible dissemination indicators developed by an Association of Norwegian Higher Education Institutions committee (chaired by the Rector of HiST), but will also seek to find relevant indicators for entrepreneurship and innovation.

Table 2.3: Budget allocation 2006 – basic funding and incentive-based funding (Source: Budget Proposition 2005-2006, Ministry of Education and Research).

(1000 NOK)	Basic funding	Incentive based redistribution		Total budget proposal ⁸
		Education	Research	
NTNU	1 545 920	529 135	542 330	2 617 385
HiST	333 888	181 068	13 372	528 327
HiNT	223 891	78 525	5 535	307 951

The HEIs income deriving from the new budget distribution model is shown in Table 2.3. Thus far, the research indicators have favoured the classical universities in Oslo and Bergen, which traditionally have a more pronounced basic research profile. Thematic research to address problems in industry and society, often producing results in terms of conference papers, development work for external partners or patents, is not valued to the same extent in the present model. These qualities are under other circumstances viewed as strengths for a technology oriented university. NTNU has drawn the conclusion that the researchers must be encouraged to change publication patterns from conference papers to recognized journals. Otherwise NTNU will lose valuable income from the research

⁷ In 2006, the new University of Stavanger was treated as a university college in the Ministry's budget distribution model. The new university thus maintained a relatively high share of basic funding and limited incentive-based funding compared to the classical universities. If in the future the Ministry should decide to treat University of Stavanger as a classical university, a limited research base would lead to a budget loss for the new university.

⁸ The final budget was slightly changed by the new Government taking office in the autumn 2005.

publication indicator. The close ties between SINTEF and NTNU on international research has also turned out to be a disadvantage in the Ministry's budget model. It will thus be important to ensure that the engagement of NTNU in European Commission research projects coordinated by SINTEF is recognized by the Ministry.

The university colleges are in reality unable to compete with the universities on the current research indicators in the Ministry's budget model. The inclusion of dissemination and third stream indicators in the budget distribution model are thus eagerly awaited by the university colleges, but this third set of indicators will also be of key interest to NTNU. See also Section 2.2.1 regarding the mandate of the HEIs.

As part of the budget process, the Ministry of Education and Research conducts annual consultative meetings with each institution. These meetings play an important role in the coordination and governance of higher education.

During the past decade, the State governance of tertiary education has changed considerably from a system emphasizing input factors and strong central control to a system more geared towards output and results, and increased institutional accountability and, especially for the university colleges, increased autonomy. The present reform, termed the Quality Reform, is a comprehensive effort to further change Norwegian higher education, both relating to the Bologna Process and the efforts to create a European Higher Education Area, and improved systematic quality improvement of higher education.

Major national agencies responsible for developing tertiary education policy, for financing the system, and for assuring its quality, and their mandates. Outline how national higher education policies are developed

Tertiary education and research is the responsibility of the *Ministry of Education and Research*.⁹

Two government agencies play key roles in higher education policy:

- The *Norwegian Agency for Quality Assurance in Education (NOKUT)*, the board of which is appointed by the Government. NOKUT supervises, controls and helps develop the quality systems of higher education institutions through evaluation, accreditation of institutions and course provision, and recognition of quality assurance systems. All HEIs are obliged by law to establish their own quality assurance system. NOKUT also assesses applications for establishing programmes of study in the university college sector, and accredits HEIs applying for a change in status.
- The *Research Council of Norway* funds research, plays a role in the development of Norwegian policies and strategies on R&D, and conducts a series of research evaluations of selected disciplines that may have a major impact on the institutions.

The *Norwegian Association of Higher Education Institutions* is a non-governmental cooperative body for universities and university colleges (equivalent to the Rectors' conference in other countries). Through this cooperation, the members aim to: develop strategies for the Norwegian system of higher education institutions, promote coordination within the sector, and use this body as a common instrument for the member institutions. The number of underlying councils have been set up for the various professional educations (teacher education, engineering and technology, business studies, health and social work education), as well as the major classical university disciplines. There are also committees for policy discussions on research, education and on infrastructural issues. The Association has no formal or legal status in the system; but plays an active role in policy-making, raising issues that are common to all institutions.

⁹ The Ministry of Education and Research has changed its name over the years. In this report the present name will be used.

The *Norwegian Association for Research Workers*, as well as the *Norwegian Student Union* and the *Norwegian Association of Students*, also play important roles in Norwegian policy-making in higher education.

Inter-institutional relationships – from division of responsibility to competition

The higher education sector is well integrated, with extensive and compulsory recognition of programmes of study and degrees across institutional types, and through student mobility between institutions. As mentioned above, inter-institutional cooperation is well developed, both through national cooperative bodies as well as inter-institutional agreements on joint degrees etc. Competition is more accentuated in the field of research.

The policy of linking the university sector and the university college sector more closely together began in the early 1990s. Norway is a small country with limited resources for research and recognized the need for increased coordination and specialization in academic fields and disciplines at national level.

The most obvious tension in the Norwegian Higher Education System concerns the differentiation of activities and responsibilities between universities and university colleges, especially concerning the possibilities and the resources for research and research training. For many decades, some colleges have strived to become universities, while the national policy was to limit the number of university institutions to the four in Oslo, Bergen, Trondheim and Tromsø, and to concentrate research funding mainly in these institutions.

As part of the Quality Reform, however, the 2005 Act has stipulated procedures for how institutions may be granted a change of status. In 2005, Stavanger University College and the Agricultural University of Norway (specialized institution) obtained university status and changed names to the University of Stavanger and the Norwegian University of Life Sciences. More university colleges aspire to university status. The next ones in line are probably Agder in southern Norway and possibly Bodø in the North. Also alliances and mergers between university colleges are considered in eastern Norway.

2.1.2 To what extent is there dialogue between government ministries concerned with territorial development, science & technology and those sponsoring higher education? What mechanisms exist to coordinate and attune the policies and measures taken by the different ministries?

National policy on education and research is the primary responsibility of the Ministry of Education and Research. The other Ministries are, however, responsible for research funding within their specific domains – industry, agriculture, health, regional development and so on. Their research funding is partly channeled through the Research Council of Norway, partly directly to the research institutions upon application from the institutions or as commission work.

Coordination between policy sectors takes place in the Government, but also in subcommittees depending on the political priorities of the given Government. It is yet to see how the newly appointed Government will be organized. It is already clear that regional policy will be among the priority areas and the Government will set up a ministerial committee to coordinate regional policy. Interministerial committees and working groups also operate at administrative level in the preparation of new policy documents and White Papers on regional policy, innovation, research and education where the role of the HEIs is described.

The past Government drew up a White Paper on regional policy (2004-2005), but this will probably be succeeded by a new White Paper in 2006. The last White Paper described the HEIs and research institutes as central resources for regional development. The institutions should use their extended freedom in the Act relating to Universities and University Colleges to adapt activities to the regional

conditions and requirements. They must develop cooperation regionally, nationally and internationally and tie it in to innovation, research and the educational provision. Regionally these institutions should be in active partnership with the public and private sectors to develop strategies and measures for regional development that use the infrastructure of skills and expertise in the region (White Paper, p. 61). The Government also commented on the attempts to obtain university status. This must not reduce the university colleges' regional role, or act against that which is beneficial for the education of researchers for the country as a whole. It may be just as good for regional industry and working life that the university colleges use their resources on developing their particular characteristics in relation to local and regional challenges, and thereby develop their own strong points (White Paper, p. 62).

The past Government also put high priority on "a comprehensive innovation policy". Their aim was to integrate innovation in a range of policy areas such as industrial policy, cultural policy, education and research, regional policy, infrastructure, labour market and fiscal policy. They established a Government Innovation Committee (Regjeringens Innovasjonsutvalg) to develop and coordinate policy development at national level.¹⁰ They also set up an interministerial committee at administrative level in charge of coordinating the work of the various Ministries. Two Ministries established new Divisions for research and innovation policy to strengthen their efforts in this field (Ministry of Industry and Trade, and Ministry of Fisheries). The past Government also set up an Innovation Forum with representatives from industry and other key actors in the innovation environment to foster dialog between public authorities and private actors in this domain.

2.2 Regional dimension "inside" the national higher education policy

2.2.1 To what extent does national higher education policy have a regional dimension?

Have regional development (economic, social, cultural) considerations played a prominent role in decisions on where to locate and build up new institutions?

Regional development played a prominent role when it was decided to establish a fourth university in Tromsø (1968). The university has reduced the shortage of higher educated personnel in certain sectors. Tax incentives also stimulate newly educated personnel to work at least some years in the northernmost counties after graduation.

The expansion of college education to all counties, in the early 1970s was also clearly motivated by regional development objectives. National competition for students and quality requirements in higher education, however, are major challenges particularly for the smaller university colleges. But also the medium and larger university colleges have a challenge in competition with the universities. In the 1980s, a major restructuring of higher education took place whereby higher education institutions in the regions were merged to form larger regional university colleges. However, the institutions have in many cases remained physically scattered, which is often academically and financially inefficient. The Ministry of Education and Research indicated in the 2006 National Budget that there will be a need for academic quality improvement to make the studies attractive and the research activity relevant for society. Relocations, mergers and alliances within and between higher education institutions are likely to come in the years ahead. Trøndelag will be no exception.

Is regional engagement imposed on institutions by government as a formal requirement?

The University College sector has since its origins as regional colleges in 1970s had a special regional mission. Regional engagement can also be derived from the more general formulations in the Act relating to Universities and University Colleges § 1-3. In addition to education and research, the institutions have a public mandate to actively serve society in various ways:

¹⁰ The Ministers responsible for the following areas were members of this committee: Labour, Finance, Fisheries, Regional Policy, Agriculture, Oil and Gas, Education and Research, and Modernization of the Public Sector. Source: The Government's Innovation Policy. Status Report 2005.

- seek *external funding* (c)
- contribute to *innovation* and added value (e)
- *dissemination* of knowledge (d)
- participate in *public debate* (f)
- cooperate with HEI in other countries, *local and regional civil and working life*, public administration and international organizations (g)
- offer *continuing and further education* (h)

The responsibility to cooperate with "civil and working life" came into the Act in 2002. Local and regional cooperation was specified in the 2005 revision as well as the task to seek external funding and contribute to innovation and added value.

The incentive-based income distribution model applied by the Ministry of Education and Research thus far does not encourage third stream activities. However, the Ministry aims to add a dissemination component in the future (see Section 2.1.1). This is partly motivated by the need to ensure that the university colleges are stimulated to prioritize their traditional regional activities.

What policy initiatives have been taken by various actors to foster the regional role of HEIs and to stimulate regional collaboration between HEIs, industry, government and civil society?

The past Government put great emphasis on *Innovation policy*, and it is expected that this work will be continued by the new Government. Innovation and regional collaboration were introduced in 2005 as explicit mandates in the Act regulating the HEIs. The Government has substantially increased funding for industrial research and innovation activities with regional partners. Funding is channeled through the public policy instruments of which the *Research Council of Norway*, *Innovation Norway* and *SIVA* are the most important ones. These institutions are present in all Norwegian regions and operate a range of programmes to foster dialogue and cooperation between HEIs and regional stakeholders (see Section 3.2.3 for a further description of relevant programmes). A tax-rebate scheme is also to stimulate research cooperation between HEIs and industry (see SkatteFUNN, Sections 1.3.6 and 3.2.3).

At regional level, the two counties in Trøndelag and the City of Trondheim have invited the HEIs to cooperate in a regional development programme. Sectors of mutual interest have been identified. Network projects are given priority in the first action plans of the *Regional Development Plan*.

2.2.2 To what extent do these considerations have a differential impact upon different types of higher education institutions?

Despite changes in legislation, the Ministry maintains the differentiation between the different types of HEIs in the National Budget Proposition for 2006 (St.prp. nr. 1 (2005-2006)):

The universities are "to participate in social and business development by means of research cooperation, technology transfer and innovation" (page 142).

The university colleges are to "cooperate with regional working life to develop an educational provision that matches the competence that is required in the region" and "cooperate with regional actors in innovation, R&D and development work" (page 152).

2.2.3 Does an emphasis upon a regional role for HEIs involve any policy tensions? For example, is there a conflict between regional commitment and the strive for quality and international competitiveness in higher education? If so, how are these resolved?

Differences in external expectations are also reflected in differences in internal perception and priority of regional activity between the university, NTNU, on the one hand, and the university colleges on the

other. This is further elaborated in Section 3.1.1 on the HEIs' research policy and in the SWOT analysis in Section 3.4.2.

Both HiST and HiNT have integrated their regional role in their strategies and core activities. This is not the case for the university. In the strategic plan for NTNU it is international quality which is highlighted with specific emphasis on the national responsibility for maintaining and developing technological expertise in Norway. There has been, and continues to be resistance in the technological research community against directing too much attention to regional industry at the sacrifice of national industry. The main argument is that NTNU does not have the capacity to engage in industrial development in all Norwegian regions. It must give priority to research collaboration with knowledge-intensive industry and the larger industrial locomotives. Engagements which take attention away from international quality development, will in the longer run weaken both the university and the cooperating institution SINTEF as a national and international research institute. Nevertheless, both NTNU and SINTEF are engaged in regional partnerships, and for NTNU, regional engagement is particularly relevant in certain research fields (e.g. medicine) and for student projects in the private and public sectors.

There has been and are several development projects in the region with the aim to stimulate cooperation between R&D institutions and private and public sector (see Chapters III, IV and V). These programmes have contributed to reduce some of the resistance against regional engagement by facilitating mutually beneficial interaction between regional actors. The Idéportal is one such example where NTNU, HiST and HiNT aim to systematically interact with regional working life on knowledge transfer via students.

2.3 Regional higher education system and governance

2.3.1 Outline the basic profile and character of HEIs in the region: Universities, Non-university HEIs

The historic links between the HEI and the region

The *Norwegian University of Science and Technology (NTNU)* was established in 1996 replacing the weak umbrella organization, the University of Trondheim (1968). The Norwegian Institute of Technology (1910), the College of Arts and Science (1922), the Faculty of Medicine (1975), the Music Conservatory (1968), Trondheim Academy of Fine Art (1979) and the Museum of Natural History and Archaeology (1767) were merged into a fully integrated new university structure.

Localizing the Norwegian Institute of Technology to Trondheim (NTH, 1910) in fierce competition with the capital Oslo, was as mentioned a political decision motivated by nation-building and regional development. *Technology* has since been a core identity in Trondheim. The city and local industry actively supported the establishment of the applied research institute, SINTEF (1950). The economic impact of the twin institutions NTH and SINTEF is significant, and since the mid-1980s some 150-200 high tech companies are localized in the region as a direct result of the Trondheim research environment.

As a result of a national reform in 1994, the public non-university HEIs were merged into *county-based colleges*, one in each County. They remained national institutions, but received a specific mandate to serve their regions.

In Sør-Trøndelag, eight institutions were formally merged to form the *Sør-Trøndelag University College, HiST* (1994). The college structure is relatively weak, partly due to the many physical locations in Trondheim and diverse cultures in the previously independent institutions. Co-localization near the university and the regional hospital in Trondheim, and possibly institutional merger with the university, are long-term strategic objectives of the university college. The various institutions and educational programmes at HiST are partly national to meet the educational needs of Norwegian

industry (Technology, 1870; Dairy industry, 1906; Bioengineering, 1968; Radiography, 1999). Other institutions and educations were established in the region as a result of the general economic development (Business Administration, 1964) and the development of the welfare state (Nursing, 1903/1976; Teachers' education, 1959; Social workers, 1962; Occupational Therapy, 1974; Physiotherapy, 1992). In comparison to NTNU and HiNT, regional policy has not been a main issue for the development of HiST, and subsequently, the regional political ownership is less strong than is the case for HiNT.

In Nord-Trøndelag, the county has played an active role in the development of higher education in the region. Until 1980, the Levanger Teachers' College (1892) was the only HEI in Nord-Trøndelag, but with regional efforts, Nord-Trøndelag obtained "its own" District College in 1980 (Steinkjer). The regional authority continues to have a strong influence over *Nord-Trøndelag University College, HiNT* (1994). The current educational programmes cover key disciplines and professional education at bachelor's level. The nursing education in Namsos and Levanger has its origin in the education of nurses at the local hospitals (1939). The Department of Agriculture has its roots in the National Forestry School localized in the region by the Ministry of Agriculture because of the significance of the forestry industry. The driving instructors' education in Stjørdal is the latest addition to the university college. Today, the university college's activity remains spread across four campuses in different towns: Namsos, Steinkjer, Levanger and Stjørdal.

How the institutions have evolved over the last ten years in terms of: (1) staff and student numbers; (2) faculty mix; (3) place of the institution in the regional and national higher education system; (4) balance between teaching and research; and (5) territorial focus

Among the six universities in Norway, NTNU is the second-largest in terms of registered students, and holds a strong position in research, specifically externally funded research from industry, the Research Council of Norway and the European Commission. Its regional engagement, measured by external funding from counties and municipalities, is at the same level as the colleges in the region. The academic staff can devote as much time to teaching and research.

Among the 23 university colleges in Norway, HiST is among the largest in student numbers, and has average performance in research. One of HiST's objectives is to improve its research base and allow the academic staff to devote 25 % of their time to research. A stronger academic standing is also called for if the college is to be authorized to offer more master's degree programmes in the future. It currently offers three programmes on its own and six programmes in cooperation with other institutions (four with NTNU).

HiNT is a medium-sized Norwegian university college in terms of students and external funding. It holds a strong position in distance learning and continuing education. It is, however, no academic research institution and scores the poorest of the university colleges in terms of scientific publications. This is partly explained by the composition of the academic staff who have limited time for research.

Key indicators of institutional strength are provided in the tables on the next page. They illustrate that the public HEIs in the region face different challenges in the national education system.

Table 2.4: Institutional evolvement and rank in national higher education system (Source: DBH)

(National rank in the institutions own category, respectively college or university)	NTNU		HiST		HiNT	
	1995	2004	1995	2004	1995	2004
Student numbers (registered)	17 248	19 540 (2)	6 034	7 850 (4)	2 989	4 255 (10)
Distance learning (completed studies) ¹¹	-	680 ¹² (4)	-	3 080 (5)	-	2 946 (3)
Staff numbers:						
- academic staff	886	1215	340	377	196	228
- of which associate professors/professors	441	915	0	68	0	34
- research fellows	415	925	0	32	5	14
Research strength						
- external funding (mill. NOK) ¹³	-	856 (1)	-	28 (9)	-	34 (10)
- publishing points ¹⁴	-	1 569 (3)	-	32 (10)	-	3 (24)
Operating income (mill. NOK)	225	3 363	14	541	15	503

Table 2.5: Sources of income for the HEIs, 2004 (Source: HEIs annual reports to the Ministry)

(1000 NOK)	NTNU	HiST	HiNT
Ministry of Education and Research and other Ministries	2 506 661	494 955	288 873
Research Council of Norway	508 995	2 403	3 007
Other External funding:	383 041	27 779	32 123
- State Authorities	99 119	12 410	6 547
- Regional Authorities	39 920	2 376	8 676
- Organizations	13 597	2 327	440
- Industry/Private Sector	163 897	0	11 877
- EU	21 710	1 668	1 812
- Foundations	11 805	4 798	320
- Others	32 993	4 200	2 450
Other income	103 951	35 769	12 351
Operating income	3 502 651	540 926	336 354

Table 2.6: Funding of research fellowships, 2004 (Source: DBH)

(1000 NOK)	NTNU	HiST	HiNT
Ministry of Education and Research	409	31	12
Research Council of Norway	383	1	1
Other external sources	133	0	1
Total number of research fellowships	924	32	14

¹¹ Source: DBH 2004. Distance learning and continuing education are overlapping activities. The university colleges are in general more active than the universities. The university colleges have the advantage of closer market relations and continuing education is part of the normal academic duties, rather than an extra task on top of normal duties as is the case at NTNU.

¹² According to the NTNU 2004 annual report, the actual number of continuing education courses was 1652 in 2004.

¹³ Source: DBH 2003. Externally funded research from Counties and Municipalities amounted to NOK 8.7 million for NTNU, NOK 9 million for HiST and NOK 9.8 million for HiNT. The regional engagement of the university colleges are largely in the Trøndelag region.

¹⁴ Source: DBH, publishing points (2004). National funding of HEIs is partly incentive based. The distribution of income related to research activity is mainly based on scientific publications. "Scientific publication points" are calculated taking into account the number of publications, the type of publication and the scientific quality of these publications.

The public HEIs offer most disciplines and professional education. The faculty mix is shown in the table below.

Table 2.7: Faculties by subject

HiNT Faculties (4 towns)	HiST Faculties (Trondheim)	NTNU Faculties (Trondheim)
<ul style="list-style-type: none"> - Health Science, Namsos - Social Sciences and Natural Resources, Steinkjer - Education, Engineering and Nursing, Levanger - Driving Instructor Education, Stjørdal 	<ul style="list-style-type: none"> - Health education and social work - Nursing - Teacher Education and Deaf Studies - Food Science and Medical Technology - Technology - Informatics and e-Learning - Business Administration 	<ul style="list-style-type: none"> - Social Science and Technology Management - Arts (incl. Music) - Medicine - Engineering Sciences and Technology - Natural Science and Technology - Information Technology, Mathematics and Electrical Engineering - Architecture and Fine Art

The differences in *territorial focus* of the three institutions is also visible in regional recruitment of students. With NTNU in the region, Trøndelag is a net exporter of higher education candidates to other parts of the country, first of all to the greater Oslo region. The overcapacity in regional terms is particularly pronounced in technology where NTNU educates almost 76 % the national graduates.

A study of the regional adaptation of candidates made by NIFU in 2003 provides interesting data on candidates from classical university disciplines, engineering and nursing education (see Table 2.8). The study showed that NTNU is the least regionally based university in Norway, not only in technology, but also in the classical university disciplines. Only 44 % of the candidates in the classical disciplines were from the region. This is far lower than the other universities where typically some 70 % came from the home region of the HEI.

The NIFU survey did not provide individual data for HiST and HiNT. Combined data from the Trøndelag university colleges, however, shows that only 48 % of the candidates in engineering originated from Trøndelag. HiST's competitive position nationally, is partly owing to its location in the "technology capital" Trondheim. The survey shows a strong regional recruitment and regional labour market in nursing. 81 % of the nurses remained in the region after graduation. HiNT has some overcapacity in nursing education in comparison to local labour market needs, but many of these nurses typically move to Sør-Trøndelag after graduation.

Table 2.8: Candidates regional adaptation. Source: NIFU report no 7, 2003.

The candidates' field of study	Regional recruitment to HE (Candidates living in Trøndelag at age 17)	Regional adaptation of candidates (Candidates living in Trøndelag 6 months after graduation)
NTNU – chartered engineer	16 %	27 %
NTNU – classical disciplines	44 %	57 %
HiST/HiNT - engineer	48 %	56 %
HiST/HiNT - nurse	73 %	81 %

2.3.2 To what extent does the financing and management of HEIs occur at a regional level? Are there regional organizations that have strategic responsibility over funding and management of HEIs?

There is no general financing of higher education at regional level. HEIs may, however, apply for regional development funds for specific projects. Regional authorities may also negotiate with the HEIs for the delivery of specific development activities or educational programmes. Nord-Trøndelag County has done so on a number of occasions, financing the start up of new programmes, academic staff and infrastructure.

The White Paper on Regional Policy (no. 35, 2004-2005) opened a debate on the regional authority's influence on higher education. Some counties commented in the hearing round that they would prefer that the management and funding of the university colleges were transferred from national to regional level. The Rectors at a Norwegian Association of Higher Education Institutions conference were strongly against such a development and underlined this in a press release on 13 June 2005 that the HEIs must be maintained as national institutions. Many of the HEIs take national responsibility in specific professional areas. They are also to maintain international quality in research. Research and education are a long-term commitment, which easily may become a balancing item for regions striving to solve specific regional tasks. The HEIs are already important actors in the regions. The collaboration with local and regional industry and public sector ought to be further strengthened through the application of existing policy instruments without changing the HEIs organizational affiliation, the Rectors concluded.

Chapter III: Contribution of Research to Regional Development

“Creative Trøndelag. Where everything is always possible” is Trøndelag’s vision for the future. Business life faces increasing challenges in terms of innovation and change. In the Regional Development Plan for Trøndelag more and more effort is to be put into creating added value and innovation. Central measures are:

- prioritizing entrepreneurship in education and working life
- developing enterprises based on culture
- establishing arenas for the development of innovation and commercialization
- commercializing research results and business ideas
- internationalization
- developing the region’s natural advantages for the benefit of the entire region

It is in these areas that the HEIs will be needed to realize the stated priorities. The counties want to add the regional dimension to what is otherwise the national education and research policy. Better means of integrating the HEIs and research institutes with those who demand competence enhancement will pave the way for better use of the resources already found in the region. This will also make the region more visible and strengthen its national standing.

3.1 Responding to regional needs and demands

3.1.1 Does HEI research policy have a regional dimension?

Norwegian universities have a national and international mandate. It is the university colleges who are the State’s instruments for higher education in the regions. NTNU typically has no mention of a regional role in its current strategies. But NTNU is of course engaged in many regions. In the ongoing strategy process, NTNU’s regional role might be clarified.

The Norwegian University of Science and Technology (NTNU) has a specific public mandate to take *national responsibility* for research and education in technology. Thus NTNU initiatives in the technology domain are to be national. The university will, however, be responsive to regional initiatives and needs. Participation in regional networks is seen as an efficient way to cooperate on a regional level. In terms of access to technological expertise, Trøndelag is in an advantaged position relative to other regions.

The university furthermore has a general mandate to develop and *disseminate knowledge to meet the needs of industry, public sector and society*. In the university’s current strategies for research and innovation towards 2010, the main focus is on addressing national needs in order to meet international competition. The location of research and innovation partners is subordinate. In several areas, the Trøndelag region is becoming more important:

- In healthcare and medical technology research, for instance, a strong regional base is perceived as a competitive advantage for international success.
- The university has always played an active role in general dissemination of knowledge in Trondheim, and in later years, it has also sponsored fine art in the city.
- If we look at innovation activities, the significance of the home region Trøndelag seems to be increasing. Lately, the university is looking into how it may contribute to the development of the “creative industries” and is about to develop closer relations with the City of Trondheim in this area. The university also participates in other regional projects. The regional partnerships enable the university to obtain public and private support for university initiatives, which may strengthen the university nationally and internationally, and at the same time benefit the region.

In the university’s ongoing strategy development towards 2020, *international excellence* is launched as the university’s vision for the future. The regional partnership with the research institute SINTEF is

important in order to realize this vision. The two institutions constitute a national and international stronghold in science and technology. This partnership is a substantial regional asset, and has led to between 150 and 200 high tech spin-off enterprises geared towards the global market.

NTNU and HiST currently investigate the advantages of possibly localizing the two institutions near the city centre, SINTEF and the university hospital. NTNU's strength in research could be beneficial to HiST's quality development, while HiST's strength in professional training and extensive regional network could be a valuable supplement to the university's educational programmes and innovation work. In addition to synergies in research and education, it is also an institutional aim to become more accessible to society. Closer collaboration with the public and private sector in the region may improve the relevance and quality of research and education.

The City of Trondheim is supportive to the ongoing strategy processes at the HEIs, and there is political support in the municipal council for further developing Trondheim as the Knowledge City. This illustrates how the region may support the university's national and international ambitions. It is in the mutual interest that the university succeeds. Prospective changes in land use plans will be dealt with in due time.

The two university colleges, HiST and HiNT, both have a public mandate to *serve their region*. This is reflected in their strategic plans and research policy. HiST's vision is to have a sound, "outward looking academic environment that works in close interaction with private and public partners." Its strategy is to develop the university college as an "expertise resource for the region, primarily through prioritizing relevant assignment-based continuing education, disciplinary support and stimulation of innovation/entrepreneurship." In the Strategic Plan for HiNT (2005—2008) one finds similar formulations defining HiNT as the university college for Nord-Trøndelag, but also for the Trøndelag region.

To what extent do HEIs draw upon the characteristics of the region to develop research activity?

Regional characteristics offer business opportunities in Trøndelag and represent a research potential for the HEIs. This potential is only utilized to a varying degree. There can be many explanations, but in general *the structure of business, industry and public sector and the availability of research funding largely determine research activities at the HEIs.*

- In basic research, there are few relevant industrial partners in the Trøndelag region and only one significant regional funding agent (the regional health authority, Helse Midt-Norge). There are hardly any industrial locomotives with headquarters in Trøndelag. However, some companies have placed their research divisions in Trondheim (Statoil, Telenor).
- In applied research and development work, the Trøndelag region offers more opportunities. The many SMEs represent a potential for more contract research, consultancy work and student projects. The public actors, in particular the municipalities, the two counties and the various state directorates, are important partners for the HEIs. In Nord-Trøndelag County, for instance, the annual Regional Development Programme provides funding opportunities for HiNT. This year the programme is extended to include activities in all of Trøndelag with partners from both regions.

The Regional Development Plan states that the region is to further develop the *region's natural advantages and drivers of growth* to promote economic development in the entire region. The HEIs were invited to contribute to the identification of the most promising areas based on their academic strengths. The industrial areas which are highlighted in various parts of the Regional Development Plan, thus match many of the strongpoints and priority areas of the HEIs.

Regional Development Plan – focus areas:

- *blue and green food resources*
- *renewable energy – wind power, bio-energy, natural gas power*
- *forestry and wood industry*
- *tourism and culture*
- *industry sector*
- *knowledge – education, research, consultancy, innovation and new enterprise*
- *infrastructure development – ICT*

The HEIs taken together have substantial research and development capacity in these areas, which to a greater extent could be utilized in the region. In *NTNU's strategic priority areas*: marine and maritime technology, energy and petroleum, materials, medical technology, ICT, and globalization, - research and innovation are particularly focused and regional characteristics and opportunities are utilized whenever it is academically interesting (see box).

NTN's strategic priority areas – examples of regional collaboration and opportunities

The ***marine and maritime area*** covers everything from ship construction to food fry technology and marine biology. The excellent laboratories are recognized as Marie-Curie training sites (EU). The new SINTEF Sealab on the harbour in Trondheim will strengthen the research institutions' joint efforts in marine research. Within marine resources, the aquaculture industry off the Trøndelag coast provides research opportunities for the development of areas such as new species and improved production methods. The major companies in fish production, feed and equipment operate from Trondheim. The production takes place on Hitra and Frøya outside the Trondheim Fjord.

Within ***Energy and petroleum, resources and environment*** more than 750 people are involved at NTNU and SINTEF. The oil and gas fields off the Trøndelag coast could not have been exploited if it was not for the deep sea technology developed by NTNU-SINTEF. The oil and gas cluster in Trøndelag consists of 65 companies with 3500 employees. Their present turnover is NOK 4 billion a year, but the market potential is 3-6 times higher, R&D service included (source: Chamber of Commerce). To take another example, to address the energy shortage in the years to come, the region takes particular interest in research on CO₂ capture for the utilization of natural gas for energy production. Renewable energy may also become a more important supplement than is currently the case (see Section 5.3.2).

The ***materials science*** field is wide covering nanotechnology, light metals and biopolymers. The production of silicon for solar cells is of research interest both from a materials science as well as an energy perspective. There are three smelteries in Trøndelag with strong industrial groups such as Orkla as owners. The regional manufacturing industry is also an asset. In solar cell technology as well as in sustainable ferroalloy and silicon production, regional actors see opportunities for the development of a regional cluster with innovative abilities.

In ***medical technology*** there has for a long time been close cooperation between St. Olavs University Hospital, the public hospital owner, NTNU, SINTEF and HiST. Much of the research activity takes place in the Medical Technology Centre next to the hospital. Joint research covers for instance image-based diagnostics and intervention, medical biotechnology and medical ICT such as electronic patient records. Sør-Trøndelag County has in collaboration with Innovation Norway set up a seed capital fund for medical technology (NOK 14 million). The fund supports the very early development of technological ideas stemming from the NTNU-SINTEF-St. Olavs Hospital environment. The Board of MedTech Trondheim AS controls the fund.

ICT is used in many applications and many spin-off companies have emerged from such multidisciplinary research. The internet search technology environment is particularly strong, with Fast Search & Transfer as one of the best known spin-offs from NTNU. There are probably as many as 150 ICT companies in the region today.

The challenges related to the food cluster, energy, health technology and ICT infrastructure are particularly relevant to research interests at HiST. When seeking funding for research projects from the Research Council of Norway, HiST refers to the Regional Development Plan's priority areas.

HiST's R&D strategies are based on HiST as a college for vocational and professional education, as well as priorities that reflect the important skills needed in the region and to a degree nationally.

In working life, HiST will address its R&D activities in the following areas:

- Market solutions and modernizing the public sector
- Habilitation and rehabilitation
- Professional education for teachers with particular focus on maths and Norwegian
- e-learning and digital skills
- innovation and entrepreneurship

New areas are planned, these include:

- Children with learning difficulties
- Cellular biological mechanisms
- MR (magnetic resonance) and image processing
- Nursing-home work

HiNT's research policy is connected to the expectations and needs in the region in several areas and leans to the cooperation with regional stakeholders and the Nord-Trøndelag Research Institute. As a result of this, the university college's strategy states that HiNT will increase its research areas like:

- fishing industry
- farming
- entrepreneurship
- clinical research

This means that the characteristics of the region to a great extent have influence on developing the R&D activity. Regional relevance in both education and research is fundamental to the survival of HiNT. As a specific result, the share of the student projects taking place in collaboration with external partners has increased significantly in the past year.

The region, furthermore, provides interesting *empirical ground* in various fields for research and development activities. As an example, one of the world's largest *health surveys* is conducted in Nord-Trøndelag with funding from the Research Council of Norway. The HUNT research centre and laboratory is part of NTNU and offers employment to 30 people in Verdal and Levanger. The database is a "goldmine" for health care research and only in Trøndelag, 35 PhD candidates utilize HUNT data in their research. The organizational model shows that decentralized research activity is possible with the university as guarantor for the academic quality of the research work.

The knowledge sector - regional research partners and international competitiveness

The significance of the knowledge sector for *regional development and international competitiveness* is recognized in the Regional Development Plan. One strategy is to set up an investment agency with the specific task to attract talents and companies to Trøndelag - *Invest in Trøndelag* (Innflugging Trøndelag). NTNU will contribute 1/8th to this operation. If the agency is to be successful, it will be important to ensure that key regional stakeholders are dedicated to coordinate actions and take the necessary measures to reduce barriers for external actors to settle in the region. Lack of industrial space of a certain size has for instance been mentioned as a major obstacle to the further growth of the knowledge industry in the city of Trondheim. On a comparatively smaller scale, lack of office space on campus is a challenge for the HEIs. In the campus planning process towards 2010, an *Innovation Village* is envisaged with work space for visiting researchers and industry partners (see box).

The Regional Development Plan would also like to see the export sector growing. In the project *Export Trøndelag*, Innovation Norway and other regional development actors try to bring interested companies together and support them in their internationalization efforts. Part of this strategy is putting these companies in touch with the R&D environment. Companies with a strong research base

will have a competitive edge on the international market. Some of these companies will also be attractive objects for international acquisition. This can be an advantage, but occasionally also a loss for local business R&D. There are examples whereby foreign owners have moved all R&D to their home country. However, if regional research ties are strong, it is more likely that the research activities are maintained in Norway. It is therefore in the mutual interest of the Norwegian research environment as well as for Norwegian industry to develop strong relations providing interesting challenges and growth opportunities for both parties.

Innovation Village – an industry house

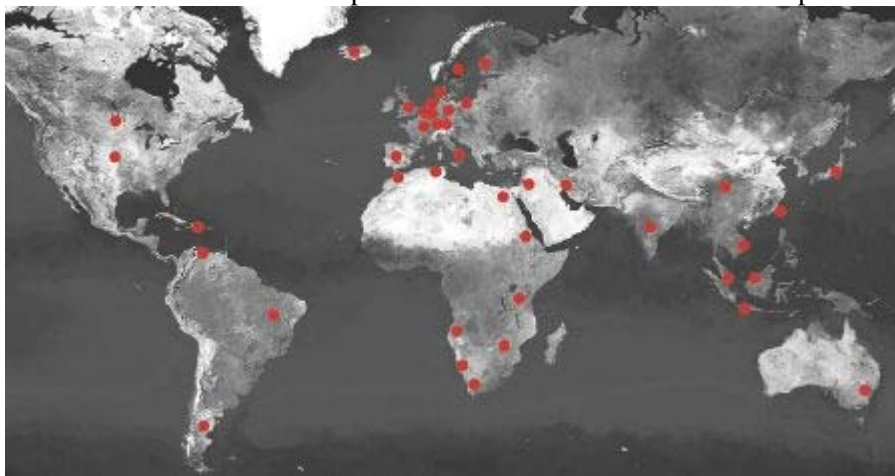
Innovation Village is a vision of creating a physical arena for collaboration between key actors engaged in innovation and entrepreneurship activities to improve visibility and coordination, thereby obtaining synergy effects from the total activity. The Innovation Village concept includes key NTNU actors such as NTNU TTO, the Norwegian Entrepreneurship Centre (Department of Industrial Economics and Technology Management) and Gløshaugen Innovation Centre (incubator). The industry house should also be an arena for existing industry, spin-off companies, funding institutions and industry liaison towards regionally based SMEs.

It is also an aim to lower the threshold for collaboration between industry and the R&D environment. An Innovation Village should have facilities enabling companies, academic staff and students to pursue research, development and commercialization work together on a project basis or semi-permanent basis. When external partners need the proximity to the research environments of NTNU and SINTEF in their technology and product development, a project hotel is envisaged as an arena for such collaboration.

The knowledge sector is recognized as one of the most important economic sectors in Trøndelag. This is reflected in the vision for Sør-Trøndelag County - “Creative Trøndelag”. Mainly situated in the urban centre Trondheim, many of the knowledge intensive industry companies and research institutes are either offsprings from the HEIs or have come to the region attracted by the research environment. There are also several public agencies which are localized in Trondheim of the same reason. The research links between the HEIs and these institutions vary in strength and motivation. The results are not necessarily applied in the region, but rather nationally or internationally. It is fair to say that Trøndelag is a net exporter of knowledge. To give a better picture of the knowledge sector, the research institutions affiliated with the HEIs are described at some length in the following, while other knowledge institutions are described in a separate box.

HEIs’ affiliated institutions

SINTEF is the most important regional partner for research at NTNU. It was originally established to handle the university’s contract research in engineering for industry. Today, *SINTEF*, is an independent research institute with 1700 employees in Trondheim and Oslo.¹⁵ It is a reputable national and international actor with operations all over the world as this map illustrates (Source: *SINTEF*).



¹⁵ *SINTEF* is subdivided in seven corporate areas to meet the demands of key industry sectors: Health; ICT; Marine technology, Fisheries and Aquaculture; Materials and Chemistry; Energy and Petroleum; Technology and Society; Building and Construction.

NTNU and SINTEF have in recent years established several Gemini centres in areas where the two institutions have international ambitions and are closely interlinked in terms of personnel, infrastructure and research activities. The collaboration includes strategic cooperation between the institutions as well as joint applications for larger R&D projects with national and international funding. The centres also aim to stimulate innovation and industrial development.

International excellence – Gemini centres

There are currently 15 Gemini centres, most of them related to energy, materials science and construction technology. They cover the following fields of research:

- | | |
|---|---|
| • Energy Supply and the Indoor Climate | • Micro- and Nanotechnology (MiNaLab) |
| • Electric Energy and Energy Systems | • Catalysis and Absorbents (CATMAT) |
| • Petroleum | • Acoustics |
| • Marine Structures | • PV Solar Cell Materials |
| • Underground Technology | • Applied Refrigeration Technology |
| • Robust Materials and Design – Offshore Applications | • Road and Transport |
| • Materials and Energy | • Health Services |
| | • Sustainable Architecture and Property |

SINTEF has recently also developed a *regional strategy* with an aim to strengthen its regional role in relation to SMEs, larger companies and the public sector. SINTEF sees itself as a national actor, but with a specific regional responsibility in the Oslo region and Central Norway where SINTEF has its main offices. SINTEF's contract research in Central Norway amounts to some NOK 200 million, but the potential is far greater.¹⁶ Larger projects are primarily within the marine area, petroleum, energy, materials and medical technology. SINTEF is about to develop a partnership agreement with Sør- and Nord-Trøndelag Counties and the City of Trondheim relating to the objectives on research and innovation in the Regional Development Plan. SINTEF MRB Ltd is a key instrument in SINTEF's regional strategy; A Trøndelag office is established to focus on industrial development and research-based counselling to the public and private sectors in Trøndelag (i.a. Research-based competence brokerage). SINTEF is also considering establishing activity near industrial centres/clusters in Trøndelag.¹⁷ Nord-Trøndelag Research Institute may become a regional partner for SINTEF.

Nord-Trøndelag Research Institute (Nord-Trøndelagsforskning) was established in 1983 with basic funding from the Research Council of Norway to develop and disseminate research-based knowledge in cooperation with HiNT and other regional, national and international institutions. In reality, there has been little cooperation with HiNT. In 2006, the research portfolio and staff (30 researchers) of the Research Institute was transferred to a new research company Trøndelag Forskning og Utvikling AS. HiNT, SINTEF and other regional actors are invited to become part-owners of the new company. The advantage of the new model is that the owners will have better control of the activities. The new model will also be more flexible with respect to adaptations to future changes in framework conditions and funding models.

Present research activities of Nord-Trøndelag Research Institute cover public administration, business, industry and rural development, health and the environment. It is a strategic priority to strengthen the collaboration with industry in general and SMEs in particular. The institute has for many years been engaged in the Research-based competence brokerage programme in Trøndelag, and will try to link this programme with the follow-up activities for export oriented companies (Export Trøndelag). Industry development based on natural resources is a priority (e.g. the Value Creation programme for the Wood Processing Industry, an EU project for SMEs in the Agro-Food sector, and culturally based industrial development). Entrepreneurship and innovation is another focus area (Strategic Institute

¹⁶ Source: Article about SINTEF's regional strategy in Arena Trøndelag No 2/2005.

¹⁷ SINTEF MRB is for instance working together with the industry environments in Leksvik, Verdal and Orkanger to develop a Centre of Expertise in water-related technologies.

Programme on innovation), and the institute will participate in the Regional Innovation Strategy project (RIS).

There are also other spin-off research institutions from NTNU. They are far smaller than SINTEF. Previously, such research institutions were established as *foundations* giving the parent institution limited control over their activities. The Centre for Rural Research (Norsk senter for bygdeforskning) is one of the research foundations, with roots in the university environment.

Today, the HEIs may set up their own *limited companies*. This gives the HEIs full control of the externally funded activities in the affiliated institution. The recognition of these activities in the budget distribution model of the Ministry is another important advantage. NTNU has so far set up two limited companies. The Centre for Economic Research AS (Senter for økonomisk forskning AS) is to engage in applied economic and business related research. The researchers behind this entity are recognized in fields such as municipal development and SME innovation. The Centre for Societal Research AS (NTNU Samfunnsforsknings AS) is another example, with emphasis on organizational matters and learning processes. Also HiST has chosen to set up its own company. HiST Kompetanse AS was founded in 2004, 100 % owned by HiST. The company is to conduct contract research, education and other externally funded activities of key interest to the university college. This includes activities to promote innovation and entrepreneurship in collaboration with private and public working life. The company has no employees and all personnel are hired from HiST. Externally funded activities at HiST will either be organized directly by HiST or through the limited company.

Independent Research Institutes and Public Agencies

Statoil, Norway's largest company has its research and technology development centre in Trondheim (Statoil Forskningscenter) which is the largest industrial research milieu in Norway. A substantial amount of its research is carried out here. Much of this in-house research and development is done in close cooperation with Norwegian universities, research institutions, other operators and the supplier industry. Research expenditure was NOK 1.027 billion in 2004.

The Paper and Fibre Research Institute AS (PFI) is a research institute for fibre, pulp and paper, located on the campus of NTNU, cooperating closely with the university researchers. PFI is a commercial organization. A major part of their research is directly related to the needs of large industrial groups, but many SMEs also use their laboratory facilities for quality testing and product development. In 2004, PFI went into formal collaboration with their Swedish counterpart - STFI-Packforsk AB. Six Swedish companies have 51 % direct ownership.

NGU (Norges geologiske undersøkelse) is the national institution for knowledge on bedrock, mineral resources, surface deposits and groundwater. NGU is a government agency under the Ministry of Trade and Industry (NHD). NGU is responsible for national databases and map series for geological properties and processes, geological mapping of Norway onshore and offshore. NGU has 213 employees, 62 % are university graduates.

The Norwegian Institute for Nature Research (NINA) is Norway's leading institution for applied ecological research. NINA is responsible for strategic research and applied research to facilitate the implementation of international conventions, decision-support systems and management tools. NINA has head office in Trondheim and employs a staff of 152 including about 95 research scientists. They have signalled an interest in relocating their activities near NTNU, Gløshaugen.

NIKU (Norsk institutt for kulturminneforskning) is a national and international centre of expertise in the field of cultural heritage research. Numbering about 70 employees, NIKU's staff is made up mainly of researchers and conservators. The head office is in Oslo with regional offices in five towns, Trondheim one of them. NIKU has accomplished two major excavations in Trondheim in 2003 which have contributed much valuable knowledge about the city's history.

The biological research sector is restructured and the regional research centre in Trøndelag (Planteforsk Kvithamar) will be part of a larger national biological research institute in 2006 with NOK 350 million in turnover and more than 400 employees. ***Bioforsk Mid-Norway*** will be one of the seven research centres in the new entity specifically in charge of R&D within animal feed and cultural landscape development. The regional

engagement is wider, and it is a question of how much of the field research work will be continued. Bioenergy also been a speciality. Relocation near one of the main partners, i.e. NTNU, is currently being considered.

3.1.2 How is provision made to meet specific regional technology & innovation needs and demands, such as those from SMEs? Is such provision undertaken in collaboration with other regional innovation and technology actors such as public labs and research institutes? What is the relationship between these innovation and technology actors other than HEIs and business in the region?

Contact between enterprises and HEI have traditionally been based on *individual connections* and interests, and often the *students and candidates* are the most important providers of innovation and technology transfer to SMEs in the region. We will return to the students' role in Chapter IV.

Induced by increased external expectations, innovation is growing into a priority area for the HEIs. The HEIs have thus begun to *work more systematically* to foster cooperation between academia and society. With NTNU in the lead, the HEIs' capacity to promote innovation is increased in terms of administrative and academic staff, a new Pro-Rector position for research and innovation, educational programmes and infrastructure. Joint plans and projects are developed in cooperation between HEIs and external partners such as:

- the counties
- The City of Trondheim
- Innovation Norway (regional funding and counselling institution)
- SIVA (State-owned investment company for innovation infrastructure, headquarters in Trondheim)
- regional trade and industry associations

The regional partners that are involved depend on the aims and target groups of the actual initiative. Concrete projects and funding mechanisms relevant for SMEs are described later in this chapter.

There used to be several *public technology and innovation actors* in Norway. This was perceived as a threshold to SMEs in particular. With the idea of the "one stop shop", several public institutions were merged, and as of 1 January 2004, *Innovation Norway* is the key public instrument for innovation-related activities. The merger included the Norwegian Industrial and Regional Development Fund (SND), the Norwegian Trade Council, the Norwegian Tourist Board, and the Government Consultative Office for Inventors (SVO). Innovation Norway has about 700 staff, offices in all counties and in more than 30 countries around the world. Innovation Norway is both a regional and national actor that contributes to better contact between HEIs and industry. Innovation Norway offers products and services to help develop the regions and enhance innovation in business and industry throughout Norway. In technological research, the *Research Council of Norway* is the key national instrument. The Research Council has close relations to the HEIs, somewhat less with industry. In order to better reach industry and SMEs in particular, the Research Council has engaged regional coordinators to supplement its head office in Oslo. Their regional coordinator in Trøndelag share offices with Innovation Norway in Trondheim.

3.1.3 What mechanisms exist to reward and acknowledge regionally-based research which has been traditionally outside of peer review processes such as academic journals?

Particularly at the university there is no tradition and few incentives for acknowledging established knowledge from the local community in academic research. However, with increased emphasis on innovation, it is recognized that academia may have a role to play in developing ideas that not only stem from academic research, but also ideas that may come from students or creative people and

enterprises outside of academia. At NTNU, researchers from the Department of Industrial Economics and Technology Management have developed a *Centre for entrepreneurship* which in various ways is engaged in developing ideas that do not necessarily stem from academia. They are engaged in business plan competitions and development programmes such as Venture Cup Trøndelag and Take Off.

Venture Cup

Venture Cup is a business plan competition with the aim to stimulate innovation and new ventures. Venture Cup Trøndelag is open to all participants with a good business idea, including students and academic staff from NTNU, HiST and HiNT. Several student teams from the region, mainly with an education in natural science and technology, have won recognition for their ideas and venture capital to further develop their business plans. In 2004 and 2005, HiST also organized its own idea competition called *HiST Gründerstipend*.

The Take Off programmes

The Take Off programmes are organized with funding from Innovation Norway and the EU Interreg II A programme. The aim is to create arenas for new innovative industry and in the longer run contribute to economic growth and employment.

In the Take Off programme at NTNU, local enterprises are assisted in the process of developing business plans for their technology-based ideas. Teams of students and innovation experts are put together to assist the enterprise in developing their idea. In this way, the enterprise may draw on technological and business expertise from NTNU as well as the innovation and venture capital network through Innovation Norway.

In the regional programme (Skandia Take Off) HiST, HiNT and university colleges in Jämtland (Sweden) also participate. In this programme, the enterprises are also offered to have a student or member of academic staff working with them while in the process of realizing the idea.

3.2 Framework conditions for promoting research and innovation

3.2.1 Does the national legal framework (e.g. Intellectual property law) support the role of HEIs in research and innovation (including research and innovation partnerships with industry)? What are the incentives and barriers in HEI-industry relationships both for HEIs and for industry?

A change in IPR law in Norway as of 1 January 2003 means that the rights to an invention belong to the institution not the individual researcher. This led to increased attention to innovation and commercialization on the part of the Ministry of Education and Research. For the HEIs, commercialization of research results became an institutional responsibility, and the HEIs had to develop systems to take care of their commercial interests and stimulate innovation. This change in the law has resulted in increased focus on innovation among staff and students at the HEIs. It is a challenge to balance the interests of HEIs for open scientific and academic work for the benefit of society with the interest of a business to secure its business interests in cooperation with the HEI. Now that HEIs have potentially become commercial actors this balance may cause problems - but few examples of this are reported so far.

The incentives for the HEIs to cooperate with business are founded in the stipulation that more and more of their income is to be generated from externally funded activities. Cooperation with the private sector is expected to have a positive effect on quality and relevance in education (e.g. problem-based learning and student projects in collaboration with public or private sector entities). It is also important for the HEIs to cooperate with industry in research to ensure that it addresses relevant issues. For industry such contact means that they know what is going on at the leading edge of research and these contacts also help staff recruitment.

The *barriers* in HEI-industry relationships are partly of a cultural nature, partly a matter of capacity. The capacity of HEI institutions for external engagement is limited. Academic staff members thus often favour externally funded projects which may increase capacity such as PhD scholarships and

student projects. Academic staff is often forthcoming, but in reality have little time for external advice and counselling activities. Neither do they have time to execute research or development projects personally. Limited capacity is also a real barrier in industry; SME managers typically perform all kinds of functions in their company from management to production and market development. It is hard to set aside time to reflect on how the company may utilize R&D results or supervise student work.

Even if there is mutual interest, there are also “language” barriers. Many of the SMEs managers and workers traditionally have a short school education and many of the students and teachers/researchers have never been in contact with industry. This picture is changing as more knowledge-based SMEs enter the scene. However, differences in expectations may be a cultural barrier even towards larger companies which are engaged in development work. The HEIs to a greater extent have a theoretical approach, while industry is seeking answers to concrete challenges or problems. Time is often a factor and in the case of most SMEs, the problem-solving timeframe is often short.

3.2.2 Describe the ways in which HEIs help to stimulate innovation and knowledge transfer between researchers and industry (both larger enterprises and small and medium-sized enterprises). Do national or regional policies exist to encourage HEIs to play such a role?

In *national policy documents* as well as in budget instructions from the Ministry of Education and Research, the HEIs are expected to engage more actively in innovation and knowledge transfer (see Section 2.2.1). The HEIs are to increase cooperation with industry, public sector and society to meet their needs. The HEIs are to establish well functioning systems for commercialization of research findings and increase the commercial exploitation of its research base. Also the *Regional Development Plan* underlines the HEIs’ role in the regional innovation system.

The HEIs have responded to increased external expectations. Strategies are formulated, earmarked personnel are engaged and projects set in motion to stimulate innovation and knowledge transfer between researchers and industry. External funding programmes strongly influence the way in which this is done by the HEI (see Section 3.2.3).

At a *strategic level*, NTNU adopted a strategy for innovation from 2001-2005. The strategy included awareness, knowledge and competence among the students and staff and also how to develop an effective infrastructure. Innovation is to be an integral part of education, research and dissemination. In February 2005 the Board of HiST approved how the university college is to organize the work of following up the Act respecting the right to employees' inventions. A separate commercialization committee was set up and is to have an advisory role for the Board.

The establishment of an efficient *infrastructure and working methods* is a challenge. All institutions have administrative staff or offices with the task of promoting innovation-related activities. Ideas are actively sought in the academic community and registered in databases. In cooperation with innovation and investment institutions, promising ideas are identified and further developed.

At NTNU, two advisers in the Central Support Unit for Research and Innovation have coordinating roles with regard to external industry collaboration and innovation activities. In order to increase capacity and competence in university-industry relations, the university recently established its own *TTO* with eight experienced entrepreneurs, as well as an *industry liaison function*. This is already producing positive effects, new win-win constellations are developed and traditional barriers between “commerce and the cathedral” have begun to erode (see box on NTNU Technology Transfer).

HiST and HiNT do not have the same in-house capacity to actively seek and promote their commercial ideas. Typically two advisers in the central administration take care of external research activity and

commercialization. Both HiST and HiNT have formalized cooperation with *Leiv Eriksson Nyskaping AS* concerning assistance in the handling and development of the university colleges' commercial ideas. Formal cooperation is also on the way with NTNU TTO and Innovation Norway.

Innovation is a priority area for the university colleges. A number of initiatives and projects are running due to contributions from the Research Council's FORNY programme. The FORNY project at HiST (2003-2005) aimed to stimulate to increased innovation and commercialization of R&D based ideas at HiST. A survey has been carried out of potential ideas for commercialization through the establishment of an "*Idea bank at HiST*", and a project manager is employed to follow up the ideas. HiST has also allocated R&D funds for the *HiST Gründer scholarship* which will support the most promising ideas that have the potential for commercialization.

NTNU Technology Transfer

Following changes in the University Act, the universities in Norway in 2004 established technology transfer offices to release the commercialization potential from their research activities. The TTOs are to some extent expected to take on a regional role. NTNU Technology Transfer AS is to serve Trøndelag, Møre and Romsdal and may assist the university colleges in the region which in terms of size and capacity cannot operate their own TTOs. Another important role is to develop relations with existing trade and industry to promote the realization of research based ideas. Regional industry is important, but the TTO also cooperates with other regions (e.g. the Kongsberg region which is a stronghold in advanced technology). It has also established a network with relevant actors around the world to benefit from international experience and market developments.

In its first year of operation, the NTNU Technology Transfer Office has focused on establishing trust internally and building external networks towards industrial partners and financial investors. A key element in this strategy has been to establish close relations to other IPR-owners such as SINTEF and St. Olavs Hospital and other commercialization actors. In comparison with the TTOs at the other Norwegian universities, NTNU TTO has put greater emphasis on *proactive search for ideas* in the research communities. Together with the researchers, ideas are concretized and registered in the TTO database for further processing and scrutiny regarding their commercial potential. The challenge is to develop business concepts with sufficient commercial potential to attract further funding. This normally demands both unique research results as well as a team of people with complementary knowledge and experience. When these factors are in place, a concrete commercialization project is established, with the aim to create new businesses or licence agreements with existing industry in or outside of Norway. In their first full year of operation in 2005, the NTNU TTO received 158 business ideas, registered 2 patents and helped establish 5 new companies. Several licence production agreements were also being processed.

In a national perspective, the Trondheim community leads the way when it comes to new start ups. Nevertheless it is a challenge to find more entrepreneurs that want to establish new businesses. The TTO has its own programme with eight *trainees* who have completed an extensive training and who represent an important resource in value creation from specific projects. Many of these trainees are about to start new enterprises. Regional incubators such as the Innovation Centre Gløshaugen also contribute to ease the start-up of new companies and bring the entrepreneurs in touch with funding agents and industrial environments.

3.2.3 Do policies or funding programmes exist to encourage cooperative research between HEIs and industry or the exchange of research staff between the two?

The Research Council of Norway and Innovation Norway are the key State instruments for funding and stimulating cooperative research between the HEIs and industry. European Commission funding from the Interreg programme has also had an impact in stimulating interinstitutional cooperation among the HEIs and regional industry.

Interreg programmes

The Interreg programme is one of the EU regional policy measures and focuses on developing cooperation across national borders. Trøndelag has taken part in several Interreg programmes and projects with Jämtland as partner on the Swedish side. One of the ongoing ones is the Interreg III A project called "*the Nordic Green Belt*" (economic framework: EUR 20 million); The three counties on both sides of the border cooperate in three areas:

- knowledge and knowledge development
- entrepreneurship and development of new companies
- culture, regional identity and attractiveness

The HEIs are directly engaged in several of the projects. In the “Border-free knowledge” project, the HEIs in the three counties cooperate on a doctoral education programme (8 research fellows). The aim is to strengthen collaboration between research, industry and public sector on sustainable economic development. There is also a distance learning masters’ programme on environmental management and entrepreneurship offered by HiNT and Mitthøgskolan. These colleges also develop models for internet-based education tailor-made for industry with the aim to improve availability “on demand” for academic education.

Another ongoing Interreg programme is called “AquaReg” and concerns the development of *fisheries and aquaculture*. The aim is to couple researchers and industry (AquaLink), education and training (AquaEd) as well as coastal zone management (AquaPlan).

In some cases one Interreg project has led to the next one. The TrønderJämt project (described in Section 3.3.1) and the Skandinavia Take Off project (described in Section 3.1.3). E-learning is another one mentioned in Section 6.1.7.

Knowledge transfer and industry networks

The Research Council of Norway is the most important source for the HEIs’ research and innovation activities. Several important instruments are placed under the framework programme “*Mobilization for R&D-related innovation in small and medium sized enterprises*” (*MOBI*). The aim is to develop long-term relations between enterprises with low research activity (particularly SMEs) and research institutions to create more innovative and competitive enterprises. The Research Council wants to stimulate regional innovation processes. Thus funding is dependent on the cooperation of regional enterprises, research institutions and other agents in the regional innovation system. The current funding programmes are (see box):

- *Research-Based Competence Brokerage* (Forskningsbasert kompetansemekling).
- *Industrial College Initiative* (Næringsrettet høgskolesatsing)
- *ARENA – Regional Innovation Pilots*

MOBI – Mobilization for R&D related innovation in SMEs

Research-Based Competence Brokerage (*Forskningsbasert kompetansemekling*)

Competence brokerage programmes have existed for about 20 years. They started with technology oriented brokerage with SINTEF in charge. Today competence brokerage in finance, organizational management and markets are given more weight and subsequently other research institutes and innovation companies have become involved.

The aim of the current Research-Based Competence Brokerage programme is two-fold:

- to stimulate R&D efforts in companies with little or no such experience to improve their innovation ability and competitive position (stimulate demand for R&D)
- to strengthen the R&D institutions role as industry partners (stimulate supply of R&D)

The current Trøndelag competence brokerage programme has been running for one year. Three researchers from SINTEF and Nord-Trøndelag Research Institute have called on SMEs in the region to identify and describe R&D opportunities. Already 80 project proposals are identified and 40 projects started. The selected companies obtain project funding from the Research Council of Norway. Researchers from R&D institutes as well as HEIs are engaged to assist the companies.

In order to get in touch with relevant companies, the competence brokers collaborate with the innovation companies. The innovation companies obtain a finder’s fee for each R&D projects they are able to identify in the region. 30 % of the R&D projects started in Trøndelag were identified by the innovation companies. Researchers from the HEIs are engaged in the R&D projects.

It is important to create meeting places and common arenas for collaboration between companies, research environments and HEIs in order to strengthen the regional innovation system. In this respect, the competence

brokers and the innovation companies play an important role reducing barriers between research environments and companies.

Industrial College Initiative (Næringsrettet høgskolesatsing)

The purpose of the Industrial College Initiative was originally to stimulate collaboration between university colleges and regional enterprises on development projects, thereby strengthening the ability of the companies to engage in R&D related innovation. When such a programme was initiated ten years ago, it was known as SME Competence.

In this programme, it is the university colleges which can obtain funding for knowledge transfer projects to regional enterprises. The programme has contributed to increased cooperation with regional enterprises and SMEs in particular. Cooperation takes place in terms of: development projects, periods of liaison for college staff in SMEs, student projects, and general continuing and further education programmes. HiST and HiNT has obtained NOK 1 million annually for such activities. In 2004, also the universities could also obtain funding for industry oriented "university pilot projects" (Idéportalen obtained such funding).

ARENA – Regional Innovation Pilots

The Arena programme is cofinanced by the Research Council and Innovation Norway with the aim to develop connections between R&D institutions, public authorities and regional enterprises in a defined sector or production chain. There are presently 19 Arena projects in Norway of which 3-6 projects are about to be completed, opening opportunities for new applicants. The regional actors should aim to obtain at least one new Arena project in Trøndelag. Such a project could be a training ground for later positioning towards becoming a Norwegian Centre of Excellence. There have been two Arena projects in Trøndelag so far.

The latest one "Innovation Mid-Norway" (2003-2006) aims to increase the competitive power of Central Norwegian industry, notably in the predominantly SME environments in Leksvik, Orkdal and Verdal. The project has thus far been involved in the development of 36 new business ideas, 7 new limited companies and 2 new business gardens in Vanvikan and Orkanger. Localized at NTNU, the project has contributed to lower the threshold between the industry centres in the districts and the Trondheim research and innovation environment.

The other project was a preliminary study on "Food from Trøndelag" (2002-2003). It started with an initiative from the food technology environment at HiST. Sør-Trøndelag County, the County Governors' Office and Innovation Norway provided further project funding to develop a food centre in Trøndelag. In 2005, this project led to the forming of a new company called "Oi! Trøndersk Mat og Drikke AS" (2005). The shareholders comprise 51 regional actors – enterprises, R&D institutions, public authorities and interest organizations. Within the company, the partners want to further develop their network thereby aiming to strengthen the market and product development in the regional food industry. In two STEP-studies (2001) on Innovation in Sør- and Nord-Trøndelag, the food sector was identified as the most complete cluster covering the whole value chain. It is also the largest one in terms of employment. In reality there are probably three clusters: the green sector, the blue sector and the food commerce sector (minerals and grocery chains). In terms of R&D, the blue sector is of particular interest.

To stimulate growth of regional industry clusters, a new large scale national programme will be introduced as of 2006. The *Norwegian Centres of Expertise* (NCE) will be funded by Innovation Norway, SIVA and the Research Council of Norway (see box). Late last year, the Sør-Trøndelag County invited interested parties to a meeting on prospective NCE applications from Trøndelag. Representatives from seven different industry areas participated, together with SINTEF and the regional representatives of SIVA, Innovation Norway and the Research Council. The sectors present where: forestry, integrated operations and underwater technology, instrumentation and measurement, water production, aquaculture, biotechnology and fish health, and silicon (the latter is described in Section 3.1.1 under NTNU's strategic priority areas). To take sustainable energy and water production as an example, the AquaLyng group (Leksvik) has ambitions in desalination of seawater. Combed with sustainable energy production on site, this could revolutionize water supply in many parts of the world. Trøndelag has the industrial production capability, experience in alternative energy sources and the necessary research competence. Trøndelag may hope for one or two centres. It will, however, be important to try and obtain alternative funding (e.g. Arena project) for those who do not get NCE status to further nurture these groups towards real clusters.

For the elite division of Norwegian industry and research institutions, the new *Centres for Research-based Innovation* (SFI) will offer substantial financial opportunities and recognition. This programme is operated by the Research Council of Norway (see box). In 2005, the Research Council received 63 draft applications. SINTEF and NTNU were host institutions for 26 of these drafts. Also the Paper and Fibre Research Institute and Fast Search & Transfer in Trondheim were among the interested institutions. NTNU and SINTEF are also involved as partners in many applications.

New large-scale funding programmes

Norwegian Centres of Expertise (NCE)

The new large-scale funding programme - Norwegian Centres of Expertise - is developed by SIVA, Innovation Norway and the Research Council of Norway on commission from the Ministries. The aim is to strengthen the innovation and internationalization processes in selected regional clusters. Close collaboration between the companies and excellent R&D environments is a prerequisite. During the coming three-year period, the ambition is to recruit 10 regional clusters. The selected clusters will obtain professional support and funding for a long-term development process of up to 10 years. The programme may fund up to 50 % of the costs for defined activities related to process management, network building, strategy processes and early project development.

Centres for Research-based Innovation (Sentre for fremragende innovasjon, SFI)

This new large scale programme operated by the Research Council of Norway aims to enhance the capability of the business sector to innovate by focusing on long-term research in an alliance between research-intensive enterprises and prominent research groups. It will make it attractive for internationally oriented enterprises to establish R&D activities in Norway. It will also stimulate researcher training in fields of importance to the business community and encourage the transfer of research-based knowledge and technology. The host institution can be an HEI, a research institute or an enterprise with a strong research activity. Each centre will receive roughly NOK 8-12 million per year. The aim is to establish 10 such centres. The total budget allocation for an eight-year period amounts to NOK 800 million.

The Centres for Research-based Innovation distinguish themselves from the already existing *Centres of Excellence (Sentre for fremragende forskning, SFF)*, which have a basic research objective and are reserved for the very best international research groups in Norway. NTNU has three such Centres of Excellence and works towards obtaining more of these in the next application round in 2006.

HEIs innovation and commercialization

The Research Council of Norway in cooperation with Innovation Norway runs the *FORNY Programme* with the objective to commercialize business ideas from staff and students at R&D institutions. R&D institutions may obtain funding to stimulate the development of research based business ideas (see box). The HEIs all agree that the FORNY funding has been vital for their increased engagement in commercialization, triggering new activity and giving the HEIs the leeway to put plans into action. Partly, owing to the FORNY programme, several ideas from the HEIs have been transformed into new business entities or licenced production in existing enterprises.

Professional *commercialization units* in the region, notably Leiv Eriksson Nyskaping AS serving HiST and HiNT, Sinvent AS serving SINTEF and NTNU Technology Transfer AS serving NTNU and St. Olavs Hospital, are engaged by the Research Council to evaluate ideas for FORNY funding. The commercialization units may assist in developing and realizing the ideas commercially.

According to the State budget proposal for 2006, new instruments are planned to stimulate R&D based innovation and commercialization. The Ministry of Education and Research intends to “import” the Danish Industry PhD model in Norway. The Ministry has furthermore asked the Research Council to develop a new funding mechanism related to the FORNY activities at the HEIs: *Commercialization scholarships (Kommersialiseringstipend)* will enable researchers at the HEIs to take a period off work to develop their research-based ideas. NOK 8 million is set aside for this new scheme in 2006.

The FORNY programme (Research Council of Norway)

The objective of the FORNY programme is to increase value creation through commercialization of research based business ideas with a substantial market potential. After the programme was launched in 1995, 350 ideas have been commercialized, including 125 licences. 174 companies is the current stock of active companies. A substantial share of the results is from Trøndelag. FORNY funding may be obtained for the following activities:

Infrastructure measures at the R&D institutions

The R&D institutions may obtain funding for measures which are to develop the staff and students' competence and interest in commercialization. NTNU has obtained such funding since 1995, while HiST and HiNT came along in 2003 and 2005 respectively. In 2006, NTNU is assigned NOK 4.1 million, HiST NOK 0.6 million and HiNT NOK 0.25 million. With 50 % own funding, the infrastructure activities of the three HEIs will reach NOK 10 million in 2006.

Assistance from professional commercialization units

Professional commercialization units may obtain funding to provide assistance to the owners of R&D based ideas and help them to commercialize the ideas in terms of patents, licenses or new business development. In 2006, LEN obtained NOK 3.65 million, NTNU TTO NOK 5 million and SINVENT NOK 3 million. The commercialization units thus obtained nearly 12 million NOK, a substantial increase from the NOK 8.5 million in 2005. The commercialization units are to add 50 % in own funding.

Verification of commercial potential of technological ideas

Programme funding is not available for product development, but funding may be obtained to verify if a technological idea has commercial potential. NOK 30 million is set aside nationally for such verification in 2006. The commercialization unit in Norway with the best competence in the given field will take responsibility for such verification.

Skattefunn – tax rebate

SkatteFUNN is a tax-rebate programme for R&D expenditure in industry and commerce for Norwegian-based companies independent of size.¹⁸ The programme is operated by the Research Council and Innovation Norway, which serve as a gateway for regional enterprises and R&D institutions. SkatteFUNN has been particularly successful in regions with strong R&D institutions and universities. Central Norway is one of the regions with the highest participation rates; 1.5 % of the companies in Trøndelag, Møre and Romsdal took advantage of SkatteFUNN in 2004. SINTEF and NTNU are nationally the largest contributors of R&D services. In 2004, NTNU was nationally engaged in 106 projects (NOK 41 million worth of research work), HiST 13 projects (NOK 2.3 million) and HiNT 3 projects (NOK 0.1 million). There were 529 SkatteFUNN projects in Sør-Trøndelag and 184 in Nord-Trøndelag in 2004 (see Sections 1.4.2 and 6.5.5).

3.3 Interfaces facilitating knowledge exploitation and transfer

3.3.1 What mechanisms have been developed to commercialize the research base of the HE sector and to promote technology transfer between the HEI and regional stakeholders?

Research contracts, collaboration and consultancy

Joint research activities and consultancy, as well as student projects are important mechanisms for *technology transfer*. Many *R&D contracts* are the result of personal connections between researchers and external partners (see Section 2.3.1, external funding, Tables 2.5 and 2.6). However, the regional offices of Innovation Norway, the Research Council of Norway, Innovation institutes and others

¹⁸ SkatteFUNN was introduced in 2002, with the policy objective to increase the R&D activity in Norwegian companies relative to GDP (1.6 %) which in comparison with other OECD countries (2.3 %) is relatively low. Tax-deductions are given for up to 20 % of total cost for SMEs, 18 % for larger companies. The maximum cost deduction is NOK 4 million for internal research activity and up to NOK 8 million for external research services. Regular product development does not qualify for support. Source: SkatteFUNN, Annual Report 2004.

increasingly channel external partners to the HEIs. New research funding mechanisms, such as SkatteFUNN, also make it more profitable for companies to involve researchers from the HEIs.

All the HEIs have thus engaged senior advisers in their administrations to serve as internal coordinators as well as *contact points* for external partners wishing to cooperate with them. The senior advisers help direct external partners to the relevant departments and research environment. They also serve as contact points towards relevant public and private institutions in the area of research development and innovation.

Intellectual property (IP) transactions

The State and regional authorities increasingly expect the HEIs not only to engage in technology transfer, but also contribute to the *commercialization of the HEIs' research base*. The commercialization of ideas in general and the protection of intellectual property rights in particular, pose a challenge to the HEIs. Under the new legal framework, researchers at the HEIs are to notify their home institution if their research has led to results that may be patented. Income from intellectual property is to be divided between researcher and HEI. It is up to the institution to decide if it wants to patent and develop the idea further or leave the property rights to the researcher. In the case of external contract research, the division of property rights between institution, funding institution and researcher are to be regulated by contract.

Clearly, the researchers and responsible Department/Faculty, as well as HEI as such, need professional guidance in these matters. At NTNU, there has been a *legal adviser* in the administration for many years who can offer assistance in contract negotiations and on property rights issues. NTNU, HiST and HiNT have until recently used Leiv Eriksson Nyskaping AS as their main instrument for commercialization. In 2004, NTNU decided to take full control of the university's potential commercial interests and established its own technology transfer office (*NTNU Technology Transfer AS*). HiST and HiNT have so far continued their cooperation with Leiv Eriksson Nyskaping AS.

Promotion of spin-offs, incubators, science parks; and clusters

Over the last 5-10 years, many new development organizations have emerged in Trøndelag. SIVA distinguishes between research parks, knowledge parks, innovation centres and business gardens. All these types of development organizations exist in the region.

Research parks are normally affiliated with a university. They provide professional support for the business development of commercial ideas and research results, as well as a common environment for such companies. *Leiv Eiriksson Nyskaping AS* (see box) has served as a commercialization unit and research park for the NTNU and SINTEF environments. Many ICT companies have been nurtured here.

Knowledge parks are affiliated with university colleges. For the *Kunnskapsparcken Steinkjer AS* it is an aim to couple the knowledge production of the college with the business competence of regional industry. It is to serve as a development arena for regional industry.

There are *five innovation centres* in Trøndelag, which provide professional assistance on commercialization and capital acquisition as well as office facilities in a start-up period. Two of the innovation centres also serve as research and knowledge parks.

- Kunnskapsparcken Steinkjer AS
- IndPro as, Verdal
- Leiv Eiriksson Inkubator AS at Pirsenteret, Trondheim
- Teknostallen Trondheim Innovation Centre AS
- Innovation Centre Gløshaugen, NTNU

Innovation Centre Gløshaugen

Innovation Centre Gløshaugen, established at NTNU in 2001, was the first *on-campus incubator* for industry development in Norway. *Innovation Centre Gløshaugen* (1000 m²) was the result of close cooperation between NTNU, SINTEF, Leiv Eriksson Nyskaping and SIVA. The centre is to stimulate knowledge-based innovation and contribute to the commercial development of ideas from students and staff at NTNU and SINTEF. Since 2001, some 50 companies have been nurtured in the incubator.

As a result of increased efforts to promote interest and activities related to innovation and entrepreneurship, also HiST experiences the need for *pre-incubator facilities* and funding for students as well as academic staff. An on-campus pre-incubator would enable them to develop ideas up to a stage where they may set up a company and seek localities in one of the existing innovation centres. However, to rent such space, the college is dependent on external funding, primarily from the Ministry.

In addition to the parks and innovation centres in Trondheim and Steinkjer, there are *12 business gardens* in the districts (Rørвик, Namdal, Leksvik, Verdal and Stjørdal in Nord-Trøndelag and Klæbu, Berkåk, Oppdal, Orkdal, Hemne, Frøya and Ørlandet in Sør-Trøndelag). A national evaluation¹⁹ found that the business parks improved the survival potential of the businesses situated in the parks as well as for existing industry near the parks. They have also created job opportunities for higher educated personnel and stimulated young people to return to their home region. The business parks and industrial centres have limited cooperation with the HEIs today, but might serve as gateways between the HEIs and industry in the districts. The ARENA project Innovation Mid Norway aims to develop internal industry relations between the industrial centres in Verdal, Leksvik and Orkanger or bring these environments in contact with the research environment at NTNU/SINTEF.

The Steinkjer and Trondheim municipalities, the two Counties, regionally based banking institutions and industry are among the owners of these regional innovation centres. The State contributes via SIVA particularly in terms of building infrastructure. Researchers at the HEIs are advisers and partners in projects at some of the centres.

The new development organizations or innovation centres are to be main actors in the regional work on innovation and entrepreneurship. The various types of companies will have different roles, but they will have a collective responsibility for the development of networks and forms of collaboration which stimulate innovation in the region. The innovation companies (approximately 20), have created a common meeting place called "*Trøndernettet*" where they meet twice a year.

Leiv Eiriksson Nyskaping AS (LEN) – research park and innovation centre

LEN has a wide ownership structure covering the R&D environment, industry, finance and public sector. NTNU, SIVA and SINVENT are the largest shareholders. The NTNU and SINTEF engagement dates back to 1995 when the two institutions established Nyfotek as their instrument for commercialization of research-based ideas.

Nyfotek later merged with a regional funding institution to become Leiv Eiriksson Nyskaping AS. LEN today has four business areas:

- business idea development
- incubator facilities
- consultancy and advisory services
- commercialization of ideas from the R&D environment

LEN has specialized in the early stage development of innovations and new companies applying its own methods and competence as well as its extensive external network to industry and funding institutions. LEN is one of the regional operators for the FORNY programme in Mid-Norway on commission from the Research Council of Norway. The FORNY programme aims to commercialize research-based ideas and inventions from the R&D sector. LEN is also involved in the work of the HEIs to stimulate the interest of students and staff for innovation and entrepreneurship, and takes care of the daily operations of the Gløshaugen Innovation Centre at NTNU.

¹⁹ White Paper no. 35 (2004-2005) On Regional Policy, page 72.

Teaching/ training and labour mobility

In terms of numbers and capacity, *students* are probably the most important instrument for technology transfer from the HEIs. Traineeships, summer jobs and project work in the public and private sectors offers problem-based learning and enhance the *quality of higher education*. Geographical proximity is an advantage. Regional access to a knowledge-based, internationally oriented business and industry environment, as well as a development oriented public sector, is valuable to the HEIs.

Traineeships in industry are a compulsory part of the engineering education at the university as well as at the university colleges. The students often write their master's thesis on real problems for specific industrial companies. With larger companies, formal cooperation agreements exist, which open up for traineeships, student projects and funding of research fellows. It is more difficult to reach the SMEs. Over the last 5-10 years, the Shell Technology Enterprise Programme and TrønderJämt are programmes which have aimed to bridge the gap and offer more SMEs the advantage of the knowledge resource which the students and their professors represent. The HEIs in the region currently cooperate to create a joint Idéportal for the same purpose (see box).

TrønderJämt (Interreg project 1997-1999)

TrønderJämt was, at least for NTNU, a pioneer project in regional industry collaboration. The project is often cited as a success worth continuing. With relatively small means, good results were obtained. Companies could obtain SEK 5 000 a month (maximum two months) in compensation for taking in student trainees in their companies. Students doing project work for a company could have their travel expenses refunded (SEK 6 000). Companies hiring a candidate for at least four months could obtain SEK 70 000 and SEK 40 000 if they engaged a member of academic staff for a year.

Shell Technology Enterprise Programme (STEP)

The *Shell Technology Enterprise Programme* existed in the UK and it was brought to Norway via NTNU (1998). STEP offers summer jobs for students in SMEs, primarily in the districts, with up to 250 employees. Many of the student projects contributed directly to new products and value creation for the companies. Ten times more students are interested in STEP projects than there are projects available, and the programme is working to increase the number of projects in cooperation with regional industry development organizations.²⁰ STEP will become part of *Idéportalen* which will be launched in 2006.

Idéportalen

Idéportalen is a joint initiative of NTNU, HiST and HiNT with the aim of developing a low threshold knowledge transfer system from the HEIs to public and private enterprises, particularly SMEs. Both students and external partners profit from the students' summer jobs and project work. External project work also expands the professors' contacts with the public and private sector. A web portal and database will serve as a market place between enterprises and students. Initially, the Idéportal aims to cover central Norway and part of western Norway (Trøndelag, Møre and Romsdal, Sogn and Fjordane). Regional mobilization projects will be organized to motivate companies and help define suitable projects. Trøndernett, which is a network of 13 industry parks in the region, will take responsibility for the regional marketing and mobilization of companies in Trøndelag. The SIVA network (industry parks), Innovation Norway (regional project funding) and the Research Council of Norway (Næringsrettet høskolesatsing) will be important partners for the HEIs in the realization of the Idéportal. The longer term ambition is to make the Idéportal a national instrument for knowledge transfer. Several university colleges outside Trøndelag are interested in joining the Portal.

Conferences and continuing education courses are other instruments for technology transfer. NTNU, with its national responsibility and dominant position in Norwegian engineering education and research, is particularly active in this respect and organizes a range of national and international conferences yearly. These certainly also benefit regional enterprises. The university colleges are particularly active in continuing education. Altogether 6 000 people completed their distance learning studies in 2004 delivered by HiST and HiNT.

²⁰ Rogaland kunnskapsark, Stjørdal Næringsforum, NHO Oslo/Akershus, Høgskolen i Narvik, Bodø Kunnskapsark.

Labour mobility between employees at the HEIs and society is limited. However, the HEIs take advantage of high skilled personnel from industry and society as part-time teachers and adjunct professors. NTNU, particularly benefits from the close ties with the research institute SINTEF. More than 500 researchers work for both SINTEF and NTNU. SINTEF researchers are engaged as adjunct professors at the university, and university professors and research fellows work on SINTEF projects. The same applies to certain large companies in the region, such as Telenor and Statoil who have significant research activities in Trondheim. HiST has entered into a liaison agreement with four regional companies with positive results. Academic staff are involved in development work in these companies and learn about the latest industrial developments. This is relevant for the adaptation of educational programmes and may also lead to future student projects and R&D contracts.

3.3.2 How have HEIs and other regional stakeholders been promoting these mechanisms described above?

What are the respective roles of the central government, regional authorities, HEIs, regional research institutes, and business in creating such mechanisms?

In regional and industrial policy there is focus on the SME's need for new knowledge and innovation. The various actors in the regional innovation system have different roles in order to meet this challenge.

The *Government* plays an important role through its institutions for business counselling and funding. The main institutions are:

- Innovation Norway which has a regional network in all counties. It provides business counselling, knowledge development, and funding of business development and innovation.
- The Research Council of Norway is the key agent for research funding, and cooperates with Innovation Norway in programmes to foster stronger cooperation between the HEIs and industry/society.
- SIVA AS invests in innovation infrastructure (e.g. as partowner of the regional research and innovation centres) as well as real estate (e.g. new industry buildings).

The *Counties* play a coordinating role in regional development, creating networks between relevant actors. Developing closer links between the R&D environments and private and public sector, is one of the objectives of the Regional Development Plan. This also motivated the two counties to participate in the OECD study. The counties also contribute financially to regional projects. State funds are channeled through the county, enabling them to take strategic responsibility based on regional needs (e.g. rural development funds, R&D contracts for industry and the public sector). Such funds are largely channeled through the Innovation Norway offices in the counties. The financial resources available are further described in Section 1.4.2. The relations between Nord-Trøndelag County and HiNT are especially close. The county sees HiNT as a regional development instrument with regard to innovation and new business development, and knowledge development in public and private sector. But also in Sør-Trøndelag, project-based cooperation between public authorities and the HEIs is increasing.

The *HEIs* in the region have always cooperated with regional enterprises and public authorities in terms of teaching and research often on an individual basis, but also under formal cooperation agreements. However, triggered by increased external expectations and available funding programmes, the HEIs are gradually developing closer cooperation (e.g. joint FORNY applications from NTNU TTO/NTNU/St. Olavs, LEN/HiST/HiNT and Sinvent/SINTEF).

Are there any specific mechanisms that have been created within or between higher education institutions?

Informal and formal *networks* have developed between the HEIs in the region among administrative staff in particular. Closer cooperation is triggered by regional funding mechanisms requiring regional cooperation and public expectations that HEIs are to play a more active role in knowledge-based innovation. Idéportalen is such an example, where the aim is to reduce barriers between SME and HEIs in the region and utilize the knowledge resource which the students represent.

3.3.3 Are there structures in place in the region that enable the HEIs to more widely disseminate its R&D and innovation initiatives beyond its contractual industry partners? (i.e., exhibitions, competitions, regular demonstrations, media, regional web page entry points, etc)

Trondheim is the most important site in the region for *exhibitions and trade fairs*. These are primarily arenas for manufacturers and suppliers, but staff at the HEIs are from time to time invited as guest speakers. At the International Nor-fishing and Aqua Nor trade fairs, NTNU and SINTEF also have had their own stand to promote their marine research activities. HiST and HiNT participated in a joint Trøndelag stand. At Nor-Fishing and Aqua Nor, manufacturers and suppliers from all over the world present current developments in fisheries and aquaculture products, services and research. The Nor-Fishing Foundation Innovation Prize is awarded to a company or research institution who have developed a new product of great impact to the fisheries and aquaculture industry.

Technoport – a technology festival

Trondheim claims to be the technology capital of Norway. When celebrating the centennial of Norway's independence, Trondheim chose to emphasize technology in a historical and future perspective. The *technology festival "Technoport"* 19 - 22 October 2005 was the result of close cooperation between the city of Trondheim, NTNU/SINTEF, the counties, major regional industry companies and Innovation Norway. The exhibitions, conferences and workshops addressed four important areas in regional development: ICT, Health and Information technology, Innovation, and Energy, Oil and Gas. Technoport also served as a place for making connections. The festival stimulated people from trade and industry, research and development environments, customers, and investors to meet and build new relations. With 15 000 visitors this first year, the festival turned out to be a success and is intended to become a biannual event.

The research community also presents itself to the general public at the annual Open Research Days. In Trondheim, school classes and the general public are invited to popular science lectures at the HEIs and to exhibitions and fun experiments on the market square.

The HEIs' R&D and innovation initiatives are from time to time presented in the *media*. The public service broadcaster, NRK, often features stories from the regional HEIs in their regular research and technology youth programme. In acknowledgement of the region's importance in science and technology, the broadcasting's editors and staff for these programmes operate from Trondheim. NTNU and SINTEF also publish a popular science journal called Gemini which features articles about new science and technology developments from these research institutions.

New *web pages* have been developed at the HEIs, as well as for the City of Trondheim, the counties and Innovation Norway to serve as gateways to relevant institutions and contact points regionally and nationally.

The Trøndelag branch of *CONNECT Norway* was established in 2002. The Trøndelag network consists of more than 40 members and 150 key resource people who on a voluntary basis offer advice and assistance to member companies on business development, strategy, marketing and funding. NTNU and NTNU Centre for Entrepreneurship are among the members in Trøndelag.

Mid-Norway European Office in Brussels was established in 2001. It is to contribute to the internationalization of regional industry and be a channel for European Commission research programmes for the regional R&D environments. It will also be an instrument for regional authorities and their collaboration with other regions in Europe through Interreg (Section 3.2.3).

START – stimulating students’ interest in innovation

The student organization START was created by NTNU students to promote students’ interest and competence in innovation. Today twin organizations exist at HiST and HiNT. START is as an asset for NTNU and organizes annual business plan competitions (Venture Cup Trøndelag). At the network meetings (Mixer) 150-200 students, business people and others from the innovation environment in Trondheim and Trøndelag meet once a semester. START also organizes courses and gives advice with regard to new entry of firms, and students and others may contact them via the internet. They serve as a guide to relevant institutions for future entrepreneurs. Start NTNU has about 25 active members, while Start HiST has 15. They operate on a non-profit basis.

3.4 Conclusions

3.4.1 Collaboration between regional stakeholders related to contribution of research to regional innovation: (1) between the HEIs in the region and (2) collaboration with other regional stakeholders (i.e. business, local government, research labs & institutions etc)

Collaboration between the HEIs in the region

In this chapter, the HEIs’ contribution to R&D based development and innovation as well as their contribution to general knowledge transfer to industry and society is discussed. The overall picture is one of fairly limited collaboration between the HEIs in the region.

With regard to *general knowledge transfer*, externally funded projects (e.g. EU-Interreg/Research Council of Norway) have led to closer administrative cooperation between the HEIs as this has been a prerequisite for the implementation of the projects. The academic staff members have obtained extended contact with external industry and society partners through these projects, but the projects have not induced any closer academic collaboration between the academic staff at the HEIs.

There are *R&D projects* involving the university and the university colleges, notably in projects funded by the Research Council of Norway or the European Commission where inter-institutional partnerships are a requirement for funding. There are also examples of projects involving the HEIs and regional enterprises/institutions e.g. in the food sector, aquaculture, renewable energy, school and health sectors, as well as in ICT. *Personal initiatives* and network development are fundamental in order to define common interests. In addition, external funding is needed. But funding will normally be available if the common interest and good projects are there.

Collaboration with other regional stakeholders

The extent of collaboration between the HEIs and regionally based *research institutions* varies. NTNU and SINTEF have substantial operational and strategic cooperation in several areas. SINTEF is also a partner to HiST and HiNT. One would expect that there were as close ties between HiNT and Nord-Trøndelag Research Institute, but this has not been the case. However, the reorganization of Nord-Trøndelag Research Institute to a limited company partly owned by the university college is likely to strengthen the collaboration between the two institutions in the future. SINTEF is also considering becoming engaged in the Nord-Trøndelag Research Institute as a “bridge” to the regional market.

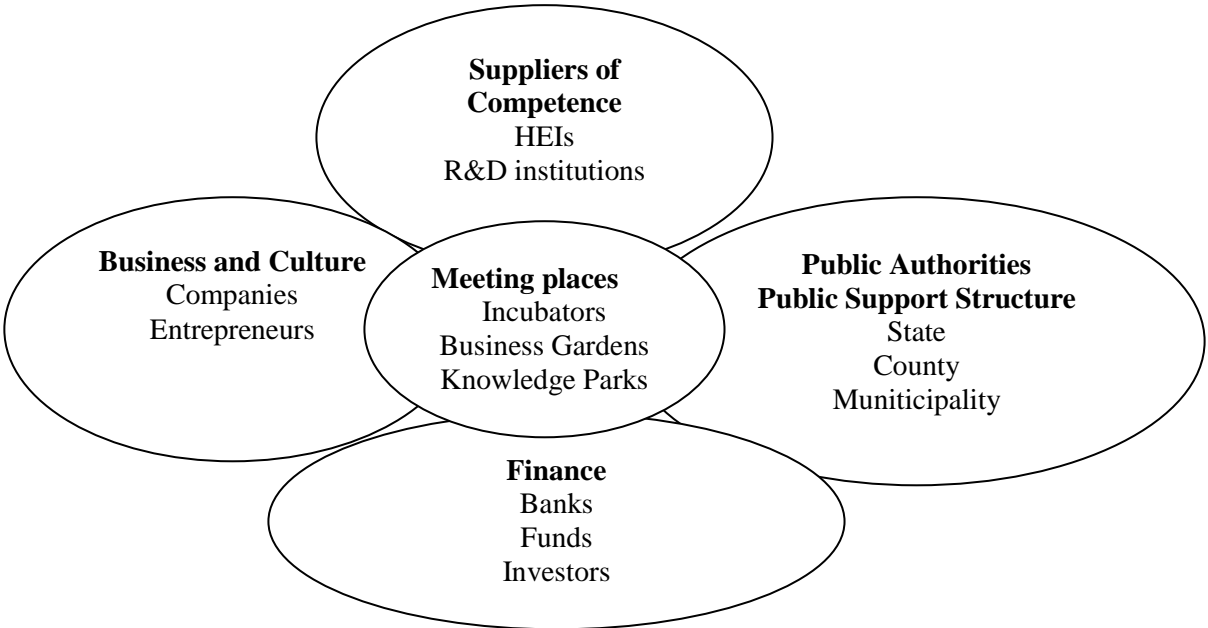
Surveys show that the HEIs only play a minor role in the innovation process of Norwegian *industry*. This is also the case in Trøndelag. The volume of R&D activity funded by regional industry partners is limited. However, externally funded knowledge transfer projects stimulate and facilitate increased cooperation. The projects “Innovation Mid-Norway” and “Research-based competence broker” prove

that it is efficient to actively call on regional enterprises and assist them in defining relevant R&D projects. As a result of active brokerage, HiNT engaged in 20 new R&D projects with regional SMEs in 2004. This was four times more than the previous year. The new tax-rebate scheme SkatteFUNN furthermore lowers the financial threshold for the enterprises.

In certain areas, *broader alliances* of HEIs, research institutes, enterprises, trade and commerce associations and public authorities have joined forces. This has for instance been the case in the food sector (Oi! Trøndersk mat og drikke AS), renewable energy (e.g. wind power and gas power), forestry and medical technology (MedTech Trondheim AS).

The HEIs are expected to contribute to knowledge-based innovation in existing industry as well as research based spin-offs from the HEIs. The Trondheim environment is the national leader in this respect and there are great expectations from the new Technology Transfer Office at NTNU. There is no lack of ideas. The challenge is to find industry partners who can realize the ideas and *competent venture capital* to develop ideas further. Regional risk capital has been a bottleneck, but new State funds may improve the situation. New regional funds have also emerged (e.g. Viking Venture Capital).

Manufacturing companies in the region are to a large extent located in smaller municipalities/towns outside Trondheim. *New development organizations* like business gardens, incubators and knowledge parks are important links between the companies and the HEIs/research institutions in Trondheim. These new organizations might be better utilized as meeting places between actors from different sectors of society that are important in fostering innovations and regional development (see illustration below).



In the banking sector, *Sparebank 1 Midt-Norge* plays a specifically active role sponsoring innovation activities. In January 2006, the savings bank signed a strategic cooperation agreement with NTNU worth NOK 10 million in 2006-2007. This will be used to further develop the Innovation Village concept (Section 3.1.1). A couple of early stage commercialization scholarships (gründerstipend, NOK 500 000) will enable innovation teams to nurture research-based ideas to a phase where for instance seed capital may come in (Section 3.2.3). Funds will also be used to organize the first annual innovation conference in Trondheim, May 2006, and combine this with the Venture Cup finals. The savings bank, the Norwegian Confederation of Business and Industry and the Chamber of Commerce are among the partners of the Trøndelag Council taking responsibility to maintain *Arena Trøndelag*. This has become an arena for debate with a series of meetings in all major regional centres.

The periodical and website, with the same name will feature articles on regional trends and opportunities.

Regional authorities look upon the HEIs as important instruments for regional innovation. This is reflected in the Regional Development Plan and the subsequent follow-up activities. The Nord-Trøndelag County specifically integrates the university college in the development and implementation of its county development plans. The public policy and support system recognizes the need to strengthen internal coordination to obtain better results in the region and make Trøndelag more visible nationally.

3.4.2 Strengths, weaknesses, opportunities and threats related to contribution of research to regional innovation in the region

The following list of strengths, weaknesses, opportunities and threats is the result of discussions in the working group and steering group.

Strengths

The students (approximately 32 000 at NTNU, HiST, HiNT) are a significant resource for knowledge transfer to private and public sectors. There are strong traditions for project work in industry within technology, but also in the health professions. HiST students annually carry out 200 projects for external partners.

The R&D environment makes up a larger share of the economy in Sør-Trøndelag than in other Norwegian regions (Largest R&D contribution per capita).

The strengths of the HEIs include broad range of disciplines, proximity to industrial work placements and internationally competitive research environments:

- The HEI and SINTEF constitute a national centre of gravity within *science and technology research* (about 4000 researchers).
- NTNU in particular, has many internationally strong research groups within: energy and environment, medicine and health, materials science, ICT, marine technology and maritime activity.
- The university colleges have strong traditions for development work for regional private and public sector.

The HEIs focus on innovation and entrepreneurship:

- All the HEIs have established an *infrastructure for commercialization* of research results and ideas from the research communities. NTNU makes a considerable effort with the establishment of its own TTO with 16 experienced entrepreneurs and trainees, and an on-campus incubator - Innovation Centre Gløshaugen. Trøndelag is seen as one of several interesting regions in this respect nationally and internationally.
- The *gründer scholarships at HiST* stimulate the interest in innovation and entrepreneurship among students and staff.
- All the HEIs offers of *courses and programmes of study* for students in most disciplines will enable them to develop new ideas and start their own enterprises.
- The *NTNU Centre for Entrepreneurship* contributes to the development of business plans for students and enterprises, and is responsible for the business plan competition Venture Cup Trøndelag.
- The *student organization START* at NTNU, HiST and HiNT promotes the interest in innovation and entrepreneurship among students and contribute to business plan and business idea competitions at the HEIs.

The industry oriented programmes of *the Research Council of Norway* work well. Continuity in policy instruments and multiannual project funding has enabled the HEIs to work with a long-term perspective to promote research-based innovation and knowledge transfer to SMEs.

Weaknesses

The HEIs, and the university colleges in particular, are given a mandate to contribute to regional development, but:

- The Ministry's *budget model* rewards the HEIs for scientific research and candidate production. It gives no incentive to engage in regional collaboration. This is to be covered by the basic funding. It is yet to see to what extent innovation activities will be rewarded when a new dissemination component is added to the Ministry's budget distribution model.
- Apart from the health sector, public sector funding for research and industry development is fairly limited in the region.
- Regional *project funding* is usually short term. The TrønderJämt-project is often cited as a success, and several of the instruments at hand ought to have become permanent (e.g. travel grants for students doing project work for regional enterprises).
- There is *limited institutional capacity in the HEIs* to strengthen the interaction with working life and industry. The same people are engaged in many projects.

The regional innovation system is characterized by:

- Few industry locomotives and little R&D-intensive industry. There is subsequently limited local demand for cooperation with the HEIs.
- 80 % of the R&D work takes place in the HEIs and R&D institutions. The structures for interaction between the HEIs and industry/industry parks are weak.
- There is limited regionally based and competent seed money and venture capital to develop good ideas, and few capitalists with ample investment money.
- Public regional funding is limited. There are many actors and unclear framework conditions, funding programmes are typically small, short term and unforeseeable.
- Few companies are internationally oriented. Their international marketing and commercialization competence is often weak.

In general, there is a need for better networks between industry, capital and the R&D environments.

Opportunities

There is a national all-party agreement for the need to increase the emphasis on innovation and integrate innovation in all policy domains. This may improve academic prestige and available funding for innovation activities and HEI-industry interaction.

Increased cooperation between HEIs and *SMEs* offers relevant practice and knowledge transfer:

- *The Idéportal* is to be developed as a joint instrument for the HEIs to increase knowledge transfer via the students to regional industry and SMEs.
- (NFR) and outreach activity towards SMEs ought to be better utilized to reduce barriers between R&D institutions and industry. Such activity produces results.
- Develop interaction between *business parks and knowledge parks* in the Trønder network to serve as as bridge between the HEIs and the SMEs.

Knowledge-based industry development is necessary in order to create a competitive private and public sector. New public policy priorities and policy instruments offers new opportunities for strengthening the interaction between the HEIs and regional enterprises:

- *Centre for research innovation* and *Norwegian Centres of Expertise* (regional clusters of enterprises and knowledge institutions) are new funding instruments as of 2006. If we are able to develop regional alliances, Trøndelag may attract more national funding for the further development of regional clusters (this applies to food, renewable energy and environmental technology, medical technology, aquaculture, ICT) and other regional development projects; This is a major motivation behind the current initiative of the public policy system to develop a regional research and innovation strategy for Trøndelag.

- *SkatteFUNN* is stimulating industry towards systematic development work. There is a potential for more such contracts to the HEIs. In 2004, there were more than 700 projects in Trøndelag alone; NTNU, HiST and HiNT were engaged in 122 projects nationwide.
- HEIs can be a resource in realizing the following business engagements in Trondheim and the two counties:
 - "*Export Trøndelag*" (*Eksport Trøndelag*) – the international contact network of the R&D institutions can be used more actively for the internationalization of business in the region.
 - "*Invest in Trøndelag*" (*Innflagging Trøndelag*) – strong research and academic groups with wide international contacts attract companies that needs leading research expertise (e.g. Statoil, Telenor, Atmel, Intel, Marine Harvest).
 - In NTNU's vision for *Innovation Village*, one idea is to set up a "research hotel" on campus as a low-threshold offer to companies.

Formal agreements with industry increase commitment and provide opportunities for collaboration between the HEIs and industry. HiNT has formalized cooperation agreements with key institutions and enterprises in the private and public sector in Nord-Trøndelag. At NTNU, 16 companies contributed to Industry's Innovation Fund at NTNU. In the past funding period, 1998-2005, the fund created an arena for top level contact in the steering committee and NOK 54 million in funding for research scholarships and workshops for the joint development of new ideas. The fund will be continued.

Trøndelag was ranked as the region with the strongest growth by the Norwegian Confederation of Business and Industry (Entrepreneur of the Year 2005). The good result was largely explained by the influence of the knowledge institutions in the region – NTNU and SINTEF. There is, however, an even greater potential for new spin-offs and idea creation from the HEIs: After a regional drought regarding seed capital, the new *public national and regional seed capital funds* may ease the entry of new knowledge intensive firms (*NOK 2.3 million in risk capital*).

Threats

The HEI activities to stimulate innovation and the entry of new firms is not well coordinated and partly in competition with public service providers. Better coordination and division of tasks is called for. There is for instance a need to clarify the division of tasks between the NTNU TTO and Leiv Eiriksson AS concerning the commercialization of ideas from the HE-environments in the region.

The industry structure in Trøndelag is characterized by many small enterprises: 84 % of the enterprises have less than 5 employees. Only 88 enterprises have more than 100 employees. The HEIs are expected to be regional competence centres. It is a dilemma that development work for SMEs has lower academic status than research projects with larger industry companies and research funding institutions. In addition, there are few *economic incentives* for R&D cooperation with regional industry.

There are many examples of *emigration of R & D intensive companies* when they reach a certain size. This is particularly a challenge to Trondheim where there is lack of larger available industrial areas and office premises. The City recently invited the neighbouring municipalities to investigate how they can contribute. *Trondheim's role* as motor for regional development remains rather undeveloped.

International acquisition of regional industry may lead to the loss of contract research for the HEIs, but may also lead to new opportunities if the new owners see the benefit of utilizing the regional knowledge resources.

There is a *high threshold for the entry of new firms* such as spin-offs from the HEIs' research activities. The legal requirement of NOK 100 000 in equity capital in Norway has led some entrepreneurs to set up companies abroad instead.

Chapter IV: Contribution of Teaching & Learning to Labour Market and Skills

“People are the most important resources in Trøndelag”. This is a foundation pillar of the Regional Development Plan. We must provide education which meets the skills needed by society and the individual. Educational statistics show that there is a geographical skills gap in Trøndelag. One of the greatest challenges is therefore to involve the whole of Trøndelag.

The Regional Development Plan points to several strategies for a coordinated research and education policy of which two strategies are specifically relevant to higher education:

- Contribute to the access of relevant higher education courses and programmes in all parts of the region.
- Utilize working and social life better as arenas for training and skills development.

4.1 Localizing the learning process

4.1.1 How do HEIs draw upon the specific characteristics of a region to aid learning and teaching?

There are various ways that the HEIs take advantage of the specific characteristics of the region in their teaching.

In many disciplines the region functions as a “laboratory” for the students. *Excursions* to specific landscapes or marine environments are an integral part of the learning programme in biology, and the students of archaeology are engaged at *excavation sites* in the region every summer.

In all professional educations like health care, teaching, and engineering, *practical training* is an integral part of the educational programme. Trainee places are sought nationally in engineering in order to obtain sufficient and relevant training places, but in health care and teaching, regional institutions take major responsibility to offer relevant trainee places. The university colleges, in particular, cooperate closely with the relevant public institutions in this respect.

Project and thesis work on real problems from enterprises and public institutions are of relevance in many disciplines, typically in engineering and business administrative studies, but also in master’s degree programmes in the social sciences. As outlined in Chapter III, a regional programme has been launched to develop closer relations between HEIs and regional enterprises for the mutual benefit of knowledge transfer and problem-based learning.

Are there any courses which meet regional needs?

In general, all university and university college courses also meet regional needs for highly trained staff. Provisions for further training are normally used more regionally than on a national scale and are also often geared towards meeting specific needs in the region.

Employers experience that new personnel are more easily recruited when they are trained in the region. This was a major motivating force behind the localization of the various schools of engineering and business administration in Trondheim and the regional university college in Nord-Trøndelag.

In *business administration and economics*, the HEIs supplement each other and to some extent cooperate to meet regional needs. HiNT has specialized in agricultural economics, HiST in business administration, while NTNU focuses on economics and technology management. The three HEIs

cooperate to offer a master's degree in entrepreneurship to meet increased regional expectations in this field (see question on students' enterprising skills). Another example is the master's degree in financial economics at NTNU which was encouraged by regional actors in the financial sector.

Several educational programmes are designed to educate skilled personnel in *primary and secondary and industry sectors*. HiNT's educational programme in farm animal, nature conservation and management, nature-based tourism and niche product development are examples of programmes where Trøndelag has a comparative advantage and where there is regional demand for skilled personnel. Trondheim and Trøndelag are the national strongholds in engineering. The engineering programmes at the HEIs cover most fields and certainly meet regional demands for candidates as well as competence. NTNU and SINTEF aim to be among the leading institutions in engineering internationally and they also benefit regional industry with international ambitions. These companies take advantage of the many courses and conferences that are held at the university, as well as the candidates and research capacity at NTNU and SINTEF.

A significant share of the regional labour market is found in the *public sector* notably in health care and social work, childcare and education, culture, regional infrastructure and administration. There is a certain division of responsibility between the university and university colleges whereby the university colleges typically take responsibility for shorter profession educations such as teacher training and nursing. These programmes of study have significant regional recruitment of students and a predominantly regional labour market. The university, on the other hand, educates secondary school teachers and physicians where student recruitment and the labour market are more national.

The cooperation with public authorities and institutions is generally well developed in education and health care. At times courses are developed to meet specific needs. For example, HiST is engaged in developing a new multidisciplinary course in "Health promoting work for children and youngsters" and have assisted Ladejarlen Upper Secondary School in developing a new technical college in food industry studies.

There is a regional demand for *decentralized education*. The university colleges specifically try and meet this demand. HiST for instance, offers decentralized college education in nursing, social education, engineering and teaching, as well as continuing education courses in most fields based on registered needs. In decentralized education, ICT is used in various combinations such as face-to-face teaching with web-based follow up, purely web-based courses, and videoed lectures combined with face-to-face teaching. HiNT also offers a broad range of distributed courses and e-learning courses in combination with workshops.

The Rørvik-model

Face-to-face teaching may take place at the HEIs or at the local *upper secondary schools*. The latter solution is called the ***Rørvik-model*** named after a human resources development project for employees working for Telenor Mobil in Rørvik. NTNU, HiST and BI offered the educational programme on the internet in combination with face-to-face teaching at the local upper secondary school. The local learning environment offers administrative support, a physical place to study and access to the internet, in addition to a social environment. The Rørvik-model turned out to be a success. The students obtained as good or even better results than ordinary students, and the dropout rate was amazingly low.

The county authorities have contributed through regional development projects to further develop and apply the Rørvik-model for professional-oriented higher education. One of these projects was called ***SLANK*** (2000-2003). The aim was to contribute to industrial development and skills upgrading in the districts, with special focus on the ability to use information technology. In the 2.5 year project period, university and university college education was offered in various disciplines, and the local participants took courses and obtained credits equal to one year of study for 140 full-time students. The project was conducted in collaboration between three regions in Trøndelag and Hedmark.

Verdal – on a good track

Another success-story comes from *Aker Verdal*. During the shipbuilding industry crisis in 1999, Aker Verdal was hard hit. The management at the shipyard realized that lack of orders quickly could tap the yard for key personnel. They decided to go for a comprehensive skills upgrading programme. The public labour exchange office (Aetat), Verdal Upper Secondary School and HiNT became partners to Aker Verdal in the skills upgrading programme. The tasks of HiNT were to organize university college courses and act as an intermediary to other HEIs. The yard invested altogether 2500 months of coursework during the project period 1999-2001. 87 % of the employees took one or more courses. The project turned out to be a success: the yard managed to create a united perception of the situation and the challenges ahead. Through early action and involvement, a deep crisis was avoided. With upgraded skills, the yard was well prepared for new contracts later. After the project period, the yard kept on cooperating with the partners to ensure continuous upgrading of skills for its staff.

Localities no longer needed by the yard, were in 2002 turned into an industry park (VIP centre) operated by Indpro Verdal. With 43 new companies here, the industry structure is far more diversified today than only a few years ago, making the community less vulnerable to fluctuations in the global shipbuilding market. The shipyard has become more competitive and has full order books today. The municipality has also contributed in several ways, turning Verdal from an industrial town to an attractive place to live. The main road no longer runs through the town centre. The town is visually upgraded, a new cinema draws a wide audience, a new cultural garden is emerging in the old mill and nearby, the Stiklestad Culture Centre has made the Stiklestad Viking battleground an all-year attraction.

In what ways are learning programmes tied to reflecting and finding creative solutions on regional issues over the medium to long term rather than not simply to meet the short term need for training students for existing known skill number gaps?

In general, higher education provides state-of-the-art knowledge in relevant disciplines. Knowledge, however, will soon be outdated particularly in science and technology. Increased emphasis is thus given to the development of *learning and problem-solving skills* which have more universal value. This is done in different ways. Project work and problem-based learning is increasingly applied in the programmes of study. At NTNU “Experts in team” is a compulsory course where students from diverse disciplines form project teams to solve a realistic problem or challenge, often from the region. There is also an increasing interest in regional enterprises and institutions as sources for relevant problems for the students’ project and thesis work.

There is limited information about *labour market needs* in the private sector, but in the public sector – education and health care – the regional authorities are well informed about trends and future needs. They also cooperate with the university colleges to adapt their programmes to meet labour market gaps.

The *students* themselves respond to changes in the labour market. The fluctuations in the labour market for ICT illustrate this. After a period of increased capacity and student numbers in ICT education, the trend has been reversed the last couple of years in response to the decline in Norwegian ICT industry.

The localization of various educational programmes in Norway has thus far been the result of political decisions and division of responsibility in the Norwegian higher education system. The educational system to a large extent reflects the current industrial structure and public sector needs. Certain educational programmes are localized in the region because of natural comparative advantages or the political wish to stimulate regional development. In other fields, it is more random where certain specialized educations have been placed.

In recent years, it is becoming more up to the individual HEIs to design their educational profile. At the same time, we see that a *market place in higher education* is developing with rather fierce competition for students. The winners so far are the institutions situated in the major cities, while the university colleges in the periphery must fight to recruit students to a greater extent. The competition for students is becoming one of the driving forces in the design and redesign of educational

programmes at the HEIs. In turn, the institutions try to develop educational programmes which are promising in terms of meeting current and future labour market needs.

Are there learning programmes within the HEIs that enhance the capacity of students to be enterprising with the skills to put in place entities and initiatives to take advantage of regional issues and opportunities?

The HEIs offer many courses and learning programmes which enhance the capacity of students to be enterprising. The courses and programmes are not necessarily geared towards regional issues and opportunities, but certainly also serve regional needs.

Most learning programmes which enhance enterprising skills are related to *engineering and business administration*. In response to regional demand for courses on innovation and entrepreneurship, Trondheim Business School at HiST has developed a one semester programme with six modules titled “Entry of firms” (Bedriftsetablering). At NTNU, the Department of Industrial Economics and Technology Management has since 1978 promoted innovation and entrepreneurship in their educational activities. The engineering students primarily, but also other students at NTNU may choose a number of courses of specific relevance to the development of enterprising skills e.g.: company formation, market-based product development and entrepreneurship, innovation management, industrial marketing, strategic management and industrial development. As of 2004, business development and entrepreneurship is a specialization in the Master of Management programme at NTNU. The target group for this continuing education programme is people with at least two years of work experience. In course and project work, the students apply their own work experience and problems. Basic courses from the university colleges can be accepted as part of the degree. New specializations tailor-made for certain industry sectors may be developed as a result of external demand. External needs have for instance triggered a new course for the regular students on “Patents and entry of firms in biotechnology” at the Faculty of Natural Sciences and Technology at NTNU.

The new trend is to *integrate and encourage enterprising skills in all fields of study*.

At HiNT, the Faculty of Society, Industry and Nature in 2004 reoriented their bachelor’s programmes to integrate innovation and external contact in the course work. In the first year, students get a taste of real life via excursions to external public and private enterprises. In the second year, a course on innovation and entrepreneurship is compulsory for all students, and in their third year, the students write reports on real problems in cooperation with external partners. This model will also be adopted by other departments at HiNT.

Also HiST gives priority to offer innovation and entrepreneurship courses relevant to the educational programmes at all faculties. In addition to more general courses on innovation, special courses are offered in *Innovation and entrepreneurship in the health and social sector* and on *Entrepreneurship in School* for the teachers’ education. The latter is in response to the national policy to encourage entrepreneurship throughout the whole education chain. All the HEIs currently work to meet this public expectation. In the teachers’ education programme at NTNU, the university teachers are to integrate innovation and entrepreneurship in relevant courses in pedagogy and subject didactics. A continuing education course in entrepreneurship for teachers was launched in 2005.

The economic potential of the cultural sector was placed on the political agenda in a bill to the Storting on *culture and industry* (White Paper no. 22 (2004-2005)). The City of Trondheim sees this potential and in cooperation with regional actors has formulated a strategy for culture-based industry in Trondheim (IdéCult City). One idea is to establish an incubator specifically for the cultural sector. In terms of skills development, the Faculty of Arts at NTNU plans to offer courses, seminars and workshops for students and staff. A new course was introduced in 2005 focusing on humanistic competence in working life; traineeships in regional enterprises are part of the course content. The need for enterprising skills is highly relevant in the arts and social sciences, where many candidates will become self-employed, engage in services and consultancy work or new industries. At the Music Conservatory, a seminar on “How to establish a one-man company” is chosen by most of the students.

The Faculty of Arts is also planning pilot projects on entrepreneurship in music, linguistics and communications studies.

The knowledge network - *Innovation Net* – comprises 20 university colleges. This loose network is to encourage the development of relevant courses and competence in innovation and entrepreneurship in higher education among students and staff. Relevant courses at the participating institutions are listed at the Innovation Net webpage. Competent staff and contact persons at the HEIs are also available on this site. Innovation Net has in cooperation with NTNU developed an experience-based master's in innovation and business development for university college staff to upgrade their skills as teachers and advisers.

4.1.2 What is the role of the careers service in the process of localising learning?

Aetat is the national employment service. So far it has not played an active role in course developments or the localization of learning programme from the HEIs. *Aetat* to some extent makes use of existing courses, such from HiNT to provide occupation retraining for the unemployed.

For students who have finished their studies, *Aetat* is the main careers service institution. There is, nevertheless, limited cooperation between HEIs and *Aetat*. At NTNU, such cooperation is limited to international employment opportunities via EURES.

To the extent the HEIs offer careers services, this is organized as part of the *student advisory services* whose primary task is educational guidance. The student advisers assist, in particular, students in finding trainee places in enterprises and public institutions (such placements are compulsory in profession educations such as health care and engineering). Apart from this, the student service/careers service has thus far not played any active role in the process of localizing learning in the region. To the extent learning has been localized off campus, this has mainly been an issue in continuing education with input from the departments and faculties and their external networks.

NTNU Student Service Centres

At NTNU, the careers service is given special priority, and two careers advisers are engaged at the Student Service Centres on campus. The careers service serves as a junction between students and labour market, industry, institutions and organizations. The career service is engaged in a number of activities to create meeting places between prospective employers and students. The companies may announce vacant jobs for free, offer summer jobs and part-time jobs, offer trainee places, project work or thesis work to students. The companies may profile themselves on campus during careers days.

The careers service assists individual students in preparing for the labour market and offers:

- courses on job application and job interview techniques
- individual counselling on career opportunities and the formulation of job applications
- the mapping of personality type and personal interests for students
- career days organized in collaboration with the student organizations to create meeting places between students and working life
- the magazine "Karriere" with information on the labour market and job hunting link-up students with external collaboration partners for master's degree and project work

The tradition for external project work is stronger in technology (see Section 3.3.1) than in the classical university disciplines. The Student Service at NTNU thus tries specifically to mediate master's degree topics relevant for the students in the social sciences and the humanities. The City of Trondheim, the Sør-Trøndelag County, voluntary organizations and banks are among the institutions which send in proposals for topics to the Dragvoll portal (ORIGO-contracts).

4.1.3 How are students integrated in the region, in terms of course placements, accommodation, volunteering activities?

In most professional educations at the HEIs, *course placement* is an integral part of the programme of study. To the extent that the region can provide sufficient and relevant course placements, students are placed within the region. This is the case in most of the shorter health care, social worker and teacher educations. In engineering, NTNU students more often have to seek course placements nationally to obtain relevant work experience. In general, the university colleges' students are well integrated in the region and pursue more and more often project work for private enterprises and public institutions. Various course placement programmes are described in Section 3.3.1.

Improved contact between the HEIs and society is now encouraged in fields where this has not been a tradition. As part of the Faculty of Arts engagement in innovation, a new course called "Humanists in practice" was created in 2005. Students will learn about how to start a new business and have a course placement period in private enterprises, public institutions and organizations in the region. The aim is to increase both students and prospective employers' awareness of humanists' knowledge and skills.

Most students find private *accommodation* during their studies and are subsequently relatively well integrated in the local communities where they study. In Trondheim, only 12 % of the students live at the student residences which are operated by the non-profit Student Welfare Organization (Studentsamskipnaden). Most students rent a room or studio flat in private homes. Some also buy a flat or house to share with other students. Living at home is of course an option for those coming from the city.

The students are engaged in *voluntary activities* at their HEIs as well as in their local communities. In the local communities, the students participate in athletics clubs, idealistic and religious organizations, fine arts and music. The HEIs for instance attract many young, talented athletes to the region, which the local community take pride in when they bring home medals in international championships.

Some 350 student organizations contribute to Trondheim's good reputation as a student town. Most organizations live their own life separate from ordinary city life, but for certain events such as concerts and debates, they open up to the society. The student's cultural contributions are further elaborated in Section 5.2.2 The City of Trondheim cooperates with NTNU and HiST in marketing and recruitment initiatives to maintain the City's position as a leading student town (Section 6.2.1)

4.1.4 What mechanisms exist to monitor/accredit extra-curricular activities

At NTNU, certain courses have been developed to offer students credits for extra-curricular student activities with relevance to management and innovation. Students are awarded credits equal to a quarter of a semester for these courses:

- In the course "Students in management" the students obtain relevant theoretical education on management theory, project theory etc. During the lessons and in the project work the students apply experience from their own duties.
- One course on "Management in practice" is reserved for students with particularly demanding duties (the head of the student festivals UKA and ISFiT, the president of the Students' Association or the Students' sports club at the university or similar). Admissions requirements are strict, and the main task in this course is to write a report from the experience of leadership.
- Students from NTNU and HiST who participate in the business plan competition Venture Cup, may obtain credits for their participation if they at the same time follow a course on business plan development and entrepreneurship.

4.1.5 To what extent is postgraduate activity - which can be an effective tool of technology transfer to the region and a way of embedding highly skilled graduates in the regional economy -geared towards meeting regional needs? (i.e. Ph.D industrial programme in Denmark; Teaching Company Scheme in the UK; external associate professorship from local industry etc)

At NTNU there are long traditions for industrial collaboration on PhD education, in terms of empirical material, counselling and funding. The Research Council of Norway runs several research programmes where there is a prerequisite for PhD funding that there are one or more industry partners. The European Commission programmes normally require consortia that include of both industry and R&D institutions. However, these programmes are rarely geared towards meeting specific regional needs.

Extensive postgraduate activity is first of all found within *medicine and medical technology* where NTNU is a key partner with the Regional Health Authority and the University Hospital. There is extensive external funding for research fellows. Furthermore, at the Faculty of Medicine, half the academic staff are adjunct professors at NTNU with their primary position at the University hospital.

Major *research institutions* such as SINTEF, the Paper and Fibre Research Institute (Papirindustriens forskningsinstitutt) and the research departments of Telenor and Statoil, are regional institutions which sponsor many research fellows and other postgraduate activity at the university. For many of these research institutions, the proximity to NTNU is the main reason why they are localized in Trondheim. The relationship is of mutual benefit. The many adjunct professors from these institutions are valued teachers at the university, and their networks benefit the students' in their future careers.

4.1.6 Do the HEIs in the region facilitate voluntary associations and coalitions of regional expertise and knowledge around key regional strategic priorities?

The HEIs' staff members are often engaged by cultural, political or trade associations as guest speakers or advisers, thereby sharing their knowledge and expertise with the broader public. There is, however, less tradition for the institutions to facilitate voluntary associations in general, or with regard to regional strategic priorities.

The HEIs, nevertheless, aim to be a regional knowledge partner and cooperate in certain projects with *trade and industry associations*. In the food sector, for instance, a broad coalition is formed between knowledge institutions, foodindustry, agricultural associations and public authorities. The joint limited company *Oi! Trøndersk mat og drikke AS* is to be an arena for knowledge transfer between the knowledge institutions and the various regional enterprises in the food chain. The HEIs are among the shareholders.

The HEIs also facilitate *voluntary associations among students and staff* in terms of financial support and access to office space and meeting rooms. In terms of regional priority areas, the best example is probably the student organization START whose main task is to disseminate knowledge and interest in entrepreneurship among students. The students organize meetings and seminars on innovation-related topics, and operate a helpdesk and advisory service on how to start a new business.

4.2 Student recruitment and regional employment

4.2.1 What are HEIs' policies concerning regional recruitment? What mechanisms are in place to increase this? Are there any collaborative partnerships or quota arrangements among regional HEIs to manage regional recruitment?

There is increased competition among HEIs for students. Admissions are coordinated nationally based on the students' priorities with regard to programme of study and institution. There are no quota arrangements. The objective of the national admissions system is to provide a student place for as many applicants as possible.

Regional recruitment is important. For instance 52 % of the students at HiST and 32 % of the NTNU students come from Trøndelag. Clearly national recruitment is necessary in order to fill the student places available. Insufficient admission numbers in certain educational programmes is a general challenge, but particularly for a small university college like HiNT. The college recruits well from its own region, but needs to increase non-regional recruitment. NTNU and HiST are in the fortunate position to be among the national winners in terms of student recruitment. The good reputation of Trondheim as Student Town no.1, partly explains this, in addition to attractive programmes of study.

The three HEIs make use of the traditional mechanisms to recruit students from the region as well as nationally. The HEIs promote their studies at education fairs and at schools visits in the region. NTNU runs national campaigns on television and cinemas. The university colleges have smaller budgets and prioritize creating attractive websites for prospective students.

4.2.2 To what extent do HEIs recognize themselves as part of a regional education supply chain?

The HEIs recognize themselves as part of the national education supply chain. The university colleges take special responsibility to fulfil this obligation in the region. The HEIs' role is underlined in public policy such as the "Knowledge Promotion Reform" in primary and secondary school²¹ and the Government's Innovation Plan (From Idea to Value, 2003).

The *Knowledge Promotion Reform in primary and secondary school* implies a stronger emphasis on basic skills such as mathematics and languages. All pupils in lower secondary school will learn two foreign languages. Innovation and entrepreneurship are to be stimulated and contact with local industry is encouraged as a learning arena. The curriculum is to be adapted to the individual pupils' ability and skills. A successful implementation of the Knowledge Reform is dependent on the HEIs' contributions. New teaching aids and curricula are to be developed. In addition, the Reform implies a substantial effort to upgrade the teachers' competence.

The HEIs are prepared to take on the job and are in the process of revising their teachers' education programmes as well as to offer relevant continuing education courses and seminars for teachers in the region. Formal skills transfer agreements are signed between the counties and the HEIs.

Falling recruitment to *science and mathematics* is a major concern, which the Knowledge Promotion Reform addresses. National and regional measures are taken to change the trend. National school curricula have been changed with an aim to integrate mathematics in other disciplines and stimulate the pupils' curiosity and interest for innovation through science and technology. The lack of teachers with relevant background and skills is a challenge which both the regional authorities as well as the

²¹ St.meld.nr 30 (2003-2004) Kultur for læring (A culture for learning).

regional HEIs are trying to remedy. The two Trøndelag Counties will for instance spend NOK 3 million on skills development for teachers in mathematics and science.

NTNU has a national role and offers continuing education and distant learning courses in mathematics and science for teachers in primary school. A new teachers' education programme leading to a master's degree in science is introduced as well as a master's degree in science didactics and teaching theory.

Also HiNT and HiST have increased their efforts to strengthen science and mathematics in their bachelor's and teachers' education programmes. NTNU and HiST²² students are used as role models for pupils in secondary school. Through fun experiments and demonstrations in the classroom, the students try to encourage pupils' interest in science and technology. NTNU hosts the National Centre for Mathematics and the National Centre for recruitment to science and technology (Renate). The latter, for example, assisted Rosenborg Lower Secondary School when they introduced technology as a new discipline for all their pupils. These centres are also engaged in developing new course material, which portray technology in more positive terms and the usefulness of mathematics to solve everyday problems.

On the production of *science and engineering graduates*, Norway scored below the EU average on the European Innovation Scoreboard 2005. The rate of such new graduates has risen from 7.2. per 1000 graduates in 1999 to 9.3 per 1000 graduates in 2003; Further improvement here could be valuable for the development of innovation in all sectors. This challenge is recognized nationally as well as regionally. Forecasts by Statistics Norway indicate a labour market shortage in Norway of more than 6 000 engineers by 2010.

The university colleges are responsible for the engineering education in Norway, while NTNU is the major producer of chartered engineers (67 % of candidate production in 2004). The Trøndelag region, with its strong technology education institutions, is thus in a privileged position (see Annex 1, Table I.7). The national candidate production varies from year to year, but the actual number of candidates has declined rather than increased in the past five years (see Table 4.1). National measures to increase the interest in and recruitment to science and technology have evidently not yet produced results in terms of candidate production.

Table 4.1: Candidate production in science and technology 2001 and 2004 (% share of the national candidate production from NTNU, HiST and HiNT). Source: DBH.

Number of candidates (% of total)	Science		Engineering		Chartered Engineer	
	2001	2004	2001	2004	2001	2004
Norway	2045 (100)	1869 (100)	1986 (100)	1949 (100)	1553 (100)	1536 (100)
NTNU	138 (7)	255 (14)			1277 (82)	1173 (76)
HiST	74 (4)	75 (4)	289 (15)	307 (16)		
HiNT	58 (3)	45 (2)	12 (1)	24 (1)		

In regional policy, *decentralized education* and *lifelong learning* are key issues. In an EU context, Norway is among the leading countries in this respect (EU Innovation Scoreboard 2005). The university colleges are particularly active to meet this demand and have many adult students. HiST, HiNT and DMMH had more than 700 registered students in continuing education in 2004. In the autumn semester 2004, 3 300 students were registered to follow distance learning programmes offered by HiST and HiNT (see Annex I, Tables I.9 to I.10). The university colleges have signed cooperation agreements with industry associations, companies and public authorities. Mainly taking place at regional level, these relations are important to maintain a good national quality in the education programmes.

²² The HiST Science project is organized in collaboration with the labour unions NITO and Tekna, and with financial support from private industry.

HiST for instance, contributes to the continuing education programme for member companies of the Federation of Norwegian Process Industries (PIL). Such activities are initiated at faculty level. HiST is also engaged by the eight inland municipalities in Trøndelag to provide continuing education courses relevant to their development needs (Blilyst:) – Municipal Development Programme). To promote e-learning, HiST assist in developing a common platform and physical infrastructure for e-learning in secondary schools and industry parks.

In 2003, HiNT signed cooperation agreements with the major companies in the region (Norsk Skog AS, Aker Verdal AS, Nord-Trøndelag Elektrisitetsverk (power utility) and Nord-Trøndelag Health Authority). The partners are making plans for knowledge transfer from HiNT. Educational offers are continuously evaluated and new educational modules developed in cooperation with the external partners. Keeping up educational offers in areas of importance to the region such as forestry, agriculture and engineering, poses a challenge for HiNT. Local recruitment is insufficient in order to defend the cost of operation, while the competition for students from other regions is tough.

4.2.3 What mechanism exists to create pathways between regional HEIs and regional firms, especially SMEs?

As described in Chapter III, several mechanisms exist at the individual institutions as well as jointly to create pathways between regional HEIs and regional firms, especially SMEs. Great expectations are given to the joint project *Idéportalen* where the HEIs in the region cooperate to increase the number of students doing their project work in SMEs (see Section 3.3.1). The students also take part in the *Take Off programme* where the HEIs cooperate with Innovation Norway to assist regional entrepreneurs in developing their business ideas (see Section 3.1.3).

In Nord-Trøndelag County, companies and public agencies cooperate on recruitment by running trainee programs for graduates from the HEIs. The trainees work in three different companies/organizations during a two-year period.

Student projects represent a significant value to the enterprises. HiST calculates that approximately 90 % of the engineering students do project work based on problems from external enterprises. The value of about 200 student projects is estimated to be some NOK 31 million a year. 75 % of these projects are in cooperation with regional enterprises.

The HEIs as well as the *students* themselves actively seek contact with prospective future employers and organize meetings and business fairs on campus. The engineering students in particular are active in this way, but also students in the humanities and social sciences take an increased interest in developing labour market relations. HiNT has *cooperation agreements* with many local and regional industry actors. Particular the Department of Society, Industry and Nature has long traditions for organizing industry meetings as an arena for making connections between students and enterprises.

All the HEIs have created *administrative units* for external relations. At HiNT and HiST these units cover the whole range of external activities from student trainee places to external research activity and business relations. At NTNU, administrative specialization is more the rule. External relations regarding students are primarily handled by the Student and Academic Division, while a special adviser is engaged to promote SME-university relations. The university's innovation policy is coordinated by the University Director's staff.

The City of Trondheim

The *political interest* in creating closer ties between authorities, regional enterprises and HEIs is growing. One aim is to encourage more candidates to stay in the Trondheim and in the region when they graduate. The challenge is put on the political agenda in several fora such as the cooperation project “Student Town no. 1” and the follow-up of the Regional Development Plan. It is also a topic of political discussion in the network of regional city centres where Trondheim participates. In the development process of the “Strategic plan for knowledge development”, the Municipality is mapping the various forms of cooperation it is engaged in with the HEIs. One move ahead might be to develop cooperation agreements with the HEIs to work more systematically and develop a more coherent strategy for the municipality-HEIs relations.

The *City of Trondheim* takes a direct interest in the HEIs to ensure adequate recruitment of candidates to the municipality. The Municipality has cooperation agreements with NTNU, HiST and Queen Maud's College of Early Childhood Education concerning course placement in municipal institutions for preschool teachers, teachers, nurses and social workers. In addition students are engaged as trainees, in summer jobs and various short-term engagements. The municipal institutions are encouraged to make use of the students’ knowledge and send in proposals for master’s theses to the HEIs where they are collected in a database and made available through the HEIs’ student advisory service. The Municipality also contributes to the NTNU Experts in Team projects where students from different disciplines engage in multidisciplinary project work. The Municipality is also present at business fairs on campus or visit individual institutes to profile the Municipality as a prospective employer.

4.2.4 To what extent is labour market information gathered to monitor the flow of graduates into the labour market? Does this process involve other regional stakeholders?

At institutional level, no systematic work is done to gather information about the flow of graduates into the labour market. In some cases, individual departments keep track of their candidates and use this information to promote their programmes of study.

Trade unions, however, keep track of their members’ entry into the labour market. In certain fields, such as engineering, most candidates are members of the trade union, and NTNU investigates together with TEKNA how systematic knowledge about the flow of graduates from the university could be collected. NTNU also aims to gather systematic information about the candidates’ labour market entry as part of the alumni system.

Most departments and faculties either have a board or *advisory committee with external members*. These boards/committees function as strategic advisers to the entities and to a varying extent play a role in interpreting labour market trends and market needs for education and research.

Are there any specific initiatives or practice to support graduate enterprise (i.e. the Cambridge MIT initiative in the UK) in an effort to retain graduates in the region and recruit alumni to return to the region?

Innovation is increasingly integrated in the programmes of study at the HEIs. In the longer run, it is expected that more graduates will start new enterprises. *Entrepreneurial students* may obtain advice and encouragement from the student organization START which operates at all the three HEIs. At NTNU, the on-campus incubator (Innovation Centre Gløshaugen) gives student entrepreneurs a chance to remain in close contact with the research environment they were educated in. The TTO will also assist students to get in contact with prospective partners in existing industry or join up with others in an incubator or industry park.

Various programmes also exist to increase *contact between enterprises in the region and students* (Section 3.3.1). A key objective is to reduce barriers and increase the likelihood that the enterprises will hire a candidate from the HEIs and that the candidates will choose to seek work in the region. It is easier to employ someone that you know.

There are no strong traditions for alumni organizations in Norway. NTNU has recently established an *alumni organization* with the aim to better maintain contact between HEIs and candidates, organizations and industry. Prior students' experience and feedback on the departments' academic profile may be useful in developing future educational programmes. It is to be part of the institutions quality system that each programme of study is to collect such experience as part of the annual evaluation of the programme of study. The alumni organization may also become a channel for marketing continuing education courses and conferences. Specific arrangements for the alumni are also planned in connection with the Student festival UKA every second autumn (Section 5.2.2).

4.3 Promoting lifelong learning, continuing professional development and training

4.3.1 How is continuing education and continuing professional development activity organized?

At the HEIs, the faculties/departments are responsible for offering and ensuring the quality of continuing education courses, both in terms of content and funding. Continuing education provisions are organized in combination with regular teaching and research activities at the faculties. Only exceptionally, individual academic staff members may devote their teaching duties exclusively to continuing education.

At NTNU, a central unit is responsible for marketing and the administration of continuing education activities. At HiNT and HiST, the institutions efforts are coordinated by a dedicated adviser in the central administrations.

4.3.2 Have external or independent enterprises (i.e. separate and independently-run business school) been established within HEIs to extend professional education provision to the region?

There are no established external or independent enterprises within HEIs to extend professional education provision to the region.

4.3.3 Is such provision undertaken in collaboration with other regional stakeholders?

Such provision is to some extent undertaken in collaboration with other regional stakeholders.

The trade union for chartered engineers, TEKNA, serve as the "alumni organization" for Norwegian technology graduates and offer relevant upgrading courses and seminars in collaboration with NTNU. Almost 800 representatives (alumni) from industry and public institutions came to NTNU the first week of January 2006 to take part in the courses and seminars organized by TEKNA in collaboration with NTNU and various branch organizations. This was the 48th time this event took place.

4.3.4 Which regional partners are involved in meeting regional training needs?

The university and the university colleges are partners in meeting regional training needs. Close relations are particularly developed to meet the training needs in *school and health sector*. The main partners are the counties as school owners, the Regional Health Authority as hospital owners, as well as individual schools and hospitals.

With respect to regional training needs in *trade and industry*, the counties, the County Governors, trade and industry organizations and certain large companies are regional partners to the HEIs (see examples in Section 4.2.2 and 4.2.3).

Most continuing education courses are adapted versions of regular programmes of study offered, but there is also a demand for tailor-made courses to meet specific regional needs such as in agriculture, aquaculture, forestry, education and health care. The university colleges are particularly aimed at reaching adults in the regional centres, as well as *servicing the districts*. Cooperation with *local municipalities* is important, and in areas of economic transition, the county play an important role with funding of retraining programmes for adults. HiNT cooperates with the *Adult Education Association* (Folkeuniversitetet) to offer decentralized education in the districts.

4.3.5 What mechanisms are in place to increase access to learners in the region who have been traditionally under-represented in higher education?

There are some mechanisms in place to increase access to learners in the region who traditionally have been under-represented in higher education.

NTNU is taking the lead nationally to *downscale barriers for disabled persons* in higher education. A special *counselling service* (Rådgivningstjenesten for funksjonshemmede studenter) is established for physically disabled students with three counsellors working partly on campus at NTNU, partly at the Lucas Centre (see box). They are engaged in *physical adjustments* and adaptations of buildings and campus environment and *adaptations during the study and exam period* to provide equal learning opportunities. They also offer *courses* and activities to improve skills needed to complete the studies and enter the job market.

The Lucas project

NTNU, HiST, the Student Welfare Association (SiT) and the insurance company Gjensidige in 2003 launched the *Lucas project* with the aim to improve accessibility for all to higher education and participation in working life. Key activities and services are places in the *Lucas Centre*. The Centre is located next to the student lodgings near Gløshaugen where *48 studios* have universal standard suitable for disabled students. The Lucas Centre *café* and classrooms serve as meeting places for social events as well as learning activities organized by the *counselling service*. Part of the Lucas project is also to ease the transition from secondary school, via higher education to working life for people with disabilities.

Ethnic minority groups are underrepresented in higher education and overrepresented in unemployment statistics. In order to increase social workers competence, HiST offers a bachelor's degree on International Social Work, where focus is on social work with respect to ethnic minority groups and refugees. None of the HEIs, however, have taken any particular measures to encourage recruitment or integration of minority students in their higher education programmes.

In order to stimulate the *re-entry of adult learners*, flexible and decentralized continuing education programmes are offered. See Section 4.4.1.

4.4. Changing forms of educational provision

4.4.1 What mechanisms exist for promoting flexible education provision such as satellite campuses, accreditation networks, on-line courses and outreach centres?

Most of the HEIs' distant learning and continuing education provisions are organized in a flexible manner to enable people to study beside ordinary work. Educational programmes and courses are typically given as a combination of *on-line courses* and *intensive work sessions* two to three times a semester.

The university colleges, in particular, have engaged in *distant learning*. HiNT makes use of its four campuses as well as the Adult Education Associations' decentralized locations (Folkeuniversitetet) to reach students where they live. HiST cooperates with several municipalities with the same aim. Distant learning is relatively expensive to maintain. Without specific public support for flexible learning, HiST points out that it is difficult to expand this kind of outreach activity much further. However, ICT as a learning tool, "diminishes the borders" between traditional education on campus and decentralized education. In the nursing education, combinations of on-campus and decentralized learning have successfully been exploited.

NTNU is starting to provide for an extended cooperation with regional university colleges as well as other education providers in order for the programmes and offers to be more available to the general public as well as businesses.

4.4.2 How do HEIs maintain institutional coherence in the light of this multi-territorial educational provision?

The university's own academic personnel are responsible for providing all education from NTNU and follow up on every course and subject given.

4.4.3 Are regional HEIs drawing upon new forms of ICT-based course delivery to enhance educational opportunities to a wider group?

Internet-based distant learning is delivered by all the HEIs to enhance educational opportunities to a wider group of students. Distant learning is provided in various vocational educations (e.g. engineering, teaching, health care, social work). In information and communication technology, HiST is Norway's largest provider of internet-based distant learning and offers more than 60 courses.

HiST has long experience applying simultaneous *video transmission of lectures* from campus to decentralized locations. This makes it possible, for instance, to train nurses and social educators in four districts in the region.

All the HEIs have started to use new *learning management systems* to make it easier to counsel the individual student as well as provide for a more flexible learning environment. NTNU and HiST use "It's:Learning", while HiNT has chosen "Class-Fronter". The learning management system is applied in communication with regular students/part-time students, but is also a useful tool in distant learning and continuing education.

At NTNU, both live- and web-based streaming as well as videoconferencing is used in regular teaching. A large part of the students have portable PCs, and most parts of the campus as well as a number of dormitories have installed *wireless networks*. The wireless networks to some extent make up for limitations in computer room and reading room capacity for the regular students.

4.4.4 What are the tensions between place-based and virtual forms of education provision?

Some of the professors prefer place-based courses to virtual forms. Students tend to prefer a flexible model that combines place-based and virtual modes of delivery. Our experience with providing most continuing education activities as a combination of both seems to be successful. As for regular campus-based education, some of the subjects have started experimenting with more virtual-based models, most of those in combination with place-based lectures. Students seem to appreciate this.

4.5 Enhancing the regional learning system

4.5.1 To what extent is there a coherent vision of an education system existing at the regional level? Do HEIs acknowledge the need to develop education on a regional basis?

There is no coherent vision of a regional education system. One reason might be that financial responsibility is scattered. The provision of primary and secondary education is a regional responsibility, while funding for higher education is a national responsibility.

In certain sectors, typically the school sector and health sector, there is a relatively direct relationship between *regional labour market demands and regional educational supply*. This may explain why there are relatively close cooperation between the owners of relevant regional institutions and the HEIs in these sectors. In the past three-four years, the development of educational activities to meet regional demands has to a greater extent also been coordinated between HiNT and HiST, particularly in teachers' education and nursing education.

HiNT is particularly oriented towards meeting regional needs and has continuous meetings with regional stakeholders. New educational offers on wind power and aquaculture are in for instance a direct response to industrial developments in the region.

4.5.2 What data analysis has been performed to establish the supply and demand of different types of higher education 'product' within the region?

There is no systematic collection of data about the supply and demand of higher education in the region.

4.5.3 Are procedures in place to support regional collaboration between HEIs in this respect?

Mid-Norway Network is an institutional cooperation forum between the university colleges in Trøndelag, Molde, Ålesund and Volda and NTNU. One aim is to develop educational programmes and courses in areas where the region has specific competence. The Network mainly serves information exchange purposes and has no steering function. Higher education is becoming more and more of a market place, where institutions cooperate when this is beneficial in order to provide a wider or better educational offer to existing and prospective students.

On the operative level, there are many examples of cooperation between the university and the university colleges for *specific courses, specializations or master's degrees*. NTNU and HiST for instance cooperate in economics and business administration to offer a wider selection of courses and specializations, including master's degrees.

The two university colleges also cooperate with each other in the teachers' education, engineering, food industry and childcare education. The university colleges aim to offer more master's degrees. A new development is seen whereby HiST and HiNT cooperate with two Danish universities to extend the Danish master's programmes to HiST/HiNT students.

Is there a credit transfer system between education institutions and what links exist between the university and non-university higher education sector?

There is a national credit transfer system in place between institutions. This is between universities and university colleges and between university colleges and universities. As a result, there are good opportunities for mobility.

4.5.4 What measures exist to promote gender equity in participation in higher education in the region?

Gender equity is a general aim in Norwegian policy. There are certain fields and professions where one gender traditionally has dominated. In childcare education, women typically dominate. At HiNT, only 14 % of the *childcare education* students are men. At Queen Maud's College of Early Childhood Education (DMMH) in Trondheim, they are trying to do something about it. At education fairs, in web presentation and brochures, male students serve as role models for prospective applicants. The school also supports the male minority by always placing several men together in each class. The new specialization in nature and leisure activity attracts 30 % male students.

In *science and technology*, women continue to be in minority. This is particularly a challenge to NTNU and all kinds of measures are taken to stimulate females to choose fields that traditionally have a male dominance.

Females and Data

The projects "*Females and Data*" (Jenter og data) was launched in 1997 as a response to very low female ratios in information and communication technology. The female ratio increased substantially after the project was launched, from 8 % i 1996 to 22 % i 2002. The ratio of females completing their degree increased from 50 % in 1996 to 79 % in 2002. In 2003 and 2004, the female ratio once again fell to 12-14 %, probably owing to the market decline in the ICT industry. The gender challenge remains.

The objectives of the "*Females and Data*" project are universally relevant and similar measures are also used in other disciplines with few female students:

- Increase the female ratio in the educational programme through various recruitment measures. A special female quota was introduced in the ICT educational programme.
- Increase the ratio of females who complete the degree: Ensure that as many females as possible enjoy and feel comfortable in their studies. A special computer room was set up for the female students.
- Create close network between the female students to enhance knowledge exchange and personal support.
- Create contact with industry to ease the transition from university to the labour market.

4.6. Conclusion

4.6.1 Collaboration between regional stakeholders related to contribution of teaching & learning to labour market and skills: (1) between the HEIs in the region and (2) Collaboration with other regional stakeholders (i.e. business, local government, training providers)

The *formal collaboration between the HEIs* in the region related to teaching and learning is limited, but increasing between the university colleges. In certain fields, such as teacher training, engineering and innovation, courses from the neighbouring institutions are integrated in the programme of study to provide wider opportunities to the students. HiST and HiNT collaborate with NTNU, but also with other universities such as Copenhagen Business School, on certain master's degree programmes. The longer term ambition of the university colleges is to offer more master's degree programmes particularly in vocational fields, to meet regional demand and become more competitive nationally. This depends on the Norwegian Agency for Quality Assurance in Education (NOKUT) accepting these degree programmes..

The HEIs have close and formalized cooperation with the *Regional Health Authority* with respect to the vocational education needed in the health service. Close relations also exist with the *County* regarding teacher training.

The collaboration with *industry* is less systematic. Regional knowledge transfer programmes have had a positive impact on the HEIs' contacts with SMEs in the districts (e.g. TrønderJämt and the planned Idéportalen). The larger companies in the region are important partners to the HEIs. Statoil and Telenor for instance sponsor several research fellowships at NTNU. HiNT's partnership agreements with the four major employers in their region covers trainee places, but also continuing education activities partially tailor-made to meet their demand. In general, all the HEIs report that contact with the students' trainee places gives valuable feedback on the relevance of the educational programmes. HiST has systematically promoted industry contacts over the past 10-15 years and today almost 90 % of the students project work in the engineering education are conducted in collaboration with industry.

All the HEIs have increased their efforts to integrate *innovation and entrepreneurship* in the various educational programmes in consistency with current political expectations. Trainee periods or project work in external institutions and industry, are usually an integral part of this effort. Innovation is no longer just a topic in engineering or business administration, but is now also introduced in other fields such as teacher training, culture-related education and the health professions.

4.6.2 Strengths, weaknesses, opportunities and threats related to contribution of teaching & learning to labour market and skills in the region

The following list of strengths, weaknesses, opportunities and threats is the result of discussions in the working group and steering committee.

Strengths

The HEIs covers all types of education at bachelor's level and are responsible for certain national functions in higher education. NTNU is the second-largest university in Norway. HiST is one of the four largest university colleges in Norway, while HiNT is of medium size.

There are many experience-based educational programmes at the university colleges. Another asset is related to the close interaction with the labour market, notably in the health professions, teachers' education and engineering education with respect to educational contents and adaptations to labour market needs. Regional industry reports that the HEIs' educational offer has a good match with their needs and skills requirements.

Trøndelag is a national stronghold in *technology education* and benefits from generally good applicants to the technology programmes. NTNU educates about 80 % of the country's chartered engineers. HiST is the largest school of engineering in Norway.

The HEIs have developed several *courses in entrepreneurship* for their own students and as further education, mainly for students in technology or business administration. But there are also relevant course offers for other educations such as the teachers' education or the health and social care studies.

Weaknesses

The region lacks a few classical fields of education at master's level such as law, agriculture, veterinary, dentist and theology.

The science crisis is a challenge to the recruitment of students in science and technology nationally and internationally. HiST has become the largest "upper secondary school" in natural sciences in terms of preparatory courses for the technology students.

For many people, geographical distance and lack of computer and internet skills are real barriers to continuing education. It is thus problematic that the HEIs are given no economic incentives to engage

in decentralized education in the districts. HiNT uses its campuses in the four regional centres and collaborates with Folkeuniversitetet (Adult Education Association) to come closer to the local labour market and where people live.

Unemployment in Norway is low (around 4 %), but in order to reduce unemployment among university graduates, more people with higher education must *create their own place of work*. The HEIs' educational programmes have thus far only slightly encouraged such interest and skills.

Opportunities

New master's degrees are developed to meet the needs of the private and public sector (e.g. master's degree in business administration/management/finance and master's in health care).

The HEIs offer *further and continuing education* in competition with private actors in most fields. The offer is given based on the HEIs' own competence and anticipated market needs. Decentralized education is offered in collaboration with the public authorities and business sector organizations. With a more offensive approach to the market, it ought to be possible to extend this type of activity.

If *NTNU and HiST* are localized near SINTEF and St. Olavs Hospital this may stimulate closer interaction between the institutions as well as other private and public actors in the City and in the region. Increased interaction may improve the quality and relevance of higher education.

Threats

Stronger competition for students leads to *lower admissions quality* in certain fields of study. Extra classes and many drop-out students during the education programme imply a loss of budget allocations due to the new results-based budget distribution model for the HEIs.

Regional needs and regional demand do not always match. HiST, for instance, had to close down an educational offer on export and marketing due to failure in recruiting enough students.

Regional demand for higher education cannot be taken for granted. Young people tend to prefer city life when studying, while the adult workforce in the districts is given an increasing offer of decentralized education via the internet. The university college is not necessarily the preferred supplier of higher education.

It is a requirement for *NOKUT approval* that a greater share of the university college staff hold a doctoral degree or the equivalent. Like most other university colleges in Norway, neither the nursing education at HiST nor at HiNT fulfilled all the NOKUT requirements in the 2005 evaluation. Within a certain period of time, they must remedy the situation if they are to maintain their nursing school authorization. The university colleges have followed a long-term strategy of upgrading their staff first to master's degree, then to doctoral degree level. HiST is likely to fulfill the skills requirement by the end of 2005, while HiNT needs some more time.

Falling recruitment to certain educational programmes may imply that these educational programmes must close down. The Ministry of Education has decided to close down the technology education at HiNT as of 2006. HiST and HiNT will investigate the possibility of a cooperation solution whereby HiST takes academic responsibility for the engineering education, but allows students to take their first year in Levanger (HiNT).

Chapter V: Contribution to Social, Cultural and Environmental Development

A good place to reside and live is one of the aims of the Regional Development Plan. It is not enough to have something to live of – people also need to have something to live for. A community must be economically, socially and culturally sustainable. Satisfactory social standards and varied opportunities for leisure activity, jobs and schools for spouses and children, are important factors for the recruitment of human capital – including the students and staff at the HEIs. They are also important factors in order to make people thrive and stay in the region.

Economic development and growth based on creativity, arts and culture is another aim of the Regional Development Plan. The region aims to establish development arenas for innovation and the commercialization of cultural-based ideas and wants to better utilize the business potential of the region's cultural activities.

5.1 Social development

5.1.1 Do the HEIs provide community access facilities and expertise support for services such as health and medical, welfare advisory, cultural exchange, Indigenous support, religious?

The HEIs only exceptionally provide community access facilities, but offer their expertise and support for various *social services* in the region and municipalities where they are located. The HEIs are also engaged in development projects and services related to the students' practical training.

To the extent that HEIs provide community services directly, this is primarily linked to the *students' compulsory practice in the various healthcare disciplines*. Patients from the region can come for consultations at the Edda Medical Office associated with NTNU, or for psychological treatment at the Department of Psychology. Similar on-campus practice exists in the other healthcare disciplines at the university colleges.

The HEIs also serve as advisers and partners to regional actors in the social sphere. *Øya Nursing Home* is part of the current planning process to relocate HiST near NTNU and St. Olavs Hospital. One idea is to use part of the nursing home as a buffer institution for elder patients released from the hospital, but not capable of living at home. The Faculty of Nursing (HiST), the Department of Community Medicine and General Practice (NTNU), Edda Medical Office and the Øya Home Care Services (Trondheim City) may be located in the same building. This would facilitate inter-institutional collaboration and provide new opportunities for clinical and multidisciplinary research. Nursing and medical students would get relevant training operating the nursing wards, as well as multidisciplinary training together with other students in physiotherapy and occupational therapy.

The HEIs may also support regional ambitions, such as the ambition of the Regional Development Plan to strengthen Trøndelag and Trondheim as an *ecclesiastical centre* in Norway. Strongpoints are the Nidaros Cathedral, where the Norwegian kings have been crowned or blessed, and the rich St. Olav tradition (see box). Several important church meetings have also been held here in later years. What the region lacks is a clerical education. NTNU to some extent makes up for this in terms by its religious science programme. University researchers collaborate with the church and public authorities on excavations and preservation of church historic objects and sites, as well as the education of guides to the museum and cathedral. The NTNU Museum of Natural History and Archaeology, features church collections and objects from the Middle Ages and onwards.

The St. Olavs tradition

The Viking King Olav Haraldsson fell at the battle of Stiklestad in 1030 and was later buried in Trondheim. The modern pilgrimage tradition started some fifty years ago with the annual outdoor performances about the last days of St. Olav attracting some 20 000 spectators to Stiklestad.

In Trondheim, the *St. Olav Festival* also hold a long tradition and offered 300 concerts and events with 280 000 visitors last year. Both places, the St. Olavs related events are used as a springboard for supplementary activities such as a medieval market and a regional food festival.

With a relative high number of international employees, NTNU, SINTEF and the university hospital St.Olav contribute to *cultural pluralism* in Trondheim. Many of their children attend one of the two international schools in Trondheim. It is also possible to take an international baccalaureat at one of the upper secondary schools in the city centre. The availability of English teaching is an important asset for the international recruitment of experts to Trondheim and the region.

5.2 Cultural development

The *cultural sector* is one of the fastest growing sectors in the Norwegian economy. Cultural-based industry (entertainment, tourism, creative business, art, libraries, museums, design, advertising, architecture, media) represents 3.5 % of Norwegian GDP. It is twice as large as the agricultural sector, three times as large as the fisheries industry and at the same level as the workshop industry.²³

The cultural sector is viewed as one of the main assets in the further regional development of Trøndelag. There is an ongoing study aiming to establish an overview of the cultural clusters and businesses in the region. This study is part of the Regional Action Programme, and the main goal is to develop strategies for a joint effort in the cultural business area.

The city of Trondheim has taken an initiative to establish a creative/*cultural incubator* (IdéCultCity). A pre-study was ready in 2004 and in 2005 the city has discussed possibilities for partnership, financing and localization of the incubator. These issues are not yet overcome. A cultural incubator has already been established in Verdalen (Tindved Culture Garden), building on the rich cultural traditions of this rural district, not least around the St. Olavs tradition at Stiklestad.

5.2.1 Knowledge dissemination – media and museums

In a broad definition of culture, the staff and students engagement in intellectual debate and dissemination of knowledge is probably one of the most important contributions from the HEIs. The HEIs are frequent contributors to the *regional newspaper*, Adresseavisa, in terms of articles and commentaries. But the newspaper has also become more active featuring news as well as good stories on the HEIs' events and achievements. Innovation and culture have obtained more space than ever before. The new journalists often have a university background and experience from the student newspapers. Also other media look upon the HEIs in Trøndelag as a resource. The Trondheim office of the *Norwegian Broadcasting Corporation* (NRK) is given responsibility for the production of science programmes. The young programme leaders are typically science graduates from NTNU who were active in the student theatre group, thus are able both to perform and communicate knowledge in a popular way.

Two of the most important tourist attractions in Trondheim, not least for the regional audience, have been created by the HEIs. *The Museum of Natural History and Archaeology* (Vitenskapsmuseet) at NTNU has 45 000 visitors annually. Many school classes and kindergardens make use of their free entry offer. The recent exhibition "Technoport" was very popular the past summer. The museum also has three botanical gardens.

²³ Source: Report 10/2004 from Eastern Norway Research Institute.

The far newer institution, the *Science Centre* (Vitensenteret) is an activity centre for curious children and adults. Annually some 50 000 visit the centre. NTNU, HiST, regional enterprises and the Research Council of Norway are among the sponsors of this centre. In addition to running activities at the centre, the centre also develops learning material and offers courses for teachers on science experiments suitable for children.

The HEIs have not established specific mechanisms through which their stock of cultural facilities can be jointly managed and marketed to the regional community. But the Royal Norwegian Society of Sciences and Letters (Det Kgl. Norske Videnskabers Selskap) and the university museum (Vitenskapsmuseet at NTNU), publish a "*Knowledge Calendar*" comprising 40-50 events each semester in Trondheim and the region, organized by museums, history and science societies, as well as the university. Lectures and excursions are announced in the regional newspaper. They are generally very popular and attract a lot of people. The calendar is also available on the website of NTNU and the City of Trondheim.

5.2.2 Student festivals - examples of cultural innovation

The students in Trondheim are known for their festivals and cultural entrepreneurship. Two biennial events particularly contribute to Trondheim's reputation as the best student town in Norway:

Since 1917, the Trondheim students have organized Norway's largest cultural festival (*UKA*). The student revue is the main attraction, supplemented with numerous concerts and parties for current students, alumni and local residents. The festival is the main source of funding for the maintenance of the Students' Association building (Studentersamfunnet), which is a landmark in Trondheim. The union is also the site of student debates, as well as national political debates by the Norwegian Broadcasting Corporation (NRK).

The International Student Festival (*ISFiT*) is a newcomer in comparison. This festival is already the world's largest thematic student gathering with some 450 participants from 100 countries. They discuss topics of current interest, and learn to know and respect each other despite political, cultural, religious or geographical differences. Families in Trondheim host the foreign students during their stay (10 days). The festival features renowned speakers such as the Nobel Peace Prize Winners - His Holiness the Dalai Lama and Wangari Mataai. ISFiT contributes to place Trondheim and the region on the map.

5.2.3 Supporting the arts through HEIs infrastructure, programmes and services

Both NTNU and HiNT take pride in their arts environments. NTNU's arts environment covers fine art, music, film and drama. Performing artists are educated at the *Academy of Fine Art* and the *Department of Music*. The latter environment is particularly visible in Trondheim with numerous concerts by staff and students. Without the Trondheim Conservatory of Music, Trondheim would not have had a symphony orchestra of such high standard. There are also several offsprings from this environment such as the *Norwegian Chamber Orchestra*; Founded in 1988 and consisting of young talented music students mixed with professionals, this orchestra has established an excellent international reputation. The annual chamber music festival is another example. Jazz and church music are other key areas for the Department of Music. The jazz education is nationally unique, and the annual *Jazz Festival* is a colourful addition to Trondheim's cultural life.

NTNU has signed sponsorship agreements with the Chamber Orchestra and the Jazz ensemble. In return, NTNU employees have been offered on-campus concerts and tickets at reduced price at certain regular concerts. The NTNU management has also actively used internal talents to produce the annual Christmas cards and gifts. The graphic art work and music CDs have been well received and contributed to widen the perception of NTNU as not only a technology hub, but also a cultural institution.

It is an objective to utilize the multidisciplinary opportunities provided by the wide disciplinary span at NTNU. Multidisciplinary research programmes and educational programmes have been initiated. Music technology is a good example. In this bachelor's and master's programme the students develop electronic music; The necessary knowledge is derived from music theory and performance (Department of Music) as well as acoustics science (Department of Electronics and Telecommunications).

Film and multimedia are newer forms of art at NTNU particularly at the *Department of Art and Media Studies*. The university facilities enable future film directors to try out their ideas in a well equipped studio. The *Trondheim Film Festival*, which was held for the first time in 2005, was an instant success and turned out to be a real competitor to the major film festivals and film awards in Norway. NTNU's film experts contributed to the success in an advisory capacity to the professional film and cinema environment in Trondheim. The chairman of the new *regional film institute* is a university professor from the Department of Art and Media, currently Dean at the Faculty of Arts. The daily operations of the institute is funded by the two counties and the City of Trondheim, while the annual film fund is allocated by the State (NOK 1.5 million in 2006). Although not a large sum of money, among film students and local film creators, there are great expectations for this new regional film institute.

NTNU plans to become even more visible in Trondheim. At the old yard, which today is a lively shoppingcentre with many restaurants, office buildings and apartments, NTNU will rent the Dock House and turn it into a social meeting place and space for the university's cultural activities – theatre, fine arts and music. There will be work space for staff and students, a stage and a café which can be used for art exhibits and the works of the architecture students, as well as popular science lectures and debates. It is planned to open in the autumn 2006.

At HiNT, the first class of *actors* started in 2005. The foundation for this new educational programme stems from the outdoor theatre traditions at Stiklestad with the annual performance about St.Olav. Several well known actors and actresses come from this amateur theatre environment. HiNT also offers teachers' education in music.

5.2.4 The HEIs support cultural groups

The HEIs provide facilities, expertise and learning programmes which benefit certain cultural groups or minorities.

HiNT has a particular mandate with regard to *sámi language and culture*. The education of teachers capable of teaching in *sámi language* is particularly important for the south *sámi* population.

HiST takes particular responsibility for the *hearing-impaired*. The learning programme covers the education of audiographic specialists and deaf language education for teachers.

NTNU offers a Nordic master's degree in *folk dance* in collaboration with the Norwegian Centre for Traditional Music and Dance and a Swedish partners in Stockholm.

5.2.5 The HEIs encourage sporting development

Sport has a unique position in the Norwegian society, both as physical activity and as entertainment. More than one third of the population is engaged in sport in different ways. The HEIs contribute by encouraging sports activity in general and supporting elite athletes in particular.

The Student Welfare Organization (Studentsamskipnaden) at NTNU has its own *sports centres* on the major campuses, and offers the necessary infrastructure for the student athletic teams, as well as training facilities for regular club members. HiST shares the same organization, and HiNT has its own Student Welfare Organization. NTNU's athletics club (NTNUI) has 8000 adult members. The students

also benefit from the many cabins in Trondheim and the mountains in the region which are owned by the Student Welfare Organization.

Many senior athletes are recruited from the HEIs to local athletics teams thereby contributing to the strong performance of several of these teams in national and international championships. The HEIs also cooperate with the Norwegian Olympic Committee and the Norwegian Confederation of Sports and offers *flexible learning programmes to top athletes*, e.g. in cross-country skiing and soccer. Some NTNU students have won Olympic medals in the winter Olympics and others play for the Norwegian national soccer team and Rosenborg soccer club. NTNU has a cooperation agreement with Rosenborg soccer club.

NTNU's *Human Movement Science* Programme offers bachelor's, master's and doctoral degree education focusing on sports and health. Most of these candidates become physical education teachers and coaches. This research environment is engaged in testing and movement analysis to improve athletic performance, e.g. among top-level footballers and ski jumpers.

5.3 Environmental sustainability

5.3.1 Are the campus of HEIs a practical demonstration of best practice to address environmental issues of concern to the regional community?

All public institutions in Norway, including the HEIs, are to introduce *environmental management* (miljøledelse) as of 2006. Priority areas to start with are energy, waste, transport and purchase. As significant purchasers and market operators, the HEIs may contribute to pushing the market in a more environmentally friendly direction. It is yet to see how this obligation will influence HEIs' practice and professional strategies.

There are examples of good practice at the HEIs. At NTNU green contracts are signed with external companies to ensure proper treatment of special waste. Green contracts are also generally encouraged in NTNU's procurement policy. The university has been engaged in energy savings for a long time. This is both when designing new buildings or refurbishing existing ones. Central control systems are improved to better manage energy consumption. Still there are more to save. Both NTNU and HiST aim to reduce energy consumption by 10-12 % in 5 years. The public enterprise ENOVA contributes financially to the HEIs' energy programmes. Regional partners to HiST are the local power utility (Trondheim E-verk) and a local consulting company (Interconsult).

HiNT is experimenting with alternative sources of fuel and uses woodchips from the forestry industry, for heating purposes on one campus. Chips for heating purposes are an abundant energy source in the region, and the university college cooperates with several municipalities to investigate how this energy source can be utilized to a greater extent.

5.3.2 Are there joint initiatives between the university, the regional community and others to demonstrate environmental sustainability possibilities for the region?

Green City

In the Regional Development Plan, one aim is to "Establish the region as part of the Green City Network for new applications of environmental technology for water treatment and ecological energy consumption". Green City is an international brand name and model for development, sale and implementation of environmental technology. SINTEF initiated the Green City project in 1994. With the City of Trondheim's engagement in 2004, the project got a new start and a pre-study was started. Participants in the project are NHO, Sør-Trøndelag County, Innovation Norway, Trondheim Chamber of commerce and trade and the City of Trondheim. The project owners will involve NTNU and

SINTEF in processes and projects to realize the Green City ambition. The main focus for Green City Norway is establishment of a common owned organization working for:

- Commercialization and internationalization of trade and industry in Mid-Norway
- Develop Trøndelag to become a pilot region within sustainable development
- Increased focus on development and innovation based on environmental technology as competitive power
- Establishment of an effective working model for international market and project work

The objectives of the Green City project are related to several of the objectives in the Regional Development Plan and the Strategic Plan for Trade and Industry in Trondheim (Strategisk Næringsplan).

Norwegian Wood Centre

Wood is a major natural resource in the Trøndelag region. Both HiNT and NTNU cooperate with regional partners in this field. The Norwegian Wood Centre (Tresenteret) at NTNU, for instance, was founded by the state, forestry owners and wood industry organizations. The Wood Centre is a national and regional centre of expertise with the aim to increase the value in the whole value chain from wood to wood products, and the use of wood as a sustainable building material. The Wood Centre offers advisory services to architects and entrepreneurs, public and private property development agents. Through its engagement in the Wood Centre, the City of Trondheim has increased its contact with the university and the national wood industry. This is seen as a valuable resource in the development of the timber-building traditions in Trondheim. Currently, a multi-story timber building is completed in one of Trondheim's most central city blocks. The municipality and regional entrepreneurs, cooperate with NTNU researchers to apply and develop new skills for large wood constructions.

Indoor climate

During 2005, researchers and experts on *indoor climate* from NTNU, SINTEF, St. Olavs Hospital and the City of Trondheim have examined the opportunities to better utilize the unique multidisciplinary knowledge in Trondheim. Inspired by the success of the Wood Centre, the City has taken the initiative to possibly develop a National Competence Centre on indoor climate. There seems to be a need for such a centre. Public and private institutions spend millions of kroner on new buildings, but little money is spent on research or on evidence-based advice to the owners of buildings. Money could be saved if the indoor climate was better integrated in the planning and building processes. Realization of this initiative depends on the national political interest in developing such an infrastructure.

Renewable energy

It is an EU objective that 22 % of the energy consumption is to be based on *renewable energy* sources by 2010. Also Norway and the Trøndelag region aim to use more renewable energy. The region is rich in renewable energy sources such as wind, bioenergy and hydroelectricity. NTNU-SINTEF's Centre for Renewable Energy is an international centre of excellence, operating test installations and engaging in national and international research activities. Nord-Trøndelag Elektrisitetsverk (power utility) is active in developing alternative energy sources and has the financial muscle to make changes. Trondheim Energiverk (power utility) is leading nationally in district heating. The technology was developed by the university in the early 1980s. Today the system covers 25 % of the heating demand in Trondheim and contributes to stabilize the local energy supply. The system uses bioenergy as well as residual waste as energy source. The capacity will be expanded to be able to handle residual waste from all parts of Trøndelag. There are also examples of new enterprises entering the scene. In total, renewable energy seems to be an area where a regional cluster could develop.

NTNU-SINTEF's *Centre for Renewable Energy* is engaged in wind research and operates a windfarm test station at Valsneset in cooperation with the local municipality there. However, the research centre

could to a far greater extent be integrated and used in regional energy planning and industrial development. Currently, Nord-Trøndelag Elektrisitetsverk (power utility) seems to be the strongest regional actor in terms of *windfarm* developments. Their new wind parks on the Trøndelag coast, have laid the ground for new industry in Verdalen with the production of wind turbines at ScanWind.

There also seems to be renewed interest in *wavepower*, where the SME project Innovation Mid-Norway has assisted an entrepreneur (Lycro) in Leksvik/Vanvikan to team up with the Centre for Renewable energy at NTNU-SINTEF. NTNUs TTO, Nord-Trøndelag Elektrisitetsverk (power utility) and industrialists from Leksvik/Vanvikan support Lycro's development. So far the idea is patented and a test model of the new wavepower plant is ready. Wind and wave power may also supplement each other. Such as in areas where bird life may be negatively affected by wind farms, wavepower plants can be an alternative.

HiNT has been particularly engaged in *bioenergy*, both as a test user on its own campus, but also professionally, cooperating with several municipalities and offering courses such as Mære Upper Secondary School to promote this renewable energy in the agricultural sector.

A strong regional alliance is formed between industry and trade associations, municipalities and HEIs to lobby nationally with the aim to bring more of the *natural gas* resources off the Trøndelag coast to the region to lay the ground for new industry and power production. Although not a renewable resource, natural gas is nevertheless perceived as an environmentally friendly energy source. NTNU is strongly engaged in gas technological developments. It would, in particular, be a research achievement if a new low CO₂-emissions power plant could be realized. Plans also exist to use natural gas to generate heat energy for Norske Skog's newspaper production at Skogn, and use natural gas from the prospective pipeline in the Trondheim Fjord for heating and industrial development purposes along the pipeline.

Higher education

The HEIs address environmental issues in various *education and research* programmes. The most important ones are:

- Nature Management (HiNT)
- Building technology and environment (HiST)
- Energy and Petroleum – Resources and Environment (NTNU)
- Industrial Ecology (NTNU)
- Health, Security and Environment (NTNU)

In these areas, students and staff members are engaged by regional actors in various ways. *Academic staff*, for example, undertake contract work for enterprises in terms of environmental audits or surveys on the indoor climate. Often external demand exceeds institutional capacity. In industrial ecology, the *master's students* are not numerous enough to take on all the projects which external enterprises and public institutions wish to have done. With increased emphasis on environmental management in public and private sectors, the demand for candidates and students with knowledge of life cycle analysis etc. is likely to increase.

In regional terms, it is only exceptionally that regional partners can afford to finance *PhD projects* and thereby increasing the HEIs' capacity to serve external partners. The City of Trondheim has, for instance, financed a PhD candidate at NTNU's research group on Industrial Ecology to develop a decision support tool on climate emissions. The municipality has an ambitious climate action plan, with an emissions reduction target for 2010 of 20 % compared to the 1990 level. In trying to implement this plan, Trondheim faces some serious challenges, which start with actually keeping track of the emissions, to understanding how different decisions at the municipal level affect emissions, to finally selecting, implementing and evaluating measures aimed at reducing greenhouse emissions.

5.4 Conclusion

5.4 1 Collaboration between regional stakeholders related to social, cultural and environmental development: (1) between the HEIs in the region and (2) Collaboration with other regional stakeholders (i.e. business, local government, social partners etc)

Social development

There is increasing collaboration between the HEIs in the social and healthcare education, as well as extensive collaboration with the *regional authorities* and public institutions in this sector. Collaboration covers vocational training as well as development work. The NTNU's master's degree in social work is an instrument for further qualification of academic staff at the university colleges as well as for personnel working in the social sector.

The students' welfare is primarily taken care of by the *Student Welfare Organization* and covers housing, primary healthcare, kindergardens and leisure time activities (sports and cultural events). Trondheim has become the preferred place of study for disabled students thanks to the *Lucas project* which is the result of cooperation between NTNU, HiST, the Student Welfare Organization, the Municipality and the *insurance company Gjensidige*.

Cultural development

NTNU, with its environments in film, fine art and music, is a major contributor to the cultural life in Trondheim and the region. There are several spin-offs from these environments (e.g. Jazzfestival, Chamber Orchestra, Film festival). The students organize concerts and festivals which contribute to Trondheim's reputation as Student Town no. 1 (e.g. the student festival UKA and the international student festival ISFiT). These cultural activities could, however, not have taken place without sponsoring from the HEIs themselves and external partners such as *the City of Trondheim, Sør-Trøndelag County and Central Norway Chamber of Commerce and Trade*.

The Museum of Natural History and Archeology (NTNU) and the Science Centre (NTNU and HiST) are important tourist attractions for the regional population. In terms of science and technology dissemination, *Innovation Norway, the Research Council of Norway, Sparebank 1 Midt-Norge, SINTEF and other technology intensive companies* are important collaboration partners to the HEIs.

Environmental sustainability

National and regional policy encourages increased collaboration between HEIs and regional stakeholders in environmental areas. The introduction of *environmental management* in all public institutions as of 2006 is likely to increase demand for education in this field. The three HEIs offer relevant courses and educational programmes for regular students and distant learning.

Energy savings programmes with state funding from ENOVA and the political objective to increase the production of renewable energy, also trigger closer collaboration between the HEIs, regional industry and regional authorities. *The City of Trondheim* aims to become part of the international Green City network and views the HEIs as key partners in this respect. *Nord-Trøndelag Elektrisitetsverk* (power utility) is a motor in regional development of wind power production and industry development. It is up to the Storting to decide to what extent the natural gas resources off the coast will be utilized for industrial development in the region. In any case, energy and environmental-related research is a significant industry engaging 600 researchers at *NTNU and SINTEF*.

5.4 2 Strengths, weaknesses, opportunities and threats related to social, cultural and environmental development in the region

Strengths

The HEIs function as *competence centres for the health and social care services* in the region (vocational and professional education, further and continuing education, consultancy and R&D).

The HEIs accommodate the *needs of minority groups*. The south Sámi language is offered at HiNT and deaf language at HiST. Special arrangements are made to integrate handicapped students in Trondheim.

Staff and students of the HEIs contribute to the *voluntary and public cultural life in the local community* (e.g. Trondheim symphony orchestra). The many events and concerts organized by the student organizations are often also open to the local population (e.g. the student festival UKA).

One in five citizens in Trondheim is a student. It is justified to market Trondheim as Student Town no. 1. There are more than 400 student organizations. The Students' Association organizes political debates, concerts and parties in the student union building which is one of the landmarks of Trondheim. UKA and ISFiT are among the largest cultural festivals in Norway.

NTNU operates important *cultural institutions* in Trondheim (the Museum of Natural History and Archeology and the Science Centre).

There are several examples of *cultural innovation* from the NTNU environment: the Chamber Music Festival, the Jazz Festival, the Film Festival, Norwegian Chamber Orchestra and Trondheim Solistene). The regional mobilization to get the new national Rock centre in Trøndelag rather than Oslo has produced results. There are also plans to set up a Museum for the deaf in Trondheim.

The students add substantial numbers to regional sports activity at top international level. The NTNU sports club has 8000 members. Dancers from this club became world champions this year. The HEIs offers flexible education to *top-level athletics* (Olympiatoppen). NTNU educates sports coaches and sports teachers and pursues research on sports performance.

Weaknesses

It is a national challenge to integrate ethnic minorities in society. There is particular need for ethnic minorities as role models and cultural translators in healthcare and teaching professions. The HEIs come short in terms of recruitment of staff and students with an ethnic minority background. This is also only to a limited degree a theme in education and research.

Opportunities

Business based on cultural activities, arts, entertainment and creativity is one of the fastest growing sectors in Norwegian economy. The HEIs and the public sector may stimulate *cultural-based business and industry* (e.g. Tindved Culture Garden in Verdal and the proposal to establish a culture incubator in Trondheim, Idékult City).

Connecting health, culture and environment may also offer new opportunities for business and industry. In Nord-Trøndelag a research project investigates how culture may be an instrument to further public health. The university college is also an active regional partner for *sustainable development of rural districts*, e.g. the development of new industry, small scale production and the farm as a learning arena in school.

The counties and municipalities have various programmes and projects to support settlement and industry development in the districts. *Blilyst*) in the inland municipalities in Sør-Trøndelag is one example, with priority to broadband development and incentive funding to further local creativity. HiST students have contributed with project work, but the expertise at the university college could have been even better utilized.

All public institutions are to have an *environmental management system* as of 2006. The HEIs can be pioneering institutions for environmentally friendly procurement and operation. Increased focus may also lead to more demand for education and research in environmental fields. The City of Trondheim has for instance taken an initiative to investigate if Trondheim may develop a national centre on indoor climate based on the competence of NTNU, SINTEF and St. Olavs Hospital.

There are collaboration projects between the HEIs and regional actors on *sustainable energy* which may have substantial impact on regional industry development (e.g. plans for a gaspower plant at Skogn, bioenergy, wind power, small-scale hydroelectric power plants).

Threats

Unemployment rates of less than 4 % are small in a European context. The figures, however, partly hide that an increasing number of people receive social security or are defined as incapable of working. These people are marginalized in working and community life. The HEIs represent a resource for occupational retraining, but there is a risk that one educates adult people to new unemployment and recipients of social security.

When 30 000 students make up 20 % of the population, they set an imprint on Trondheim for good and for bad. They give colour to the city and customers to local trade and business, but they also live rather isolated from the city and the local community. The will to invest in the local community is affected by the fact that most of the students are staying in the city only for a short time. The students crowd out the local citizens in certain parts of the city.

Chapter VI: Capacity Building for Regional Cooperation

Capacity building for regional cooperation is the essence of the Regional Development Plan:

If our politicians and public support systems acted together and on a regional basis to develop common strategies and plans of action, this will bring considerable advantages in terms of our competitiveness and business innovation. Education, research, culture and business are to be developed by interaction on a regional basis. The synergy effects will bring broad and far-reaching social benefits. The region has to stand behind the priorities that are decided if we are to have a chance to influence the national framework conditions.

The Regional Development Plan is binding for the two counties and the City of Trondheim, but it is not only a plan for the public sector. A number of actors, the HEIs including, have voiced their willingness to take social responsibility and contribute to the development processes. Institutional ownership by all the regional partners is fundamental if the Regional Development Plan is to succeed. In preparing for the Regional Action Programme 2006, it is stated that political attention first of all will be given to projects where:

- joint action will make a difference
- there are available resources and commitment by the regional partners
- success is likely

In the previous chapters, there are many examples of areas where there are mutual interests between the HEIs, regional authorities and other regional stakeholders. The interest in and the incentives to engage in regional activity has been touched upon and will be further elaborated here.

6.1 Mechanisms to promote HEI-regional involvement

6.1.1 What formal and informal mechanisms exist to identify regional needs? Has the catalyst for regional engagement been internal or external to HEIs?

The catalyst for regional engagement has been both internal and external to the HEIs. Particularly in experience-based education and development, there is a direct mutual benefit of close cooperation between the HEIs and the regional employers. In these areas, *informal networks* between academic staff and regional institutions and enterprises are important mechanisms to identify regional needs and adapt educational programmes and development effort to satisfy these needs.

The university colleges have always been expected to fill a regional role and serve regional needs. It is part of their public mission. The regional dimension is not spelt out for the universities, and it is up to the university to define if regional collaboration is productive relative to the national mission. In the case of NTNU, the main catalyst for regional engagement has thus been *external*. The university is responding and is becoming engaged in an increasing number of *regional projects* usually together with the university colleges.

External funding, not least the industry related programmes from the Research Council of Norway, has enabled the university colleges to set up their own projects to develop networks with regional industry and the public sector. These projects have been instrumental in identifying regional needs, and have resulted in increased project volumes and new cooperation partners. The projects have also stimulated an institutionalization and a build-up of administrative capacity to cope with external relations at the university colleges on a more permanent basis.

External members of the governing and advisory bodies of the HEIs are potentially instruments for identifying regional needs. The Board members are appointed by the Ministry of Education and Research. At the university colleges, all board members come from the region. In the case of the

university, two of the four external board members, including the chairwoman, know the region well and may contribute to strategic discussions about the HEIs' regional role if this should become an issue. There are also advisory bodies at faculty level with external representation. At the university colleges these representatives typically come from public institutions such as upper secondary schools, municipalities, hospitals and directorates, and from industry associations or companies in the region. At NTNU, external members hold top-level management positions in companies as well as public and private institutions in relevant sectors (R&D, HE, industry and health sector). Depending on the sector, one or more external members come from the region.

External Board Members ²⁴		
NTNU	HiST	HiNT
- Chair, Marit Arnstad, Law firm Schjødt, Trondheim (lawyer, former Minister for Oil and Energy) - Morten Loktu, Statoil Research Centre (director) - Christian Thomessen, professional board member (MBA) - Siri Beate Hatlen, professional board member (chartered engineer)	- Torbjørn Auran, Norwegian Agricultural Supply Cooperative (director, feed development) - Torstein Vik, Medical Faculty, NTNU (professor) - Grete Samstad, St. Olavs Hospital - Inga Balstad, Selbu (former County Council member)	- Hanne Ellekjær, Levanger Hospital (physician) - Karl Audun Fagerli, Lierne Municipality (chief officer) - Ragnhild Saxebø Nordset, Verdal Upper-Secondary School (headmaster) - Håvard Størseth, Nobø Electro Ltd. (technical manager)

Of the three HEIs in this study, HiNT has the strongest regional orientation. This is reflected in HiNT's close relations to the county at political and administrative level, as well as through cooperation agreements with the larger companies and health authority in the county. These external partners serve as gateways to define regional needs and have substantial influence on HiNT's activities.

The regional dimension in higher education is not very developed in Norway. Each county has its university college. Cooperation between HEIs rests on mutual interest and voluntary action. The *Mid-Norwegian Network* is a cooperation forum for the HEIs in Trøndelag, Møre and Romsdal. The objective is to develop educational programmes and courses to meet regional needs. In reality, this loose network has little impact on the HEIs' educational offers. The market in higher education plays a more significant role.

Are their formal processes such as signed agreements that bind those in the engagement relationship?

The HEIs have signed agreements with certain regional actors which have binding effect on educational activities and R&D efforts.

The HEIs have for instance cooperation agreements with *municipalities* for trainee places, development work and student projects, as well as decentralized education. HiST and HiNT, for instance, have cooperation agreements with all municipalities in Trøndelag for trainee places for their health- and social care education. There are also agreements with "Municipal Regions" such as Fosen, Orkdal, the Inland²⁵ and Trondheim, on decentralized education and development projects.

In volume and funding, however, the cooperation agreements between the HEIs and the regional *hospitals and Regional Health Authority* are the most important (see box).

²⁴ The Board of HEIs has 11 members: external members appointed by the Ministry, 4 academic staff members, 1 administrative staff member and 2 students elected by their respective groups. NTNU has chosen to have an external chair of the Board, while the university colleges have maintained the traditional model with the Rector as chair.

²⁵ Blilyst:) cooperation between eight inland municipalities in Sør-Trøndelag.

Cooperation fora between the Regional Health Authority and regional hospitals

The health sector is important for all the three HEIs and coordinating fora are established between the Regional Health Authority, regional hospitals and the HEIs:

The forum for collaboration between the Regional Health Authority and the *regional university colleges* has primarily dealt with developing efficient systems for the distribution of trainee places for students. The university colleges deliver continuing education and courses for the regional hospitals, and the Regional Health Authority is planning to create a “health academy” to coordinate the human resources development activities for the regions’ 15 000 hospital employees.

Another forum coordinates activities involving *NTNU and St. Olavs University Hospital*. This forum has also been given responsibility for the distribution of R&D funding (NOK 88 million in 2004). NTNU administered NOK 37 million of this funding directly. NOK 31 million was distributed by the coordinating committee between St. Olavs Hospital and NTNU. The university colleges only obtained NOK 1 million for R&D activities in 2004, but there is a far greater research potential, according to HiST.

The Regional Health Authority has set up a *research committee* with participation from the HEIs, which is to offer advice on strategies and priorities for R&D work. As this committee represents both university and university colleges, this work is likely to have an impact on the future resource distribution.

The HEIs have some formal cooperation agreements with *larger companies in the region*, but they certainly have a wider network of project-based cooperation with industry, research institutes, new development organizations, public institutions and cultural institutions in the region. The list below is limited to *formal agreements* with large companies in the region. Several of them are part of national and international corporations.

Table 6.1: Formal cooperation agreements between the HEIs and large companies in the region

<i>HEIs</i>	<i>Large companies present in the region</i>	<i>Contents of formal agreement</i>
NTNU	SINTEF (research)	See Section 3.1.1
	Statoil Research (oil and gas)	The formal agreements are with the parent company on PhD education, student projects and R&D. R&D collaboration with the companies’ research units in Trondheim.
	Telenor Research (telecommunications)	
	Sparebank 1 Midt-Norge (savings bank)	Innovation and entrepreneurship
HiST	TINE Mid-Norway (dairy)	- trainee places and continuing education
	Gilde (meat producer)	- trainee places
	Norwegian Seafood Federation (FHL)	- R&D cooperation
	TrønderEnergi, Nord-Trøndelag Energiverk (power utilities)	- trainee places
HiNT	Nord-Trøndelag Energiverk (power utility) Norske Skog (pulp and paper) Aker Kværner Verdal (shipyard) Nord-Trøndelag Hospital Trust (part of Central Norway Regional Health Authority)	A mutual partnership agreement which covers: - continuing education - R&D work - recruitment of skilled personnel - organizational development
	Marine Harvest AS, Lerøy Midnor AS, SalMar AS (aquaculture)	Intention Agreement on continuing education and R&D (fishhealth and management).

6.1.2 Have government and/or regional authorities undertaken an audit of the knowledge resources of the region in terms of: (1) the expertise, skills and experience of people in the regional population; (2) the research places and spaces; and (3) the accessibility of research and learning infrastructure for new innovative knowledge generating and dissemination initiatives?

The regional authorities generally follow developments through key variables that are of importance for regional development. However, there are no specific audits of the knowledge resources in the region.

(1) In terms of *expertise, skills and experience* in the regional population, we have to use national surveys. Statistics Norway for instance provides statistical information about the education level in the population (see Annex I, Section 2).

(2) *Research places and spaces* are relatively few and mainly concentrated in the two regional centres, Trondheim and Steinkjer.

(3) In terms of *accessibility to research and learning infrastructure for new innovative knowledge generating and dissemination initiatives*, the Counties Regional Development Divisions keep track of incubators, industry parks, innovation environments etc. and their various activities.

6.1.3 Does the region's strategic plan include the role of the HEIs as a key element?

In the *Regional Development Plan* (2005-2008) three basic drivers for regional development are identified: Creativity, Competence and Interaction. In the Action Programme, "Trøndelag as the leading region in the country on education and competence" is one of the focus areas. Projects are defined where the HEIs and the regional authorities are key actors in the partnership.

The goals and strategies for wealth creation in the Regional Development Plan are followed up in the *municipal and industrial plans for the City of Trondheim*. The research and education environment in Trondheim and the ability to utilize these resources in innovation and commercialization are central elements of the City plans.

In the *regional development programme* for Nord-Trøndelag County, HiNT's role is defined "to be the most important resource for competence development in Nord-Trøndelags". HiNT is engaged in county development from regional planning to conduct of development projects.

6.1.4 What resources are made available to HEIs by government and others to support regional engagement? How are these distributed? What incentives and support are provided to support regional engagement of HEIs?

The HEIs have a public mandate to serve the community in general. The university colleges are to take special responsibility in their region. However, as *State funding* of the HEIs predominantly is linked to education production factors, there is little economic incentive in terms of basic funding to engage in regional activities. The volume of externally funded activities is part of the income distribution model applied by the Ministry, but this does not give the HEIs any incentive to work with SME partners whose ability to contribute economically is often minuscule.

When the HEIs, nevertheless, have been able to engage in regional development work and reach out to SMEs in coherence with national and regional strategies, this is primarily owing to *project funding from national and regional sources*. Too high dependency on project funding is, however, problematic because it takes time to organize an efficient support structure and mobilize staff and students.

External partnerships are also vulnerably with a short-term commitment to the project in question.

A higher degree of foreseeability is called for. In order to maintain an external relations infrastructure also at the smaller HEIs, it is important that funding programmes are maintained over a longer period of time and that the institutions may expect a reasonably stable funding level. Within such foreseeable

framework conditions, project-based funding may function and offer some flexibility for both HEIs and funding agents.

Nationally, the Research Council of Norway's industry related programmes are the most important sources for the funding of HEIs' regional development activities (See Chapter III).

At regional level, the Counties, the County Governors' Office as well as the municipalities, contribute to regional development projects involving HEIs. Nord-Trøndelag County has more development resources available than Sør-Trøndelag County. The reason is that the counties obtain regional development funding depending on population and industry development factors. Nord-Trøndelag is characterized by rural districts and has some industrial areas in decline which qualify for public development funding. The result is that HiNT has better access to regional funding than HiST and NTNU.

6.1.5 What processes are in place to regularly review current engagement arrangements between the HEIs and the region so as to build an element of ongoing improvement into the relationship?

There has not been any systematic review of current engagement arrangements between the HEIs and the region, but HEIs' role in regional development is one of the focus areas of the *Regional Development Plan* and its action plan "*the Action Programme*". The Regional Plan will be reviewed after four years in 2008, whereas the Action Programme is to run on an annual basis. Progress reports relating to individual actions in the Interaction Programme are continuously updated.

The Regional Plan is reviewed at political level by Trøndelag Council, a coordinating body consisting of representatives from the two County Councils and Trondheim Municipal Council. "How to develop a coherent competence system in Trøndelag", was a topic at the Trøndelag Council's meeting in September 2005. Regional partners such as the HEIs and industry associations were invited. The Regional Development Plan is, evaluated by the Norut Group Ltd, Tromsø (Arbo et al., 2005), and the first results from this follow-up project were also presented at this meeting of the broad regional partnership.

In the *health sector and school sector*, formal cooperation structures and regular meetings between the owners and the HEIs, facilitate continuous reviews and improvement in relationships.

The *funding institutions* (Research Council of Norway, Innovation Norway, counties etc.) also review their funding programmes on a regular basis, but the HEIs are not necessarily part of such review processes apart from regular progress reports and final reports when projects are completed.

6.1.6 How do government and/or regional authorities evaluate the success of HEIs in regional engagement? Have government and/or regional authorities identified any good practice in respect of regional engagement of HEIs and if so how has this been disseminated?

Regional authorities have thus far not systematically evaluated the success of the HEIs in regional engagement. But the *regional actors*, who follow this activity closely, certainly note examples of good practice. The TrønderJämt project is often cited as a success story, and it is claimed that the working methods and funding mechanisms applied in this project ought to have been continued on a more permanent basis. With only minor seed money, students and their academic supervisors were able to reach out to SMEs in the districts who otherwise never would have had access to their expertise. Some of this good practice will now be followed-up with regional co-sponsorship in the planned Idéportal.

The *Ministry of Education and Research*, representing the owner of the HEIs, has annual meetings with the HEIs. In their *management dialogue* with the university colleges, their regional role is a priority topic for discussion. The HEIs are also expected to deliver an extensive *annual report* to the

Ministry. In 2005, all the HEIs and the universities were asked to report on “to what extent and how the institutions cooperate in R&D with local and regional working life and social life”.

6.1.7 What formal and informal mechanisms exist to coordinate the activities of HEIs in regional engagement both within HE sector and with those of other participants?

Formal and informal mechanisms exist to coordinate the HEIs’ regional engagement. In *education*, the HEIs in central Norway have cooperated in Mid-Norwegian Network since 1996. This network has led to wide cooperation on subject development, division of responsibility and exchange of personnel. It has also contributed to strengthen the Trøndelag region vis-à-vis the Ministry. So far it has not been engaged in any marked development of higher education to meet regional needs. This OECD study may, however, encourage the HEIs to do.

In terms of *industry development and innovation*, external funding opportunities have brought the HEIs together and strengthened informal and formal networks with other regional development actors. The EU Interreg Programme is typical in this respect. In the application process as well as in the operation phase, the actors learn to know each other better and clarify their respective roles. This is of value in itself, in addition to the more substantial objectives of the interregional development projects. If successful, one project has tended to lead to another one. This was the case in e-learning (DO-IT 1999-2000 and Netbased Education on Commission 2005-2008), as well as in knowledge transfer to SMEs (TrønderJämt 1997-1999 and Skandia Take Off 2000-2005).

6.1.8 Do the HEIs make use of existing regional community infrastructure for its operation? Also, does the community access HEI infrastructure for its day to day needs? (i.e., testing laboratories, libraries, sporting and cultural facilities, transport, accommodation for students, etc)

The HEIs in general do not make use of existing regional community infrastructure for their research and education operations. The institutions are mainly self-contained, but may rent localities for lectures or office space when internal capacity is inadequate. The HEIs have their own libraries and reading rooms, but students also make use of the public libraries in their studies when this is more convenient for them.

The HEIs, especially in Trondheim, are also largely self-contained in terms of social welfare and leisure opportunities for the students. The Student Welfare Organization in Trondheim provides housing for 13 % of the students. Their sports facilities, health service, kindergardens and cultural localities are widely used by the students, and cover most of the students' needs. When this is said, staff and students are also engaged in the activities of local institutions and organizations. This is further described in Chapter V.

The same picture applies to the community, which does not access to the HEI infrastructure for its day-to-day needs. Apart from the campus park areas which are open to the public, the HEIs’ infrastructure is for the HEIs’ own use only. However, more interaction between HEIs and the community is discussed in the NTNU-HiST 2020 project. In this project representatives from NTNU, HiST, SINTEF, the Student Welfare Organization and the City are drawn into a discussion on the HEIs’ future and their needs such as increased capacity for student housing or sports facilities. Among the physical scenarios which are drawn up in this project, we find a new learning centre/library and an Innovation Village. Both ideas combine internal needs and a desire to lower the threshold between HEIs and society.

6.2 Promoting regional dialogue & joint marketing initiatives

6.2.1 What mechanisms exist to promote communication and dialogue between HEIs and regional stakeholders?

In this chapter, several mechanisms for communication and dialogue between HEIs and regional stakeholders have been mentioned:

- *Cooperation agreements with regional enterprises and institutions* provide a common platform for regular meetings typically on educational matters and R&D cooperation. HiNT's partnership agreements with three major regional enterprises and the local health authority is one example. Another example is the formal regional cooperation between all the HEIs and the Regional Health Authority.
- The HEIs are invited on a case-by-case basis to contribute to *strategy and action plan development* in the counties and municipalities. This interaction is becoming more systematic as a result of the Regional Development Plan and Action Programme. Subsequently, the HEIs are involved in various actions relating to the Action Programme whether we speak of developing an innovation strategy or a strategy for internationalization. In Nord-Trøndelag, HiNT has generally been better integrated in regional policy development such as the regional development plan as well as in dialogue with regional development actors.

Trondheim is the *regional centre in Trøndelag*. There is increased awareness of this role both in the city and increased expectations in the region. This is one reason why Trondheim is a direct partner in the Regional Development Plan to promote "Trøndelag as the leading region in education and competence". In later years, Trondheim has engaged in several projects and cooperation networks with the aim to strengthen the city's position as a study and research town. As of 2005, one of the city's priority areas is to establish interaction between the HEI and regional industry and labour market.

One important arena is established under the title *Student Town no. 1*. In this cooperation project the city of Trondheim bring together the HEIs, the Student Welfare Organization, Sør-Trøndelag County, Mid-Norway Chamber of Commerce and Industry and the student organizations. Recruitment of students, to give the students a good period of study in the city, and to encourage more students to remain in the region when they graduate are among the objectives of this cooperation. Trondheim is to be the preferred place to study in Norway.

In order to improve communication between the students and the city, The City of Trondheim has established a *Student Council* (Studentråd) which serves as an advisory body to the Municipality Council. The student leaders from the HEIs in the city have monthly meetings with the political and administrative leadership of the Municipality. One positive effect is that the city is becoming more aware of and willing to respond to the needs of the students.

Trondheim also makes use of its *Nordic cooperation* network with Sundsvall and Østersund, as well as the twin town network with Odense, Norrköping and Tampere, to exchange experience about how to strengthen the city's position as a student town.

6.2.3 What groups are part of the dialogue of regional engagement? How are the regional interests of various sectors of interest such as HE, industry, the private, public and voluntary sectors represented?

The previous sections describe how the HEIs cooperate formally and informally with regional stakeholders and partners. The most comprehensive arena for regional dialogue, however, is related to the *follow-up of the Regional Development Plan*. In this process, the HEIs, industry associations, innovation and funding actors and the labour market agency take part in regional high-level meetings. The partners invited to the Trøndelag Council in September are probably typical for these high-level meetings:

- Trøndelag Council:
- Sør-Trøndelag County
 - Nord-Trøndelag County
 - The City of Trondheim
- Observers:
- Steinkjer Municipality
 - County Governor's Office in each County (represent the State)
 - KS (the Municipality Sectors Interest and Employers Association)
- HEIs:
- NTNU
 - HiST
 - HiNT
- Trade and industry associations:
- Confederation of Business and Industry (NHO Trøndelag)
 - Norwegian Confederation of Trade Unions (LO in the two Counties)
 - Mid-Norway Chamber of Commerce and Industry
- Innovation and funding actors:
- SIVA
 - Innovation Norway in the two Counties
 - Sparebank 1 Midt-Norge²⁶
- Labour market:
- Aetat (Norwegian member of EURES)

6.2.4 What is the extent and nature of HEI staff representation on public/private bodies in the region? What are the reasons for such representation and what is their role? Is such representation monitored?

In the Regional Development Plan work, the HEIs are normally represented by their *University Directors* in high-level meetings. At project group level, *administrative staff* engaged in the respective areas, take part in the dialogue. In Trondheim, there have also been annual meetings between the *Rectors* and the City. Likewise, the Rector is engaged in the partnership dialogue which HiNT has with its major regional partners – Aker Verdal, Norske Skog, Nord-Trøndelag Elektrisitetsverk (power utility) and the Nord-Trøndelag Health Authority.

Academic and administrative personnel from the HEIs are members of boards and advisory committees in trade and industry, as well as in public and private institutions engaged in regional development. They are normally appointed as individuals and the HEIs typically do not have any overview of these engagements.

6.2.5 What role do external bodies play in decision making within HEIs?

No external regional bodies as such play any formal role in the decision making of the University and university colleges. The external members of the board are nominated by the HEIs and appointed by the Ministry of Education and Research. Lately, City Directors from Trondheim have been members of the working group for the HiST 2020 study and the steering committee for the joint NTNU-HiST 2020 project.

The HEIs are *accountable to the Ministry of Education and Research*, as the State owner of the institutions. The political expectations are conveyed in the annual National Budget Proposition to the Storting, in the Ministry's letter of instructions and in management dialogues between the Ministry and the individual institutions. The management trend follows the international pattern with the delegation of powers to the institutions and increased emphasis on quality control systems and accountability towards political objectives. To take education as an example, the Ministry decides which professional and vocational studies the institutions can offer, but the institutions themselves

²⁶ Regional savings bank, which supports regional innovation activities with regional seed capital funding, sponsorship of the Arena Trøndelag network and publication, and the students' Venture Cup.

decide the courses and course content (Section 2.1.1). There should thus be sufficient room for manoeuvre in order to meet regional needs in education.

6.2.6 Are there joint HEI/regional promotion and marketing initiatives or a 'buy local' purchasing programme within the HEIs in the region?

As a result of the cooperation project *Student Town no. 1*, the HEIs in Trondheim in 2005 for the first time joined efforts with the Municipality, County and Chamber of Commerce to promote Trondheim for prospective students. Common brochures have been made and the institutions consider having a joint stand at education fairs. A welcome letter from the City Mayor and Chairman of the County Council was sent to all students who were offered a place to study in the City. Joint international recruitment efforts are also considered.

The various *Interreg projects* also contribute to the promotion of the Trøndelag region compared to the other participating regions.

The former "buy local" procurement policies are in contravention of present legislation. As public institutions, the HEIs have to purchase according to tender.

6.3 Evaluating and mapping the impact of the regional HE system

6.3.1 Have HEIs, collectively and/or individually, undertaken an audit of their (its) impacts on and links with the region? (i.e., Direct economic impact of the institution; Contributions to local economic development; Social and cultural impact)

No thorough audit has been undertaken regarding the HEIs' impact on the region at either NTNU or at the university colleges. In the NTNU-HiST 2020 project, however, socio-economic analyses are made of the impact of the HEIs in general and of relocalizing these institutions near the city centre.

Based on informal calculations made by the Information Division at NTNU, the local impact of NTNU-HiST is estimated to be NOK 4 350 million NOK annually. The *economic impact* is calculated in the following way:

- If we anticipate that 2/3 of the annual operating income of NTNU and HiST (total income NOK 4 000 million) remain in the region in terms of taxes, local consumption, housing expenses, local transport and so on, the annual spending by *the institutions and their staff members* represent an annual value of NOK 2 700 million.
- If we furthermore anticipate that the students spend 70 % of their income and student loans locally (total income NOK 80 000 on average), the contribution of the 28 000 *students* at NTNU-HiST represent an additional value of NOK 1 600 million.
- Lastly, the *participants at conferences* organized by the university probably represent a value of NOK 50 million in the city. The number of participants was 2 800 in 2003. The Norwegian Convention Bureau estimated in 2001 that such participants on average stay 3.6 days in the congress city, and spend around NOK 2 500 a day (about NOK 3 000 at today's price level). Their stay, in addition, has a multiplier effect on the local economy of up to 70 %. All in all, the direct contribution may reach NOK 30 million and the indirect contribution NOK 20 million.

In preparation of this report, the Nord-Trøndelag Research Institute (Roald Sand and Even Bjørnstad) assisted the regional working group on the collection of statistics. They also looked upon the economic impact of the higher education sector in terms of numbers employed and the multiplier effect of the HEIs and the staff and student expenditure. Rather than direct economic impact, they estimated the *impact of the HEIs on local employment*.

The researchers confirmed that the HEIs have a strong economic impact in Trøndelag through the numbers employed, the staff and student expenditure and the contribution to knowledge and

development in the region. Table 6.1 gives the total impact on employment through the staff and student expenditure. The calculations are based on an analysis of the regional impact of a small number of (other) HEIs in Norway (Sæther et al., 2000). The multiplier effects for a full-time member of staff is employed in other HEIs, based on that all staff and students in HEIs are removed to other regions, are justified with the number of students as the share of those employed in the HEIs in Trøndelag. This method gives a multiplier of 1.77 in Trøndelag. This means that 100 employed in HEIs in Trøndelag give 77 other employed in Trøndelag. This method shows that the 5 175 employees and the 31 000 students in the HEIs in Trøndelag give the basis for 9 175 employees or 5.3 % of the total employment in Trøndelag. In addition, there is the impact through the contribution to knowledge and development in the private and public sector in the region. With 20 % of the full-time employees and 18 % of the students in Norway, the HEIs in Trøndelag have a very high economic effect in a region with only 9 % of the population in Norway.

Table 6.1: Numbers employed numbers of students and regional multiplier effects of HEIs in 2004.

Source: Database for Higher Education in Norway.

	Numbers employed in full time in HEIs	Numbers of Students	Students as share of employed	Calculated multiplier	The total effect in employees (included HEIs)	Share of total employment in the region
HINT	376	4255	11.32	2.00	752	0.4 %
HIST	645	7 974	12.36	2.11	1 361	0.8 %
NTNU	4 154	18 772	4.52	1.70	7 062	4.1 %
Trøndelag	5 175	31 001	5.99	1.77	9 175	5.3 %
Norway	25 714	176 136	6.85	1.86	47 828	2.3 %

6.3.2 How are such impact statements used and distributed to the region and further afield to promote the HEIs and the region?

The preliminary calculations originally made by the Information Division at NTNU, are used by the NTNU-HiST 2020 project to illustrate the HEIs' impact. The project has been presented at the Trøndelag Council. Even for the City of Trondheim such impact statements increase the political and administrative awareness of the HEIs' significance for the city and the region.

6.3.3 Do mechanisms exist to raise awareness of the role of HEIs in the region? What is known about the contribution that higher education makes to the region?

The Regional Development Plan, this OECD study, and participation in European regional programmes such as Regions of Knowledge and Regional Innovation Strategy, contribute to raising awareness of the HEIs' role in the region. These are all new initiatives, and are expected to have an impact in the longer run.

6.4 Institutional capacity building for regional involvement

6.4.1 To what extent has academic leadership and central management been altered to engage with regional needs?

Regional activities are integrated in the ordinary operation and decision-making structure of the HEIs. Institutional dialogues with regional partners are conducted by Rector and University Director with support from the HEIs' central administration. In sector specific areas, the academic leadership at the faculties and departments represent the institution regarding external partners.

At both HiST and HiNT, there are two advisers in the central administrations who work full or part-time on external research activities and regional relations.

At NTNU, two advisers in the central administration work on industry relations. One part-time position is established to specifically promote cooperation with SMEs (Idéportalen). The NTNU TTO (16 employees) also play a regional role.

6.4.2 Does the institution's strategic plan include its relationship with the regional community as a key strategy for enhancing viability?

In the strategic plans of HiST and HiNT the regional responsibility is apparent and emphasis is given to collaboration with regional authorities, industry and society at large.

HiNT expresses in its strategic documents that external activities will become increasingly important for the survival of HiNT in the future. External activities will be prioritized to improve its earnings potential. The ability to collaborate with SMEs is of particular significance in Nord-Trøndelag, and HiST has engaged personnel who will be able to radically strengthen such relations.

The mission of HiST is to be a university college serving its students, staff and the region (Strategic plan for HiST 2005-2010). HiST has extensive collaboration with regional industry and has engaged two advisers to coordinate externally funded activities and continuing education. In addition most faculties in have their own employees with the primary task of following up the demand for continuing education, establish collaboration with regional working life etc.

In *NTNU's* current strategy documents, the regional dimension is not explicitly mentioned. However, innovation and knowledge transfer are key missions, with emphasis on the university's national responsibility for knowledge development in science and technology. In order to fulfil this mission, the university will continue to cooperate with the locomotives in Norwegian industry. The political emphasis on the university's responsibility for new industry development and improved competitiveness of Norwegian industry is, however, likely to also strengthen the regional dimension of the university's policy and activity. The public sector also poses interesting opportunities for the university. In medicine and the fine arts specifically, regional partnerships are fundamental for the success of the university.

6.4.3 What are the main channel of communication between regional stakeholders and the institution (senior managers, committees, etc) and who is responsible for regional decisions in the institution?

The HEIs' executive management – *Rector and University Director/University College Director* – have regular meetings with regional stakeholders such as the host counties and municipalities, and are responsible for decisions binding the institution, including resource allocations to institutional support structures.

In sector specific matters, the *deans and academic staff* conduct the dialogue. The faculties are the responsible partner on external R&D contracts and have the authority to develop new courses and operate continuing education programmes.

The main channel of communication between regional stakeholders and the institution continue to be between *dedicated academic staff and project managers* and their external network in industry and society.

6.4.4 What internal mechanisms exist for co-ordinating regional activities within the institution especially in relation to funding issues and what new posts/ offices have been created with an explicitly regional local remit?

The HEIs have dedicated *administrative advisers* in the central administrations to coordinate regional activities internally and serve as contact points externally. HiNT only recently established such an administrative unit for external relations, and expects that this new unit will contribute to an increase in externally funded activities.

At the HEIs the Deans' meetings are important *coordinating bodies* in research and external relations matters. But committees are also set up to cope with specific issues. At NTNU, Rector is personally engaged in the internal business liaison reference group whose aim is to coordinate and further develop NTNU's industrial relations at regional, national and international levels. HiST has set up specific steering committees with external participation for their University College projects with funding from the Research Council of Norway. A commercialization committee is to serve as an advisory body for the HiST Board on patented innovations.

6.4.5 Does the institution use adjunct appointments to add expertise to its capacity?

All the HEIs use adjunct appointments to add expertise to their capacity. Adjunct professors typically hold 20 % positions at the HEIs. At NTNU there are some 225 adjunct professors many of which come from the research institute SINTEF. In many areas the institutions are strongly integrated both at strategic and operational levels.

HiST and HiNT have a different academic composition than the university. For the time being, there are 9 adjunct professors at HiST and 4 at HiNT.

6.4.6 In what ways is the institution responding to regional ICT infrastructure and is it adopting new technologies to restructure their own management structures?

The HEIs are leading institutions in the application of new ICT infrastructure in the region. NTNU early started to install a *wireless network* on the university campuses as a service to the students, and is currently cooperating with HiST and the City of Trondheim regarding installation of a wireless network in the city and along the bus line from the city centre to the main campus areas.

The students are a motivating force in many new ICT infrastructure projects. NTNU Library will create a *learning lab* in their new localities on Dragvoll campus (NTNU). One aim is to provide group work facilities with access to the wireless net and video/DVD equipment (BIBLAB project). Electronic knowledge resources are becoming increasingly important, and the library is giving priority to the subscription of electronic academic journals.

HiST has been a pioneer in *e-learning* nationally and took advantage of being one of the first institution to educate computer engineers in Norway. Today, HiST has 400 regular ICT students and more than 1000 part-time students spread all over the country following HiST's e-learning programme via the internet. More than 70 courses are offered as distant learning, making HiST Norway's number one deliverer of ICT courses on the internet. Also the other HEIs make use of ICT tools in education and distance learning.

HiNT has also been in front with regard to the application of modern ICT tools in administration, being one of the first HEIs to introduce *electronic archive systems and electronic case work*. NTNU has followed suit and will gradually implement its electronic archive and administrative work system in 2005-2006. An *electronic invoicing system* was fully implemented in 2005.

6.5 Human & financial resources management

6.5.1 How is the regional dimension incorporated into the human resources policy of the institution?

The regional dimension is to some extent present in human resources policy at the HEIs. The HEIs take *social responsibility* and offer apprentice contracts to pupils in vocational training in the region. The HEIs also take certain responsibility to integrate disabled people in the labour force.

In the university colleges' human resources policy, the regional dimension is visible also in the *academic career policy*. Due to the educational structure of the university colleges (primarily bachelor's degree programmes), the institutions have thus far primarily employed assistant professors. Both university colleges aim to be able to offer more master's degree programmes notably related to the vocational professions. This is, however, dependent on a stronger research base. Both institutions thus try to increase the *research time* available to their academic staff and encourage staff members to obtain a *doctoral degree*. In this process, the use of *adjunct professors* plays an important role in terms of academic quality as well as in building relations to strong research and industry environments in the region. HiNT also wants to increase the number of *external lecturers* with top qualifications from the region as a mechanism to promote regional activity with external funding.

There may be *internal tension* between academic qualifications which are dependent on basic research work, and the needs of regional actors which may lean towards development work with little academic value. This is a dilemma for the HEIs in their human resources policy.

6.5.2 What training is given to staff with regional responsibilities? How is staff rewarded for regional engagement?

No specific training is given to staff with regional responsibilities. There are no special rewards for regional engagement.

Organized training programmes or project management skills development may, however, be included in R&D projects funded by the *Research Council of Norway*. The Research Council has for instance contributed financially to enable university college staff members to take courses and obtain a master's degree in innovation and entrepreneurship within the Innovation Net cooperation between NTNU and the Norwegian university colleges. In general academic qualification among staff members are encouraged and may lead to an increase in personal salary (annual wage negotiations).

6.5.3 How are regional and national funding streams managed? What are the possibilities of financial decentralization within the institution? How does the institution embed new devolved financial responsibilities into academic life?

Externally funded *infrastructure projects* are managed at institutional level. This is because such projects or programmes engage staff and students across faculty divisions. Knowledge transfer projects involving students is typical in this respect.

The faculties are strong at all the HEIs in the region and they manage the majority of the *externally funded research and education activities* of the HEIs whether these are nationally or regionally funded.

The autonomy which the institutions have been given is actively used by the HEIs. The university colleges have systematically redistributed budget resources to make room for increased research time for their academic staff. This is necessary as higher academic standards among the academic staff are one of the prerequisites for NOKUT accreditation of degrees and vocational qualifications. The HEIs are also adapting their education programmes and course content to make their offers more attractive in the educational market or to meet specific needs in the public or private sector. The university

colleges, in particular, have successfully utilized the growing continuing education market as a supplement to their regular offers.

6.5.4 How are new resources for regional engagement and activity generated? Who pays for the regional role of the institution?

The *Ministry of Education and Research* provides *basic funding* for the HEIs' general engagement in knowledge transfer to society. The incentive-based budget distribution model, which the Ministry applies, will also include research activity as of 2006. The budget distribution model is likely to be further developed to also reward dissemination and innovation activities. This additional factor is viewed as important in order to give the university colleges the incentive to continue their regional engagement.

Other funding for regional activity is on a *project basis*. The most important source has been the *Research Council of Norway's* industry related research and development programmes. At regional level, the *counties* are a major contributor either directly or via the county offices of Innovation Norway. This is especially the case in Nord-Trøndelag.

As mentioned in other parts of this report, there are many other regional partners contributing financially to the HEIs' regional role and activity. Examples are municipalities, major enterprises and public institutions, as well as regional industry and trade associations.

6.5.5 What new regional funding streams are emerging which the institution can tap into? What mechanisms are being established to tap into these sources?

There are no particular new regional funding streams emerging, which the institutions may tap into. If the HEIs are to play a stronger regional role, increased regional funding is called for.

There are, however, some promising new national funding opportunities, which ought to be utilized better by the regional actors (Section 3.2.3).

- *SkatteFUNN – the tax-rebate programme for R&D expenditure* in business and industry can be exploited more than today. NTNU is nationally very active, but the regional contract research potential for NTNU, as well as for the university colleges is probably underexploited. Proactive work by relevant actors in the region could change this situation; Experience from the Research-based competence brokerage projects in Nord-Trøndelag proves that such an approach works. More regional funding to this effect would be welcome.
- *Norwegian Centres of Expertise (NCE)* and *Centres of Research-based Innovation (SFI)* are new large programmes funded by the Research Council of Norway. In these programmes it is a prerequisite that one is able to bring together excellent research environments with strong industrial partners. With long-term R&D commitments, the aim is to create economic winners on the international market. It is expected that NTNU and SINTEF will be engaged in several projects, but it is too early to see how regional industry can be integrated in these prestigious projects.

6.6 Creating a new organization culture

6.6.1 Are there any significant cultural obstacles to adopting greater regional engagement within the institution (i.e. the connotations which regionalism has with parochialism, newness, and unsophistication)? What efforts have been done to overcome these obstacles?

The regional mission is well embedded in the organizational culture of the university colleges which from the outset were established to serve regional needs. This is less so for the university.

NTNU's strongest identity is linked to its national mission in science and technology and the *responsibility for basic research and knowledge development of international quality*. To fulfil this mission, the research environments in science and technology primarily orient themselves towards other universities, research institutes and research-based industry. Some of these are situated in the region, such as the research institution SINTEF, but internationally oriented and financially strong cooperation partners who are able to fund basic research activity, are far between in the region. There are some strong research environments at HiST, but cooperation between the neighbouring institutions has been limited. In general, integration or increased cooperation with the university colleges and SMEs in the region is viewed as being counterproductive for the university's international academic ambition by many research groups at NTNU. This perception is widespread in the academic culture in science and technology and is an obstacle to achieving greater regional engagement in these environments.

The university has always been expected to contribute to new industrial developments and spin-offs from its research and development activities, but there are increased political expectations that a university of technology like NTNU, also should take on certain responsibility for regional development in Norway. The technology management environment has for many years been engaged in this field (Centre for Entrepreneurship). Students are also engaged in knowledge transfer in terms of project work in regional enterprises and institutions. Innovation activity is, however, placed higher on the political agenda of the university and more resources are allocated to this mission (e.g. TTO). The university's strategic priority areas are given a specific mandate to promote innovation. The university's innovation and knowledge transfer efforts will benefit the Trøndelag region in terms of spin-off companies, but also knowledge development in existing industry. In both types of activity, however, it will be important that regional authorities provide the financial incentive to do so as well as the infrastructure to ease the development of new industry.

6.6.2 Is regional engagement part of the institution's mission? Has regional engagement become part of the academic mainstream of the institution? If so, how far this has influenced mainstream teaching and research?

NTNU's mission is described in the above section. It is clear that regional engagement is not part of the academic mainstream of the university, but there seems to be a slight shift in attention encouraged by increased focus on innovation, which has led to more institutional and to some extent academic interest in regional engagement in Trøndelag.

The regional mission is, on the other hand, well embedded in the organizational culture of the university colleges. This is among the academic staff as well as in teaching and research activities.

HiNT's vision is to be leading in knowledge and competence development in Central Norway. This is reflected in the educational activities which are geared to improve the inhabitants' competence in refining the natural resources in the region such as wood, green and blue food resources as well as renewable energy. The university college also takes its regional responsibility in vocational education to meet the needs in the school and health sectors. The university college adapts its educational activities to regional needs. This is also reflected in research and development activities. Regional engagement is an integral part of all activities at HiNT.

HiST's vision is "With profession and subject in focus – quality based vocational practice and research". The R&D objectives are to devote 25 % of the academic resources to research. The research activity is to primarily have its basis in regional needs, but be of national and international relevance and quality. The R&D work is to contribute to good quality in educational programmes and provide society with updated knowledge in the fields of study which HiST offers.

HiST has extended cooperation with the working life in the region. With funding from the Research Council of Norway, HiST is currently working to develop a multidisciplinary and cross-sectoral culture in innovation and entrepreneurship in order to better meet the needs of regional enterprises. Changing attitudes takes time. On the one hand, it is necessary to develop incentives for the academic staff and the institution as a whole to engage in regional activity and innovation related work, and on the other hand, investigate how the university college's capacity to take on external contract work can be increased.

Chapter VII: Conclusions: Moving Beyond the Self-evaluation

7.1 Lessons to be learned from the self-evaluation process

Which practice and methodologies seem to be the most promising for strengthening regional capacity building, and what factors make for their success?

Based on the experience from regional projects of good practice, key success factors are:

- *Low threshold* for industry to get in touch with the HEIs. This is one of the objectives for the new joint Idéportal which the HEIs in the region are currently developing.
- *Outreach activity* is necessary in order to make companies understand that they may take advantage of the HEIs' expertise. *New development organizations* such as business gardens, business incubators and competence parks are important links between the SMEs in the districts, the HEIs, the public support system and financial operators. There are lessons from the Innovation Mid-Norway project as well as the Research-based competence brokerage projects. The SMEs, but also larger companies, do not necessarily come to the HEIs, the HEIs must come to them.
- *Appropriate financial incentives* both on the part of the HEIs (staff and students) as well as the industry partner. Relatively small means can give valuable output.
- *Long-term funding and stable framework conditions* are important in order to strengthen the HEIs' capacity to engage in regional activity and maintain an administrative infrastructure to coordinate activities internally and serve as a contact point externally. The Ministry of Education and Research takes responsibility for basic funding in education and research, but not for regional industry, social and cultural development. Regional economic development is defined as industry or regional policy. Subsequently, available funding for the HEIs' regional engagement has thus far primarily come from the Research Council of Norway's industry related programmes and regional sources (Innovation Norway and the County Authorities). The Research Council's framework programmes have been relatively stable and foreseeable, while regional funding has been less so. The EU and regional authorities have contributed to the Interreg projects. Increased engagement with a longer term perspective is desirable if the HEIs are to play a more active regional role.

What synergy is there between the aims and objectives of institutions and regions? Are there conflicting interests?

The *Regional Development Plan* shows that there are potential synergies between the aims and objectives of the HEIs and the regions. It is a regional objective to better utilize the natural resources and human capital in order to make the region nationally and internationally competitive. Economic sustainability must be coupled with social and cultural sustainability. This report has shown that the HEIs contribute to making Trøndelag an attractive place to live. The HEIs play a key role in the development of human capital, but may to a greater extent than today contribute to regional economic development and the internationalization of regional industry. If this potential is to be exploited, increased funding from national and regional sources are called for in order to stimulate the HEIs to engage more in outreach activities. This applies both to the provision of distant learning in the districts as well as R&D cooperation with regional industry. Regional funding and infrastructure will also be called for to stimulate innovation and newborn industry developments in the region. It is in the common interest that spin-off companies remain in the region.

Are there conflicting interests? International quality is required if the HEIs are to maintain their relevance as partners to Norwegian industry in the long run. It is also required if the HEIs are to maintain competitiveness in national and increasingly international competition in education. The university colleges must give higher priority to basic research in order to elevate *academic standards* that are required to retain the licence to teach and in the future develop more master's degree programmes. The students represent a significant knowledge transfer resource, but the HEIs already experience that the demand for student projects outnumbers the available capacity in local industry. More effort is required to motivate companies to host students (Section 3.3.1). Insufficient capacity may thus be an obstacle unless external funding makes it possible to increase the number of research staff at the university colleges.

What incentives are there at institutional, departmental and individual level for HEIs to become more engaged?

With relatively small amounts of external funding, the HEIs have been able to provide a valuable service to the regional community. This is particularly due to the *students' project work* in industry and regional institutions. The incentive to take on projects in the districts is, however, meagre. Regionally funded travel money (e.g. TrønderJämt) would in many cases have given students and staff the necessary incentive to reach further out than the hometown of the HEIs.

Political expectations, particularly relating to national innovation policy, give the HEIs a *moral incentive* to engage more actively in regional innovation activity. More projects in the SkatteFUNN *tax-rebate scheme* ought to be taken place in collaboration between industry and the HEIs. Outreach activity, however, costs time and money. The Innovation Mid-Norway project shows that external funding might be available if the right person is available to do such a job.

In general, the higher education *institutions* value externally funded activity because of the direct income it produces as well as the indirect income via the Ministry of Education's income distribution model. On an institutional level, there are thus certain economic incentives to stimulate external activity. For the *individual staff member*, external R&D work may not necessarily be advantageous. Too much development work will not promote the formal academic career of staff members, but the institutions are free to credit such enterprise in annual wage negotiations if they wish to do so.

What are the main challenges facing the different sets of decision-makers?

The HEIs have a double challenge – to increase each institution's *academic quality* and at the same time increase its engagement in *knowledge transfer and innovation* to society. How to solve the academic staff members' time constraint in fulfilling this double task is a challenge for the decision-makers.

A challenge for the decision makers in the regional authorities is to *secure long-term funding* for regional development.

7.2 The potentialities and problems, opportunities and threat for increasing the contribution that HEIs make to the region

Increased political attention to research and innovation, combined with a strengthening of State-funded mechanisms in this area can result in more *opportunities* for increased collaboration between HEIs and regional industry. It is one of the special tasks of the counties to facilitate dialogue and collaboration between regional stakeholders – HEIs, private and public sector. Initiatives to this effect are taken under the Regional Development Plan by both Counties as well as the City of Trondheim.

The university colleges' external pressure to improve academic standards required by the Norwegian Agency for Quality Assurance in Education, pose a potential *threat* to the regional R&D engagements. More *PhD scholarships* for the university college staff members seem to be necessary preferably related to the basic funding of the institution, alternatively from the Research Council of Norway or the counties. Nord-Trøndelag County has offered such scholarships in relevant areas of regional development.

7.3 The way forward: the discussion of the region's vision for future policy

"Creative Trøndelag. Where everything is always possible" is the vision for Trøndelag and Trondheim (Regional Development Plan 2005-2008). Trøndelag is to work towards this vision by further developing the region's advantages and growth motors, and by giving priority to creativity, competence and interaction. The regional authorities look upon the HEIs as instruments for regional development, as part of regional identity and as an industry in itself.

Research and education comprise one of the most important industries in Trøndelag. The research and education institutions compete nationally and internationally to attract knowledge-based activity, gifted students and highly qualified researchers. It is of great significance to the region that the knowledge institutions succeed on the national and international markets. It is recognized that the knowledge industry needs to be given good framework conditions for its further development. On the other hand, it is expected that the HEIs contribute directly to regional development. The Regional Development Plan states that:

- If Trondheim is to succeed as a motor for regional development, the competitive power of Trondheim as a city of study and research must be strengthened.
- The interaction between the knowledge environments in the whole region must be further developed to achieve mutual benefit from the strengths of each other.
- The HEIs must be more closely connected to society and industry in the region to develop relevant offers in education, contribute to the internationalization of regional industry, research-based wealth creation, innovation and entrepreneurship.

National expectations

In national policy, emphasis is given to international quality in education and research. In the State Budget Proposition the Ministry of Education and Research points to the key challenges for the HEIs (St.prpr.nr 1, 2005-2006).

The Ministry claims that an academic strengthening of the university colleges is called for. Even after the mergers in the university college sector in 1994 and the establishment of one university college in each county (HiST and HiNT in our region), there are still academic groups which are not sustainable. The Ministry is of the opinion that it is necessary to look at the division of work between the HEIs, the preferences of the students and the scope of the educational offer at each institution.²⁷ Some university colleges are still geographically dispersed. Co-localization may thus be an instrument to strengthen the academic work. The Ministry is considering if there is a need for further structural change within and among the university colleges. This is a challenge which the region and the HEIs must meet proactively. The Ministry is of the opinion that it will be more important to:

- give priority to what the institution is best at and
- create vigorous academic groups through binding cooperation across institutional borders, or the merger of related academic groups/institutions.

²⁷ The Ministry of Education and Research proposes in the State Budget to close down the engineering education at HiNT from 2006. It is perceived that if HiST can take over the responsibility for the engineering education in Levanger, this would strengthen the engineering education in the region.

The Ministry sets clear objectives for the regional role of the university colleges and their responsibility to offer education at bachelors' level. The university colleges with profession educations are for instance to:

- contribute to professional-oriented research, development work, knowledge development and innovation activities in the regions,
- cooperation with regional industry on educational offers in accordance with regional competence needs, and
- cooperate with regional enterprises on innovation, research and development work.

With regard of the universities, the Ministry points to the responsibility of the universities for the development of international expertise in fields which are significant for the social and economic development in Norway. Emphasis is particularly given to:

- strengthening of basic research (research education and international publishing) and
- participation in international research cooperation.

The HEIs as resource for regional development

This report has shown that in many ways the HEIs are a resource for regional development:

- They contribute to knowledge transfer via the students and to innovation and entrepreneurship in existing industry.
- They attract knowledge-based business and industry and put the region on the international map.
- The HEIs are also central to regional identity "Creative Trøndelag. Where everything is always possible", and they contribute considerably to the cultural life where they are located.

The report, furthermore, shows that there is a potential for utilizing this resource for the mutual benefit to a greater extent than today:

- Based on the student body and the academic priorities of the HEIs, there is a considerable potential for new products and the entry of new firms.
- The HEIs must be more visible and accessible to external collaboration partners.
- Regional co-funding and long-term commitment to funding instruments which according to experience works well, are necessary if regional engagement is to be integrated in the regular operation of the HEIs, public and private sector and the public support system.
- Regional authorities must coordinate their activities and collaborate with all the knowledge providers on a common arena. Capacity limitations should be respected. Thus concentration on a few projects/programmes is called for so that all relevant partners may participate and it is possible to take out the full synergy effects of regional partnership.

The Knowledge City Trondheim

If the HEIs are to succeed as resources and motors of regional development, they must be nationally and internationally competitive. The Regional Development Plan points out the importance of strengthening Trondheim as a Knowledge City. The plan, furthermore, encourages the knowledge environments in the whole region to develop collaboration and achieve mutual benefit from each others strengths. The plan recognizes the importance of HEIs for regional development and identity, as well as the significance of the HEIs as an industry in itself.

The City of Trondheim has recently started working on a strategy for Trondheim as a knowledge city that will be a supplement to the existing strategic plan for the Municipality. This plan will aim at strengthening the cooperation between the local and regional administration, the HEIs, trade and industry partners and the rest of the society. Linked to this strategy process, NTNU and HiST are currently engaged in a strategy process that will have impact on the future development of the Knowledge City.

The involvement of the HEIs in the Regional Development Plan comes basically as a result of project participation in the Action Plan. There are several projects in the Action Plan concerning the HEIs, e.g. “Develop a regional research and innovation strategy” and “Joint efforts in student recruitment”. In addition parts of the NTNU 2020 project are included in the Action Plan.

In the NTNU 2020 project, the university investigates how it is to meet the challenges posed by the globalization of knowledge. The project covers prospective challenges in education, research and third stream activities as well as campus design for the future. A future-oriented campus ought to, for instance, arrange for multidisciplinary activities and external collaboration. In this perspective it would be an ideal solution if all the NTNU faculties could be co-localized near the city centre where the faculties in science, technology and medicine are already located. At the same time HiST stands at a crossroads. In order to strengthen research, the identity as a unitary institution, and improve efficiency in daily operations, HiST wishes to co-localize its scattered faculties near the most important partners NTNU, SINTEF and St. Olavs Hospital.

Against this background, NTNU, HiST, SINTEF, St. Olavs Hospital and the City of Trondheim are studying how Trondheim can become an attractive, creative and internationally leading *Knowledge City* in 2020 in accordance with the aim of the Regional Development Plan.²⁸ During the spring 2006 NTNU and HiST will decide if it is economically feasible and academically interesting to concentrate the activities of both institutions near the city centre and the key partners. The project “NTNU 2020/HiST 2020” has placed the HEIs’ challenges, inter-institutional collaboration and the relationship to Trondheim and the region on the agenda. Regardless of the outcome, HiST plans to gather and relocate its faculties near NTNU and St. Olavs Hospital.

HiNT follows the developments in Trondheim from the outside. The primary strategy is to ensure high quality standards and provide attractive educational programmes. In this way HiNT wants to be an attractive collaboration partner in the region by itself, or possibly as part of the academic community in Trondheim.²⁹

The vision for the Knowledge City and region has been discussed by the City Council of Trondheim, and there is political will to contribute to necessary land adaptations if the HEIs choose to go for “co-localization”. In any way, the City of Trondheim intends to arrange for more systematic collaboration between the HEIs, the city and the region. The city itself wants to develop a more development oriented culture in the administration as well as in municipal service provision. In this way the city will become a more active partner and user of the HiST and NTNU knowledge resources.

Institutional collaboration or structural change in HE

The HEIs in the region have binding academic collaboration in several fields, and also collaborate on an administrative level to coordinate regional projects. More emphasis on academic quality and

²⁸ The project group for “NTNU 2020/HiST 2020 – Possible co-localization” wrote in an information leaflet, October 2005, that the following ought to be done:

- develop collaboration between NTNU, SINTEF and HiST
- strengthen quality in research and education
- stimulate innovation and entrepreneurship
- strengthen the alliance with the city, partners, industry, culture and society
- better arrange for multidisciplinary collaboration
- recruit the best students and researchers
- make the period of study an unforgettable experience
- strengthen institutional identity individually and collectively
- emphasize campus design and development as instruments to increase attractiveness
- develop better services for students, staff and partners

²⁹ Statement by the Rector of HiNT at the board meeting 4 November 2004, Agenda no. 49/04.

stronger national competition for students in later years has also put strategic and organizational matters on the agenda.

HiST in particular, has had extensive internal processes concerning strategic choices. In addition to co-localization, HiST has investigated *institutional alternatives* as an instrument to realize academic objectives and observations such as these:

- More staff members with a doctoral degree is a prerequisite for NOKUT approval of the basic education as well as for the development of new master's degree programmes.
- An upgrading of research efforts in the health and social care professions is called for.
- Institutional status may have a bearing on the researcher's access to the international research community.
- When Stavanger obtained university status, the traditional university college education suddenly became a university education. The threshold for institutional change has thus become lower than before.

For many years there has been collaboration between *HiST and HiNT* both on a professional level and also in a dialogue about institutional strategies for the future. The two university colleges face many of the same challenges with respect to improved quality in research and education, as well as the development of a more distinct academic profile. The subjects offered by the two colleges are to a great extent overlapping. With 12 000 students they would have been a large university college by Norwegian standards. Institutional merger could pave the way for larger academic groups which would be able to give more priority to research, master's degree education and innovation. It would at the same time improve their ability to maintain the strong position of the university colleges in continuing and further education, and experience-based education in collaboration with the private and public sectors in the region. The main challenge will be the geographical distance between the campus centres. In 2004, HiST and HiNT agreed to develop closer collaboration and investigate opportunities for applying for joint status as specialized university institution. This may still be an alternative in the long run, on the premise that both university colleges develop congruent visions for the future and that Nord-Trøndelag County perceive that it is well served with such a solution.

In the meantime co-localization with NTNU is given first priority by HiST and alternative institutional relations to NTNU need to be considered (the Omdal Committee, 2005). The university is the most important partner, and a merger with NTNU could make it easier to reach the objectives of HiST. In an internal report it is argued that *HiST-NTNU* would give the region a complete HEI at all academic levels and fields. A merger would facilitate new multidisciplinary research between experience-based and basic research. It would be easier to develop new experience-based master's programmes. Together, the institutions would be able to meet the crisis in science and technology in the whole education chain from primary school to higher education. But a merger may also imply threats. The university college's traditional strengths within experience-based education and cooperation with SMEs might come under pressure from the university's basic research priorities and international orientation. Overlapping academic groups at HiST, not least within the engineering education, may be marginalized.

NTNU has thus far given priority to internal strategic processes and co-localization investigations. Inter-institutional relations have not been an issue. Such relations may possibly be discussed when the localization question is decided upon. It is recognized that the academic groups at HiST in many fields may complement and offer interesting multidisciplinary research opportunities for the university (e.g. in health care). The problem may arise in overlapping areas such as technology, where there is a widespread perception that the university has little to gain from integration with the university college's less research intensive and more experience-based academic groups.

We are probably going to see structural changes in Norwegian higher education. The university colleges in the western part of Norway consider merging into a Møre University. The university colleges in eastern Norway may form an Inland University. The university college in Stavanger has already become a university, and Agder and Bodø are likely to follow suit. A merger between the

university and the university college in Tromsø was discussed some years ago. Also in Trøndelag the organizational structure in higher education is likely to become an important academic as well as political issue in the years ahead. The fact that there is political majority in the Storting for establishing larger regions in Norway as of 2010 does not make this question less relevant.

Regional partnerships continue after the OECD project

The OECD project has been an arena for contact between the HEIs, public authorities and business organisations. Cooperation between key actors and institutions will continue under the *Regional Action Programme* also in 2006.

The most comprehensive result of the regional partnership is related to *the RIS project* (European Commission programme on Regional Innovation Strategies within the 6th Framework Programme). This is a large development project based on a broad regional partnership. On the steering committee there are representatives from industry, banking/investors, R&D institutions and the public sector. The aim of the RIS project is to improve Trøndelag's innovation system and hence innovation performance by developing an innovation strategy for the region using a special methodology which has been applied in many European regions since the mid 1990s. The project involves partners from East Lombardy and Oslo, and will draw upon experience from these regions. RIS-Trøndelag will build synergies between key organizations and enterprises (SMEs), foster a culture of entrepreneurship, help to bring ideas to the market, support innovation in the food, energy and engineering sectors with pilot projects. Partnerships between Trøndelag and East Lombardy are particularly appropriate at methodological, strategic and sectoral levels. The regions will engage in a mutual learning process in assessing innovation support policies and schemes. The RIS project will build on and cooperate with ongoing projects and establish working groups in main target areas of the regional development plan. RIS will visualize and strengthen synergies between ongoing activities within innovation in Trøndelag, making the region stronger and more visible in the national arenas.

One important RIS sub-project is to develop a *research and innovation strategy* for the region. One idea is that due to improved coordination between the public authorities and the public support system, the region may achieve more and obtain more national funding for regional activities. The project is starting off as an investigation process among public stakeholders, but the intention is that the HEIs institutions and other relevant actors will be involved in the process in due course.

In addition to the above strategy development process, the RIS project will take special interest in the following *four areas* of the Regional Action Plan:

- *Entrepreneurship*. The aim is to encourage entrepreneurship in the society by creating a culture for entrepreneurship, developing skills and a spirit reducing the cultural barriers to create private companies. Emphasis is given to regional coordination of activities. For instance, the vision to create an Innovation Village at NTNU and the planned Idéportal will probably be seen in relation to this priority area.
- *The food sector*. The company "Oi! Trøndersk mat og drikke" will serve as the joint collaboration arena for this sector.
- *Industrial manufacturing*. One aim in this sub-project is to continue the fruitful partnerships which were developed in the Innovation Mid-Norway project, and develop innovative arenas where industry, both the few large enterprises and the SMEs, R&D institutions, university/colleges, financial intermediaries and the local authorities will participate.
- *Energy*, in particular renewable energy.

The HEIs and other regional actors will be involved in all these projects.

Annex I – The Demographic Situation

1. What are the key demographic indicators for the region and how have they changed over the last 20 years?

Over the past 20 years, Trøndelag has grown at a slower pace than other comparable regions. In 2005, 8.7 % of the Norwegian population lives in Trøndelag compared to 9 % in 1986. For many indicators, it is relevant to distinguish between Sør- and Nord-Trøndelag.

1.1 Age structure

Sør-Trøndelag basically follows the national patterns in *age structure* and population growth (10.4 % between 1986-2005). Nord-Trøndelag on the other hand, has slower growth rates (1.4 % in the same period). The subsequent impact on the age structure is that the younger adult's share of the population is below and the elder share of the population is above the national average (Table I.1).

Table I.1: Population level and age structure 1.1.2005 and changes in the period 1986-2005.

Source: Statistics Norway

	Population 1.1. 2005					Growth in the period 1986-2005					
	Total	% in each age group				Population		% change in age group			
		0-14	15-39	40-64	64+	yearly growth	growth percent	0-14	15-39	40-64	64+
Norway	4 606 363	19.7	33.6	31.9	14.7	22 359	10.8	-0,1	-4.6	5.8	-1.1
Trøndelag	401 011	20.0	33.4	31.8	14.9	1 375	7.4	-0,3	-4.8	6.0	-1.0
Sør-Trøndelag	272 567	19.8	34.5	31.5	14.3	1 288	10.4	0,0	-4.1	5.5	-1.4
Nord-Trøndelag	128 444	20.4	31.2	32.4	16.0	87	1.4	-0,8	-6.2	7.2	-0.2

1.2 Emigration and immigration

In the past five years, both Sør- and Nord-Trøndelag have experienced a yearly *net immigration* of respectively 0.4 and 0.1 % (Table I.2). For Sør-Trøndelag this is on a par with comparable regions in Norway. However, the official immigration statistics do not give the full picture. In Trondheim it is estimated that some 13 000 students remain registered in their parents' home county during their period of study.

Table I.2: Emigration and immigration at a national and regional level. All values in %.

Source: Statistics Norway

Region (Main city in the region)	Immigration as share of population	Emigration as share of population	Immigration as share of population	Emigration as share of population	Population growth from net immigration
	Yearly average 1986-2005		Yearly average 2001-2005		Total period 1986-2005
Norway ³⁰	0.7	0.5	0.8	0.5	4.4
Rogaland (Stavanger)	2.3	2.1	2.2	1.8	5.0
Hordaland (Bergen)	2.0	1.9	2.1	1.8	2.7
Trøndelag (Trondheim)	2.6	2.5	2.8	2.5	1.2
Sør-Trøndelag	2.7	2.5	2.9	2.5	3.4
Nord-Trøndelag	2.3	2.5	2.5	2.4	-3.1

1.3 Health and well being

Life expectancy is an indicator of *health and well being*. Men in Trøndelag may expect to become 76 years old, while women are likely to become 81-82 years old. For both genders, life expectancy is at or slightly above the national average (Figure I.3). Illness and incapability to work are other key indicators of health (Table I.4). Trøndelag is slightly above the national average, and in Nord-

³⁰ Immigration and emmigration between Norway and other countries.

Trøndelag 6.9 % of the working age population is transferred from the labour force to the industrial insurance system. This is 0.4 % higher than the national average, and is probably explained by less job opportunities in certain areas in the northern part of the region.

Figure I.3: Expected duration of life (forventet levealder) at birth in Trøndelag and Norway (hele landet). Source: Statistics Norway)

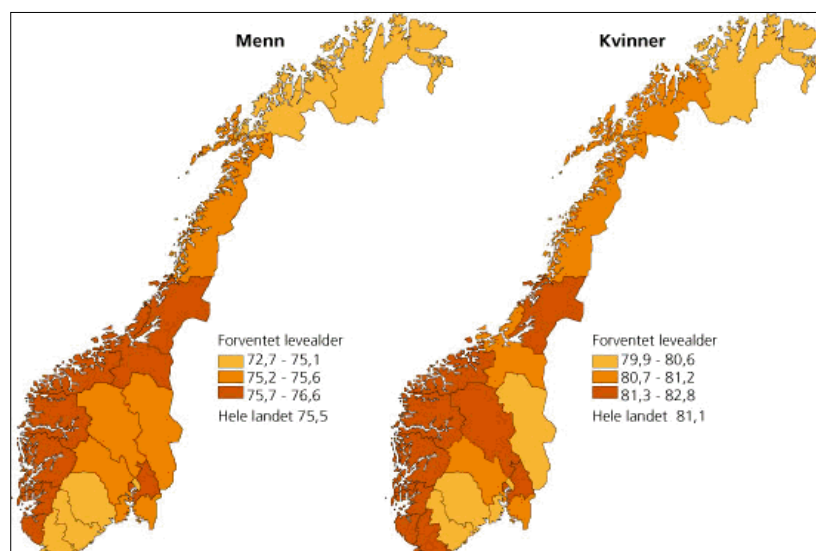


Table I.4: The average days absent through illness for employees and the share of the population, which is in the age of the working force, but is incapable of paid employment in Trøndelag and Norway, 2003. Source: Statistics Norway.

	Average days absent through illness for			Incapable of paid employment as share of the population		
	All	Men	Women	All	Men	Women
Norway	6.2	5.0	7.7	6.5	5.6	7.5
Trøndelag	6.3	5.1	7.9	6.6	5.5	7.7
Sør-Trøndelag	6.3	5.1	7.9	6.4	5.3	7.6
Nord-Trøndelag	6.4	5.3	7.9	6.9	5.9	7.8

1.4 Levels of deprivation

Income inequality and poverty are central indicators of *levels of deprivation* (see Annex I, Table I.5). The average disposable income is lower in Trøndelag (NOK 157 000) than the national average (NOK 170 000). Among the 19 Norwegian counties, Nord-Trøndelag has the lowest disposable income per inhabitant, while only five counties have lower disposable income per inhabitant than Sør-Trøndelag. Poverty is, however, rather seldom in Trøndelag. Only 2.9 % in Nord-Trøndelag and 3.3 % in Sør-Trøndelag have less than 50 % of the average national income.

Table I.5: Disposable income per inhabitant and the share of inhabitants that have below 50 % of median income. Source: Statistics Norway and Langørgen et al. 2003.

	The average disposable income per inhabitant in 2002 (1000 NOK)	National limit defined as 50 % of median income (83 200 NOK)	Regional limit defined as 50 % of median income ³¹
Norway	170	3.2	3.3
Trøndelag	157	3.2	2.7
Sør-Trøndelag	160	3.3	3.0
Nord-Trøndelag	149	2.9	2.1

³¹ Poverty limit is justified with local income and house prices.

Child poverty is another important indicator of levels of deprivation. Kamerman et al. (2003) show that child poverty among lone mothers, two parent and other family types in Norway, is respectively 10.4 %, 3.4 % and 4.4 %. These findings are consistent with the results in column two in Table I.5. Ytrehus (2004) has studied regional differences in child poverty in Norway and finds that the share of households with income below 50 % of median income is relatively low in Trøndelag compared with other regions.

2. What are the participation levels of the local population in higher education by social group and by gender and where do students attend for this purpose?

Over the past twenty years, Trøndelag follows the national pattern of *increased participation* in higher education. The share of the population with a college or university degree increased from 11 % in 1983 to 23 % in 2004. The share is slightly above the national average in Sør-Trøndelag, and from 3 to 5 percentage points below in Nord-Trøndelag. While the female share of the population in Nord-Trøndelag today is approaching the national average, the male share of the population with higher education remains low in a national perspective. This is largely explained by the continuing strong position of the primary sector in Nord-Trøndelag (4 % of the wealth creation in the county).

In a *gender perspective* it is interesting to note that the male population was overtaken by the females around the turn of the millennium; the share with tertiary education is now higher among women than men nationally as well as in both Trøndelag counties. 20.5 % of adult women in Trøndelag have a higher education (4 yrs and below) compared to only 14.2 % of the men; However, among the ones who take a longer higher education (4 yrs and above), one will find more men (7.5 %) than women (3 %) (Source: Statistics Norway).

Table I.6: Share of population 16 years or older with college or university degree.

Source: Statistics Norway.

		1983	1993	2000	2004
Sør-Trøndelag	men	14.2 %	18.8 %	22.8 %	24.1 %
	women	10.3 %	16.2 %	22.1 %	25.2 %
	all	12.2 %	17.5 %	22.5 %	24.6 %
Nord-Trøndelag	men	9.3 %	12.7 %	15.3 %	16.2 %
	women	8.3 %	13.4 %	18.5 %	21.4 %
	all	8.8 %	13.0 %	16.9 %	18.8 %
Trøndelag	men	12.5 %	16.8 %	20.4 %	21.6 %
	women	9.6 %	15.3 %	21.0 %	24.0 %
	all	11.1 %	16.0 %	20.7 %	22.8 %
Norway	men	13.7 %	18.0 %	21.5 %	22.4 %
	women	10.3 %	15.9 %	21.4 %	24.0 %
	all	12.0 %	17.0 %	21.5 %	23.2 %

2.1 Science and engineering graduates

Norway scores below the EU average when it comes to the supply of new science and engineering graduates (EU innovation scoreboard 2005). It might strengthen Norway's otherwise strong innovative position if this innovation driver is strengthened. Trøndelag is in a favourable position in this respect, hosting Norway's strongest engineering education institution (see Section 4.2.2). As one would expect, the share of the population with a science or engineering degree is above the national average in Sør-Trøndelag and below the national average in Nord-Trøndelag. Far less women than men hold a science or engineering degree.

Table I.7: Share of population 16-74 years with a science/engineering degree (%). University or college education of less than 4 years, more than 4 years and all durations. 2001. Source: Statistics Norway 2001, Population and Housing Census.

	4 years or less			more than 4 years			all durations		
	men	women	all	men	women	all	men	women	all
Sør-Trøndelag	4.6	1.1	2.9	5.5	1.3	3.4	10.1	2.4	6.3
Nord-Trøndelag	3.1	0.6	1.9	1.4	0.3	0.9	4.5	0.9	2.7
Trøndelag	4.1	0.9	2.6	4.2	1.0	2.6	8.3	1.9	5.2
Norway	4.5	0.9	2.7	3.0	0.8	1.9	7.5	1.7	4.6

Trøndelag has the *largest number of students* in comparison to population size. The region is thus more dependent on “student immigration” than other regions in Norway. In 2004, 17 % of all new students in Norway began studying in Trøndelag, most of them in Trondheim/Sør-Trøndelag (15 %). 73-74 % of the students from Trøndelag, also study in Trøndelag. In Nord-Trøndelag, only 31 % the new students are studying in their own county (see Table 1.8).

Table I.8: The new students in 2004. Source: Sørli, Universities and Colleges Admission Service

The authority of the higher education institution	The students' local authority							
	Norway		Trøndelag		Sør-Trøndelag		Nord-Trøndelag	
Norway	49 022	100 %	4 666	100 %	3 154	100 %	1 512	100 %
Trøndelag	8 114	17 %	3 412	73 %	2 298	73 %	1 114	74 %
Sør-Trøndelag	7 154	15 %	2 739	59 %	2 094	66 %	645	43 %
Nord-Trøndelag	960	2 %	673	14 %	204	6 %	469	31 %

2.3 Continuing education and distance learning

We have not come across regional statistics on participation in *continuing education and distance learning*, but statistics on the supply side are available in national education statistics. There are nearly 900 registered students in continuing education at NTNU, HiST, HiNT and DMMH. When these students graduate, they are registered together with ordinary students at each institution. The significance of continuing education varies from 14 % at DMMH to 1 % at NTNU.

Table I.9: Registered students in continuing education at the main HEIs in Trøndelag, 2004. Source: Budget proposition to the Parliament, St.prpr.nr.1 (2005-2006)

	Continuing education		Total number of reg. students
	Numbers	% of total number	
NTNU	164	0.8	19 518
HiST	450	7.0	6 449
HiNT	176	4.8	3 630
DMMH	106	13.6	782
Sum	896	2.9	30 379

Distance learning is a priority area for the university colleges in particular. National statistics provide statistics on registered students and completed study programmes on a semester basis. Many students follow distance learning courses for several semesters. Thus the number of people engaged in distance learning is much lower than the number of registered students.

Table I.10: Registered students and completed studies in distance learning programmes, 2004 (DBH).

	registered students			completed programmes of study		
	spring	autumn	year	spring	autumn	year
NTNU	415	65	480	538	142	680
HiST	1535	1347	2882	1649	1431	3080
HiNT	1919	1944	3863	1300	1646	2946
Sum	3869	3356	7225	3487	3219	6706

Annex II - The Economic and Social Base

1. What is the economic and social base of the region compared to the national average?

1.1 Industrial structure by sector

It is already indicated that 8.7 % of the population of Norway lives in Trøndelag. Trøndelag has the same share (8.7 %) of the total number of employed in Norway. Table II.1 shows how these workers are distributed in the different industrial sectors.

Table II.1: Employment in different industrial sectors in Trøndelag and Norway, 2003.

Source: Statistics Norway

	Primary industries	Manufacturing and other industries	Construction	Wholesale and retail trade	Hotels and restaurants	Transport and communication	Finance, real estate, R&D, renting and business activities	Public Services	Other service activities
Region/NACE	A, B	C, D, E	F	G	H	I	J, K	L, M, N	O,P,Q
Norway	3.5 %	13.7 %	6.7 %	15.2 %	3.3 %	6.9 %	12.2 %	34.0 %	4.6 %
Trøndelag	5.9 %	12.0 %	7.5 %	13.9 %	3.2 %	6.1 %	11.1 %	36.2 %	4.0 %
Sør-Trøndelag	4.2 %	11.2 %	7.4 %	14.3 %	3.4 %	6.1 %	12.9 %	36.2 %	4.3 %
Nord-Trøndelag	9.7 %	13.9 %	7.6 %	13.1 %	2.8 %	6.1 %	7.0 %	36.2 %	3.6 %

The table is based on NACE codes, as reported in the second row. We see that primary industries (agriculture, forestry and fish) are heavily represented in Trøndelag, especially in Nord-Trøndelag. We also see that the share of employment in manufacturing is relatively low in Sør-Trøndelag. Wholesale and retail trade is below the national average in Trøndelag, while public services (Public administration, defence, education, health and social sector) are clearly higher than the national average.

1.2 Knowledge intensive sectors, including high technology industry

Table II.2 is also based on the NACE codes. Trøndelag has a lower share of employment than the national average in knowledge intensive market and financial services. If we look at all knowledge intensive services, we find that the share of employment in these sectors is higher in Trøndelag than the national average. The main reason for this is the high share of employment in education, health and social work, recreational, cultural and sporting activities, reported as 'Other knowledge intensive services' in the table. We note that Sør-Trøndelag has had a significantly higher share while Nord-Trøndelag has a lower share than the national average in knowledge intensive sectors.

Table II.2: Employment in knowledge intensive sectors in Trøndelag and Norway, 2003.

Source: Statistics Norway

	Knowledge intensive high-technology services	Knowledge intensive market services	Knowledge intensive financial services	Other knowledge intensive services	All knowledge intensive services	Other sectors	Total
Norway	3.6 %	9.6 %	2.0 %	28.7 %	43.9 %	56.1 %	100 %
Trøndelag	3.6 %	8.2 %	1.7 %	31.1 %	44.6 %	55.4 %	100 %
Sør-Trøndelag	4.3 %	8.9 %	2.0 %	31.5 %	46.8 %	53.2 %	100 %
Nord-Trøndelag	1.8 %	6.7 %	1.0 %	30.4 %	40.0 %	60.0 %	100 %

With the strong emphasis on technology at the HEIs in the region, one would expect that the *high-technology manufacturing and the high-technology service sectors* held a strong position in the Trøndelag region. This is not the case. In the manufacturing sectors the data show that the employment in high-technology and medium high technology manufacturing is lower in Trøndelag than in the country as a whole. Sør-Trøndelag is close to the national averages in high-technology manufacturing, while in Nord-Trøndelag the employment share in this sector is half the national share. Employment in medium high-technology manufacturing is relatively higher in Nord-Trøndelag than in Sør-Trøndelag.

Table II.3: Employment in high-technology manufacturing ()*

	2000	2001	2002	2003	2004
Sør-Trøndelag	0,47 %	0,47 %	0,50 %	0,47 %	0,47 %
Nord-Trøndelag	0,26 %	0,28 %	0,26 %	0,24 %	0,24 %
Trøndelag	0,40 %	0,41 %	0,42 %	0,40 %	0,40 %
Norway	0,56 %	0,61 %	0,56 %	0,52 %	0,50 %

(*) High technology manufacturing includes these NACE codes (Source: Statistics Norway):
code 30 (Office machinery and computers)
code 32 (Radio, television and communication equipment)
code 33 (Medical, precision and optical instruments)

Table II.4: Employment in medium high-technology manufacturing ()*

	2000	2001	2002	2003	2004
Sør-Trøndelag	2.26 %	2.28 %	2.19 %	1.79 %	1.72 %
Nord-Trøndelag	3.45 %	3.67 %	3.64 %	3.53 %	3.49 %
Trøndelag	2.63 %	2.71 %	2.64 %	2.33 %	2.27 %
Norway	3.94 %	3.95 %	3.89 %	3.63 %	3.49 %

(*) Medium high technology manufacturing includes these NACE codes (Source: Statistics Norway):
code 24 (Chemicals and chemical products)
code 29 (Machinery and equipment)
code 31 (Electrical machinery and apparatus)
code 34 (Motor vehicles and trailers)
code 35 (Other transport equipment)

In *high-technology services*, Sør-Trøndelag with its research institutions, consultancy firms and ICT companies, places the county well above the national average. Nord-Trøndelag falls in the opposite category with very limited high tech service industry.

Table II.5: Employment in knowledge-intensive high-technology services

	2000	2001	2002	2003	2004
Sør-Trøndelag	5.01 %	4.93 %	4.68 %	4.42 %	4.34 %
Nord-Trøndelag	2.01 %	1.96 %	1.82 %	1.74 %	1.83 %
Trøndelag	4.07 %	3.99 %	3.79 %	3.58 %	3.56 %
Norway	3.90 %	4.02 %	3.80 %	3.62 %	3.60 %

(*) High technology services includes these NACE codes (Source: Statistics Norway):
code 64 (Post and telecommunications)
code 72 (Computer and related activities)
code 73 (Research and development)

1.3 The leading export sectors

Table II.6: The value of exports in Trøndelag and Norway. Preliminary numbers for 2004 in million NOK and shares in %. Source: Statistics Norway

Source: Statistics Norway, Foreign Trade	Fish products	Other food, beverages and tobacco	Other raw materials	Energy	Processed Products	Total value of export	Export value in 1000 NOK per capita
Nord-Trøndelag	435 13.1 %	51 1.5 %	87 2.6 %	0 0.0 %	2 751 82.8 %	3 324 100.0 %	26.0
Sør-Trøndelag	1 753 36.5 %	70 1.5 %	77 1.6 %	0 0.0 %	2 898 60.4 %	4 798 100.0 %	17.8
Trøndelag	2 188 26.9 %	121 1.5 %	164 2.0 %	0 0.0 %	5 649 69.6 %	8 122 100.0 %	20.4
Norway	27 273 12.1 %	3 245 1.4 %	9 447 4.2 %	31 683 14.0 %	154 251 68.3 %	225 899 100.0 %	49.4

Table II.6 considers exports. In the last column, we see that the export value per inhabitant in Trøndelag is NOK 20 400 each year, much lower than the national average. With exception of fish and processed wood, there are not many export oriented sectors in Trøndelag.

1.4 The occupational structure of employment (manual, technical, clerical, professional)

Trøndelag has a lower share of employment in management, academic and clerical, sales/marketing and service compared to the Norwegian average. These shares are lower in Nord-Trøndelag, especially in academic work than in Sør-Trøndelag. On the other hand, farmers, fishermen, construction workers and operators are overrepresented in Trøndelag, compared to the national average.

Table II.7: Employed 4th quarter 2003, by region and type of occupation. Source: Statistics Norway

	Management	HEI and academic	Clerical, sales, marketing and service	Farmers, fishermen, self- employed	Construction workers	Operators manual work	Other	Total
Nord-Trøndelag	2 000 5.4 %	6 174 16.5 %	10 176 27.3 %	6 004 16.1 %	5 168 13.9 %	5 281 14.2 %	2 508 6.7 %	37 311 100.0 %
Sør-Trøndelag	6 377 6.3 %	28 689 28.4 %	29 515 29.2 %	6 069 6.0 %	12 423 12.3 %	10 746 10.6 %	7 347 7.3 %	101 166 100.0 %
Trøndelag	8 377 6.0 %	34 863 25.2 %	39 691 28.7 %	12 073 8.7 %	17 591 12.7 %	16 027 11.6 %	9 855 7.1 %	138 477 100.0 %
Norway	130 075 7.7 %	460 995 27.4 %	500 761 29.8 %	85 104 5.1 %	206 082 12.3 %	184 436 11.0 %	112 914 6.7 %	1 680 367 100.0 %

1.5 Ownership structure of enterprises (e.g. balance between SMEs and MNCs)

The size of the enterprises in Trøndelag is very much like the average distribution in Norway (Table II.8). With the high share of employment in primary industries, Nord-Trøndelag has more small enterprises with 0-4 employees than the national average.

With respect to large firms, Nord-Trøndelag has relatively few firms with more than 100 employees while Sør-Trøndelag has a little more than the national average. Since the export orientation is low in the industrial sectors in Trøndelag on average, there is a relative small number of MNCs with high

activity in Trøndelag. As an example of this, none of the companies with NOK 1 000 million turnover a year and less than 66 % national ownership have their head office in Trondheim (Gjeldsvik et al., 2004).

Table II.8: Enterprises and numbers of employees in Trøndelag and Norway, 1 January 2005.
Source: Statistics Norway

	0-4 employees	5-9 employees	10-19 employees	20-49 employees	50-99 employees	More than 100 employees	Total number of enter- prises
Nord-Trøndelag	83.6 %	8.0 %	4.9 %	2.5 %	0.8 %	0.3 %	13 790
Sør-Trøndelag	80.8 %	8.4 %	5.3 %	3.6 %	1.1 %	0.7 %	23 981
Trøndelag	81.8 %	8.3 %	5.2 %	3.2 %	1.0 %	0.5 %	37 771
Norway	81.8 %	8.1 %	5.2 %	3.3 %	1.0 %	0.6 %	431 510

1.6 Level of public and private R&D

The region is better placed when it comes to research and 11.4 % of the R&D in Norway is done in Trøndelag (Table II.9). Almost all the R&D is done in Sør-Trøndelag. In Trøndelag, almost 40 % of the R&D is in the HEIs, 40 % is in the institute sector (especially SINTEF) and 20 % is in industry (Gjeldsvik et al., 2004).

Table II.9: The level of R&D in Trøndelag and Norway in 1999.
Source: Gundersen, F. (2002): *FoU og innovasjon i norske regioner*, Statistics Norway Report 2002/26.

		R&D done by the region	R&D that is purchased	Total amount R&D	Percentage of Norwegian R&D
Nord-Trøndelag	in NOK million	49.6	48.2	97.8	0.7 %
	in NOK/inhabitant	387.6	376.6	764.2	26.2 %
Sør-Trøndelag	in NOK million	946.0	480.6	1 426.6	10.7 %
	in NOK/inhabitant	3 500.3	1 778.2	5 278.5	180.8 %
Trøndelag	in NOK million	995.6	528.8	1 524.4	11.4 %
	in NOK/inhabitant	2 500.0	1 327.8	3 827.9	131.1 %
Norway	in NOK million	9 527.0	3 838.9	13 366.0	100.0 %
	in NOK/inhabitant	2 081.3	838.7	2 920.0	100.0 %

Total spending per capita on R&D has increased between 1991 and 2003 in Norway as a whole. The Trøndelag region is well above the national average for this whole period, but once again there is a large difference in per capita spending in the two Trøndelag counties. In 1991, Sør-Trøndelag spent 23 times the amount per person on research as did Nord-Trøndelag. This difference was reduced to around 9 times in 2003. The location of the University and the large research institutions in Trondheim explains much of this difference.

Table II.10: Total R&D spending in NOK 1000 per capita, 2003 currency

	1991	1995	1999	2001	2003
Sør-Trøndelag	11.79	11.46	14.73	12.43	16.03
Nord-Trøndelag	0.51	0.69	0.84	1.44	1.80
Trøndelag	8.00	7.88	10.18	8.88	11.41
Norway	3.91	4.40	5.05	5.58	6.07

Sources: www.nifu.no, www.ssb.no

The low levels of business R&D spending in Norway (87 % of EU average) is pointed out as one of the main challenges for improving Norwegian innovation (EU Innovation Scoreboard 2005). Tables

II.11 and II.12 show in which sectors the R&D activities take place. It is worth noting that a greater proportion of R&D activities take place in research institutes and HEIs in Trøndelag compared to the rest of the country, where about half the research spending appeared in the private sector (2003). Note also that over 70 % of the relatively small amount of R&D financed in Nord-Trøndelag was spent in the private business sector.

Table II.11: R&D spending in NOK 1000 per capita by sector of execution and region. (2003 values).

	1991			1999			2003		
	B	R	HEI	B	R	HEI	B	R	HEI
Sør-Trøndelag	2.6	5.5	3.8	4.1	5.1	5.5	4.4	5.4	6.3
Nord-Trøndelag	0.2	0.3	0.1	0.5	0.2	0.1	1.3	0.3	0.3
Trøndelag	1.8	3.7	2.5	2.9	3.5	3.7	3.4	3.7	4.3
Norway	1.5	1.4	1.0	2.4	1.2	1.4	3.0	1.4	1.7

B = private businesses, R = research institutes, HEI = universities and university colleges.

Source: www.nifu.no

Table II.12: Share of R&D spending by sector of execution and region (%).

	1991			1999			2003		
	B	R	HEI	B	R	HEI	B	R	HEI
Sør-Trøndelag	21.7	46.4	31.9	28.0	34.6	37.4	27.1	33.6	39.2
Nord-Trøndelag	31.5	56.2	12.2	57.1	26.0	16.8	70.9	14.4	14.7
Trøndelag	21.9	46.6	31.5	28.8	34.4	36.8	29.4	32.6	38.0
Norway	39.1	34.6	26.4	46.9	24.5	28.6	49.3	23.3	27.4

B = private businesses, R = research institutes, HEI = universities and university colleges.

Source: www.nifu.no

1.7 Indicators of entrepreneurial activity

Since the turn of the century, Norway and Trøndelag seem to be in a good phase for entrepreneurial activity. The number of new firms is increasing in both Trøndelag and Norway. Table II.13 shows that the share of new firms is clearly above the national average in Sør-Trøndelag and totally for Trøndelag. A part of this is probably explained by new spin-offs from the R&D environment in Trondheim. An informal survey made by NTNU TTO in 2005 identified 142 new companies from NTNU, SINTEF and HiST in the period 1988 to 2005. The number of companies established varies from year to year. There was little activity in 1988-1994 with 0-4 start-up companies annually. Then there was a boom in 1995-1997 and again from 1999-2004 with 10-20 spin-off companies a year.

Table II.13: New firms in all industries except public sector and primary industries in 2003 and 2004.

Source: Statistics Norway

	New firms in 2003		New firms in 2004	
Nord-Trøndelag	358	6.2 %	509	8.2 %
Sør-Trøndelag	1 291	9.9 %	1 564	11.0 %
Trøndelag	1 649	8.8 %	2 073	10.1 %
Norway	22 081	8.6 %	26 590	9.6 %

On the EU Innovation Scoreboard (2005), Norway performs below average on *intellectual property rights and international patents*. If we look at US patents, the number of patents has increased from a little more than 100 in 1991 to well above 250 the last five years. American statistics do not reveal the sub-national origin, and so the Trøndelag contribution is unknown.

Table II.14: Patents granted by the United States Patent and Trademark Office

	1991	1995	1999	2001	2002	2003	2004	All Years
U.S. and Foreign	106 840	113 955	169 145	184 047	184 425	187 050	181 322	3 101 716
Norway, number	119	138	246	282	261	279	255	4 253
Norway, share	0.11 %	0.12 %	0.15 %	0.15 %	0.14 %	0.15 %	0.14 %	0.14 %

Source: www.uspto.org.

According to the Norwegian Patent Office (NPO), practically all patents granted to Norwegian applicants are also registered in the files of the NPO. Norwegian patent statistics indicate that between 500 and 600 patents are registered (approved) annually during the last five years. This number was a little above 300 in the 1990s. In Trøndelag, the number of patents has increased from around 20 to close to 50 per year in the same period. Among these, only a handful patents are granted to Nord-Trøndelag applicants each year (see Table II.15).

Table II.15: Number (share) of registered patents by region and year, NPO

	1995	2001	2002	2003	2004	2005
Sør-Trøndelag	18 (5.6 %)	31 (6.0 %)	37 (6.8 %)	35 (6.9 %)	25 (7.6 %)	42 (7.4 %)
Nord-Trøndelag	2 (0.6 %)	7 (1.4 %)	4 (0.7 %)	4 (0.8 %)	4 (1.2 %)	5 (0.9 %)
Trøndelag	20 (6.3 %)	38 (7.4 %)	41 (7.6 %)	39 (7.7 %)	29 (8.8 %)	47 (8.3 %)
Norway	319 (100 %)	510 (100 %)	541 (100 %)	509 (100 %)	331 (100 %)	564 (100 %)

2. What are the key labour market indicators?

The growth in total employment in Trøndelag has been higher than the national average in the period 2000-2004. Sør-Trøndelag has a 5 % growth in employment in the period, while Nord-Trøndelag has a 2.4 % growth in employment. In the last two years, the growth in Nord-Trøndelag has been as high as in Sør-Trøndelag.

Table II.16: Development in total employment from 2000-2004. Source: Statistics Norway.

		2001	2002	2003	2004	2000-2004
Norway	Total employment	2 275 000	2 267 000	2 260 000	2 274 000	12 000
	yearly growth	0,6 %	-0,4 %	-0,3 %	0,6 %	0,5 %
Trøndelag	Total employment	189 413	189 739	193 481	194 995	7 838
	yearly growth	1,2 %	0,2 %	2,0 %	0,8 %	4,2 %
Sør-Trøndelag	Total employment	134 007	134 705	137 519	138 387	6 535
	yearly growth	1,6 %	0,5 %	2,1 %	0,6 %	5,0 %
Nord-Trøndelag	Total employment	55 406	55 034	55 962	56 608	1 303
	yearly growth	0.2 %	-0.7 %	1.7 %	1.2 %	2.4 %

In spite of a much more positive development in employment, the growth in population in Trøndelag is only slightly above the national average the last years. Table II.17 shows that the growth in the total population in Trøndelag has been similar to the national average in the period 2001-2005. The development in employment in the period 2000-2004 is comparable with the development in population in the period 2001-2005, because the population is measured at the beginning of the year while the employment is measured at the end of the year. In the table, we see that Sør-Trøndelag has a 2.9 % growth in population in the period, while Nord-Trøndelag has a 0.9 % growth in population.

Table II.17: Development in population 2001-2004. Source: Statistics Norway.

		2001	2002	2003	2004	2005	2001-2005
Norway	Total population	4503436	4524066	4552252	4577457	4606363	102927
	yearly growth	0.6 %	0.5 %	0.6 %	0.6 %	0.6 %	2.3 %
Trøndelag	Total population	392126	393780	395798	398239	401011	8885
	yearly growth	0.6 %	0.4 %	0.5 %	0.6 %	0.7 %	2.3 %
Sør-Trøndelag	Total population	264865	266323	268188	270266	272567	7702
	yearly growth	0.8 %	0.6 %	0.7 %	0.8 %	0.9 %	2.9 %
Nord-Trøndelag	Total population	127261	127457	127610	127973	128444	1183
	yearly growth	0.1 %	0.2 %	0.1 %	0.3 %	0.4 %	0.9 %

2.1 Unemployment and economic activity rates

The rate of unemployment in Trøndelag is marginally above the national average. We also see that the workforce is smaller in Trøndelag than in other parts of Norway, as the share of the population. The workforce in Nord-Trøndelag is remarkable low compared to Sør-Trøndelag and the national average. Higher unemployment and a smaller workforce have of course consequences for production in the industries in the region.

Table II.18: Unemployment and economic activity rates in 2004.

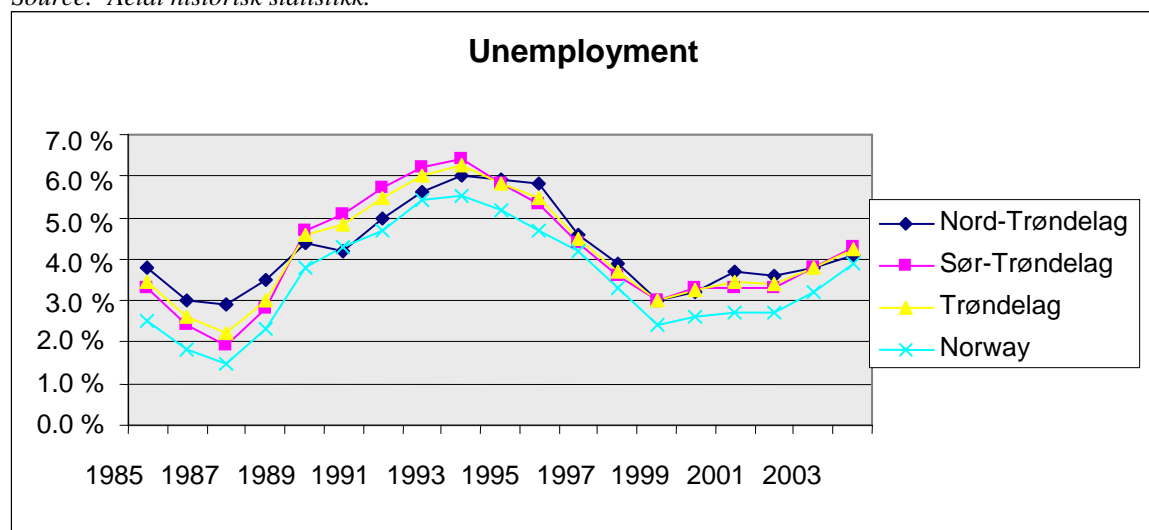
Source: Statistics Norway

	Total number of unemployed, yearly average	Total number of unemployed as share of the workforce	The workforce as share of the population between 16 and 74 years of age
Nord-Trøndelag	2 489	3.9 %	70.4 %
Sør-Trøndelag	5 785	4.1 %	72.0 %
Trøndelag	8 274	4.0 %	71.5 %
Norway	91563	3.9 %	72.1 %

Figure II.19: shows that unemployment in Trøndelag follows the national trend but the level is slightly higher than the national average.

Figure II.19: Unemployment in % in Trøndelag and Norway from 1986-2004.

Source: Aetat historisk statistikk.



2.2 Levels of educational attainment of the population including the proportion proceeding to and with tertiary level of educational qualifications, origin and destination of graduates

This question is partly answered above. On average, the educational attainment in Trøndelag is higher than in other regions in Norway. This applies especially to upper secondary education, as we see in Table II.20.

Table II.20: Education level in the population above 16 years of age.

Source: Statistics Norway

	Primary education	Secondary education	Higher education, 0-4 year	Higher education, more than 4 years	None or missing data about education	Total (N=100%)
Nord-Trøndelag	20.5 %	59.7 %	15.5 %	2.8 %	1.5 %	100 100
Sør-Trøndelag	18.9 %	54.8 %	17.8 %	6.4 %	2.1 %	213 044
Trøndelag	19.4 %	56.4 %	17.1 %	5.2 %	1.9 %	313 144
Norway	19.5 %	54.8 %	17.8 %	5.0 %	2.9 %	3 616 315

3. How has the region performed over the last 20 years in relation to the nation in terms of the following key indicators: (1) GDP per capita; (2) GVA per capita; (3) unemployment; and (4) share of employment in growing sectors?

The GDP and GVA per capita has for long time been lower in Trøndelag than the national average. This is strongly connected with the high share of employment in farming, forestry, the food and timber industry, and the public sector. In addition there is a relatively small workforce in Trøndelag. Table II.21 focuses on GDP per capital and GVA per capital in Trøndelag and Norway from 1993-2001, the period this data is available. We see that it has been a positive development in both GDP and GVA per capita in Trøndelag. This applies especially to Sør-Trøndelag in the period between 1997 and 2001.

Table II.21: GDP per capita, GVA per capita in Trøndelag and Norway, 1993, 1997 and 2001.

(Source: Statistics, Norway)

	GDP per capita	GVA per capita	GDP per capita	GVA per capita	GDP per capita	GVA per capita
	1993		1997		2001	
Nord-Trøndelag	153.3	144.1	184.5	164.5	202.9	183.1
Sør-Trøndelag	178.8	163.8	206.8	184.3	252.9	228.2
Trøndelag	170.1	157.1	199.4	177.7	236.7	213.6
Norway	208.9	189.0	236.5	210.8	272.1	245.5
Trøndelag/Norway	81 %	83 %	84 %	84 %	87 %	87 %

In Norway the growing sectors are hotels and restaurants, finance, real estate, renting and business activities, public services and other service activities. Of these growing sectors, Trøndelag has a high share in only public services. In addition, it can be shown that the growth in the public services has stopped after 2001. This means that the region has a challenge in taking advantage of most growth sectors.

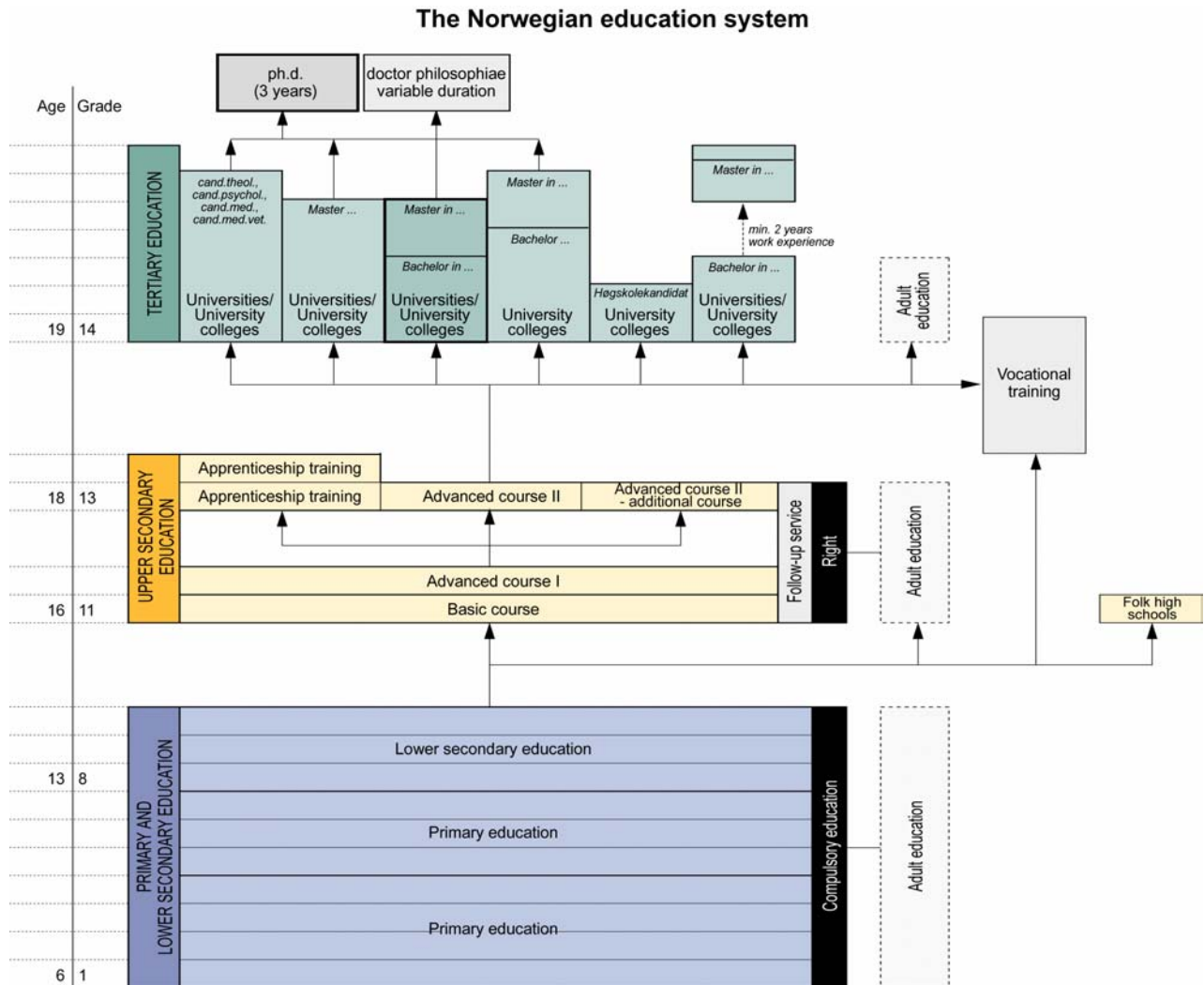
Table II.22: Percentage growth in employment in different sectors in the period 1991-2001 in Trøndelag and Norway. Source: PANDA

	Primary industries	Manufacturing and other industries	Construction	Wholesale and retail trade	Hotels and restaurants	Transport and communication	Finance, real estate, renting and business activities	Public Services	Other service activities	Total
Norway	-26 %	-5 %	7 %	6 %	29 %	8 %	80 %	22 %	93 %	17 %
Trøndelag	-35 %	-7 %	10 %	1 %	24 %	-3 %	93 %	26 %	97 %	14 %
Sør-Trøndelag	-31 %	-6 %	9 %	2 %	32 %	-2 %	103 %	27 %	92 %	19 %
Nord-Trøndelag	-37 %	-12 %	12 %	-3 %	5 %	-4 %	56 %	23 %	110 %	5 %

Annex III – The Norwegian Higher Education System

Source: NIFU-STEP report for the OECD review of tertiary education in Norway 2005.

Figure III.1: General Structure of the Norwegian Higher Education System



Institutional landscape

The categories of higher education institutions are as follows:

Universities are broad institutions, covering most disciplines, main national responsibility for research training.

- University of Oslo (founded 1811)
- University of Bergen (founded 1946)
- Norwegian University of Science and Technology (NTNU) (founded 1968 as the University of Trondheim, and reorganized as the NTNU in 1996)
- University of Tromsø (founded 1968)

In 2005, two universities have in addition been established after passing the new institutional accreditation procedures:

- University of Stavanger (a former university college)
- Norwegian University of Life Sciences (a former specialized university institution for agriculture)

The university colleges in Agder and in Bodø also aim to obtain university status in the future.

Specialized university institutions in fields like: veterinary medicine, architecture, physical education and sports, music and arts, and economics and business administration offer professional programmes at advanced (master's) and postgraduate level, doctoral degrees. These have a national responsibility for research within their fields.

University colleges (former State Colleges): The university colleges predominantly offer 3-year professional programmes and some master's and a few doctoral programmes, and have research responsibilities in fields where they award doctoral degrees. In addition, most university colleges offer some programmes which are parallel to undergraduate university subjects, mainly 1-year programmes

Other colleges: This category includes military colleges, and the National Police Academy.

Private tertiary education institutions: This category covers a broad range of institutions and tertiary programmes. The largest number of students is found within business administration. The largest institution, BI Norwegian School of Management has about 20 000 students (including part-time students), most of them at undergraduate level or shorter courses, but there are also master's level and doctoral programmes. (The Norwegian Lutheran School of Theology is the first private institution to be accredited as a specialized university institution, see above).

In Norway, there is no official or formal hierarchy between institutions within each category.

A separate institution has a specific responsibility for continuing and further education; however, this is also a responsibility for all higher education institutions. The institutions offer a broad range of courses, both general and profession-specific, often in close cooperation with industry, public administration or professional organizations. The institutions may charge fees for such courses. In addition, Norwegian institutions have a large but not easily identifiable number of students who are mainly part-time and follow the courses offered to ordinary students.

The introduction of a degree structure according to the 3 + 2 (+ 3) model from 2003 was mainly a response to the *Bologna Process*. Some professional and vocational programmes of study in the university sector (e.g. chartered engineer, medicine, architecture and industrial design, pharmacy, theology) have kept their one-tier structure. Some teachers' education programmes and programmes of study in music have retained their 4-year programme. The majority of professional programmes within the university college sector have been redefined into the bachelor's structure. There is broad range of bachelor's programmes offered by the universities, both predominantly discipline-oriented, cross-disciplinary programmes, and also professionally-oriented programmes. Even though more master's programmes are being introduced in the university college sector, most master's programmes are found within the university sector. Also the master's degree includes both disciplinary as well as professionally oriented programmes.

Table III.2: Number of pre-reform degrees and qualifications. 2002-2003

Type of institutions	Lower level	Higher level
Total	22 717	6 659
University sector	3 570	5 898
University colleges	15 435	494
Other colleges (including art and private institutions)	3 712	267

Source: Statistics Norway. The table covers pre-reform degrees, before the introduction of the bachelor's and master's degrees from 2003. Lower level includes both the lower 4 years degrees at the universities as well as the professional degrees at the colleges.

Overall size of the tertiary sector

Table III.3: Students by gender and institution. 1993 and 2003

	Total		Females		Males	
	1993	2003	1993	2003	1993	2003
Total	172 574	209 770	93 449	125 673	79 125	84 097
University sector	77 252	78 753	40 462	43 427	36 790	35 326
University of Oslo	34 628	29 230	19 753	17 442	14 875	11 788
University of Bergen	15 537	17 110	8 545	9 943	6 992	7 167
Norwegian University of Science and Technology	15 522	19 404	6 542	9 140	8 980	10 264
University of Tromsø	6 276	5 508	3 395	3 188	2 881	2 320
Specialized university institutions*	5 289	7 501	2 227	3 714	3 062	3 787
University Colleges	67 362	98 315	40 398	63 955	26 964	34 360
Other colleges	6 362	2 272	2 784	866	3 578	1 406
Private institutions**	21 598	30 430	9 805	17 425	11 793	13 005

Source: Statistics Norway. Present terms for institution and institutional category

*Including National Academy of the Arts

**Including the Norwegian Lutheran School for Theology

The figures in Table II.3 are individuals. The number of full-time equivalents (FTEs) is lower, but not easy to estimate. The stagnating enrolment in the university sector between 1993 and 2003 is mainly due to a drop in enrolment at the University of Oslo, while other institutions, with the exception of the University of Tromsø, have expanded.

Table III.4: Students by type of institution and age. 2003

Age	Total	University sector	University colleges	Other colleges*
- 19	3.5	4.2	3.2	2.9
20 – 21	16.3	17.6	15.7	14.8
22 – 24	24.8	27.2	22.9	24.8
25 – 29	21.9	28.2	18.1	17.9
30 – 34	10.7	9.3	11.5	11.8
35 -	22.7	13.5	28.6	27.8

Source: Statistics Norway.

*Including National Academy of Arts and private higher education institutions.

Figure III.5: Cumulative % enrolled in higher education among those who were 19 in 1985, 1990, 1998 and 2000. Source: Statistics Norway.

