The Governance of Knowledge: Perspectives from Brunei Darussalam and Malaysia

Farah Purwaningrum, Syamimi Ariff Lim, Hans-Dieter Evers, Tony Banyouko Ndah

Universiti Brunei Darussalam

Working Paper No. 9

Institute of Asian Studies, Universiti Brunei Darussalam

Gadong 2014

Authors

Dr. Farah Purwaningrum, Research Fellow, Institute of Asian Studies, Universiti Brunei Darussalam. Contact: farah.purwaningrum@ubd.edu.bn; fara.arum@gmail.com

Dr. Hajah Syamimi binti Haji Mohd Ariff Lim, Acting Director, e-Government Innovation Centre, Universiti Brunei Darussalam. Contact : syamimi.ariff@ubd.edu.bn

Prof. Dr. Hans-Dieter Evers, Eminent Visiting Professor, Institute of Asian Studies, Universiti of Brunei Darussalam. Contact: hdevers@uni-bonn.de . Internet: https://sites.google.com/site/hansdieterevers/home

Anthony Banyouko Ndah, M.A., Research Fellow, Environmental Studies Programme, Faculty of Arts and Social Science, Universiti Brunei Darussalam. Contact: tonyban83@gmail.com

List of IAS Working Papers

King, Victor T., Culture and Identity: Some Borneo Comparisons. Working Paper No 1 Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

Evers, Hans-Dieter and Solvay Gerke, Local Knowledge and the Digital Divide: Focus on Southeast Asia. Working Paper No 2. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

King, Victor T., Borneo and Beyond: Reflections on Borneo Studies, Anthropology and the Social Sciences. Working Paper No 3. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

King, Victor T., UNESCO in Southeast Asia: World Heritage Sites in Comparative Perspective. Working Paper No 4. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

Purwaningrum, Farah, Knowledge Transfer Within an Industrial Cluster in the Jakarta Metropolitan Area. Working Paper No 5. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

Evers, Hans-Dieter, Ndah, Anthony Banyouko & Yahya, Liyana, Epistemic Landscape Atlas of Brunei Darussalam. Working Paper No 6. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

Carnegie, Paul J., Is the Indonesian Transition a Model for the Arab Spring? Working Paper No 7. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

Lian, Kwen Fee, Citizenship Regimes and the Politics of Difference in Southeast Asia. Working Paper No 8. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2013

Purwaningrum, Farah, Ariff Lim, Syamimi, Evers, Hans-Dieter & Ndah, Anthony Banyouko, The Governance of Knowledge: Perspectives from Brunei Darussalam and Malaysia. Working Paper No 9. Gadong: Institute of Asian Studies, Universiti Brunei Darussalam 2014

The Governance of Knowledge: Perspectives from Brunei Darussalam and Malaysia

Farah Purwaningrum, Syamimi Ariff Lim,
Hans-Dieter Evers, Tony Banyouko Ndah

By the middle of the last century, a paradigm shift in development policies took place. The question was asked: How can resource poor countries develop in a world of increasing demand for - and rising prices of raw materials, especially fossil fuel. What can be done to pay for ever increasing prices of fossil energy and heavy metals while striving for the status of an industrialised country? This question was asked by Vietnamese, Malaysian and Thai politicians, however, the same question never arose in oil-rich Brunei Darussalam. How can human resources be utilized to raise countries above the low-income levels? The World Development Report of 1998/1999 summarized current thinking at that time by identifying "knowledge" as the new factor of production (World Bank 1999, World Bank 2008). In a by now famous study, comparing the development path of South Korea and Ghana the World Bank economists concluded that the input of the classical factors of production: land, capital and labour could only explain a fraction of the different development paths of Ghana and Korea. The rest could be attributed to the much higher input of "knowledge" into Korea's development efforts, explaining why Korea surged ahead to become one of the world's leading industrial countries while Ghana was left behind (World Bank 1999). This actually rather simplistic argument legitimized increasing funds for research into "knowledge for development (K4D)" and a host of development programmes. Governments in different parts of the world adopted the general idea of 'knowledge society' and embarked on political

programmes targeting the construction of 'knowledge societies' (Hornidge 2007, Menkhoff, Evers et al. 2010, Hornidge 2012). The discussion of knowledge for development in Singapore among other countries was often cited as an example of a country without any natural resources that developed into an industrial high tech economy through a consistent science and knowledge policy (Hornidge 2008, Menkhoff, Evers et al. 2011). The "knowledge assessment method (KAM)" of the World Bank Institute and its data bank became a valuable instrument for development planners around the world. The idea in itself is not new. Already, in 1934, Sir Winston Churchill, looking at the crumbling British Empire found consolation in the idea that "the empires of the future will be empires of the mind".

In the meantime, the euphoric acceptance of K4D has given way to a more realistic evaluation of the use of knowledge for development. In some of our studies, we have identified the dilemma of "closing the digital divide", proposed by UNESCO and alerted development planners to the "knowledge trap" on the way towards a knowledge-based economy and society (Menkhoff, Evers et al. 2011). The paper aims to revisit the concept of knowledge governance and epistemic landscape as subject matter of research carried out by a research group in the Center for Development Research (ZEF), University of Bonn, Singapore Management University and, recently, in the Institute of Asian Studies- University of Brunei Darussalam[1]. It also looks at knowledge governance from the perspectives of Brunei Darussalam. It does so by drawing on the lessons learned from building knowledge clusters in Peninsular Malaysia.

[1] This paper presents some results of the research projects "Penang as a Knowledge Hub" (USM) and "Brunei as a Knowledge Hub" (UBD). This project was carried out under a UBD research grant Research Team: Associate Professor Dr Roger Lawrey, (formerly FBEPS UBD) School of Accounting, Economics and Finance, University of Southern Queensland; Professor Dr Hans-Dieter Evers, Eminent Visiting Professor, Faculty of Arts and Social Sciences, UBD; Hjh Siti Rafidzah binti Hj Sulaiman, Lecturer, Faculty of Business, Economics and Policy Studies, UBD; Anthony Banyouko Ndah, PhD Research Fellow, Environmental Studies Program, FASS UBD; Liyana Yahya, Research Assistant, FBEPS UBD.

The paper is structured as follows: the first section will explain the epistemic backlash the knowledge trap and the strategies a country may adopt to govern knowledge. The second section will look at epistemic landscapes in Peninsular Malaysia. Two knowledge clusters are the focal points of analysis, namely the North Corridor -Penang Knowledge Cluster and the Multimedia Super Corridor - Cyberjaya Knowledge Cluster. The third section delves into the perspectives from Brunei Darussalam capitalising on knowledge as an effort to diversify its economy. The last part sums up the discussion and provides recommendations.

1. From Epistemic Backlash To Knowledge Governance

Without going into the epistemology of knowledge for development in detail, we would like to draw attention to the fact that knowledge as a commodity has a number of particular attributes that sets it apart from other commodities. One of these is the fact that the production of new knowledge also increases non-knowledge or "ignorance". In many cases research projects yielding new knowledge also increases the knowledge of what we do not know. The typical final report of a successful research project states that the initial research problem has been resolved, i.e. that our knowledge on a certain topic has increased, followed by a statement that during the research new problems have emerged that need further research (and, of course funding). For each problem solved, more problems emerge. A linear increase of knowledge is accompanied by an exponential increase in knowledge of what we do not know. To put it in other words, an increase of knowledge leads to an even greater increase in ignorance, which can be described as an "epistemological backlash". This increase in "ignorance" is accompanied by an increase in risk and an increase in necessary research

funds for the next stage of development. This is one aspect of the "knowledge trap" that projects and governments have to avoid.

Another part of the "knowledge trap" is based on the observation that an increase in knowledge input into the economy and society is only possible with an increasing use of knowledge. Knowledge has a peculiarly shaped supply and demand curve. The demand for knowledge rises with increasing supply of knowledge. This is because knowledge production and utilization for productive purposes need further knowledge as a resource. This is usually indicated by an increasing demand for high-level manpower and the need to establish large research institutes and think tanks. Both demands are difficult and expensive to fulfil and governments may fall into this "knowledge trap", if they cannot meet this demand because of shortcomings in their own system of higher education or they do not have the financial means to attract expensive talents or equip high-level research institutions. Singapore has avoided this "knowledge trap" by importing foreign academics and investing heavily in research infrastructure (NUS, A*Star etc.). Quite a number of government documents in Singapore aiming at the construction of a knowledge society emphasised the belief that Singapore needs to develop faster and to perform economically better, in order not to fall behind other industrialised countries (Hornidge 2007: 162). Malaysia's higher education policy is now geared towards internationalization of its higher education institutions (MoHE 2011). This is aligned with the Vision 2020, particularly the National Higher Education Strategic Plan and the "New Economic Model" proclaimed by the Malaysian Prime Minister. It aims at putting Malaysia in the spotlight as a renowned education hub globally and emphasising the academic role of these institutions in nation building (MoHE 2011: 27). However, despite this policy, Malaysia has fallen into the "knowledge trap" by ethnically motivated discriminatory recruitment policies for research and university staff, in addition to an under-

financed higher education sector. Existing expertise available in the higher education organizations or academia are underutilized. There is not enough knowledge to produce new knowledge in universities and research institutes.

Knowledge governance can be defined as both an administrative process and a structure of authority relations. It involves the channelling of resources in building up knowledge management capabilities and improving the competitive advantage of a country in the world market by utilising knowledge as a factor of production (Menkhoff, Evers et al. 2011). An inquiry into knowledge governance requires one to look at the formal and informal institutional arrangements allowing the process of knowledge flow or knowledge exchange at a regional level (or to be more specific on a cluster level).

There has been a growing volume of literature discussing the knowledge base or knowledge dissemination on a regional level. These studies have been carried out by drawing on the study of clusters in European countries and in Canada. Henry and Pinch proposed a model of knowledge dissemination derived from the knowledge based view of the firm (Henry and Pinch 2006). This calls for a focus on internal knowledge assets of the firm as the source of competitive advantage instead of the firm's market position. Their model points to a continuum of two types of knowledge. First is component knowledge which refers 'to those specific knowledge resources, skills and technologies that are related to identifiable parts of an organizational system, rather than to the whole…it is often relatively codifiable and transferable' (Henry and Pinch 2006: 119-120). Component knowledge however is not the same as codifiable knowledge because several of its elements are tangible and tacit whilst others may be organizational routines that are tacit and intangible. Second is architectural knowledge that 'relates to the organization of an entire system and the structures and routines

for organising its component knowledge' (Henry and Pinch 2006: 120). It has the tendency to be specific to particular organizations within which it evolves endogenously over time in a complex trajectory. Specifically, Henry and Pinch argue that architectural knowledge may augment the capacity of learning of individual firms and of industrial clusters (Henry and Pinch 2006: 120).

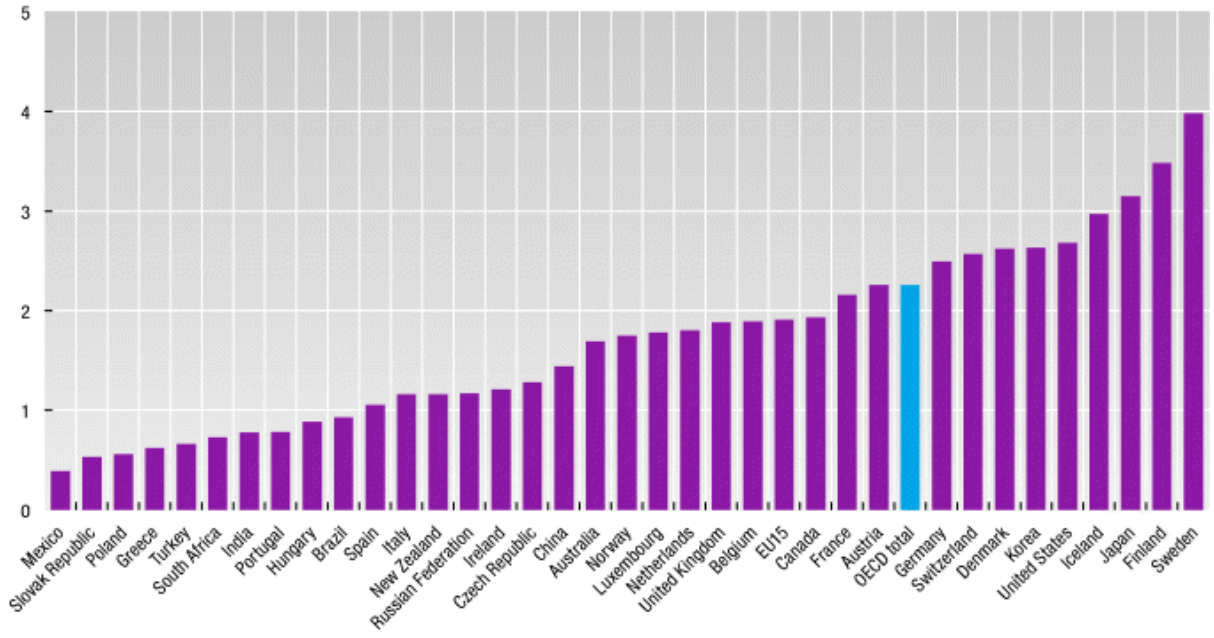
The previously mentioned inquiry of the knowledge base or knowledge dissemination attempted to move beyond the (binary) distinction between codified and tacit knowledge. There was no discussion about local knowledge, which is rooted in the respective social contexts and their economies (Antweiler 1998, Evers and Gerke 2012). Moreover, what are the traits of the linkage enabling the knowledge flow into the cluster and within the cluster? This discussion is dealt with by looking at the important role of both local links namely localised assets in certain territories such as labour, and the non-local links, namely of the flows of knowledge to the emergence and sustainability of industrial clusters (Yeung 2008). One should not only look at the relational and structural element of such networks/links (Dicken, Kelly et al. 2001), but also at the degree of competition and/or collaboration of organizations in the cluster within and outside of the networks. These organizations may include higher education organizations such as polytechnics and universities, industries which are 'foreign transplants', to government-sponsored business incubators. This is where the concept of knowledge cluster bears fruit. Knowledge clusters contain universities and colleges, research institutions, think tanks, government research agencies and knowledge-intensive firms; have the organizational capability to drive innovation and create new industries; are central places within an epistemic landscape, i.e. in a wider structure of knowledge production and dissemination (Evers, Gerke et al. 2010, Evers, Gerke et al. 2010, Menkhoff, Evers et al. 2011).

Indeed, there are five knowledge strategies a country may adopt in governing knowledge. The first is to develop knowledge clusters, as defined in the previous paragraph. Second, create knowledge hubs and centres of excellence. Third, create comparative advantages through local knowledge. Fourth, develop an ICT infrastructure. Especially for the last strategy, the backbone of any knowledge-based economy is a fast internet connection. In Malaysia, the national IT agenda was formulated in 1996 and it aims to enable the country to move quickly into an information and knowledge-based nation (Ariff 2008). In an effort to leapfrog Malaysia into a knowledge economy, two initiatives were adopted. The first is the Multi Media Super Corridor; and secondly, the enactment of a set of cyberlaws (Ariff 2008: 380). Internet infrastructure and high-speed internet connections are key for this leapfrogging. A glass fibre optic net improves access to the internet. Furthermore, realizing that a full coverage of the Malaysian peninsular, as well as the vast states of Sabah and Sarawak is impossible, the Malaysian government under its Prime Minister Mahathir has created the Multi Media Super Corridor, with high-speed internet connections to lure high tech foreign investment into Malaysia (Bunnell 2004). Fiber-optic networks have also been created in parts of Kuala Lumpur and Penang, but a total coverage like in Singapore and some European countries is still not achieved. Despite these efforts, other technological advancements like the spread of smart phones and tablet computers are gobbling up cyberspace. Massive further investments in the ICT infrastructure will be necessary to keep the flow of information and knowledge going, in addition to chats, streaming of videos and songs that are expanding fast and creating bottlenecks in data transmission.

Establishing knowledge hubs and centres of excellence require a reflection on higher education policy. Most ASEAN states, especially Singapore, Malaysia and Brunei have given up an equalizing policy of higher education. Educational and science policy are directed

towards the creation of centres of excellence, like the APEX university system in Malaysia or the turn towards research and research funding in the University of Brunei Darussalam, which is striving to climb up the ladder of academic success as measured by various indicators. R&D expenditure, still low in most ASEAN countries except Singapore, will have to rise above an average higher than 2% of the GDP of OECD countries.

Figure 1 R&D Expenditure as % of GDP, 2004



Source: OECD 2004

Knowledge production needs knowledge: science parks, research institutes, R&D divisions, SMEs, universities, etc. in close proximity. “Naturally” grown as well as government initiated clusters now exist in many parts of the world: Silicon Valley, Hyderabad, ABC (Aachen-Bonn-Cologne), Penang, Biopolis Singapore, MSC Malaysia, Jababeka Industrial Cluster- Jakarta, HCMC, and possibly soon also Brunei-Muara District - Bandar Seri Begawan in Brunei Darussalam are knowledge clusters in epistemic landscapes.

Often cluster analysis looks at the firms, including the firms' locational decision in the cluster (see for example : Johansson and Forslund 2008) or the 'capability' perspective on the firm (Lawson and Lorenz 1998). There is also the transaction cost perspective (Gordon and McCann 2000, McCann, Arita et al. 2002, McCann 2008) which later hypothesised three formats of industrial clusters, ranging from pure agglomeration, industrial complex, to social network (Iammarino and McCann 2006: 1022). The reduction of transaction cost due to proximity has always been a forceful argument explaining the "natural" clustering of industries. This argument is weakened by the fast development of information and communication technology. A video conference can easily connect executives of various companies, government officers and scientists without concern of their respective location. ICT was often thought to reduce industrial and knowledge clustering, but as examples like the Silicon Valley or the industrial cum knowledge clusters of Cambridge UK and Massachusetts demonstrate, proximity is still an important factor in creating innovations and high-tech output. ICT and face-to-face contact do not substitute each other rather they are frequently complementary (Iammarino and McCann 2006: 1021). Meusburger highlights that frequent face-to-face contacts between those who have decision making authority, requiring a high level of education with highly qualified specialist demonstrate a strong predisposition toward spatial concentration in few centres (Meusburger 2000: 360). The term 'geographical stickiness of knowledge' often surfaces in the existing literature on knowledge and the geography of innovation (Von Hipple 1994, Audretsch and Feldman 2004, Iammarino and McCann 2006). The flow of tacit knowledge is, thus, key in understanding why organizations (including firms) located in a cluster perform better than those located outside of clusters. It may well be the case that firms in organized clusters do better than firms in clusters in general (Tallman, Jenkins et al. 2004, Sölvell and Williams 2013). Sölvell and Williams argue that more successfully organized clusters tend to bring more interest and more member

firms over time (Sölvell and Williams 2013: 30). These point out two interrelated notions in observing clusters: first is the diversity of firms/institutions in the cluster, and, second, the level (or degree) of clusters' organization.

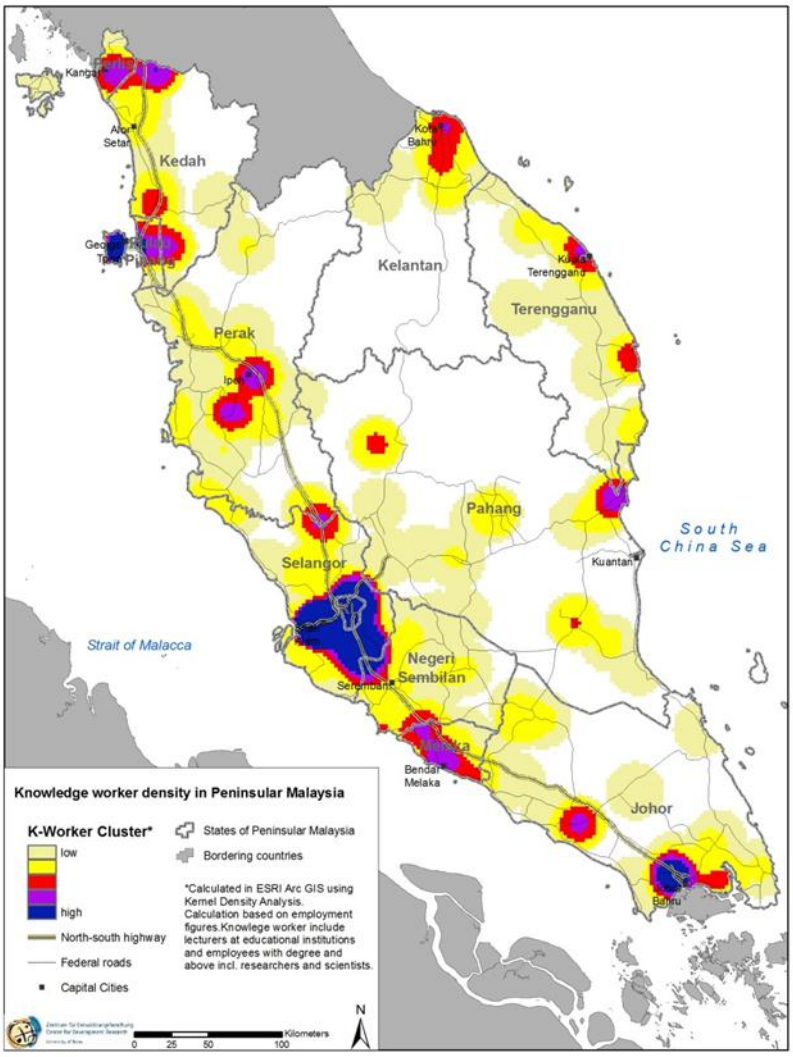
Hence, observing the dynamics of a knowledge cluster and its degree of interconnectedness with other hubs does require one to observe the flow of tacit knowledge, as reiterated above. In addition, it is also important to observe the level of education and the training that qualified personnel received. Understanding the movement or mobility of these qualified personnel from research institutes to private firms (Gertler and Wolfe 2005), for example, is essential to grasp the pattern of knowledge flow in the cluster. The distribution of the level of manpower and education of knowledge workers in a particular geographical area is the first entry point into looking at this dynamics. This is carried out in the epistemic landscape analysis. The second entry point is the output in the form of publications of universities. The next section (section 2) will deal with epistemic landscapes in Malaysia and subsequently section three will discuss the epistemic landscape in Brunei Darussalam.

2. Perspectives from Peninsular Malaysia: The Epistemic Landscape

Developing a knowledge-based economy and society requires a comprehensive approach as well as regional planning. In this section, we present our analysis of the epistemic landscape of Peninsular Malaysia. We use the term "epistemic landscaping" to emphasize the often-neglected aspect of knowledge governance, namely that the development of a knowledge-based economy and society requires more than ICT and engineering. It will be necessary to develop ICT facilities, educational and research institutions, closely-knit knowledge clusters

and knowledge hubs and a host of government and civil society initiatives to create an epistemic landscape with high peaks of knowledge production and lower plains of basic education.

Map 1. Knowledge Clusters in Peninsular Malaysia



Source: (Evers, Nordin et al. 2010) ArcGIS kernel density map.

Map.1 shows the concentration of knowledge workers in the ICT sector. Although there is knowledge clustering throughout the Malaysian Peninsular, three dense knowledge clusters stand out: a Northern Cluster concentrated in Penang, the Kelang Valley, Kuala Lumpur and the Multi Media Super Corridor with Putrajaya and Cyberjaya, and the Southern cluster of Southern Johor close to Singapore.

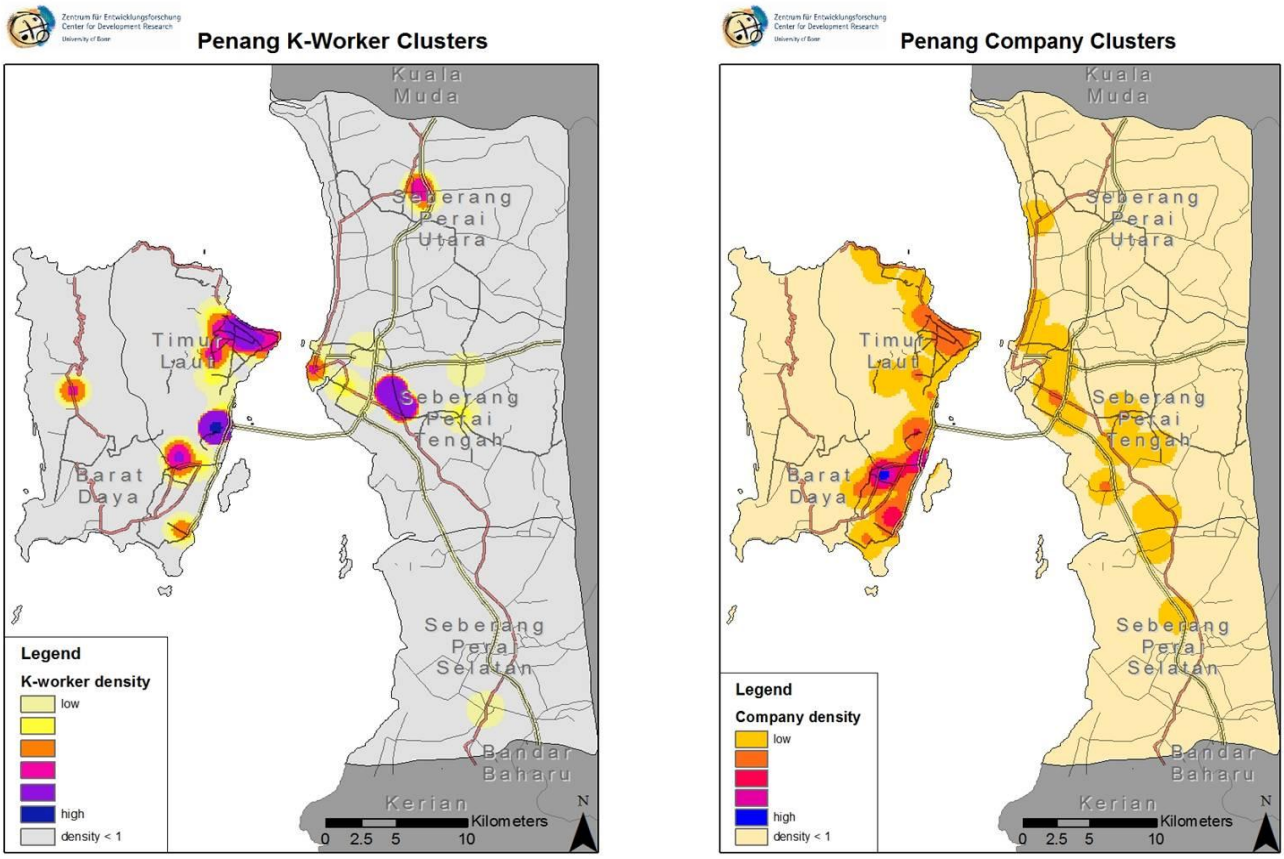
The Multi Media Super Corridor (MSC) itself, according to Indergaard (2003), reflects the use of sovereign power by the Malaysian state. The MSC represents a comprehensive plan that focuses on creating and combining digital infrastructure, actors as well as markets (Indergaard 2003: 390). There are conditions constricting the creation of start-ups in MSC. These range from the problems related to extending MSC networks outside of the enclave, to the issue that this calls for realignments in the power relations (Indergaard 2003: 395). Nordin (2012: 203), based on his study of the ICT companies in Cyberjaya, argues that Malaysia's centralised administrative system, ethnic groups, political elites and crony –based capital distribution have affected the development of knowledge-based clusters. The study, however, also suggests that geographical proximity of companies and employees contributes considerably to the creation of a dynamic cluster. Richardson, Yamin et al. (2012) investigate the internationalization of firms in a policy driven cluster of MSC. Their findings demonstrate that: first there is lack of spontaneous, informal interaction within the cluster, which constrains the flow of knowledge of international corporations through the region; second, firms located outside the MSC seem to be in a better position to attain internationalization by means of localised informal interaction; third, MSC policymakers are taking steps to stimulate the diffusion (or flow) of global, international knowledge within the MSC Cluster through organising regular networking functions (Richardson, Yamin et al. 2012: 799-801). The policy-driven cluster such as the MSC entices a reflection on the

optimal level of the government's involvement in cluster organization (for a discussion see: Enright 2003, Evers 2011) and, more importantly, government's role in the facilitation of inter-firm knowledge flow in the cluster itself. The European Union has therefore created positions for cluster manager to take care of the above-mentioned tasks.

The Northern Corridor[2] spearheads several key thrust areas, including the agricultural sector, manufacturing sector, tourism sector and logistics services. We focus on the knowledge clusters in Penang, Malaysia. These clusters exhibit a degree of diversity in terms of knowledge workers and companies (see Map 2). Penang is one of the hubs in the Straits of Malacca owing to its historical past as a trading centre (Evers and Hornidge 2007, Gerke, Evers et al. 2008, Gerke and Evers 2012) and its reputable role as the locus of the top manufacturer of electronic products in Malaysia since early 1970s (Rasiah 2003). Penang is indeed making headway towards the development of an integrated cluster. Two reasons for this may well be due to critical mass of firms and the involvement of the State Government of Penang and the Penang Development Corporation to support horizontal information sharing among firms (Rasiah 2003). A similar case may be emerging in Gresik and Surabaya, East Java, as these clusters become the basis of electric vehicles production in Indonesia. This is due to the active role the East Java Province has played in promoting the cluster and the manufacturing basis for electric vehicles (Purwaningrum and Boavida 2013). Gresik itself has been well known as one of the traditional trading centres in East Java, Indonesia (Evers 1988). Historical roles as trading hubs or port cities are however often neglected. The success of the Penang state government to capitalise on its knowledge clusters may well be due to a combination of its historical trajectory, the role of local government agency and the diversity of companies (see Map 2).

[2] See the following website: http://www.koridorutara.com.my/site/.

Map 2 Penang Knowledge Clusters

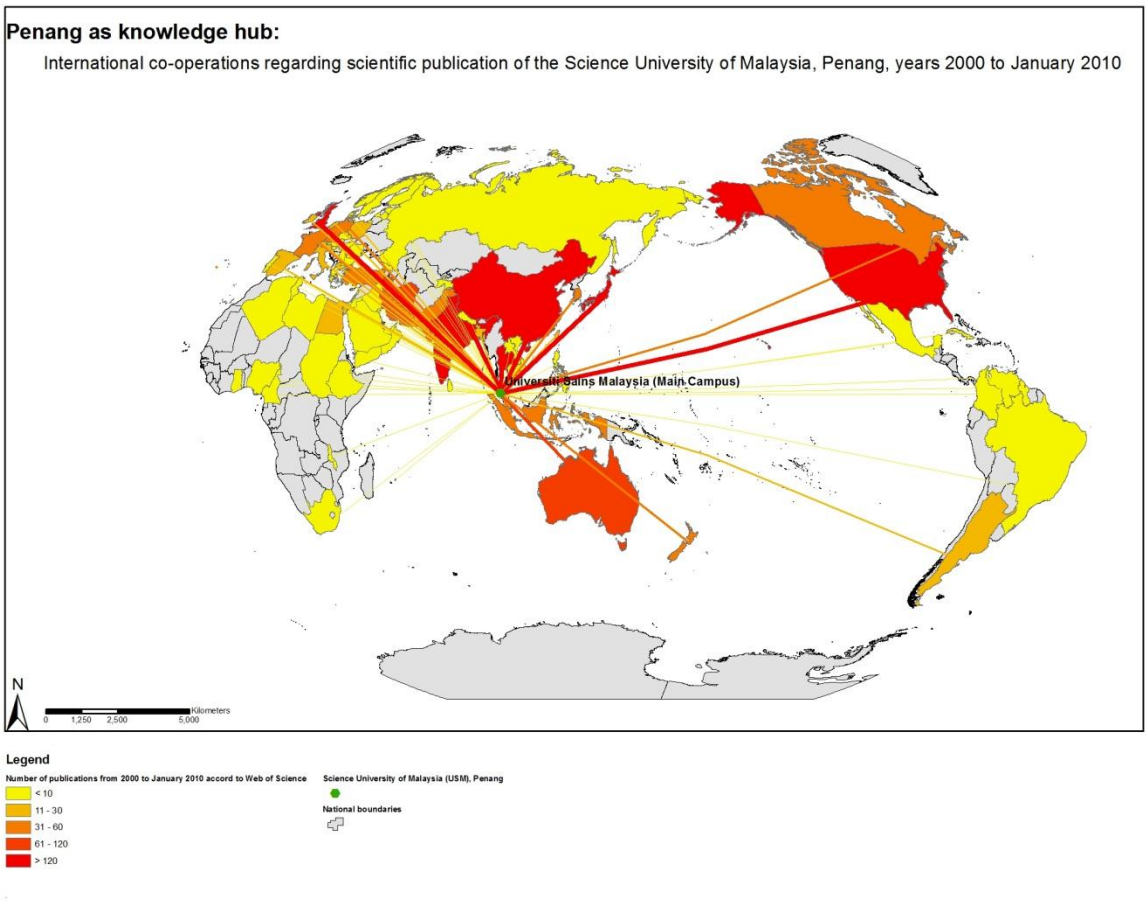


Source of Map: (Gerke and Evers 2012) ArcGIS kernel density map.

Inferring from Map 2, it can be argued that Penang Knowledge Clusters require high-level manpower. A sufficiently trained work force with various vocational and technical skills is, in fact needed in the industrial sector in Penang (IPPTN 2010). The state government has set up several training institutions, for example, the Japan Malaysia Technical Institute (JMTI), Tunku Abdul Rahman College (TARC), Institute Perguruan Tun Abdul Razak (IPTTAR), MARA Training Center (IPPTN 2010: 20). Universiti Sains Malaysia (USM) is one of the premier universities in Malaysia, established in 1969; it is the second oldest university in

Malaysia (IPPTN 2010: 36). The pattern of collaboration in the science network of USM can be seen in Figure 2.

Figure 2 Science Networks of Universiti Sains Malaysia as Knowledge Hub



Our analysis as shown on Figure 2 indicates that most of the research output is based on cooperation with foreign universities rather than local Malaysian universities and institutions, whose research output is relatively small or not existent, though there may be hidden treasures in the form of unpublished reports not covered by our data. From our data, it can be inferred that the private sector companies increasingly take part in collaborative research. Yet this is still dwarfed by USM and other research institutes. Of these, the World Fish Center and the Fisheries Research Institute stand out, whereas a well-known local think-tank like

SERI, recently re-named Penang Institute, is well established and cooperates and publishes locally, but shows little international connections.

At the policy level, the Ministry of Science Technology and Innovation (MOSTI) has invested in the science fund to, among others, support R&D in universities with preference to applications that demonstrate links with companies (Rasiah and Chandran 2009). Despite this initiative, officials of the Federation of Malaysian Manufacturers report that there are scant university-government relationships in the manufacturing sector in Malaysia (Rasiah and Chandran 2009). Unfortunately, no available empirical studies document the local relations between research institutions, government and industry, the so-called 'triple helix' (Etzkowitz 2008). However, we would like to hypothesise that either of them would not have been successful without the support of the other.

Summing up, the analysis of the epistemic landscape of the Peninsular Malaysia shows varying results. It does show the importance of capturing the distribution of manpower in building successful knowledge clusters. It also demonstrates the impact of different level of government and private sector involvement as corroborated in the knowledge clusters located in Peninsular Malaysia.

The next section (section 3) examines the epistemic landscape of Brunei Darussalam and focuses on Universiti Brunei Darussalam. Reaching a productive stage of knowledge output is a long process, as the comparison between UBD and USM suggest. Both institutions have followed a policy of upgrading facilities, staff training and research funding in order to be

transformed into research universities. Both universities have increased their output, though USM having been established longer time, with a larger number of academic staff and larger research funds, is still ahead and defends its place as one of the leading Southeast Asian universities.

3. Perspectives from Brunei Darussalam: Efforts to Diversify the Economy

Brunei Darussalam has been attempting to diversify the economy by investing on knowledge. Various researches have pointed out how the oil and gas sector contribute significantly to the economic development process. The 2012-2017 Economic Development Plan of Brunei stated that one of the pillars (*teras*) is a productive and progressive economic (development) based on knowledge and innovation (EPU-Office 2012). Research carried out in Brunei has shown on the one hand, that small enterprises have a weak knowledge base (Anwar No Year), and that the enterprises adopted an ethnocentric type of marketing. Azal and Lawrey observe knowledge utilization in terms of the percentage of ICT goods in total export goods, which reveals the knowledge utilization dimension. They conclude that knowledge is under-utilised in Brunei (Afzal and Lawrey 2012). On the other hand, infrastructural development for industrial cluster development is underway. The government has constructed a Zone Village with infrastructure at the Sungai Liang Industrial Park (SPARK) (Ku 2010). It is one of the main initiatives of the Brunei Economic Development Board (BEDB) to develop a world class petrochemical hub (BEDB 2013). Currently a plan is underway to build the proposed technology park at Anggerek Desa in Brunei-Muara District. It is aimed to nurture more innovation and boost entrepreneurship among Bruneians in the high tech growth industry. Phase 3 of the Technology park is an extension of Phase 1 i.e. iCentre and Phase 2 i.e. Knowledge Hub (Bakar 2013). The existing land optimization strategy endorsed by the

government placed a special emphasis on, *inter alia*, the creation of economic sectors (or clusters) to drive Brunei's economic diversification and development (Lennon 2011). In this section, we propose several perspectives, drawing from our study of Brunei Knowledge Hubs, to show how Negara Brunei Darussalam can possibly capitalise on knowledge for development (K4D).

Brunei's investment in R&D is still comparatively small (BEDB 2012). The data suggests that the budget allocation for R&D is only 1.7% out of the 9.7 billion BND of the total budget allocation (BEDB 2012). In terms of the percentage of the Brunei's GDP we estimate it to be below one percent, probably the lowest in ASEAN. The future of the state, economy and society of Brunei Darussalam will also depend on leveraging on Brunei's comparative advantages within ASEAN.

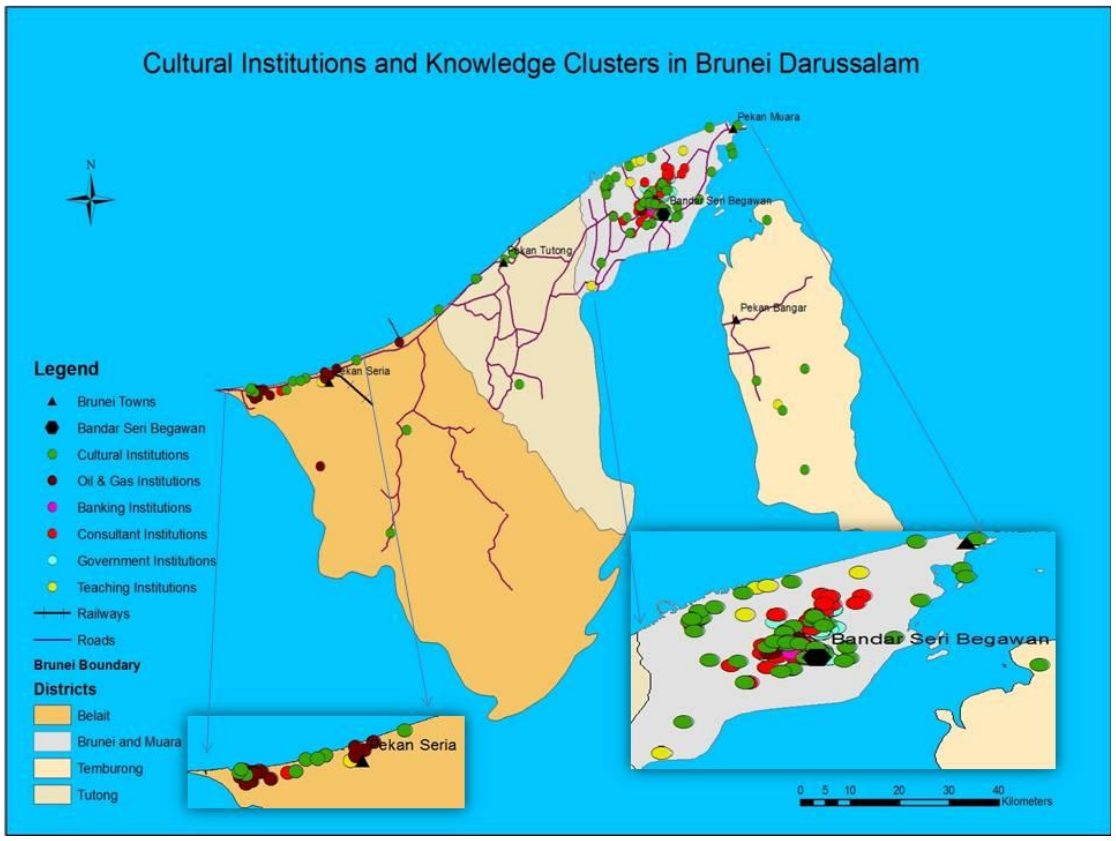
What are these comparative advantages?:

1. The location of Brunei in the geographical centre of Southeast Asia, bordering the South China Sea, its vast resources and its importance for international shipping.
2. The long history of oil and gas exploration and exploitation
3. The relatively large reserves of tropical rain forest
4. A long cultural tradition, local knowledge and ethnic diversity.

Local knowledge in the field of oil exploration, of forest management and the governance of ethnic diversity may be important assets that have to be integrated into a knowledge governance strategy. The first perspective is integrating local knowledge into Brunei's efforts to diversify the economy. So far, the use of local knowledge is minimal, as most development tasks are outsourced to foreign companies and experts.

In Brunei Darussalam, a state with a population of approximately 400,000, clustering is very dense and follows population density. Except for a small oil related cluster around Seria, almost all knowledge related organizations are located in the Brunei-Muara District knowledge cluster. This is portrayed in Map 3.

Map 3 Knowledge Clusters in Brunei Darussalam[3]



Source: UBD Study on Brunei as a Knowledge Hub, 2011-2013. Map design: Anthony Banyouko Ndah, FASS UBD and Liyana Yahya, FEBS UBD.

Government institutions, universities and private companies are densely located in the Brunei-Muara District. There are currently eight public higher education organizations in

[3] This is measured by the number of knowledge related institutions in 2011

Brunei, including: Universiti Brunei Darussalam, Brunei Institute of Technology, Sultan Sharif Ali Islamic University, Seri Begawan Religious Teachers University College, Brunei Polytechnic, Wasan Vocational School, Jefri Bolkiah College of Engineering, Nakhoda Ragam Vocational School, Mechanic Training Centre, Business School of Brunei Darussalam. These institutions increasingly cooperate with foreign universities and research institutes.

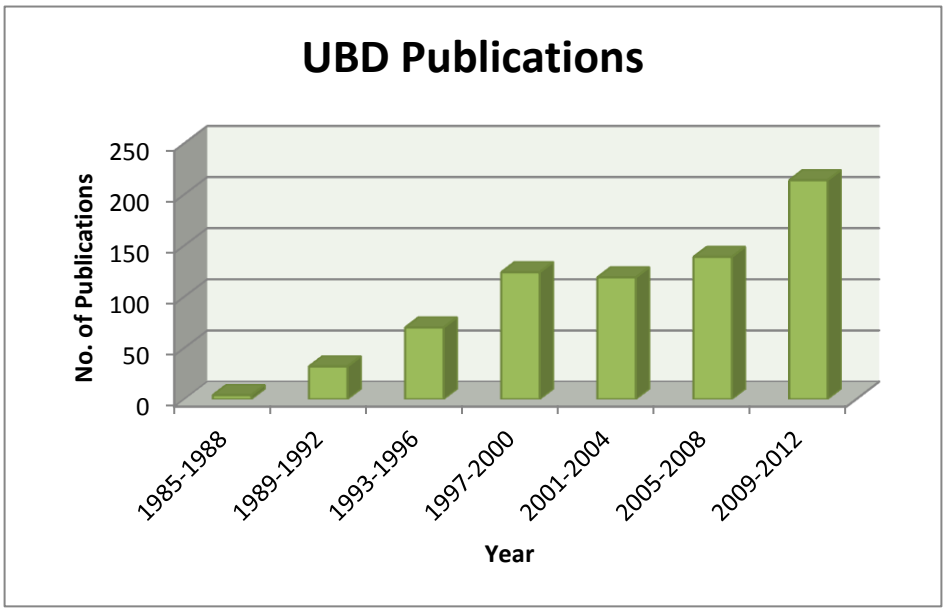
Local cooperation between knowledge producing institutions does not match the increase of international knowledge hub activities. . Although we can speak of a Brunei-Muara knowledge cluster in terms of proximity of private companies, government departments and institutions of higher learning, this cluster has not yielded innovations and new knowledge that could have been expected due to high clustering. Lack of internal cooperation, i.e. the underdevelopment of the knowledge hub function may be the main detrimental factor in need of further development. The knowledge clusters' analysis may hint that geographical proximity does not necessarily correlate with increasing knowledge sharing among organizations.

In fact, our preliminary data suggests that knowledge exchange among government agencies is lacking, despite their geographical propinquity. We focus on ICT application and utilization. The government of Brunei Darussalam is embarking on various initiatives such as the development of National Single Window (NSW) in order to simplify the trade processes, seed funding schemes for ICT start-ups which is a collaborative effort between DST, BEDB and the Authority for Info-communications Technology Industry of Brunei Darussalam (AITI), and the E-Darussalam project which consists the Business Licensing System as well

as access to online services of government agencies (Bakar 2012). This is exemplified in the E-Darussalam case. E-Darussalam is a portal whereby online transactions can be carried out. Our preliminary analysis suggests that the usage and design of E-Darussalam faces several problems due to duplication in the registration process, the issue of privacy and security, and data integration. A respondent revealed how data integration is cumbersome between ministries and added that policy is vital for online applications usage (and data integration). This will enable data integration, especially among Chief Information Officers in each ministry in Brunei Darussalam (Observation, Gadong, 25.02.2013). The need to integrate this (spatial) proximity with knowledge exchange practices possibly with the usage of ICT is the second perspective.

A case study of Universiti Brunei Darussalam (UBD): UBD is the leading university in Brunei Darussalam. Aspirational slogans like being a "first class international university" reaching place 50 on a ranking of Asian universities (UBD vision) or using key performance indicators (KPI) to measure and compare achievements in Brunei, will do little without a considerable recruitment of qualified academic staff and massive investment in universities and research centres. The knowledge output of UBD as measured by papers published has increased gradually between 1985 and 2012 (see Figure 3).

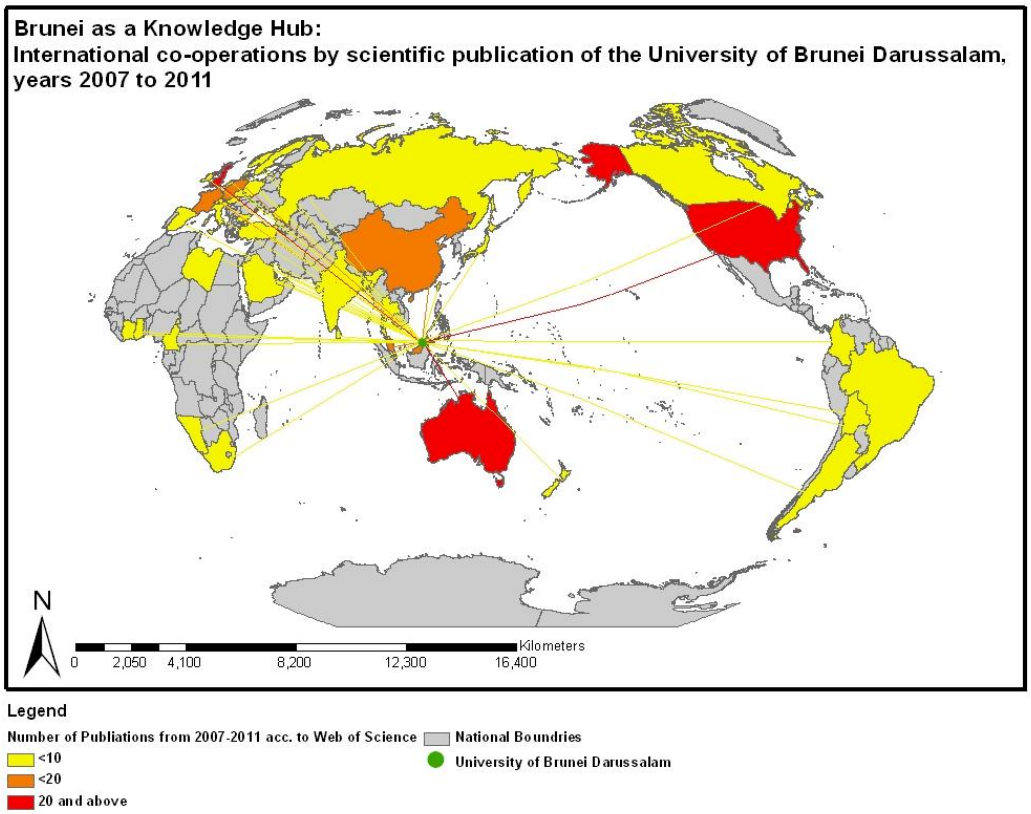
Figure 3 Knowledge Output UBD (Papers published by UBD Staff, 1985 to 2012)



Source: Brunei Knowledge Hub Project, FEBS-FASS UBD, ISI Web of Knowledge 7-7-2012

The number of joint publications between researchers of different universities can comfortably measure external networking. For companies joint product development would be a good measure. In her study of the Industrial Cluster of Jababeka near Jakarta, Indonesia, Farah Purwaningrum however shows that knowledge is transmitted mainly along the supply chain network of the dominant automotive industry with relatively weak linkages to universities and research institutes (Evers and Purwaningrum 2013, Purwaningrum 2013). With little or no industrial base to speak of, following supply chain networks is no viable option for Brunei. UBD cooperates mainly with universities in the U.K, Australia and the U.S., as shown bythe patterns of joint publications. (see Figure 4).

Figure 4 Science Networks of Universiti Brunei Darussalam as Knowledge Hub, 2007-2011



Thus, both Malaysia and Brunei (see Figure 2 and Figure 4) appear to have strong ties with Australia and the UK, followed by EU countries, India and China. It should be noted that international cooperation has been on the increase, as evidenced by an increasing number of joint publications. Networking and research cooperation within the ASEAN region however is surprisingly low. Brunei's forest reserves with high bio-diversity and UBD's Belalong Field Research Station have attracted many foreign researchers, leading to an increase in cooperation and joint publications. The efforts of the university administration to transform UBD from a teaching to a research university are also bearing fruit, as evidenced by a rapid increase of journal articles published in leading international journals.

In Academia, joint publications show the degree of networking and scientific cooperation more than Memoranda of Understanding (MoU), signed in most cases by university administrators rather than researchers themselves. By using the knowledge hub function through international networking, new knowledge can be accessed and data can be transmitted. These networks are still lopsided in the sense that the lead authors often come from universities and research institutes of countries with a high ratio of R&D expenditure or institutions with a relatively higher knowledge output than the co-authors. Historical connections and alumni networks appear to be additional factors in shaping the science and research networks. This is the third perspective.

Hence, in summary, based on available data, three perspectives are proposed as a baseline from which Brunei Darussalam may capitalise on as part of its K4D. The first is the integration of local knowledge as part of Brunei's comparative advantage. The second is the need to utilise spatial proximity to increase knowledge exchange which can be achieved with ICT. The historical connection and alumni networks as factors in shaping the science network of UBD is the third perspective.

4. Conclusion and Recommendations

We started by drawing attention to a possible knowledge trap that has to be avoided on the path towards a knowledge-based economy and society. This paper described and analysed the outcome of knowledge governance strategies by drawing on the experiences of developing knowledge clusters in Malaysia and in Brunei Darussalam. It also proposed some strategies to avoid the knowledge trap.

The first section of the article dealt with the features of a knowledge trap. Knowledge as a commodity has several attributes that are different from other commodities such as land. The creation of new knowledge brings along non-knowledge or 'ignorance.' An increase of knowledge may result in an even greater increase in ignorance, or in other words, an 'epistemological backlash.' Another form of knowledge trap is the increase in the need for talented manpower, large R&D institutes and think tanks. Governments may fall into this "knowledge trap" by failing to meet the demands due to problems in their educational system or they lack of financial resources required to employ expensive expertise. Singapore has avoided this by investing significantly in research and importing foreign talents.

The terms knowledge governance and knowledge base have been discussed, in which we pointed out that it is vital to observe the formal and informal institutional arrangements enabling the process of knowledge flow or knowledge exchange at an industrial cluster level. We also argued that in order to look at the knowledge base (be it local, scientific or tacit knowledge) and the linkages of knowledge, one should observe the knowledge clusters as conceptual schemata. Knowledge clusters contain universities and colleges, research institutions, think tanks, government research agencies and knowledge-intensive firms, have the organizational capability to drive innovation and create new industries, and are central places within an epistemic landscape, i.e. in a wider structure of knowledge production and dissemination. Epistemic landscapes capture, among other features the level of available manpower (quantity and quality) and the level of education of knowledge workers in a particular geographical area. In addition, one could also look at the knowledge output in the form of publications of higher education organizations, patents and innovations.

We moved on to look at the epistemic landscape in peninsular Malaysia, focusing on the epistemic landscape analysis covering the Northern Corridor and the Multi Media Super Corridor. For the former, we observed the Penang Knowledge Clusters. Our analysis suggests that the potential of Penang to capitalise on its knowledge clusters may rest on its historical trajectory, the diversity of the companies and the role of local government agency. Universiti Sains Malaysia being located in the Penang Knowledge Cluster has more research output in cooperation with foreign universities rather than local Malaysian universities. For the latter, the Knowledge Cluster of Cyberjaya was examined. It was revealed that cluster's development is disrupted by the centralised administrative system and remains government driven. This brings into question the benefit of firms locating in the cluster, and whether with the current existing form of (power) structure and expert knowledge, effective product innovation is possible in the Multi Media Super Corridor (MSC).

The next section examined the epistemic landscape of Brunei Darussalam based on the findings of our knowledge hub research from 2011-2013 and proposed that Brunei should capitalise on knowledge for development. Brunei's key advantages were also observed, ranging from its location, long history of oil and gas exploration, large reserves of tropical rain forest and long cultural tradition, as well as ethnic diversity. These analyses resulted in the development of three main perspectives. The first perspective is to integrate local knowledge to economic diversification efforts as part of Brunei's comparative advantage. In Brunei Darussalam, with a population of approximately 400,000, a pattern of dense clustering can be observed. The current knowledge clusters' analysis may hint that geographical propinquity does not necessary correlate with an increase of knowledge exchange among organizations. This hypothesis is confirmed by our preliminary findings, that there is limited knowledge exchange between government agencies located in Brunei-Muara District, which

hosts the most dense knowledge cluster in Brunei Darussalam. This brings us to the next perspective, namely the need to combine spatial proximity with knowledge exchange practices and the usage of ICT.

The case of University of Brunei Darussalam (UBD), the premier higher education organization in Brunei, shows that there is a gradual increase of publication output from 1985 to 2012. Our analysis of the joint publication in UBD as part of a knowledge hub function shows that networking and research cooperation with other higher education organizations located in ASEAN is low, whereas there are stronger ties with Australia, UK, EU countries, India and China. We infer that historical ties and alumni linkages are to be the third perspective in observing the performance of a university as a knowledge hub.

We propose several recommendations based on our study and findings. To begin with, a combination of knowledge clustering and well developed international knowledge hubs should result in a high output in terms of product innovations and new knowledge, measured by publications and patents. This is however only the case if three other conditions are met:

1. knowledge sharing and internal networking within the knowledge cluster
2. support of a highly trained research staff by adequate recruitment policies and research funds
3. Sufficient time to develop and nurture an epistemic culture of knowledge production.

Knowledge clusters, i.e. the assembly of research institutions, universities, government offices, consultancy business and manufacturing companies have the potential to produce

new knowledge, if networking and knowledge sharing are allowed within the cluster. Universities in particular, profit from location within a knowledge cluster. Therefore, creating universities or research institutions in isolation is not likely to transform a country into a knowledge-based economy and society.

Formulating and implementing an appropriate government policy would however result in the development of an epistemic landscape of well-balanced knowledge clusters and knowledge hubs.

References

Afzal, M. N. I. and R. Lawrey (2012). "KBE Frameworks and Their Applicability to a Resource-based Country: The Case of Brunei Darussalam." Asian Social Science **8**(7): 208-218.

Antweiler, C. (1998). "Local Knowledge and Local Knowing: An Anthropological Analysis of Contested "Cultural Products" in the Context of Development." Anthropos **93**: 469-494.

Anwar, S. A. (No Year). Small Enterprises in Brunei Darussalam: Ethnocentric or Regiocentric? Bandar Seri Begawan.

Ariff, M. (2008). New Perspectives on Industry Clusters in Malaysia Analyses of Industrial Agglomeration, Production Networks and FDI Promotion. M. Ariff. Chiba, IDE-JETRO**:** 368-397.

Audretsch, D. and M. Feldman (2004). Knowledge Spillovers and the Geography of Innovation Handbook of Regional and Urban Economics J. V. Henderson and J.-F. Thisse. Amsterdam, the Netherlands, Elsevier**:** 2713-2739.

Bakar, A.-H. A. (2013). "Tech park seen boosting innovation, biz ventures ". Retrieved 27th of August 2013, 2013, from http://www.bt.com.bn/business-national/2013/06/28/tech-park-seen-boostinginnovation-biz-ventures.

Bakar, A. A.-H. (2012). "Brunei to continue ICT growth efforts: minister." Retrieved 27th of July 2013, 2013, from http://www.bt.com.bn/legco/2012/03/07/brunei-continue-ict-growth-efforts-minister.

BEDB (2012). "Brunei's National Development Plan ". Retrieved 24th of May 2013, 2013, from http://www.bedb.com.bn/why_ndp.html.

BEDB (2013). "Key Industrial Sites." Retrieved 27th of August 2013, 2013, from http://www.bedb.com.bn/keyindustrialsites.html.

Bunnell, T. (2004). Malaysia, Modernity, and the Multimedia Super Corridor: a Critical Geography of Intelligent Landscapes London, RoutledgeCurzon.

Dicken, P., et al. (2001). "Chains and Networks, Territories and Scales: Towards a Relational Framework for Analysing the Global Economy." Global Networks **1**(2): 89-112.

Enright, M. J. (2003). Regional Clusters: What We Know and What We Should Know. Innovation Clusters and Interregional Competition. J. Broecker, D. Dohse and R. Soltwedel. Berlin, Heidelberg, Germany, Springer-Verlag.

EPU-Office (2012). Rancangan Kemajuan Negara Kesepuluh (2012-2017) Negara Brunei Darussalam: Pengetahuan dan Inovasi Meningkatkan Produktiviti Mempercepatkan Pertumbuhan Ekonomi. J. P. d. K. E.-J. P. Menteri.

Etzkowitz, H. (2008). The Triple Helix University-Industry-Government Innovation in Action. New York, Routledge

Evers, H.-D. (1988). "Traditional Trading Networks of Southeast Asia." Archipel **35**: 89-100.

Evers, H.-D. (2011). Knowledge Cluster Formation as a Science Policy: Lessons Learned. Science, Technology and Society Workshop, Universiti Brunei Darussalam. Bandar Seri Begawan, Brunei Darussalam**:** 1-25.

Evers, H.-D. and S. Gerke (2012). Local Knowledge and the Digital Divide: Focus on Southeast Asia. Working Paper No.2, , Institute of Asian Studies, Universiti Brunei Darussalam.

Evers, H.-D., et al. (2010). "Knowledge Clusters and Knowledge Hubs: Desgining Epistemic Landscapes for Development." Journal of Knowledge Management **14**(678-689).

Evers, H.-D., et al. (2010). "Knowledge Clusters and Knowledge Hubs: Designing Epistemic Landscapes for Development." Journal of Knowledge Management **14**(5): 678 - 689.

Evers, H.-D. and A.-K. Hornidge (2007). "Knowledge Hubs along the Straits of Malacca " Asia Europe Journal **5**(3): 417-433.

Evers, H.-D., et al. (2010). "Knowledge Cluster Formation in Peninsular Malaysia: the Emergence of an Epistemic Landscape." ZEF Working Paper Series **62**: 1-32.

Evers, H.-D. and F. Purwaningrum (2013). "Japanese Automobile Conglomerates in Indonesia: Knowledge Transfer within an Industrial Cluster in the Jakarta Metropolitan Area." ZEF Working Paper Series **111**.

Gerke, S. and H.-D. Evers (2012). "Looking East, Looking West: Penang as Knowledge Hub." ZEF Working Paper Series **89**: 1-15.

Gerke, S., et al. (2008). The Straits of Malacca- Knowledge and Diversity Berlin, London Penang, LIT Verlag.

Gertler, M. S. and D. A. Wolfe (2005). Spaces of Knowledge Flows: Clusters in a Global Context DRUID Tenth Anniversary Summer Conference 2005. Copenhagen, Denmark**:** 1-17.

Gordon, I. R. and P. McCann (2000). "Industrial Clusters: Complexes, Agglomeration and/or Social Networks?" Urban Studies **37**(3): 513-532.

Henry, N. and S. Pinch (2006). Knowledge and clusters. Clusters and Globalisation The Development of Urban and Regional Economies C. Pitelis, R. Sugden and J. R. Wilson. Cheltenham, UK

Northampton, MA USA Edward Elgar**:** 114-132.

Hornidge, A.-K. (2007). Knowledge Society: Vision & Social Construction of Reality in Germany and Singapore. Muenster, LIT Verlag.

Hornidge, A.-K. (2008). From Trading Goods to Trading Knowledge: Singapore's Development into a Knowledge Hub. The Straits of Malacca: Knowledge and Diversity. S. Gerke and H.-D. Evers. Berlin, London, Penang, LIT Verlag/Straits G.T.**:** 63-84.

Hornidge, A.-K. (2012). 'Knowledge', 'Knowledge Society' & 'Knowledge for Development'. Studying Discourses of Knowledge in an International Context. Methodologie und Praxis der Wissenssoziologischen Diskursanalyse Band 1: Interdisziplinaere Perspektiven. R. Keller and I. Truschkat. Wiesbaden, Springer VS Verlag**:** 397-424.

Iammarino, S. and P. McCann (2006). "The structure and evolution of industrial clusters." Research Policy **35**: 1018-1036.

Indergaard, M. (2003). "The Webs They Weave: Malaysia's Multimedia Super-corridor and New York City's Silicon Alley." Urban Studies **40**(2): 379-401.

IPPTN (2010). The State of Penang, Malaysia: Self-Evaluation Report. OECD Reviews of Higher Education in Regional and City Development. M. Sirat, C. Tan and T. Subramainiam. Penang, The National Higher Education Research Institute (IPPTN).

Johansson, B. and U. Forslund (2008). The Analysis of Location, Colocation and Urbanization Economies. Handbook of Research on Cluster Theory. C. Karlsson. Cheltenham, UK, Northampton, MA USA, Edward Elgar.

Ku, S. C. Y. (2010). "Brunei in 2009: Maturity in Doubt?" Asian Survey **50**(1): 260-264.

Lawson, C. and E. Lorenz (1998). "Collective Learning, Tacit Knowledge and Regional Innovative Capacity." Regional Studies **33**(4): 305-317.

Lennon, S. (2011). "Developing the Knowledge Economy and Integrated Employment Areas in Brunei Darussalam: the Innovation Challenge." CSPS Strategy and Policy Journal **2**(July 2011): 31-54.

McCann, P. (2008). Agglomeration Economics. Handbook of Research on Cluster Theory. C. Karlsson. Cheltenham, UK Northampton, MA, USA, Edward Elgar.

McCann, P., et al. (2002). "Industrial clusters, transaction costs and the institutional determinants of MNE location behaviour." International Business Review **11**: 647-663.

Menkhoff, T., et al., Eds. (2010). Governing and Managing Knowledge in Asia, 2nd revised edition. New Jersey, Singapore and London, World Scientific Publishing.

Menkhoff, T., et al. (2011). Achieving Knowledge Economy Status through Good Knowledge Governance: the Singapore KBE Story Revisited. Beyond the Knowledge Trap: Developing Asia's Knowledge-Based Economies. T. Menkhoff, H.-D. Evers, Y. W. Chay and E. F. Pang. New Jersey, London, Singapore, Beijing, World Scientific.**:** 299-324.

Menkhoff, T., et al., Eds. (2011). Beyond the Knowledge Trap: Developing Asia's Knowledge-Based Economies. New Jersey, London, Singapore, Beijing, World Scientific.

Menkhoff, T., et al. (2011). Introduction: Strategic Aspects of Developing Asia's Knowledge-Based Economies. Beyond the Knowledge Trap: Developing Asia's Knowledge-Based Economies. T. Menkhoff, H.-D. Evers, C. Y. Wah and P. E. Fong. Singapore, New Jersey, London, World Scientific Publishing**:** 1-24.

Meusburger, P. (2000). "The Spatial Concentration of Knowledge Some Theoretical Considerations." Erdkunde Archive for Scientific Geography **54**: 352-364.

MoHE (2011). Internationalisation Policy for Higher Education Malaysia 2011. Putrajaya, Kementerian Pengajian Tinggi.

Nordin, R. (2012). Creating Knowledge-based Clusters through Urban Development: A Study of Cyberjaya, Malaysia. ZEFa Department of Political and Cultural Change. Bonn, Universität Bonn.

Purwaningrum, F. (2013). Knowledge Governance in an Industrial Cluster : the Collaboration between Academia-Industry- Government in Indonesia (Forthcoming). Bonn, LIT Verlag

Purwaningrum, F. and N. Boavida (2013). Leapfrogging Development? Electric Mobility Policy in Indonesia and Portugal. 9th International Conference on ASEAN Community Knowledge Networks for the Economy, Society, Culture and Environmental Stability. Bandar Seri Begawan, Brunei Darussalam.

Rasiah, R. (2003). Regional dynamics and production networks: the development of electronics clusters in Malaysia, Universiti Malaysia Sarawak.

Rasiah, R. and V. G. Chandran (2009). University-Industry R&D Collaboration in the Automotive, Biotechnology and Electronics Firms in Malaysia 7th Globelics Conference organised by UNU-MERIT Dakar**:** 1-21.

Richardson, C., et al. (2012). "Policy-driven clusters, interfirm interactions and firm internasionalisation: Some insights from Malaysia Multimedia Super Corridor." International Business Review **21**: 794-805.

Sölvell, Ö. and M. Williams (2013). Building the Cluster Commons- An Evaluation of 12 Cluster Organizations in Sweden 2005-2012. Stockholm, Ivory Tower Publishers.

Tallman, S., et al. (2004). "Knowledge, Clusters, and Competitive Advantage." The Academy of Management Review **29**(2): 258-271.

Von Hipple, E. (1994). "Sticky information and the locus of problem solving: implications for innovation." Management Science **40**(4): 429-439.

World Bank (1999). World Development Report 1998-99: Knowledge for Development. New York, Oxford University Press.

World Bank (2008). Knowledge for Development. Washington, DC, The World Bank Institute.

Yeung, H. W.-C. (2008). Industrial Clusters and Production Networks in Southeast Asia: a Global Production Networks Approach. Production Networks and Industrial Clusters: Integrating Economies in Southeast Asia. I. Kuroiwa and M. H. Toh. Singapore, Institute of Southeast Asian Studies**:** 83-120.