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Further references in the Annex to this case

- **Presentation and rationale of the case study**

"Universities as development and innovation hubs" is presented as a case for purposes of impact and exemplarity. The main point is that "learning economies" rather than "knowledge economies" are keys to development and innovation, Lundwall (2007). Universities are able to couple higher education and research in regional and national contexts to local resources (both human and material) and needs, for example by introducing projects and problem based learning (PBL) in research and curricula and establishing real and mutually beneficial links to local/regional business, both public and private. Experience and project examples are used here to illustrate these points.

The Danish experience (1850-2007) demonstrates the long perspective in establishing the world's most competitive economy (The Economist, 2005) as well as a top ranking in Europe in terms of innovative capacity. Focus on learning and innovation and shortening of distance between higher education and society seem important ingredients in this achievement, Lundwall (2007).

The SUDESCA project (1996-2007, a DANIDA (Danish International Development Agency) financed ENRECA (Enhancement of Research Capacity in Developing Countries) activity in Central America; Johnson et al (2007), Dirckink-Holmfeld and Illera (2006)) shows a learning and innovation centered development through university-business interaction and facilitated new national policy and project formulations. Additionally, new international projects emerged and found EU financing. An example is the ELAC ("European and Latin American Consortium for ICT Enhanced Continued Education in Environmental Management and Planning", 2004-2008) project. The project focused on the use of ICT (Information and Communication Technology) as a means to enhance PBL, local society development, and research capacity. The project was established as a joint enterprise to meet the needs of the Latin-American partners. The project had a major institutional impact within the participating universities but also on the national research and development agenda.

The DUCED project (1998-2004, DANCED (Danish Cooperation for Environment and Development)/DANIDA financed university cooperation between Southern Africa, Malaysia and Thailand; Hansen and Lehmann (2006), Agamuthu and Jeremiah (2006)) provides examples of implementation of new university curricula, new modes of learning as well as new project cooperation between universities and industries in the developing countries.

Tools such as PBL and ICT are shown in both programs to enhance development in terms of faster transition to more effective learning, institutional change and productive public-private partnerships in the

formulation of tasks and their implementation.

- **Emergence of the initiative**

The Danish experience is a historically interesting case to demonstrate how a generally high level of (general) education may facilitate a long development to wealth and welfare in spite of limited material resources. While agriculture was the original basis for this development, the present situation is characterized by an industrially advanced and innovative business culture that is globally competitive in spite of high wages and salaries. There has been emphasis on human resource development, including higher education and research. As a matter of fact, innovation (as defined in this bid document/template) is substantiated by the Danish experience. Thus knowing how innovation works, there is basis for use of this experience in other contexts, i.e. learning from the Danish experience and then implementing development and innovation over much shorter spans of time in new situations and new fields of development.

DANIDA suggested several ENRECA projects to enhance North-South university research based on needs in both Denmark and co-operation countries. Hence SUDESCA (1996-2007). As a spin-off, the ELAC project emerged by support from the EU and is an example of a collaborative effort between four Latin American Universities (Nicaragua (2), Costa Rica and Mexico) and four European Universities (DK (2), UK, Spain).

Danish universities suggested building higher education and research capacity for environment and development in both Denmark and developing countries as part of the DANCED project. Hence DUCED (1998-2004).

- **Project implementation**

The Danish experience is documented by a series of research as well as M.Sc. and Ph. D. projects carried out over the last 20 years at Aalborg University and in the context of international research networking on innovation systems, e.g. GLOBELICS. See Lundwall (2007).

The SUDESCA project aimed at enhancement of the research capacity in three Central American countries (Costa Rica, Nicaragua and El Salvador). Focus was on capacity building within the areas of systems of innovation analysis and the implementation of cleaner technology. The SUDESCA project had a three-tiered approach. The first tier was about learning-by-doing-research and learning-by-networking, i.e. learning as an interactive process. The second tier was individual human capacity building, e.g. enhancing the capabilities of individual researchers by scholarships, conference participation, and production of reports. The third tier was institutional capacity building, i.e. enhancing the capabilities at the institutional level to support various research activities carried out by the individual researchers and research groups. This includes embedding of the

specific research area in the overall university strategy, financial support, legal and administrative issues in relation to contracts with external partners, research equipment, and access to library and databases.

The ELAC project was carried out as a demonstration project based on pilot experiments with ICT. Each of the universities (in Nicaragua, Costa Rica and Mexico) developed a number of pilot experiments with the integration of ICT for learning. Some projects focused on the use of ICT in the ordinary university programmes with the aim of enhancing quality, while other focused on the integration of ICT in community building and local development. Moreover, the entire project constituted training in international research collaboration using ICT. The project used open source programs which proved to be very successful. All of the universities have now systematically implemented an open source learning infrastructure. Moreover, they are continuing the work on pedagogical improvement of teaching and learning.

The DUCED projects took place in Thailand, Malaysia and Southern Africa (Botswana and South Africa) in two stages. In stage one, which focused mainly on building Danish HER (Higher Education and Research) capacity, a network was established between 18 universities (6 in the North and 12 in the South). Danish students and faculty went abroad to do field courses and projects together with the local universities and industry to train the Danish students under real development conditions. This paved the road for new learning and research in the South, and in stage two the South universities prepared new curricula and started introducing PBL, thereby starting developmental cooperation with local industry (external stakeholders) instead of doing only class room teaching and laboratory work. 'Outreach' was an important goal which was implemented through specific industry hosting of student projects as well as direct involvement of industry representatives in environmental management seminars. The Danish Government (DANCED) and the universities themselves financed the activities. A government reorganisation of Danish aid programmes in 2002 meant the closing of DUCED by 2004.

- **Obstacles and factors of success**

The SUDESCA and DUCED projects were successful in that they initiated a move towards radically new approaches to teaching and learning within the universities in the South, leading to graduates much better suited to participate in the development process in their home countries. This was to some extent due to role models presented by Danish students and in this context more direct cooperation between local universities and external stakeholders, e.g. in project work or management seminars organized at the universities as joint ventures of the Danish and the local universities. It was realized that capacity building takes time and that the first 2-4 years are necessary to build the trust and professional relations that are

necessary for local development and innovation to get off the ground.

The combination of higher education and research is vital. This was realized by the implementation of SUDESCA and DUCED. SUDESCA started as a research project and DUCED as an education program, but in both cases the most important outcomes were based on a combination of higher education and research. Ph.D. projects were essential in the research projects. The closure of the DUCED program after 5 years and the cut in the SUDESCA 12 year funding horizon in 2001 disrupted the processes of mutual trust- and capacity building. Some of the activities survived due to personal involvement and commitment though mostly on a bilateral basis, i.e. the S-S interaction was terminated. Too short life time and lack of understanding regarding the intimate coupling between research and higher education are the most important obstacles experienced in these capacity building programs.

The success of the ELAC project was highlighted by the participants to be due to the genuine collaborative process among the Latin American and European partners, building on trust, mutual respect and mutual learning. Moreover, the tangible results in terms of human resource capacity building, pedagogical development, and ICT use are indicators of success. The pilot projects were well integrated in the institutional arrangement and has been sustained in e-centers and e-learning labs after the project ended. Moreover, a joint Ph.D. program in Human Centered Informatics between Aalborg University and Universidad Nacional, Costa Rica has been established.

A new ELAC program is being prepared for establishment in 2008. This means that for two years funding has not been available. Especially within the area of ICT this interruption is critical to universities in the South, because ICT in an organizational transition process is an extra cost. Moreover, ICT integration requests a number of technical and ICT-pedagogical skills, cf. Dirckinck-Holmfeld & Rodriguez (2006)

- **Impacts**

The Danish experience (1850-2007) documents economical development and innovation ability in an ever more competitive global market economy. The results are tangible and demonstrated by a high ranking of Denmark on the international innovation scale and a strong economy to sustain the wealth and welfare.

In the SUDESCA and DUCED projects the impacts of capacity building in HERI (Higher Education, Research and Innovation) are more knowledgeable graduates with highly relevant competences in communication, team working and project management, as well as enhanced innovative capabilities when employed in private firms and public organizations. Other tangible though more difficult to document directly results relate to new ways of participating in the learning economies through interdisciplinary

approaches and action oriented research, for example in joint ventures between companies and universities, i.e. continuing the innovative symbiosis between education and research that was part of their own success while being students.

A learning and innovation centered approach to development issues are now an integrated part of the research agenda among the SUDESCA partners. The involved research groups and individual researchers participate in international research networking and collaboration leading to spin-offs in terms of new projects.

At the institutional level the administrative capability to handle international collaboration projects and organizing international workshops and conferences is improved.

The learning and innovation centered approach to development has stimulated researchers' contributions to related policy formulation via various channels:

- Publications and presentations
- Workshops and seminars with participation by politicians and decision-makers
- Consultancy work
- Individual positions as decision-makers and research organizers.

Some additional tangible results of the ELAC-project are:

- "Future Workshops" with stakeholders within the universities in the South. (app. 20 participants within each university)
- Workshops and international seminars for practitioners, politicians and consultants (20 – 100 participants in each event)
- Training courses. A full training program was developed and run by the European partners (12 courses – most of them run in circles of two years). The training courses focused on institutional arrangements, ICT as learning infrastructure, learning theories, innovative pedagogical approaches, the art of learning in virtual environments, and learning on environmental issues.
- 12 pilot projects on different aspects of ICT supported learning environments
- The ELAC project was followed by a Ph.D. program in Human Centered Informatics. Up to now 3 Ph.D. students from Latin America have enrolled.

The combination of pilot projects, courses, workshops and Ph. D. scholarships would provides a very sustainable contribution to the building of capacity and taking ownership in higher education and research in developing countries.

In Malaysia, Thailand and Southern Africa, new PBL curricula have been introduced in a number of universities and the trend is continuing. Direct cooperation between industry and university is a new and rewarding activity in relation to research and education, see Agamuthu and Jeremiah (2006) and Agamuthu and Hansen (2007). On the interface between urban development and university action the new program on "Urban Quality Development and Management" is an interesting university outreach that involves 4 cities (2 in Europe and 2 in SE-Asia) and 5 universities (3 in SE-Asia and 2 in Europe); cf. www.urbanquality.net.

- **Conclusions**

1) Higher education, research and innovation (HERI) capacity existing in the North has to be carefully adapted to the specific conditions in the South, before transfer of experience, curricula and research agendas takes place. In principle, the point is to secure generic training in the South, i.e. make universities and their stakeholders in their societies able to take care of own development, research and innovation. Partners from the North will profit from the collaboration, because it means new challenges in intercultural understanding and science as well as new market opportunities for companies in the North.

2) HERI capacity building in the South needs a long-term perspective to be effective. Building mutual trust, establishing research groups, including stakeholders in projects and their management, and securing adequate administrative routines take time and long term funding, given acceptable progress reports at reasonable intervals. Time necessary to develop trust and produce sustainable outcome in HERI capacity building programs is 15 rather than 3 years. Abrupt shifts in donor policies must be avoided. They mean loss of motivation to sustain already achieved results and they are poison to innovation.

3) In principle donors must think in two parallel tracks when investing in HERI in the South. In track one it is necessary to invest in a robust infrastructure that can sustain a new local "learning economy" (cf. above in Introduction and Rationale). This means binding agreements at government, university and industry levels. In the other track it is imperative to secure scholarships and other to facilitate mobility of graduate students and young faculty in order to get abroad to build networks and take home new ideas and inspiration for HERI. In this context track one becomes vital; without an infrastructure that enhances HERI in their home country, the scholars will not return.

4) More efficient learning seems on the agenda in all countries and PBL is one efficient tool for such development towards HERI. PBL enables universities to become more efficient in producing graduates and doing research to the benefit of society. The partnership between industry and universities is crucial in the learning (knowledge) economy and mutually beneficial interaction is secured as an integrated part of the PBL approach.

5) ICT is a tool for enhanced transition to the learning economy and

knowledge society. The appropriation of ICT for learning should be carefully adapted to the specific needs and human resources among the partners. ICT provides a number of new opportunities to enhance learning capabilities and to offer education to local communities. Moreover, ICT is a transformative tool in relation to organizational changes and development in general.

6) The results from SUDESCA, DUCED and ELAC will be relevant for other countries, including several of the 6 countries directly involved in the WBI Africa Forum in Nairobi in May 2008.