Industrializing Cambodia:

Making a Roadmap to Construct Core Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University,
Chairman of Jayavarman Center for Development)

KOREA UNIVERSITY 1905

Peace & Democracy Institute
KACDC
Korea-Asia Center
for Development and Cooperation

KOICA
Korea International
Cooperation Agency

ACKNOWLEDGEMENTS

This book is published in cooperation with the Korea International Cooperation Agency (KOICA) and the Korea University Research & Business Foundation in 2016 as a public-private cooperation project subsidized by the Ministry of Foreign Affairs.

It is a product of a two-year research project for the development of Cambodia. In the first year, we investigated why and how the country can become a bridging state in Southeast Asia. A bridging state is a state that connects men and commodities. It thus promotes peace among intra-regional states and inter-regional states. Given the geopolitical and geoeconomic environment in which Cambodia is situated, we proposed a vision and action plan for bridging state strategy for the country. In line with the macro-level strategy, in the second year we explored a micro-level strategy about how Cambodia can become an economic hub of Southeast Asia through industrialization. The outcome of the exploration is the plan to build core industrial clusters in Kampong Speu province in this book.

Numerous organizations, scholars, and assistants in Korea and Cambodia made this research possible. We are indebted to the University of Puthisastra, and to its president Peter Sok and vice president R Anbin Ezhilan. We also thank the Union Youth Federation of Cambodia and its president Hun Many. We obtained invaluable information and feedback from Choong Lyol Lee, Hanwool Jeong, Seong Mee Bae, Chang Hoon Lee, Sok Silo, and Un Kheang. A special thanks goes to the provincial government officials of Kampong Speu, including the governor, vice governors, and directors, who spared time to discuss our project and gave it warm support. We are particularly grateful for the support from excellent assistants—Hansol Kwak, Jung-in Shin, Ji Sun An, Dong-il Lee, Ahra Jo, Jeong Weon Baek, Tae Young Lee, Ouk Suna, and Sokhan Darapy.

본 출판물은 외교부 보조금 민관협력사업의 일환으로 2016년 한국국제협력단과
고려대학교 산학협력단이 협력하여 출간하였습니다.

Contents

I. Introduction and Geo-economic Opportunities for Cambodia in Building BSS

Hyug Baeg IM (Korea University)

Industrializing Cambodia:
Making a Roadmap to Construct Core
Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University,
Chairman of Jayavarman Center for Development)

I

Introduction and Geo-economic Opportunities for Cambodia in Building BSS

Hyug Baeg IM (Korea University)

1. Visions of Bridging State Strategy (BSS) and Developing Cambodia as an Industrial Nation

The optimal and desirable national strategy for Cambodia is the Bridging State Strategy (hereafter BSS) that purports to enhance external state capacity of Cambodia. The source of enhancing external state capacity lies in Cambodia's geo-economic, geo-political, geo-cultural, and geo-strategic value. Cambodia is located in the crossroad of ASEAN region; Inland powers and maritime powers in Southeast Asian Mediterranean meets in Cambodia; Cambodia is located in the heart of GMS (Greater Mekong Sub-region); Phnom Penh and Sihanouk Ville have the potential to become the hub city and hub port of Chinese One Belt One Road respectively.

BSS is the grand national strategy to develop Cambodia as a modern industrial state by maximizing these geo-economic, geo-political, and geo-cultural value of Cambodia. Cambodia can maximize its external state capacity by bridging people and commodities between inland and maritime people in ASEAN, by playing the role of gateway of continental states to Southeast Asian Mediterranean and the gateway of maritime states to continental states in Southeast Asia, and by intermediating the role of bridging peace between G2 countries, US and China.

These visions of BSS can be realized by 4 strategies. The first strategy is the industrialization of Cambodia through building industrial cluster and trading hub in ASEAN. The second strategy is the

informatization of Cambodia by building ICT infrastructure in order to enhance both intra-connectivity among Cambodian cities and villages and inter-connectivity between Cambodia and ASEAN countries. The third strategy is reinventing Ankor and Siem Reap as the center of BSS-based international tourism and the symbol of Cambodian national identity and nation building. Last but the most important strategy is transforming Cambodia as the hub state in ASEAN, AEC, GMS, CLMV, building Cambodia as the bridge of peace between G2 rivals, the US and China, and linking Cambodia with ASEAN and three Northeast Asian countries. By strengthening the role of bridging state (BS), Cambodia can raise the geo-economic and geo-political leverage vis-a-vis ASEAN countries, vis-a-vis both US and China, and Northeast Asian countries, and thus can benefit a lot in terms of economic interests and political status.

However, these visions of BSS cannot be realized in months or in a few years. The BSS visions must be a long-term goal of Cambodian nation and thus would likely face many difficulties and yokes. Nonetheless, in drawing national visions, Cambodians must be creative, imaginative, and "think big and globally" with the posture of "think the unthinkable."

After designing the grand national vision of BSS, Cambodians are recommended to explore how to implement global vision of BSS in the local environment. In the implementation stage, Cambodians have to make more practical and detailed policy implementation and action plans for BSS. In making policy implementation plans, Cambodians must take the posture of "think globally, act locally." In designing grand national plan of BSS, Cambodians should have to be dreamers that draw Cambodia's future with big picture laden with a lot of creativity, imagination, and possibilism. However, in implementing the vision of BSS, Cambodians must be cool practitioners who calculate carefully the feasibility, probability, meticulous details, contingency planning and structural constraints.

Our book, *Industrializing Cambodia: A Roadmap to Construct Core Industrial Clusters in Kampong Speu*, is about the implementation plans on making Cambodia as a "BSS-based Industrial nation with special focus on Kampong Speu area." We have tested the feasibility of BSS vision and exploring optimal ways to implement BSS with more meticulous, detailed planning. We narrow the range of testing BSS vision to Kampong Speu areas because the area is the standard bearer of industry cluster,

ICT infrastructure, the transportation center of Greater Capital area and geo-economic and geo-political hub of BSS.

We believe that BSS-based industrialization plans are the optimal strategy of national development for Cambodia with feasibility and efficiency. We hope that our model of BSS-based industrialization be used as the stepping stone for institutionalizing sustainable development model for Cambodia. The national development for Cambodia. Therefore, our job in the second year will be. The second year project based on BSS.

2. Visions of Bridging State Strategy (BSS)[1]

1) Geopolitical and Geo-economic Value of Cambodia

Cambodians can dream to become the core "bridging state"(hereafter BS) in Southeast Asia because Cambodia has the geo-economic, geo-political, geo-strategic and geo-cultural advantage to be BS vis-à-vis neighboring countries. Cambodia is located in the heart of Southeast Mediterranean that can be the key strategic post linking Southeast Mediterranean countries (ASEAN) and East Asian Mediterranean countries (China, Korea, Japan, Taiwan, North Korea, Philippines).[2] As ASEAN expands into Northeast Asia and Asia-Pacific, the Cambodian port city, Sihanouk Ville, can become the “pearl” of the Southeast Mediterranean and could replace Singapore as the hub port city of the Southeast Asian Mediterranean.

Intra-regionally, Cambodia is the ideal place to be the intra-regional bridging state in GMS (Greater Mekong Sub-regions). Cambodia shares borders with 4 out of 5 countries of GMS (Chinese Yunnan,

[1] Substantial part of this section is a revised and complemented version of Hyug Baeg Im, "Vision and Action Plan for Bridging State Strategy (BSS) for Cambodia, Hyug Baeg Im et al., *Bridging State Strategy for Cambodia*, KOICA APP 1-1, 2015.

[2] Southeast Mediterranean stretches from the West coast of Myannmar, Malaca Strait, Indonesian Celeves Archipelagoes, trading corridors of ASEAN coastal cities, Philippines archipelagoes, and littorals of the South China Sea to the littorals of the southern part of East China Sea and its port cities. East Asian Mediterranean stretches from Japanese archipelagoes, East Sea, Korean Strait, East China Sea, Okinawa archipelago, Taiwan, Chinese cross-strait, Philippines archipelagoes to Hainan Island and part of South China Sea. East Asian Mediterranean is rising as the world’s largest economic area. For the concept and boundary of East Asian Mediterranean, see Gipouloux, 2011; Lombard, 2007; and Blank, 1999.

Vietnam, Laos, Thailand). Cambodia's Greater Capital Areas (Phnom Penh, Kampong Speu, Sihanouk Ville) is the center of Southern Coastal Corridor of GMS. Cambodia can be the bridge linking China (Yunnan Province) and 4 other GMS countries.

Geopolitically and geo-culturally terms, Cambodia can become the BS that can intermediate and interlocute with China and the US, because Cambodia was a former ally of China, and now normalized relationship with the US. Therefore, Cambodia can play a key role in making peace between the US and China and can make a peaceful and prosperous Southeast Asian Mediterranean (or ASEAN) and restore peace in South China Sea.

Therefore Cambodia can be the ideal Bridging State in Southeast Asian Mediterranean because it is located in the center of ASEAN, GMS, and Southeast Asian Mediterranean; Phnom Penh and Kampong Speu will be the final destination of China's Southern Belt project and Sihanouk Ville can become the hub port city of China's "One Road"[3]; and Cambodia can be the proper candidate for making peace between US and China

2) Concept of Bridging State (BS)[4]

A bridging state is a state that connects men, commodities, and peace among intra-regional states and inter-regional states.[5]The bridging state connects the inland people and the maritime and coastal people; it is the trading center that commodities of inland and maritime goods are exchanged, traded, and bartered; the bridging state is peace-making state in which different people from different intra- and inter-regional areas gather, exchange, and propagate their ideas, products, technology, religion,

[3] Chinese President Xi Jinping visited Cambodia in 2015 and mentioned that Cambodia's Greater Capital City area is the key place for the China's ambitious project of "One Belt, One Road" (一帶一路, continental economic silk road and maritime silk road). Sihanouk Ville will be the hub port of "One Road," (一路 or maritime silk road) and Phnom Penh and Kampong Speu will be the hub of "One Belt" the final destination of Southern Belt that links China to Southeast Mediterranean

[4] Hyug Baeg Im, 2015. "The Regional Peace Building in 'East Asian Mediterranean Era'," paper presented at Shanghai Forum, May 22-25, Fudan University, Shanghai, China; H. B. Im, 2006."The US Role in Korean Democracy and Security since Cold War Era," *International Relations of Asia-Pacific*, Vol. 6(2); Hyug Baeg Im, 2008. "East Asian Regionalism in the Era of Globalization," paper presented at Beijing Forum, Beijing, China, November 6-9; Hyug Baeg Im, 2014. "Exceptional Difficulties of Peace Building in Korean Peninsula: An Eclectic Approach," *Viennese Contributions to Korean Studies*, Vol. 6.

[5] For the concept of "connecting state," seeT.J. Pempel, 2006. "The Race to Connect East Asia: An Unending Steeplechase," *Asian Economic Policy*, Vol. 1.

information, knowledge, cultures and folklores, and even weapons.

Domestically, the bridging state is a “linker state” that links people, commodities, and culture between inland people and offshore people, and thus makes modern national integration of the country among people living in center and periphery, cities and countryside, and inland and maritime areas. By linking people living in different geopolitical, geo-economic, geo-cultural areas and regions, the bridging state can integrate diverse economies, cultures, ethnicities, religions by means of sharing knowledge, information, technologies, ideas, and material goods and services. This kind of “trade, barter, and exchange” of ideas, cultures and commodities enables “the unity of diverse people in one country”, in other words, the modern country of “unity in diversity.”

Regionally and internationally, the bridging state is a kind of “gateway state” that plays, in geopolitical and geo-economic terms, the double roles of the gateway of continental states to the maritime world and the role of linking maritime countries and continental states. The bridging state transfers the technology, products, and ideas of maritime countries to continental countries and vice versa. The bridging state can transfer prosperous maritime states’ learning experience of industrialization to relatively underdeveloped inland states; the bridging state can deliver the demands for more redistribution from the poor South to wealthy countries in the North.

Lastly, the bridging state is a “peace-making state.” It is not the place of colliding interests between maritime and continental powers, but peace-making state by becoming an inter-mediator, interlocutor, and promoter of dialogue, interactions, and compromise between continental and maritime powers.

In short, the bridging state, “links, and makes gateway and peace” between people in inland and offshore areas, continental and maritime countries, and integrate diverse people within the country and make “one nation with diverse people” by becoming a “melting pot” of diverse ethnicities, ideas, economies, technologies, and religions.

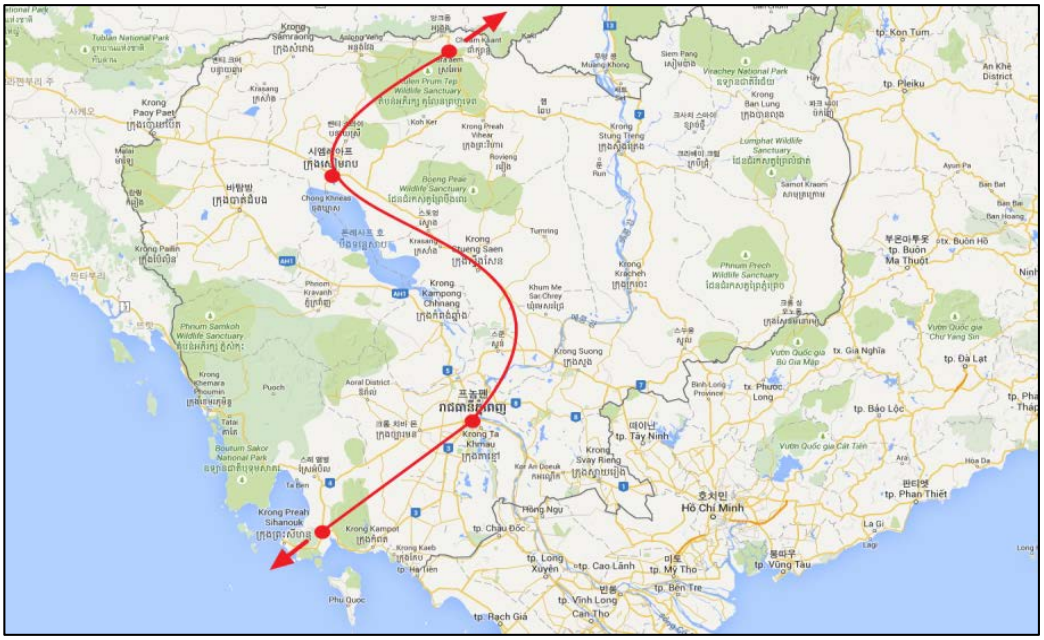
3) Visions of Bridging State Strategies(BSS) for Cambodia

The great vision of “Cambodia as the Bridging State” in Southeast Asian Mediterranean can be

realized by means of strategies and action plan based on “interests” rather than “passions” in the words of Albert O. Hirschman.[6] The strategies and action plan must be feasible rather than desirable, should be based on “possibilism” rather than “impossibilism,” and could be a “big dream project with meticulous action plans.”

The visions of Cambodian BSS can be realized along the lines of polycentric S-shaped pillars, i.e., Siem Reap, Phnom Penh, Kampong Speu, and Sihanouk Ville, in which each city and area plays interconnected division of labor.

Figure 1-1. S-shaped Pillar



First, northern pillar, Siem Reap is blessed with the world greatest cultural heritage, Angkor Wat. With Angkor Wat, Siem Reap can be developed as the hub of culture, contents industry, archeology, and tourism in Cambodia as well as the world. In addition, Tonle Sap Lake (Boeung Tonle Sap), the greatest lake in South East Asia, is the source of eco-tourism and thus raise the value of Siem Reap as the world's

[6] Albert O. Hirschman, 1971. "Political Economics of Possibilism," *A Bias for Hope: Essays on Development and Latina America* (New York: Oxford University Press)

greatest heritage and the center of eco-tourism. It is highly recommended for Siem Reap to be connected with China through South China Express Railroad (TCR) or Southern Economic Silk Road (一帶), with ASEAN neighbors through highways and airports. Besides, Siem Reap is recommended to be developed as the hub of inland economy of Cambodia as well as ASEAN.

Second, the capital city Phnom Penh is recommended to be developed as the political hub city[7] of ASEAN regional community as well as regional and global peace center which would be assigned to play similar roles that Brussel of Belgium functions as the political hub of EU. It is highly recommended to invite and lure secretariats of various regional organizations and institutions related to ASEAN such as secretariat of ASEAN, AEC (ASEAN Economic Community), Chiangmai Initiative (CMI), Asian Bond Fund (ABF), Asian Bond Market Initiative, ARF (Asian Regional Forum), APT(ASEAN+3), EAS (East Asian Summit: APT+3), RCEP (Regional Comprehensive Economic Partnership), and regional headquarters of Chinese Silk Road and Belt.[8]

To be selected as the political and peace hub in ASEAN, the Cambodian government is recommended to educate the young Cambodians to be equipped with global literacy (to read, write, and speak global languages, English and to lesser degree French). In addition, colleges and universities are recommended to open more courses which are taught in English. Global literacy is very important to upgrade Cambodia's internationalization and helps to be selected as a global as well as a regional headquarters of international organizations and institutes.

Third, Kampong Speu is located between Phnom Penh and Sihanouk Ville in S-Shaped Pillars and the suburbs of capital city Phnom Penh. However, the role of Kampong Speu is no less important than Phnom Penh and Sihanouk Ville because Kampong Speu is supposed to be the industrial center of

[7] For the concept of "hub and spokes," see Mari Pangestu and Sudarshan Gooptu, 2002. "New Regionalism: Options for China and East Asia," unpublished paper.

[8] One of rationales to locate regional and global peace center in Phnom Penn comes from the historical human tragedy of Killing Field in which two million innocent people were massacred just on the ground of ideological reasons. In cooperation with UNESCO, global peace NGOs and regional peace forums and organizations in ASEAN should be located in Cambodia. The Cambodian government is recommended to build holocaust and peace memorial museum and peace institute that commemorate the massacre by Khmer Rouge and have researches for institutionalizing long lasting peace in very heterogeneous Southeast Asian Mediterranean.

modern Cambodia and to provide goods and services, communications (on and off-line), transportation (areal, road, and railroad), and infrastructural facilities. The Cambodian government is recommended to build Greater Capital Area Airport around Kampong Speu city to carry passengers and high-tech products like smart phones and memory chips to and from Cambodia and all over the world, and to convey passengers and goods to the port of Sihanouk Ville. Only with the global level airport, greater capital city area can be selected as the final destination of Chinese Southern Silk Road Expressway and Sihanouk Ville will be selected as the hub port of Chinese Maritime Silk Road.

Lastly, Sihanouk Ville connects Cambodia to maritime economic routes of ASEAN as well as the key countries of East Asian Mediterranean such as China, Japan, Korea, and Taiwan.[9] Cambodian government is recommended to expand the existing port and to build a new mega port that has the size and facilities to sufficiently accommodate shipments from all over the world. To be the hub port that can replace Singapore, the new port of Sihanouk Ville is recommended to be built as "pentaport" (airport, seaport, ICT information port, business port, and leisure port). Among 5 functional pentaports, the functions of business port are shared by offshore Sihanouk Ville and Kampong Speu; functions of the leisure port are shared by amusement park and casino in Sihanouk Ville and world historical heritage in Siem Reap and Angkor Wat; hub airport has to be built in the center of greater capital area, Kampong Speu which connects maritime center of Sihanouk Ville and capital city of Phnom Penh, and transports industrial export goods produced in industrial clusters around Kampong Speu.

In short, the vision of BSS purports to bring Cambodia to the prosperous and peaceful hub country in Southeast Asian Mediterranean by connecting continental areas and maritime world in ASEAN and East Asian Mediterranean, by intermediating China and the US, and domestically connecting inland and offshore areas, and linking four polycentric centers of cultural heritage center Siem Reap, political center Phnom Penh, industrial center Kampong Speu, and maritime center Sihanouk Ville. Building BS by connecting and making division of labor among four polycentric pillars, Siem Reap, Phnom Penh,

[9] If Kra Canal is built in between Kra and Isthumus, Thailand by Chinese maritime silk road authorities and financed by AIIB, the position and influence of Singapore (Malaysia) as the hub of Southeast Asian Mediterranean will decline and instead, the power and influence of Sihanouk Ville will rise as the hub of Southeast Asian Mediterranean.

Kampong Speu and Sihanouk Ville would upgrade Cambodia to a modern industrial country in 21st century.

3. BSS-Based Industrializing Cambodia: with Special Focus on Kampong Speu Area

The first step to realize the vision of BSS for Cambodia is to develop Cambodia a modern industrial country. Industrialization is the material base for BSS for Cambodia. Without industrialization, Cambodia does not have economic leverage to become a BS in Southeast Asia.

Industrialization in Cambodia has to take place along the lines of polycentric S-Shaped Pillars such as Siem Reap, Phnom Penh, Kampong Speu and Sihanouk Ville as mentioned above. Among these four core industrial pillars, we focus on industrialization in Kampong Speu area. Our implementation strategy of BS is, first, to construct core industrial clusters of semi-conductor industry, agro-processing industry, ICT infrastructure and research parks, and social and physical infrastructure in Kampong Speu area. The second step of our BSS in Cambodia is to dissipate the success story of industrial clusters in Kampong Speu to other S-Shaped pillars and to upgrade Cambodia as a modern industrial country.

Then why is building industrial clusters the optimal strategy of industrializing Cambodia and why does constructing industrial cluster have to start in Kampong Speu area and then dissipate "Kampong Speu model" to other key pillars?

1) Why Cambodia Needs to Build Core Industrial Clusters?

Why does Cambodia need to build industrial clusters in order to industrialize the country? It is because realizing the vision of BSS makes it necessary to build industrial clusters and socio-economic infrastructure for industrialization. The concept of industrial cluster is literally that similar and related firms locate on the same place. Porter defines industrial cluster as "geographic concentration of interconnected companies and the location of institutions in particular field" (Porter, 1998) and thus has both competitive and comparative advantages such as the extension of vertical linkage of production

structure (via downstream and upstream firms) and the participation in global production and value chain.

Industrial cluster also promotes both competition and cooperation. By nature of cluster, similar firms compete with each other within the cluster Industrial cluster, while cooperation takes place in vertical value chain. Mutual competition and cooperation within a cluster can drive innovation and technological spill-over, and promote the productivity growth of the whole firms in a cluster. (Shi Young Lee and Kea Yun, 2016)

With these advantages and values, building industrial cluster is a good strategy to start industrialization drive for late, late industrializing country like Cambodia. Cambodia as a late, late industrializer has met great barrier to economic development because currently it produces low value added products, has weak infrastructure for industrial development, and its export products have low competitiveness in global market. To overcome the barriers, Cambodia needs to build global industry clusters that have competitiveness, high value added supported by good industrial infrastructure.

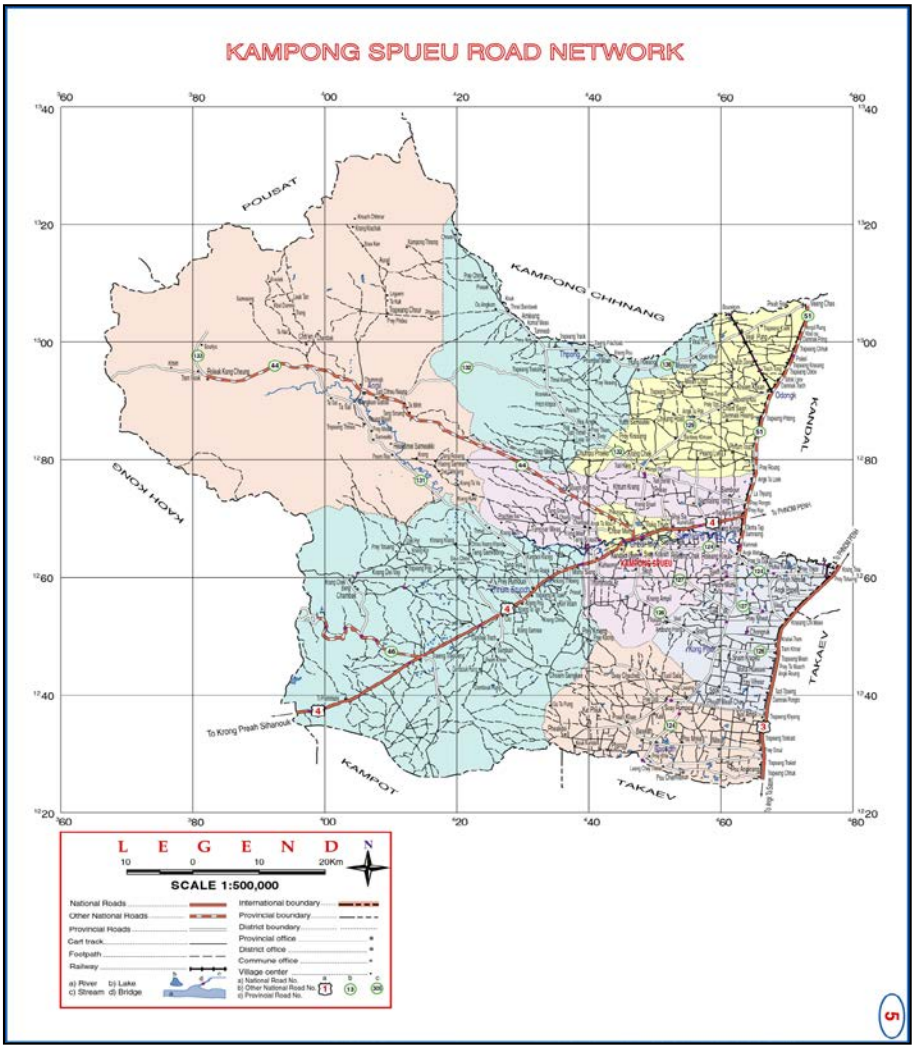
In building industrial cluster, the choice of location and industry is the most important for the success of industrial cluster. In choosing industry, competitive advantage of particular industry in Cambodia which has dynamic efficiency is important. The industries that have competitive advantage are agro-food processing industry, semi-conductor industry, ICT infrastructure, and research parks. These industries in the clusters can produce high value added commodities, export goods for Southeast and East Asian markets, and thus are expected to make sustainable development with reducing poverty in Cambodia.

2) Why Campong Speu?

The location of industry cluster is important in determining competitive advantage of firms in specific industrial cluster. According to Albert O. Hirschman's "uneven(unbalanced) development" theory, successful industrialization can be induced by core industries. In Cambodian case, the core industries are industries related to export-oriented open economy. Therefore the location of industry cluster for

Cambodia should be the place close to offshore areas of Kamport and Sihanouk Ville and to greater Phnom Penh airport area. Kampong Speu is located between offshore of Sihanouk Ville and Kamport and Phnom Penh and near Phnom Penh airport.

Figure 1-2. Road Map of Kampong Speu Province



The second location advantage for Kampong Speu is that the area is located between Phnom Penh and Sihanouk Ville where Chinese One Belt meets One Road. Kampong Speu can take advantages that both Continental One Belt and Maritime One Road provides.

Third, Kampong Speu area is a good place for semi-conductor industry cluster. Semi-conductor

industry cluster is the most proper industry cluster in Kampong Speu because Kampong Speu has airport (Phnom Penn) and sea port (Sihanouk Ville) that can be used for exporting semi-conductor products. Semi-conductor industry could be a good industry that can promote related industry in Cambodia because it has the advantage of easy transfer of technology and building the cluster in shorter period of time.

Fourth, another industry that can be proper for industrial cluster in Kampong Speu is agro-food industry cluster. Cambodia needs to process quality agricultural products into a high value-added agro and food goods. Kampong Speu needs to build agro-food industry cluster for processing high quality rice and mango.

3) The Validity and Feasibility of the Constructing Industrial Clusters

Constructing industrial clusters is feasible and viable on the following grounds. First, Cambodia currently needs double jobs of sustainable development and poverty reduction by means of industrialization.

Second, industrializing Cambodia based on industrial clusters has resonance with Cambodian government's national development strategies such as "Rectangular Strategy III: RSG III", "NSDP, 2014-2018,"and "Post-2015 Development Agenda." One of four pillars of "Rectangular Strategy III: RSG III" is "Integration into Regionalization and Globalization" that exactly fit into our BSS. In addition, "NSDP, 2014-2018" purports to create high value added industries that is exactly consonant with the purpose of our project of "Creating Core Industrial Clusters in Cambodia." "Post-2015 Development Agenda" includes removing poverty and sustainable development that is the main purpose of our project of creating industrial clusters.

4. Geo-economic Opportunities for Cambodia in Building BSS

As mentioned above, Cambodia is located at the center of Southeast Asia. Therefore, in terms of

maritime trade, Cambodia can be a maritime hub in Southeast Asian Sea and South China Sea. Cambodia is recommended to develop BSS-based economic development by maximizing theses geo-economic opportunities.

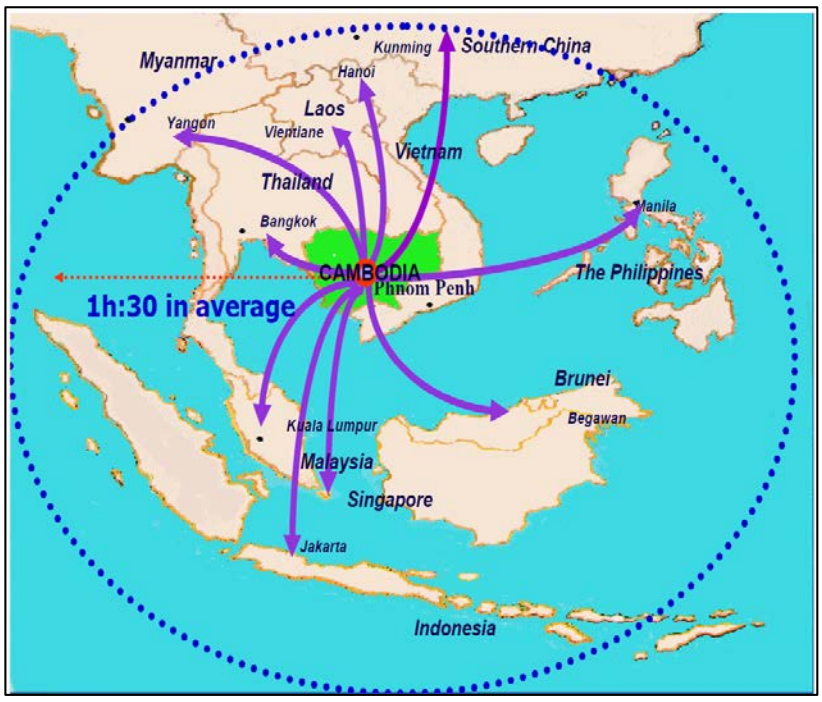
As One Belt One Road, AIIB, and AEC promotes and accelerates regional economic integration, Cambodia has the potential to be the hub of fast growing South East Asian regional economy. To make Cambodia as the regional hub and economic power house, Cambodians must find the opportunities ahead for them and make the opportunities into reality by building core industrial clusters in Greater Capital Area, Kampong Speu in particular.

The major geo-economic opportunities for Cambodia are China's grand national project of One Belt One Road that has been funded by AIIB, AEC, GMS and CLMV and mediating role in Sino-US rivalry.

Cambodia can become the regional hub of Chinese One Belt One Road by taking geo-economic advantage of the crossroad of Southeast Asia. In addition to play a key player of regional economic community such as AEC and RCEP, Cambodia can strengthen ASEAN's ties with three Northeast Asian trading giants, China, Japan, and Korea. ASEAN’s strong ties with those three Northeast Asian countries would surely help Cambodia to promote economic development and help to build inter-regional economic community that can accommodate both ASEAN and Northeast Asia by developing and upgrading East Asian regional economic and security architecture, APT (ASEAN plus Three). Cambodia can also take the initiative to bridge the US/Japan-led regional system such as ADB and TPP and the China-led regional system such as AIIB and RCEP.

Lastly, to say briefly with regard to Sino-US rivalry, Cambodia has a close relationship with China and it also has maintained a relatively good relationship with the US. The Sino-US rivalry and tension rise as China claims most of the South China Sea and its friction with other Southeast Asian offshore countries increases. Under the circumstance of Sino-US rivalry, Cambodia as one of few countries of ASEAN can profit from playing a role of mediator between China and the ASEAN states, and between China and the US.

Figure 1-3. Cambodia as the Hub of Southeast Asia

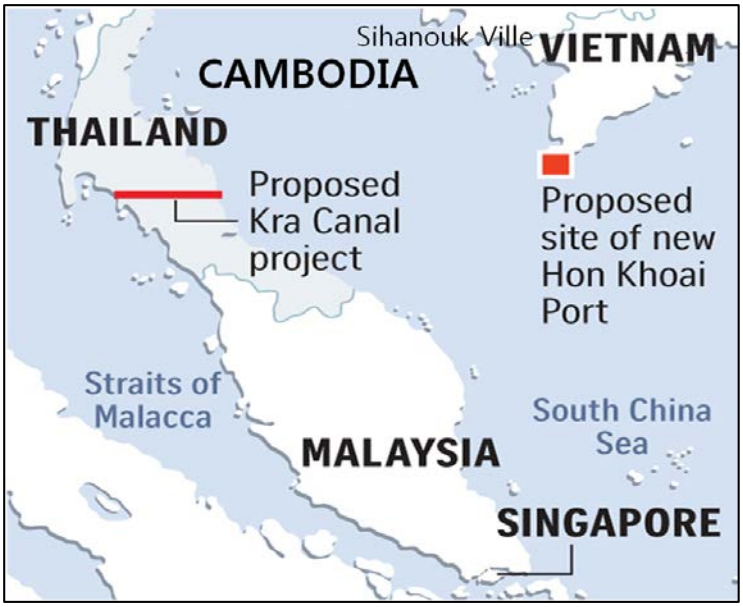


1) One Belt-One Road, AIIB and the Development of Cambodian Economy

In 2013, Xi revealed an ambitious project of "One Belt, One Road" (一帶一路) to realize his vision of New Model for Great Power Relations. Xi's One Belt One Road is to construct continental silk road (road and railroad) of One Belt and maritime silk road of One Road and to connect China to the everywhere in the world, Paris, Durban, Sao Paolo, and Canada. Xi himself calls this ambitious project as the main means of realizing China's Dream (中國夢) to reproduce old but great Chinese empires. One Belt or continental silk road is planned to connect China, Central Asia, Russia and Europe while One Road, 21st century maritime silk road is planned to link China, Southeast Asia, India, Pakistan and Africa. These two global silk roads would function as the global military and economic networks to reversely encircle the American "Great Crescent" (Dean Acheson) which contains China by offshore military defense line from Middle East to India, South East Asia, Philippines, Taiwan, Korea and Japan.

Figure 1-4. Map of "One Belt-One Road"

Figure 1-5. Proposed Kra Canal Project



Cambodia has great geo-economic advantage in utilizing Chinese One Belt One Road for industrializing Cambodia. Capital city Phnom Penh can be selected as the final destination of Chinese Southern Silk Road Expressway and Sihanouk Ville will be selected as the hub port of Chinese Maritime Silk Road that links to international ports in Southeast Mediterranean. Chinese President Xi Jinping

visited Cambodia in 2015 and mentioned that Cambodia's Capital City area is the key place for the China's ambitious project of "One Belt, One Road" (一帶一路, continental economic silk road and maritime silk road).If Chinese authorities have planned Kra Canal as a key project of One Road (Maritime Silk Road). Kra Canal was supposed to be built in between Kra and Isthumus, Thailand but the project has not been launched because of the opposition from Thailand.

The strategy for Cambodia to maximize geo-economic utility is to persuade Chinese authorities to choose Sihanouk Ville as the hub port to and from Kra Canal. Currently Sihanouk Ville, Cambodia has been competing with Hon Kohai Port to be chosen as the hub port to Kra Canal by Chinese maritime silk road authorities. If Sihanouk Ville is chosen as the hub port to Kra Canal, Sihanouk Ville will replace Singapore and Malaysia as the pearl of Southeast Asian Mediterranean Sea. Therefore, Cambodian government is recommended to expand the existing port and to build a new mega port that has the size and facilities to sufficiently accommodate shipments from all over the world.

2) AEC (ASEAN Economic Community)

Since the end of Cold War and the outbreak of East Asian financial crisis, Southeast Asian countries initiated organizing regional institutions that enabled collective actions and enhanced bargaining powers of small economies vis-à-vis great powers of the US, China, and Japan. (Pempel, 2002: 111) As early as 1967 they formed ASEAN. As ASEAN countries and settled security problems such as internal security problem, Vietnam War, and involvement in Cold War, they turned attention to economic issues such as trade liberalization, market opening and inducing foreign direct investment. In this way ASEAN countries became more closely linked with each other. Southeast Asian regionalism provided ASEAN countries prosperity in Southeast Asia. ASEAN exported Northeast Asian countries regional governance such as ASEAN+Three (APT), Asian Security Forum, Chiangmai Initiative and ABI (Asian Bond Initiative) and have become economically integrated regional community.

Based on substantial progress in the past decades, ASEAN declared of building ASEAN Economic

Community (AEC) in Bali, 2003.[10] AEC is one of three Communities built by ASEAN in 2015, i.e., ASEAN Political-Security. Community, ASEAN Economic Community and ASEAN Socio Cultural Community. After Bali Declaration in 2003, AEC came into effect in 2015.[11]

Cambodia as a member country of AEC can find great opportunity in AEC because ASEAN economic integration, free flow of capital, goods, and service among member countries of AEC, and AEC's program for SME development and poverty reduction is very important for social and economic development of Cambodia.

Cambodia is expected to play pivotal role in the regional integration body like AEC. As AEC is located between two rapidly growing and modernizing economic giants, India and China. As China's economy matures with rising production costs, and increasing consumption and technological advancement, AEC will become Asia's production floor. Consequently, the AEC will experience increased investment in manufacturing based on market segmentation and specialization. Under these circumstances Cambodia can benefit a great deal from being AEC member. Cambodia has abundant cheap, young labor with an average age of 24.1 years. Each year there are approximately 400,000-500,000 youth entering the market place. Cambodia can reap economic benefits from the AEC based on a number of factors. AEC will constitute a large population size of over half-a billion people. It occupies an important geopolitical and economic location with abundant natural resources.

AEC also has diversity in its economic structurein terms of labor needs, level of technology and production. These developments offer AEC the potential for intra-regional specialization based on production networks. To maximize these opportunities, Cambodia has to design institutions and policies to utilize their comparative and competitive advantages. (Kheang Un and Jae Hyeok Shin, 2015)

[10] Declaration of ASEAN Concord II.

[11] Choong Lyol Lee, AEC and Global Value Chains and Industrial Clusters in Southeast Asia," paper presented at International Conference on Making a Roadmap to Construct a Core Industrial Cluster in Kampong Speu, Cambodia," University of Puthisastra, December 16-17, Phnom Penh, Cambodia.

3) GMS and Economic Corridors

Another Cambodia's economic opportunities can be found in Cambodia's location advantages in GMS (Greater Mekong Sub-region). Cambodia is located in the heart of GMS. GMS has three economic corridors (EWEC, NSEC, and the SEC) and every corridor goes through Cambodian territory. Cambodia has utilized these geo-economic advantages to its benefit by connecting China and GMS and ASEAN. (Kheang Un and Jae Hyeok Shin, 2015)

Figure 1-6. GMS and Economic Corridors

The Greater Sub-Mekong Region (GMS) was established in 1992 to promote economic cooperation in the Mekong Basin that includes Thailand, Vietnam, Myanmar, Laos, Cambodia and two provinces in China—Yunan province and the Guangxi Zhuang Autonomous zone. The main objective of GMS was, first, to build transport infrastructure, and then to finance investment in physical infrastructure development, and currently to transform GMS physical infrastructure into a mechanism to promote

economic growth and to narrow the development gap within each ASEAN member state and between ASEAN member states and Southern China.

In order to build transportation infrastructure GMS members agreed to set up three economic corridors. These are (1) the East-West Economic Corridor (EWEC), (2) the North-South Economic Corridor (NSEC) and (3) the Southern Economic Corridor (SEC). Theses corridors have objectives to provide transport links to hinterlands, to build growth centers as catalysts for development of surrounding areas, to foster opportunities for foreign investment, to enhance sub-regional economic clusters, to promote coordination among member countries, and to foster tangible demonstrating effects.

Economic corridors within the GMS have helped to promote trade liberalization within CLMV (Cambodia, Laos, Myanmar and Vietnam) and to prepare them for the integration into the AEC. Cambodia has benefitted from the Southern Economic Corridor (SEC) of GMS that connects Cambodia to Thailand, Laos, and Vietnam. The SEC can facilitate economic development within Cambodia particularly in rural areas. One major mechanism that the corridor offers to Cambodians is the access to all season roads. Transportation networks, telecommunications, and electricity are critical ingredients for economic development. The contribution of rural roads to a country's sustainable, equitable, and inclusive economic development partly derives from rural road infrastructure's complex, direct and indirect webs of mutually beneficial interactions. Expansion in rural road networks helps reduce production and transaction costs, and correspondingly raises production output, for these road networks help improve access to inputs, extension services, and technology. (Kheang Un and Jae Hyeok Shin, 2015)

The Southern Coastal Subcorridor links Bangkok, cutting through Thailand's Eastern Seaboard, traverses through Koh Kong, Kampot, and connects to Vietnam at the Prek Chak-Ha Tieng border point.

The Intercorridor Link connects various parts of Cambodia starting from Sihanoukville passing through Kampong Speu, Phnom Penh, Kandal, Kampong Cham, Kratie, Mondulkiri, Stung Treng, and connects with Lao at the Trapaing Kreal-Dong Krak border point. From there it links to the East-West Economic Corridor (EWEC) that stretches from the Andaman Sea to the South China Sea by way of

Myanmar, Thailand, Laos, and Vietnam, Laos, and Thailand.

Lastly, the Northern Subcorridor covers areas that are rich in agricultural land with high potential for agro-business and tourists sites that could feature both eco-tourism and monuments. So there is the strong potential for the establishment of circuit tours that include diverse tourist sites. Within the SEC, road networks are the best developed.

4) Cambodia as the Hub of CLMV (Cambodia, Laos, Myanmar, and Vietnam)

The so-called CLMV countries (Cambodia, Laos, Myanmar, and Vietnam) had been centrally planned socialist economies. However, since the opening up of their centrally planned economies, CLMV has been one of the fastest growing economies in the world. In particular, since 1992 GDP growth rates for those four countries have been higher than the world average; in 2014, for example, the average GDP growth rate in the world was 2.5%, while the GDP growth rate for Myanmar was 8.5%, Laos 7.5%, Cambodia 7.0%, and Vietnam 6.0%. (Kheang Un and Jae Hyeok Shin, 2015)

Vietnam became the richest country among CLMV. Vietnam's GDP per capita (current USD) increased from $98 in 1990 to $2,052 in 2014, Laos from $203 in 1990 to $1,707 in 2014, Cambodia from $251 in 1993 to $1,084 in 2014; Myanmar's GDP per capita (current USD) is $1,198 in 2014.

CLMV countries have transformed themselves from centrally planned autarchic country to aggressive trading states. The proportion of trade in GDP has increased. For example, Cambodia's proportion of trade in GDP increased from 49% in 1993 to 144% in 2014, Laos from 36% in 1990 to 90% in 2014, and Vietnam from 19% in 1988 to 170% in 2014.

Investments in CLMV countries have increased dramatically over the past two decades, as well. The amount of foreign direct investment (FDI) flowing to CLMV countries has surged: the amount of FDI to Cambodia was 33 million USD in 1992, which multiplied to 1.3 billion USD in 2013; FDI to Laos was 8 million USD in 1992, which increased to 427 million USD in 2013; FDI to Myanmar was 163 million USD in 1990, which soared to 2 billion USD in 2013; FDI to Vietnam was 180 million USD in 1990, which skyrocketed to 9 billion USD in 2013.

As a result, despite the substantial increase in GDP, the proportion of FDI in GDP has surged for all CLMV countries as well. The amount of FDI to Cambodia was equivalent to 2.14% of GDP of the country in 1993, which multiplied to 8.83% in 2013; FDI to Laos was 0.69% of its GDP in 1990, which soared to 3.84% in 2013; FDI to Vietnam was 2.78% of GDP in 1990, which increased to 5.2% in 2013; FDI to Myanmar was 3.81% of GDP in 2013. (Kheang Un and Jae Hyeok Shin, 2015)

5) Intermediating Sino-US Rivalry

(1) G2 Competition: China's "Great Power Relations" vs. US' "Rebalancing Strategy"

Since the dawn of 21st century Global power center has shifted from Atlantic world to Asia-Pacific. After the fall of communism in Eastern Europe and Soviet Union in 1989-1991, American imperium had been recharged and strengthened and became uni-polar hegemonic power. However, since the dawn of 21st century American hegemony has met a new competitor, China. In 1979[12] China's Deng Xiaoping put an end to inner-oriented (內向的, 內省的), autarchic Soviet model of socialism, instead opened China's economy to the world market and integrated China into "capitalist world economy."[13] Since then China has been the fastest growing economy in the world with average GDP growth rate of 8%-10% annually and became the second largest economy in the world. Nonetheless, in terms of political and military power, China had remained a regional power in East Asia until the 21st century. Deng Xiaoping, acknowledging China's weakness in political and military power, adopted the main line of Chinese foreign policy as "韜光養晦" (to conceal one's ability and bide one's time) and Deng's successors maintained "韜光養晦(Tao Guang Yang Hui)" as the main pillar of foreign policy. Deng successors, Jiang zemin and Hu Jintao have kept low-key policy vis-a-vis the US. Deng's successors have abstained challenging American hegemony and preferred defensive and status-quo policy.

[12] While Deng's rise to power was in December 1978, his economic policy of Gaige Kaifang (Reform and Openness) started in early 1979.

[13] Gipouloux said that China is slowly turning away from its continental, collectivist, autarchic basis towards the other Asia which is maritime, open, mercantile and cosmopolitan. …This shift also opens up the possibility of China finally becoming one, true, federated nation and its reconstruction into a *flexible empire*, fully adapted to the demands of globalization." (Gipouloux, 2011)

Since then China has rapidly grown from the second largest economy to the world largest manufacturing and trading country and many have projected that China surpassed the US the world's largest economy in terms of GDP by 2020. Emboldened by China's economic strength, Chinese leaders became more assertive and aggressive with regard to foreign policy. Since inauguration to the first secretary of CCP, Xi Jinping announced New Model for Great Power Relations (新型大國關係) with the hegemonic power, US. Xi's announcement of Great Power Relations reflects the rising China's ambition to make shifting its role from the follower or taker of global standard, actually American standard to the setter or maker of new global standard in the area of international politics, security and economy.

Xi Jinping has strengthened naval defense against world's most powerful American navy by setting two maritime defense lines called the 1st Island Chain and the 2nd Island Chain. The First Island Chain is inner defense line that starts at south of Kyushu island - Okinawa - Taiwan - Philippines - north of Burnai and end at Malaka Strait. The Second Islands Chain is the outer defense line that runs from Kuiles through mid-Honshu Japan and runs through Guam, west of Philippines, Saipan, Samoa and Paua New Guinea. To defend the inner and outer sea of China, East China Sea and South China Sea, China has set the zones of "areal denial" and "no-go-zones" where no ships were permitted to enter inside the First and the Second Defense Line.

The US responded Xi's new offensive foreign policy of New Model for Great Power Relations, One Belt, One Road, and Inland Chains with so called "Pivot to Asia," (2011) and "Rebalancing toward Asia" (2011.3) "Pivot to Asia" and later "Rebalancing" aim at containing China by shifting main focus of US foreign policy from Middle East to East Asia, China in particular. Rebalancing strategy seems to be similar strategy of Dean Acheson's "Great Crescent" in Cold War years extending from Middle East to Japan that was designed to be the containment arc against the expansion Communist empires of Soviet Union and China together. US' "Rebalancing" and China's Great Power Relations have collided first at Senkaku Islands in 2012-2013 on the issue that who had the territorial rights of those small islands. As the US Senate approved unanimously that the US would defend under US-Japan Mutual

Security Treaty the Japan-administered islands in the event of armed attacks from China, Sino-US military tension went up high on the brink of naval conflict.

Figure 1-7. Rebalancing Strategy of the US

Figure 1-8. U.S. "Pivot to Asia" (Rebalancing) Policy

Figure 1-9. A Map of the Dispute over South China Sea

After the incident of Senkaku Islands in East China Sea, Sino-US rivalry moved to South China Sea around Spratly Islands. Spratly Islands dispute is an ongoing territorial dispute between China, Brunei, Malaysia, Philippines, Taiwan and Vietnam, concerning the ownership of the Spratly Islands and associated reefs, banks, and cays. The territorial dispute deteriorated as China increased its military presence and since 2015 has been constructing an airfield on Fiery Cross Reef and the US intervened militarily in the territorial disputes in favor of non-China 5 countries. South China Sea dispute has resulted in favor of US because China has lost the friendship of five countries and made them turned to the side of US. Spratly Islands dispute in South China Sea shows that China, even though it deserves to be called a G2 country economically, does not have a great ocean navy to project its power to all over

the world. China, in order to be a Great Power or G2 country, must have the military capacity to dispatch its military forces all over the world to defend its national interests. However, China has been overwhelmed by US naval forces even in its internal sea, East China Sea, South China Sea, and to say nothing of East Sea (Sea of Japan).

The Rebalancing strategy of the US is an offensive strategy of containment toward China. First, the US has moved its forces that have stationed in Middle East to Asia-Pacific. The US has plan to move 60% of naval forces to Asian-Pacific. Second, the US induces its allies in East Asia and Oceania to position militarily against China. The US resuscitates the networks of bilateral alliance with Korea, Japan, Australia, New Zealand, Philippines that was formed in Cold War period.[14] Third, the US strengthens the southern triadic alliance of US, Japan, and Australia and make the triad the core of containment against China. In response to the Chinese the 1st and 2nd Islands Chain, the US has formed American Islands Chain that starts from Okinawa via Taiwan and ends at Philippines. Fourth, by strengthening bilateral alliances with Korea and Japan, the US builds triadic alliance of US-Japan-Korea against China. Fifth, the US constructs a diamond-shaped strategic partnership with India, Australia, and Japan. Sixth, the US increases military networks with ASEAN countries, Vietnam and Singapore in particular. Seventh, the US improves relationship with Mongolia, Myanmar, India, and Vietnam Rebalancing strategy of the US and Great Power Relationship of China collided first in East China Sea, Senkaku Islands in particular and then in South China Sea around Spratly Islands in 2014-2015. Now the main frontline between Rebalancing a Great Power Relationship has moved to Korean Peninsula.

As G2 competition intensifies, the US has urged Korea to join US-Japan-Korea triadic alliance against China by threatening "abandonment" of Korea from US' defense umbrella in East Asia. The US pressed President Park Geun Hye to accept the Japanese Prime Minister Abe's tepid apology and small amount of compensation to Korean comfort women that were taken to war camps as sex slavery and then persuaded Japan and Korea to cooperate US' efforts to contain China. In addition, the US presses

[14] US revives so called "hub and spoke" system in Cold War era, a network of bilateral defense allies it threatens in the 21st century.

Korea to accept building MD bases including THAAD that target not only North Korea but also China.

Before the rise of China, the US had been benevolent towards South Korea's relations with China in terms of trade, investment, and personal exchanges. However, since China has grown up to G2, the US has demanded South Korea to participate in building MD system in East Asia, to shoulder the cost of offshore balancing, and to join the triadic (US-Japan-South Korea) alliance against China.

With the advent of G2 era, Korea has been in paradoxical circumstances in which it has to rely more on the US with regard to security while it needs to increase its economic exchange, trade, and partnership with China as China has become the largest trading and investment country. Faced with the dilemma of disjoint of politics and economy, South Korea has adopted an eclectic policy of "relying security on the US and economy on China" (安美經中). Such eclectic policy, though, is desirable but not a feasible policy. China would not let South Korea maximize economic interests if South Korea sides with US to rely continuously its security on the US and join offensive triadic (US-Japan-Korea) alliance targeting China. The US, too, would not allow South Koreas "security free-riding" to rely on US military defense umbrella for resolving its security dilemma while continuing economic cooperation and exchanges.

G2 competition changed security landscape in East Asia. It has been, since the rise of China as one of G2, the main source security destabilization and tension in East and South China Sea. And now the tension has been moving to Korean Peninsula. G2 competition revives new cold war in Northeast Asia. two triadic security blocs, China-North Korea-Russia vs. US-Japan-South Korea have formed across the demilitarized zone in Korean Peninsula.

In short, intensifying G2 conflict has acted upon as the major stumbling block to inter-Korean peace. It has raised the strategic value of North Korea to China. Under the circumstance of G2 competition in East Asia, China needs more of North Korea's buffer role against American offensive than North Korea does for Chinese protection and economic aid. Thus North Korea's Kim Jong Un has been emboldened to test more atomic bombs and even hydrogen bomb and to launch long-range missiles. In response to North Korean nuclear offensives, South Korea finally accepted the US' offer to place THAAD (Terminal

High Altitude Area Defense)[15] in USFK's base. China, rather than North Korea reacted strongly over the South Korean announcement of deploying THAAD. China argues that THAAD would alter strategic security balance in East Asia because "with the radar that can reach up to 4,000 km away, a THAAD system based in South Korea would severely compromise China's controversial air defense zone."[16] China worried seriously that THAAD is simply a mean to neutralize missile threats from North Korea but change the balance of power between Northern triad, China-Russia-North Korea and Southern triad, US-Japan-South Korea, or what a retired Chinese colonel Yue Gang calls "a mini NATO."

G2 conflict in East Asia revives military confrontation structure between two triads, Southern triad of US, Japan and South Korea vs. Northern triad of China, Russia, and North Korea that had been the dominant security architecture during Cold War era. Therefore G2 conflict can be said to function as the stumbling block to inter- Korean peace as well as East Asian regional security community.

(2) Cambodia as the Mediator of Sino-US Rivarly

Cambodia can be a proper intermediator of Sino-US rivalry because Cambodia is the only littoral state in Southeast Asia that has not involved in Sino-US conflicts in South China Sea and Cambodia has maintained good relationship with both China and US. While China and several ASEAN members such as Vietnam, Philippine, Malaysia, Indonesia, Brunei have overlapping claims over South China Sea, Cambodia has not have territorial disputes over the Parcel Islands and the Spratley Islands in South China Sea. Sino-US conflicts have worked as opportunities rather than constraints and challenges for Cambodia's foreign relations because Sino-US rivalry provides opportunities for Cambodia to play a bridging role between US and China and to build trust with China in building One Belt, One Road.

Sino-Cambodian relations in the 1970s were characterized by the real politik of the Cold War which prompted the Chinese government to support the ultra-Maoist Khmer Rouge regime during its rule over

[15] THAAD(The Terminal High Altitude Area Defense) provides the Ballistic Missile Defense System (BMDS) with a globally transportable, rapidly deployable capability to intercept and destroy ballistic missiles inside or outside the atmosphere during their final, or terminal, phase of flight.

[16] "Why does China react so strongly over the South Korea-based anti-missile system?" *South China Morning Post*, February 12, 2016.

Cambodia from 1975-1979 and its guerrilla activities from 1979 to 1991. China's support for the Khmer Rouge strained relations with the Hun Sen government and the ruling Cambodian People's Party. However, since the late 1990s, Cambodia's relations with China have improved and solidified as China provided development assistance to Cambodia and cooperated with Cambodia in the areas of military, trade and diplomacy. China has become the largest bilateral donor to Cambodia. Bilateral trade between China and Cambodia has also grown exponentially. Between 1994 and 2013, with a presence of over 3,000 companies, Chinese investment in Cambodia was $9.6 billion. Bilateral trade reached $2.83 billion in 2013. (Kheang Un and Jae Hyeok Shin, 2015)

In contrast, the US relations with Cambodia since independence from France have not always been friendly. The troubled relations originated during the Cold War when the United States attempted to contain the spread of communism through its military intervention in Vietnam. Up until 1970, Prince Sihanouk was able to prevent the Vietnam War from spreading into Cambodia through pursuing a neutral policy by cultivating relations with communist countries like China and the former Soviet Union. The United States viewed Prince Sihanouk's neutrality as a pro-communist policy, prompting the United States to collaborate with Cambodian rightists to topple Sihanouk in a coup d'état in March 1970. The United States soon provided financial and military assistance to the new government under the name of the Khmer Republic which fought against China-supporting Khmer Rouge guerrilla forces and increased heavy military bombing of Cambodia. Such strong US support, however, failed to slowdown the Khmer Rouge advance. Between 1975 and 1979, Cambodia was no longer the concern of the United States foreign policy. Normalization of Cambodia-US relations began following the 1991 Paris Peace Agreement. US foreign policies toward Cambodia in post-Cold War era have been along the lines of strengthening democracy and human rights, including promoting citizen advocacy, civil society, and election monitoring.[17]These US foreign policies have sometimes strained its relations with Cambodia and have been seen as interference in Cambodian domestic affairs.

[17] Thomas Carothers, *Aiding democracy abroad: the learning curve*, (Washington D.C.: Carnegie Endowment, 2011); James Scott, and C. Steele. "Sponsoring Democracy: The United States and Democracy Aid to the Developing World, 1988–20011" *International Studies Quarterly* 55, no. 1 (2011): 47-69.

While US-Cambodian relations were strained over issues of human rights and democracy, the US has tried to cultivate good relations with Cambodia because the US viewed Cambodia as a key country for promoting US geopolitical, geostrategic and geo-economic interests.[18] As Cambodia's strategic value to the US security interests in South China Sea has risen, Cambodia-US relations has improved since 2009. Since 2009, Cambodia and the US exchanged military attaches and have since organized a series of bilateral and multilateral military exercises and trainings centered on disaster relief, counter-terrorism, demining and peace-keeping. Now the United States remains Cambodia's largest trading partner, accounting for over 60 percent of Cambodia's total exports; ninety-eight percent of imports are textile and apparel items. Cambodia's success in exporting to the US stems from the 1999 US-Cambodian agreement that links the advancement in protecting labor rights with increased US import quotas for Cambodian textiles.

With regard to Sino-US rivalry Cambodia has to play as mediator of G2 conflicts in order to be a bridging state (BS) in Southeast Asia. To be a BS, Cambodia needs to position itself as an unbiased, neutral, and fair mediator. Therefore Cambodia has to remove commonly believed public opinion that Cambodia sides with China on South China Sea conflicts.[19] Cambodia should not just rely on China to the extent that jeopardizes its relations with the United States. Even though the US has disagreements with regard to the state of human rights and democracy in Cambodia, the US has been a critical country for Cambodia to become a BS in Southeast Asia. If Cambodia is seen as a "pawn of China" by neighboring countries, Cambodia will not have the credibility to be trustworthy mediator.

If China is continuously perceived as a threat to regional peace by ASEAN member countries, the Philippines and Vietnam in particular, then ASEAN unity might be in jeopardy. Similarly, the US' pessimistic view of China's rise to a dangerous level, this perception will endanger multilateral

[18] The Obama administration wanted to cultivate good relations with Cambodia and to maintain some leverage in the country and to ensure that it would not fall too deeply into China's orbit. With reference to Cambodia's close relations with China, Secretary of State Hilary Clinton remarked: "you don't want to get too dependent on any one country."

[19] However, Cambodia has issued statements claiming that Cambodia does not side with China and there is no high quality publications by the Cambodian government that defend Cambodia's position on this issue. (Kheang Un and Jae Hyeok Shin, 2015)

cooperation in addressing common issues such as economic and environmental issues as well as arms races and security issues. Given Cambodia's close relations with China, Cambodia's status as non-claimant to the territorial waters in the South China Sea and its warm relations with the United States, Cambodia can play a role to find common ground for resolving the conflicts and lessening tensions in the South China Sea.

Cambodia, in order to be a BS in Southeast Asia, should find venues for dialogue to search for common ground and put away differences. This forum should aim to build mutual trust among all parties involved in the conflicts in the South China Sea. Such a forum aims at promoting cooperation and mutual benefits and mutual understanding among conflicting claimants.

Given China's insistence on projecting its "peaceful rise" image, it has been more than willing to provide financial support to dialogue forums and Cambodia should capitalize on China's eagerness. China articulates a new China-ASEAN treaty of good neighborliness and cooperation. Therefore Cambodia should further explore what China's objectives are in this treaty including its goals of resolving conflicts in the South China Sea. In order to avoid involvement of outside powers, China also proposes the promotion of "regional solutions for regional problems." Within this context, Cambodia should create initiatives to open discussions between China and ASEAN and between the US and China. (Kheang Un and Jae Hyeok Shin, 2015)

5. Geopolitical and Geo-economic Opportunities and the Future Vision of BSS under Trump Presidency

Unexpected election of Donald Trump to the President of the US has shaken geopolitical and geo-economic environments in Southeast Asia. The election of Trump symbolizes the advent of post-neoliberal globalization era that has characteristics of protectionism, isolationism, populism, tribalism and ethno-racism. The advent of new era would surely affect geopolitical and geo-economic opportunities and constraints of Cambodia as well as Southeast Asian countries. Cambodia should

maximize opportunities and minimize constraints to be a BS in Southeast Asia.

1) The Historical Meaning of the Election of Trump

Since Global Financial Crisis in 2008, global order has entered into Post-Neoliberal Globalization. As neoliberal globalization worsened social and economic inequality, polarized society, and created 1% vs. 99% society, those who have suffered the economic and social effects of globalization revolted against 1% financial elites who led the financial globalization. In October 2011, starting from “Occupying Wall Street,” many off-line and on-line SNS and social media demonstrations poured into the streets and swept away privileged establishment class in the elections.

In Brexit in June 2016, British people showed their discontent and anger to neoliberal globalization that generated economic inequality, mass unemployment by the infusion of workers from Arab, Turkey, and Eastern European Bohemians.

In November 8, 2016 US presidential election, populist Donald Trump won over elitist Hillary Clinton. Trump won the election by means of creating the Trump phenomenon ("Trumpism") combining ethnic neo-tribalism (anti-Mexican immigrants and Islam), religious fundamentalism (Christian Right), economic protectionism in Rust Belt, and political isolationism of "America First."

2) Trumpism in American Foreign Policy Tradition: 21st Century Jacksonian

(1) Jacksonian Democracy and Trumpism

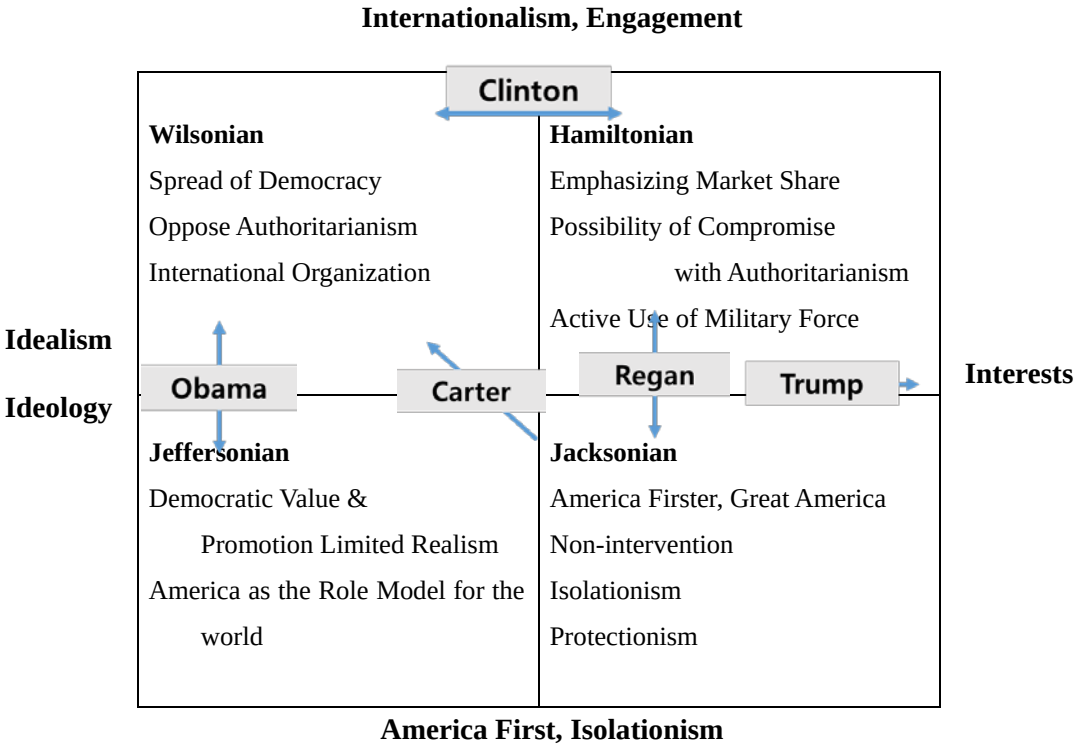
Donald Trump will be a Jacksonian president I 21st Century. Andrew Jackson was the 7th President of USA. Jackson was the first president of mass democracy. Jackson (1829-1837 from rural Tennessee) symbolizes the transition from elite democracy of “gentlemen presidents” (Washington, Jefferson, Madison, Hamilton, Adams from Massachusetts, New York and Virginia) to mass democracy representing ordinary citizens.

Jackson was the first president elected with universal adult male suffrage. With industrial revolution and expanding frontier in the West, universal suffrage invited "common men" into electoral politics.

Now, the mass, not the elite, decides the locus of power. Therefore the essence of Jacksonian democracy is mass democracy based on universal suffrage.

In Jacksonian Democracy, ordinary voters decide the political power to decide the fate of the nation. Therefore, power-seeking politicians put the first priority on following what the constituency wants and demands. Populism and "America Firster," and nationalism prevailed in the election during Jacksonian era. Andrew Jackson was the faithful follower of "Jacksonian" and elected to the 7th President of the US with “American Firster,” “Christian moralism, anti-banker political attitude and policy, republican value, and anti-elitism.

Figure 1-10. Four Traditions of American Foreign Policy



Source: Walter Russel Mead, “The Jacksonian Tradition and American Foreign Policy,” *National Interest*, Winter 1999/2000

Trumpism shares many features of Jacksonian such as America Firster, white supremacy and statism, protectionism and the resurrection of manufacturing America, especially Rust Belt, diplomacy based

on the interests of ordinary white Americans, the president of common men, isolationism in international relations, and not allowing security free riding to Japan, South Korea and allies.

(2) Trump's East Asian Policy

Under Trump presidency, Obama's "Rebalancing policy" will be retreated. Instead of "pivot to Asia," Trump will move "pivot from Asia." Trump, during presidential campaign, announced that he will withdraw from TPP if elected. He promised to revise conditions of FTAs with East Asian countries, especially Korea. He reveals strong protectionism with regard to American trade policy. He promised to protect domestic market and to re-manufacture Midwest America.

Under Trump presidency, the US engagement with East Asian allies such as Japan and South Korea will be weakened even though Trump tries to complement the retreat from the alliances with Japan and South Korea with offshore balancing strategy. Under Trump presidency security landscape will be that pragmatic Chinese leadership meets Trump's merchant leadership. Trump's US and Xi Jinping's China can make "deal" based on interests, not on ideology and values.

(2)-1. Policy toward Russia: "以夷制夷" (take control of a group by using another group)

Under Trump presidency, Putin's Russia will rise to key East Asian security architect. Putin has been a close friend of Trump and thus Trump will make use of Russia's Putin in order to contain China. Trump tries to contain China by strategically using the power and influence of Putin's Russia.

If Trump have transaction with Putin to help Russia to install trans-Siberia railroad, gas-pipeline, electricity line, it could damage Xi Jinping's ambitious project of One Belt One Road (一帶一路). By using Putincard, Trump can isolate China in Central Asia. East Asian security landscape will be formed by "marriage of convenience" between American nationalist Trump and Russian nationalist Putin. Trump may strategically think that strong Russia will be a good leverage to the rising power, China. Trump outsources Putin to maintain precarious balance in East Asia after the US will retreat from Asia.

(2)-2. Policy toward South Korea and Japan: "Offshore Balancing"

The US has had vital interests in South Korea and Japan. Therefore, the US cannot withdraw its forces from these two key allies even though the US can withdraw from NATO and Middle East. However, US does not have fiscal capacity to maintain stationing of US forces in these two rich allies. To resolve the security dilemma in Japan and South Korea, Trump is expected to relay on "offshore balancing strategy" (John Mearshimer and Stephen Walt, 2016). The US as the offshore balancer can maintain military forces in these two countries by imposing the costs of staining American troops on these two affluent allies. On trade and economic issues, Trump will keep protectionist policy toward these two big trading countries to protect American manufacturing workers and firms in Rust Belt America. Trump will sanction these two countries by imposing high customs on export goods and services, withdrawing from TPP, and revising the conditions of KORUS (Korea-US) FTA.

(2)-3. China Policy: "Outsourcing"

Trump will outsource China to resolve North Korean nuclear issues in order to concentrate on domestic issues. Outsourcing strategy reflects Trump's isolationist foreign policy. If North Korean nuclear issues will be outsourced to China, China will revive "two track" approach, that is, to resolve denuclearization of NK in parallel with negotiating peace treaty between US and North Korea and to assure North Korea the regime security by the US and six parties. The two track approach had been discussed among China's Foreign Minister Wang Yi, the US Secretary of the State John Kerry and North Korean delegates since March, 2016 to October 2016.

China will accept the role of outsourcer on the condition that the US loosens the economic and trade sanctions such as 45% tariffs on Chinese export goods and reduces the military presence and pressure on China in South China Sea.

(3) Trump's Policy Toward Southeast Asia: Retreat, Disengagement, Uncertainty and Pragmatism

All Southeast Asian countries worry about Trump's views on Southeast Asia laden with high

uncertainties and express implicitly and explicitly anxieties over Trumpist policy of disengagement. However, they found opportunities in Trump's "transactional," pragmatic, and less ideological and value-oriented leadership.

Lack of US support for multilateral ASEAN would be a strong blow to ASEANS' aspirations to be a central hub in regional politics and a regional power that can compete with East Asian big three, China, Japan, Korea.

Trump's stronger preference of bilateralism to multilateralism might frustrate those who try to build multilateral institutions like ASEAN, East Asia Forum, EAS, and AEC. Trump's isolationism in Southeast Asia such as withdrawal from TPP of 12 nations economic pact which includes 3 SE Asian countries, Malaysia, Singapore and Vietnam will be early signal of setback, disinterest and disengagement in the region.

With TPP withdrawal, Southeast Asian region will lose an important balancing leverage against China. However, Trump's merchant leadership will be good news to Philippine, Thailand, Malaysia that had been pressed by Obama for their violations of democratic norms and human rights. Trump's pragmatic, putting priority of economic interests over democratic norms and human rights, and most of all, the leadership that prefers transaction, "deal" and interest-based negotiation will be key source of optimism for these authoritarian countries to improve relationship with the US under Trump presidency.

But Trump's anti-Islamism is bad news for Islamic countries. It will deteriorate US relation's with Indonesia and Malaysia and undermine popular support for Trump in these Muslim countries. In addition, Trump may strike a "deal" with China over its territorial claims in South China Sea despite the opposition from Japan, Philippine, Vietnam, Malaysia, Indonesia, Brunei.

(3)-1. Indonesia: Growing Distance, Hostility and Uncertainty

Indonesia supported Hilary Clinton and liked Obama and therefore has strong anxiety over Trump's hostile policies toward Muslims. With regard to economic policies, Indonesia worries about Trump's inward-focused, protectionist economic policies.

If Trump rebuild its own manufacturing in Rust Belt America and cut corporate tax, demand for Indonesian goods will decrease. Trump's campaign promises to ban on foreign Muslims entering the US and other policies that stymie Muslim's rights and civil liberties might provoke anti-American sentiment in Indonesia.

(3)-2. Malaysia: Guarded Optimism

Malaysian Prime Minister Najib Razak told that the partnership with the US will remain strong under Trump presidency. According to Deputy Prime Minister Ahmad Zahid Hamid, Malaysia and the US will maintain comprehensive partnership on the area of politics, economy, security, defense, counter-terrorism.

Malaysian reactions to Trump's election are diversive; 1) Islamic conservatism and Pan-Malaysian Islamic Party worries Trump as Islamphobe; 2) Liberal Progressives view Trump with contempt for his xenophobic and misogynistic remarks; 3) Democratic Action Party and those who believe in learning lessons from "Trump effects" are looking for the possibility of dislodging Najib and his coalition from power.

(3)-3. Myanmar: Loss of a White Night, Overcoming Shock and Connecting with Trump

Since democratization, Hillary Clinton has been welcomed as the darling of Myanmar media. Aung San Suu Kyi was a close friend of Hillary and the ruling NLD (National League for Democracy) has supported Hillary Clinton and her Democratic Party.

Because of economic value and the support of Republican Party leaders to Aungsan Suu Kyi and democracy in Myanmar, Trump will not have free hand to reverse Obama's US policy toward Myanmar. However, Union Solidarity and Development Party (USDP) and the Arakan National Party (ANP) welcome President Trump.

Trump as pragmatic and transactional leader will appreciate the strategic opportunity and dilemmas of Myanmar as the sandwich state between China and India and make use of its geostrategic and geo-

economic value. Ideology or political stance of Myanmar during the campaign may not be important to Trump. Only national interests matter for Trump. Therefore, Myanmar needs to buildnew bridgesto connect with Trump

(3)-4. Philippines: "Economy Bad, Politics Good"

Philippines' reactions to Trump's victory were "worry, hope, and vindication." Philippines worry about lower remittance from 4 million Filipinos in the US ($8billion dollar), the loss of BPO (Business Processing Outsourcing) as Philippines is world largest BPO hub and lower total exports because the US market composes over 15% of total Philippine exports.

Nevertheless, President Rodrigo Duterte who was elected to the president at the end of June 2016 expressed hope in the US-Philippine relations. Duterte who is populist, and is called as Philippines' Trump seems to believe that Philippines can maintain and develop close relationship with the US under Trump presidency.

Duterte's optimism about US-Philippines relations and Duterte's call for a more independent foreign policy and a more distant relationship with US and a more close relationship with China has been vindicated by Trump's revisionist American trade and security policy.

(3)-5. Thailand: Stagnation, Missed Opportunities, Uncertainty

Thailand strongman General Prayat Chanocha and the ruling NCPO (National Council for Peace and Order) junta congratulated Trump for being elected to the president.

In reaction to the death of TPP, Thailand supports China-backed RCEP and talked that Thailand's relationship with the US no longer provide means of balancing Thailand's ties with China. Human rights and the violation of democracy by military junta in Thailand may not be the main concern of Trump who put priority of interests over human rights and democracy.

(3)-6. Vietnam: Blow to Economy and Security, and Striving for Continuity

In reaction to Trump's election, Vietnamese leaders, President Tran Dai Quang and Prime Minister Nguyen Xuan Phuc worry about US withdrawal from TPP. They thought that it might impair their efforts to deepen economic integration through 12 FTAs.

They hope that Trump maintain engagement in the South China Sea and its commitment to Asia-Pacific security. The only thing that is certain is that bilateral ties between the US and Vietnam will remain strong and be promoted further.

3) Trump and Geopolitical and Geo-economic Opportunities for Cambodia: Bridging State(BS) for Resetting Southeast Asian Security and Trade Architecture

(1) Cambodia as the first-mover to welcome and accommodate Trump's election to the president

Prime minister Hun Sen enthusiastically endorsed Trump prior to the election and is the first Southeast Asian leader who congratulated Trump's triumph. Trump's "transactional", less ideological leadership enables the improvement of the US-Cambodia relationship. Hun Sen and Trump could be a "political cousins." (*Cambodia Daily*, Nov. 10, 2016) Prime Minister Hun Sen has good friendly relations with Trump and his close friend Putin, and China's Xi Jinping.

Under Hun Sen's leadership, Cambodia can become an active player in Southeast Asian international politics. Trump, as a Jacksonian president, has not been interested in a value-based foreign policy stressing human rights.

(2) Cambodia can be the Bridging State(BS) in Southeast Asia under Trump Presidency

Cambodia is already under Chinese economic influence. Cambodia is a member state of RCEP, but not the member of TPP. China would fill the void that would be made by Trump's "pivot US from Asia." As Bridging State (BS), Cambodia can be a bridge between outgoing US and incoming China. As BS, Cambodia can play the role of balancing between two great powers in Southeast Asia, China and the

US.

By improving its relations with Trump's US, Cambodia can get rid of the infamous status as human rights violator. Obama and Hillary Clinton singled out Cambodia as a country violating human rights.[20]

(3) Cambodia as the BS in the US-China Conflict in South China Sea

Cambodia is the only country that has not been involved in Sino-US conflict in South China Sea. Cambodia can play as a mediator between the US and China by using the naval port of Sihanouk Ville as a leverage.

Cambodia, the only country that has not been involved South China Sea disputes, can overcome "Consensus Dilemma" of ASEAN over the South China Sea. Different postures of member countries over South China Sea disputes constrains and threatens the ASEAN's principle of consensus-based decision making (consensus and consultation), especially about security issues.

Cambodia can become the "Consensus Builder" by making use of its geopolitical and geo-strategic advantage. Cambodia can lead the trust building, cooperation, and dialogues among ASEAN countries, between ASEAN and China, and can strike a balance between national interests and regional security interests.

(4) Cambodia's National Strategy in Turbulent Era of Transition: Consensus-Builder and Mediator, not as Game-Changer in Southeast Asian Security Landscape

The recommended strategy for Cambodia in the era of Trump's unraveling Strategic Rebalancing is a consensus-builder and mediator. For small country with geo-strategic value, game-changer strategy is dangerous, precarious and can be criticized as "de-stabilizer."

"External balancing strategy" by strengthening alliance is not good strategy for small countries in the years of power transitions and in the era of "the precarious balance."(Dehio, 1962) It is unwise and un-

[20] However, pessimists view that the change in US-Cambodia relations under Trump presidency would be minimal and Cambodia will be left on the backburner. "Cambodia is now a second or third order priority for Washington": Sebastian Strangio)

strategic policy to shift from "pivot to US" to "pivot to China" as Trump unravels Obama's Pivot to Asia. The policy is very dangerous because it would be backfired soon.

Cambodia needs to have equidistance diplomacy with the US and China and thus should not make security (or defense) alliance with either of these two great powers. In the era that Trump's US will turn inward and away from Asia, "pivot to China" as Philippines Duterte has done, only deepen Cambodia's dependence on China in terms of security, trade, economics, and politics. Therefore, Cambodia has to keep friendly relations with the US and use the US as the leverage whenever Cambodia negotiates with China on trade, FDI, FTA, and security matters.

II. Agro-Industrial Cluster in Kampong Speu

Jae Hyeok SHIN (Korea University)
Theara HORN (University of Puthisastra)

Industrializing Cambodia:
Making a Roadmap to Construct Core Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University, Chairman of Jayavarman Center for Development)

II

Agro-Industrial Cluster in Kampong Speu

Jae Hyeok SHIN (Korea University)

Theara HORN (University of Puthisastra)

1. Overview of Government Policy

Agriculture has been one of the most important sectors of the economy in Cambodia, which counted for 45.3% of the labor force of the country in 2014 (see Table 2-1). Agricultural activities are believed to contribute significantly to the nation's economic growth and poverty reduction. From 2004 to 2012 more than 60% of poverty reduction was contributed by the positive development in the agriculture sector. The agricultural development has slowed down since 2013, however. Most of the agricultural growth resulted from the expansion of cultivated land, and the pace of expansion began to decelerate. To accelerate the growth in the agricultural sector, therefore, agro-processing industries should be developed further in the country (World Bank 2015).

Additionally, workers outflow from the agricultural sector to the other sectors, such as manufacturing and service sectors. According to the Socio-Economic Survey in 2009, labor in the agricultural sector counted for 57.6% of the total labor in the country, but the labor share of agriculture decreased to 45.3% in 2014 (Table 2-1). As the country's economy grows, the labor in the primary sector, such as agriculture, forestry, fishing, and mining, is transferred to the secondary sector producing manufactured goods and the tertiary sector producing services. The decreased labor force in agriculture is substituted by the mechanization of the agricultural industry.

Table 2-1. Labor Outflow from Agriculture Sector 2009, 2014

Labor in Industrial Sectors	Socio-Economic Survey 2009				Socio-Economic Survey 2014			
	Cambodia	Phnom Penh	Town	Rural	Cambodia	Phnom Penh	Town	Rural
Total labor (1000 persons)	7,469	686	735	6,048	8,235	1,059	957	6,220
Agriculture (%)	57.6	1.9	24	68	45.3	2.5	17	56.9
Manufacture (%)	15.9	21.2	17.8	15	24.3	28.2	25.4	23.5
Service (%)	26.5	76.9	58.3	17	30.4	69.3	57.6	19.6

Source: National Institute of Statistics, Socio-Economic Survey 2009, 2014

As the labor share of the agricultural sector is decreasing, it is imperative for the sector to improve its profitability by increasing productivity and efficiency. Nonetheless, the profitability of the sector has not been improved significantly owing to low productivity and efficiency.

So far most agricultural products of Cambodia have been exported to foreign countries as raw materials. Then, the companies in the import countries process the raw products and export to others countries for higher prices. This lowers the productivity and efficiency of the Cambodian agricultural production, and thus lowers the profitability of the country's agricultural sector.

As a consequence, although Cambodia has been one of the major agricultural product suppliers in the global market, the country has been suffering from trade deficits on agricultural products. As shown in Table 2-2, for instance, in 2014 Cambodia exported agricultural products worth of 78 million USD to foreign countries; it imported agricultural products worth of 1,171 million USD from foreign countries. In particular, Cambodia exported 31 million USD worth agricultural products to Vietnam; it imported 102 million USD worth products from that country. This is mainly because Cambodia exported raw products to Vietnam and imported processed products from that country.[1]

The low profitability also contributes to the outflow of labor from the sector. It is greatly important, therefore, that the Cambodian agricultural producers must be able to process the agricultural products in order to add higher values to them.

[1] Interview with LEE Chang Hoon, CEO of Hyundai Corporation Cambodia, Kampong Speu, 21 October 2016.

Table 2-2. Ten Major Countries Trading Agricultural Products with Cambodia, 2014

Rank	Partner Country	Import (US$ Thousand)	Partner Country	Export (US$ Thousand)
1	Indonesia	350,593	Vietnam	31,502
2	Thailand	199,571	United States	15,141
3	Singapore	134,073	Thailand	10,210
4	Vietnam	102,635	Bulgaria	8,936
5	Malaysia	88,737	Singapore	5,046
6	China	55,484	China	1,986
7	United States	34,536	Greece	1,357
8	India	32,794	Malaysia	693
9	Brazil	24,940	Indonesia	673
10	Korea, Rep.	24,347	Korea, Rep.	381
11	Other 48 countries	124,053	Other 29 Countries	2,195
	TOTAL	**1,171,762**	**TOTAL**	**78,126**

Source: World Integrated Trade Solution (WITS).
Accessed at http://wits.worldbank.org/CountryProfile/en/Country/KHM/Year/2014/TradeFlow/Import/Partner/all/Product/16-24_FoodProd#on 15 October 2016.

The Cambodian government realized the low profitability of the agricultural sector, and suggested a series of national economic development plans. The Rectangular Strategy Phase III has set agriculture as one of the four priorities, and focused on the improvement of productivity and the commercialization of agricultural products. To achieve the goal, the Ministry of Agriculture, Forestry, and Fisheries (MAFF) announced the Agricultural Sector Strategic Development Plan 2014-2018. In the development plan, the MAFF sets a policy goal to "increase the agricultural growth around 5% per annum through the enhancement of agricultural productivity, [and the] diversification and commercialization [of agricultural products]."[2]Toward this goal, the MAFF offers support for a variety of activities, which include research and development (R&D) to increase the productivity, implementation of laws and regulations to enhance the commercialization, establishment of "One Window Service" to facilitate trade, improvement of technical capacity to process agricultural products.[3]

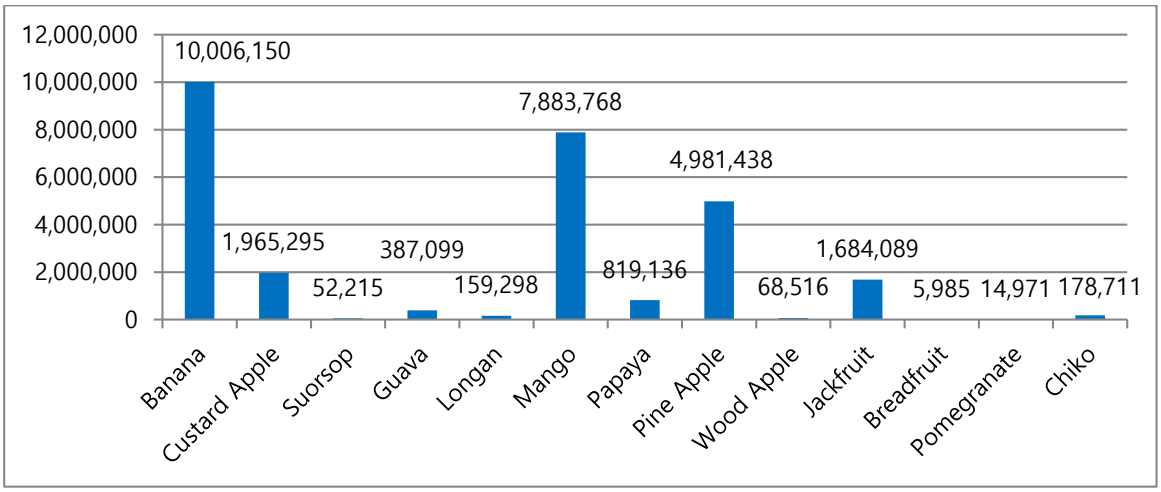
Although those government plans contain desirable visions and goals, they all seem to lack specific

[2] Ministry of Agriculture, Forestry and Fisheries. "Agricultural Sector Strategic Development Plan 2014-2018." p. 26.
[3] Ibid. p. 29.

policies to achieve the suggested goals. For instance, the MAFF mentioned the necessity to improve technical capacity for agricultural processing; nonetheless, it specified nothing about how to improve such capacity. If the government intends to support the building of agricultural processing facilities in Cambodia, which agricultural products should be processed, and where should the facility be located? Also, precisely how should the government support such facilities? In this chapter we aim to address these questions.

To increase the profitability of the agricultural sector, the sector should be able to attract more investment from domestic and foreign investors. For this end, building an agro-industrial cluster is one of the most effective ways. Some of the reasons are as follows.

Figure 2-1. Number of Cultivated Fruit Trees (2013)



Source: NIS-MoP Agriculture Census in Cambodia (2013)

First, Cambodia has abundant cultivated areas for fruits. Based on the agricultural census, Cambodia has more than 10 million trees of banana, 7.8 million trees of mango, 4.9 million trees of pine apples, 1.6 million trees of jackfruit and other fruit trees (Figure 2-1). These fruits can be used as raw materials for agro-processing industries.

Second, demands for processed food such as instant food are increasing remarkably as urbanization proceeds rapidly. As more people get busier with their work and with the congested traffic, the demands for processed food are growing.

An agro-industry cluster is important to boost the food processing industries in Cambodia. It would help improve the competitiveness of the products in the global market as it is more efficient to do all operations in an area that consists of many facilities of related businesses. We need a big push that serves as a catalyst to attract many companies and investors to build such an agro-industrial cluster. We suggest that an agro-industrial cluster starting from mango processing plants should be built in Kampong Speu province.

2. Potentials of Kampong Speu Province

1) Overview of Kampong Speu

Kampong Speu is located in the west of Phnom Penh city, about 45 minute drive along National Route number 4 from the Phnom Penh International Airport, easily connecting to Phnom Penh Port and Sihanoukville Port. The province consists of seven districts and one town with 87 communes and 1,340 villages (see Table 2-3). Samroung Tong district and Chbar Mon town are the commercial and administrative center. Aural and Thpong districts are covered by forest and mountains, also having big fertilized land that produces a large volume of crops and livestock. Kang Pisei, Oudong, and Basedth districts are flat area surrounding by mountains, good for agricultural production, especially palm production in Oudoung (see Figure 2-2).[4]

In Kampong Speu province, there are 166,411 households with density of 119 per km^2. Each household has on average 5 members. The paddy land area is 130,600 hectares and other agricultural crop land area is 48,288 hectare. The province has abundant labor force as 52% of the population are working age from 18 to 60 years old, and 39% are young population whose ages are less than 17 years old (Figure 2-3). 76% of the population make their living in agricultural sector.

[4] Five Year Action Plan 2015-2019, Kampong Speu Province

Figure 2-2. Map of Kampong Speu Province

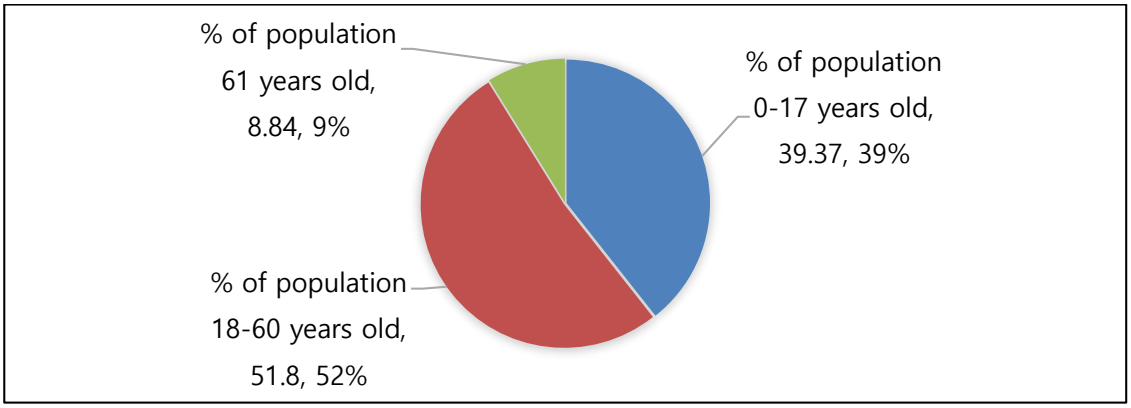
Source: Angkorfocus.com(accessed at http://www.angkorfocus.com/userfiles/kampong-speu-geography-map.jpg on 28 December 2016).

Table 2-3. Description of Kampong Speu Province

Description	Year 2013
Area	6,969 Km^2
Town and Districts	8
Commune	87
Villages	1349
Population (Total)	827,699
Population (Female)	422,684
Household	166,411
Head of Household (Female)	15%
Percentage of population relying on agriculture	76.6%
Percentage of Children without schooling	11.8%
Illiteracy rate (age 15-45)	4.4%
Maternal mortality ratio (out of 100,000 live births)	110
Tap water consumption ratio	12.2%
Water well access ratio	83.2%
Ratio of household without toilet	33.7%

Source: Five Year Action Plan of Kampong Speu Province, 2015

Figure 2-3. Labor force Share in Kampong Speu Province (2013)



Source: Kampong Speu Province's Five Year Action Plan, 2015

Kampong Speu province has 106 large factories, among which 64 factories are operating, 41 are under construction, and one postponed operation. There are 6,646 small and medium-sized enterprises (SMEs) and 15 water supply firms.[5]Additionally, there are 106 small and medium-sized factories hiring 100,000 workers with the average wage of 174 USD/month. Finally, there are 325 registered companies, 19 of which invest in the agricultural sector, including 53 rice mills.

2) Potentials of Kampong Speu Province to Build an Agro-Industrial Cluster

Kampong Speu is located near the capital city. Public utility service can be thus accessed easily from Phnom Penh. For example, electricity is supplied to Kampong Speu by the Electricité Du Cambodge (EDC) with the same rate as in Phnom Penh.

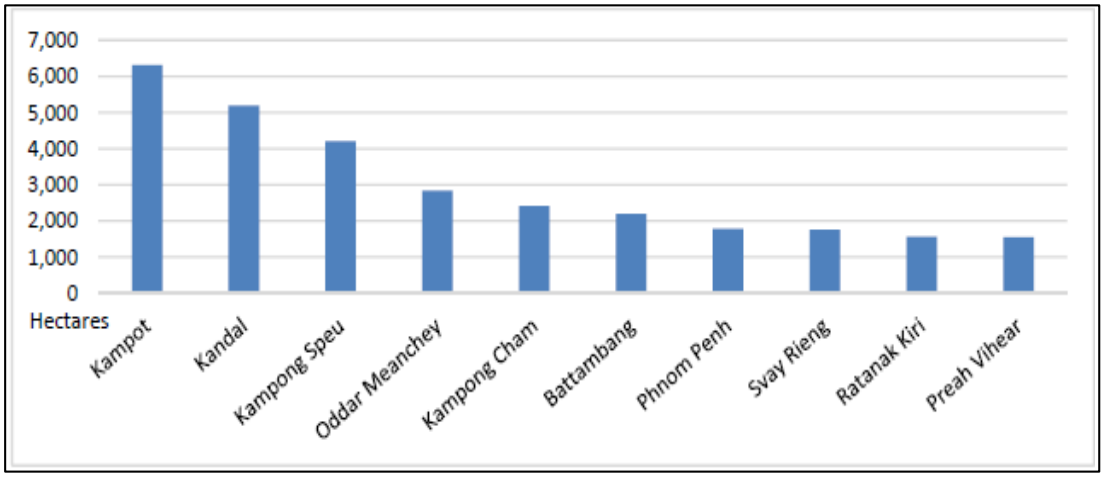
In addition, the province is located near ports—40km from the Phnom Penh International Airport and 180km from the Sihanoukville Port. It is easy to transport the processed products to domestic and global markets.

Kampong Speu is also located in an economic corridor set by the government development plan (The Rectangular Strategy Phase III). Thus, it is expected to observe more infrastructure development to boost industrialization and economic growth in the province.

[5] 16.3% of population (24,876 households) can access tap water.

Finally, the temperature is from 20.3 to 37.7 degree Celsius (average 29 degree Celsius). This is favorable for growing fruits and crops. In particular, Kampong Speu is one of the top three mango producing provinces in Cambodia (Figure 2-4).

Figure 2-4. Top Mango Producing Provinces in Cambodia



Source: NIS-MoP Agriculture Census in Cambodia (2013)

It thus seems most relevant to build an agro-industrial cluster in Kampong Speu starting with mango processing plants. The subsequent section assesses the potentials and challenges of that plan.

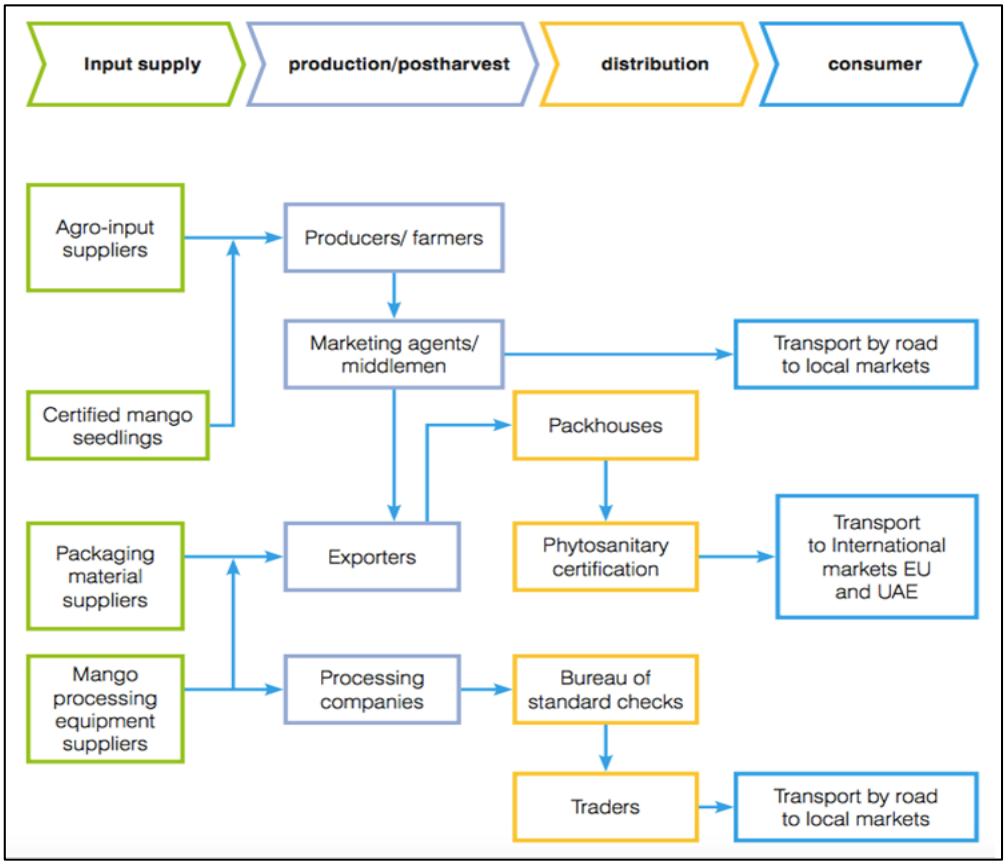
3. Potentials and Challenges of Mango Processing Industries

Figure 2-5 gives a brief review on how mangoes are processed and reach customers through multiple channels. Mangoes are not only available raw but also available in the consumer markets in various forms since they can go through different processing processes.

At large, there are three forms of 'processed' mango available in the consumer market. The first form is fresh mango. The fruit will reach customers freshly through appropriate packaging processes. Second, the fruit will be processed into juice, jam or pulp. Lastly, the fruit goes through drying process with or without sugarcoats to be sold in a dried form.

Keo Romeat, the head of the Agricultural Cooperative for Processed Fruits and Export in Trat province reports, “Mango currently sells for about 35 US cents per kilogram in the Thai-Cambodian border. However, it can sell for 2 US dollars per kilogram after it has been processed and exported as dried or sugar-coated mango.” As he indicates, processed mangoes yield much higher profits to the producers.

Figure 2-5. Value Chain of Processed Mangoes



Source: International Trade Center. (2014). Road Map for Developing & Strengthening the Processed Mango Sector, Switzerland: Beatrice Ng’ayu& Genevieve Audet-Belanger.

For now, most mangoes harvested in Cambodia are exported to foreign countries where companies can process those raw products or can guarantee more constant price. The constant price provides great advantages to harvesters and therefore expansion of international market would have to be a priority in Cambodia’s mango industry. Nonetheless, in order to broaden potential markets and increase the agricultural revenue, it is necessary to conduct an analysis of the feasibility and desirability of mango

processing industrial cluster in Cambodia, particularly in Kampong Speu province.

A SWOT analysis will be an appropriate tool to assess the feasibility and desirability of mango processing industry in Kampong Speu, Cambodia. The SWOT analysis is a helpful business tool to evaluate SWOTs—Strengths Weaknesses, Opportunities, and Threats—of a proposed project (see Table 2-4). It helps to identify the internal and external factors that are favorable and unfavorable to certain business goals, in this case, to increase the profitability of agricultural sector through building an agro-industrial cluster starting with mango processing plants in Kampong Speu.

Table 2-4. SWOT Analysis for Mango Processing Plants in Kampong Speu

	Helpful	**Harmful**
Internal factors	Strength • Abundance • Quality • Labor	Weakness • Infrastructure • Capital • Brand power
External factors	Opportunity • High demands • Free trade • FDI	Threat • Competition • Crisis in the SCS • Political risk

First, strengths are helpful internal factors. There are three strengths in building a mango processing industrial cluster in Kampong Speu—abundance in production, products with high quality, and abundant, cheap labor.

Strength 1: Abundance

The first strength is the abundance of the products. Mangoes are permanent crops. That is, farmers do not need to plant new seeds every year. Moreover, in Kampong Speu it is possible to do double-cropping, therefore, enabling abundance of mango produce. The first harvest is from March to April and the second one is from October to November. In real number, there are 40,000 hectare mango farms in Kampong Speu, and 10,000 hectare of them are registered in the Mango Association in Kampong

Speu. One of the farms in the province, Hyundai Arirang Farm in Kampong Speu, is 300 hectare large, producing 4,000 tons of mangoes annually.[6] Given the low input cost and high output, mango processing has great potential in Kampong Speu.

Strength 2: Quality

The second strength is that Cambodia's mangos are of high quality. 80% of mangoes produced in Cambodia is KeoRomiet. This yellow mango contains lots of sugar and is a very popular type in the global market. 15% of mango produced in Cambodia is Keo Chen. The CEO of Hyundai Corporation Cambodia said in an interview that the Cambodian mangoes tasted the best amongst all other mangoes he ever tasted from various countries.[7]

Strength 3: Labor

The third strength is abundant labor force available in Kampong Speu province. Farms have had little difficulty in recruiting workers, which has enabled stable supply of the fruit.[8] Moreover, the wages of workers are relatively cheap. For instance, the wage for each person picking mangoes is 30,000 riel(7.5 USD) per day. The wage for persons carrying the picked mangoes is 40,000 riel(10 USD) per day. In an interview with the Mango Association, it is indicated that two to three people can pick one ton of mangoes each day, which means labor cost for picking a ton of mangoes is only 15 to 22.5 USD.[9]

Next, weaknesses are harmful internal factors. There are three weaknesses—poor infrastructure, insufficient capital, and weak brand power.

Weakness 1: Infrastructure

The first weakness is the Cambodia's poor infrastructure in terms of insufficient roads, electricity,

[6] Interview with LEE Chang Hoon, CEO of Hyundai Corporation Cambodia, Kampong Speu, 21 October 2016.
[7] Ibid.
[8] Ibid.
[9] Interview with IN Chayvan, President of the Mango Association in Kampong Speu, 27 August 2016.

irrigation, etc. Also, poor government support can be regarded as one of the lacking social infrastructure. A representative of the Mango Association expressed frustration for the lack of governmental support as he said in the interview, “The main problems are that the government does not support, does not care, does not help, does not advertise and does not motivate us.” As a result, he continued, it is difficult to reach global standards of certification, because most mango producers have no capacity to sterilize viruses. Thus, exports are not possible and most producers resort to selling fresh mangoes that yield much less profit compared to processed mangoes.[10]

Weakness 2: Capital

Another internal weaknesse is insufficient capital. Most mango farming companies and individuals do not have sufficient funds to invest in processing facilities. At this point, most Cambodian mango farms including the ones in Kampong Speu do not have their own packaging machines and thus have to sell raw mangoes at cheap prices.

The representative of the Mango Association in Kampong Speu talked about the difficulty in following the government rules. He said, “Even if we sign a MOU with Korea, we still do not have enough capacity to follow their rules. We do not have vapor heat treatment (VHT) machines to check chemicals or kill viruses. They are expensive.”[11]

Due to the lack of funds to equip processing machines, most mango producers in Cambodia have focused on informal export of fresh mangoes. This type of unofficial trade has led the Cambodian mango producers to yield even less profit.

Weakness 3: Brand power

The representative of the Mango Association in Kampong Speu also reported that Cambodian mangoes have no brand, and therefore there is no brand power to bring advantages in marketing. He

[10] Ibid.
[11] Ibid.

expressed that government officials and farmers association need to work together to improve the global reputation of Cambodian mangoes, which are of great quality at comparatively lower prices.[12]

Next, opportunities are helpful external factors to the mango processing industry in Kampong Speu. There are three opportunities identified—high demands in the global market, advantages of free trade agreements, increasing foreign direct investment.

Opportunity 1: High Demands

As shown in Tables 2-5a and 2-5b, imports of mango to nations such as the US, the Netherlands, and China have been on the rise in general. It contributes to global increase in mango imports from 1,418,713 tons in 2011 to 1,623,090 tons in 2015, and from 1.7 billion USD in 2011 to 2.4 billion USD in 2015. This tendency shapes a favorable environment for expanding the share of Cambodian mangoes in the global market.

Opportunity 2: Free Trade

The second external opportunity for mango processing industry in Kampong Speu is the trend of free trade. Trade blocs, such as Association of South East Asian Nations (ASEAN)'s Free Trade Area, ASEAN Economic Community, RCEP (Regional Comprehensive Economic Partnership), ASEAN Plus Three (Korea, China, Japan), and ASEAN Plus Three plus Austrailia, New Zealand, India, will facilitate the export of Cambodian mangoes to those neighboring countries in Asia Pacific, and will thus increase the profitability of the Cambodian mango industry.

[12] Ibid.

Table 2-5a. Imports of Mango (tons)

Country	Period				
	2011	2012	2013	2014	2015
USA	379,803	377,408	436,108	385,807	405,823
Netherlands	137,703	128,542	130,733	150,095	148,613
China	111,878	129,180	138,433	89,164	112,923
Viet Nam	7,932	N/A	33,984	53,375	99,774
U.K	50,165	49,445	56,228	59,641	71,222
Germany	57,566	52,134	56,223	65,725	70,855
Saudi Arabia	63,497	70,390	57,858	63,668	64,841
United Arab Emirates	N/A	84,397	103,966	104,187	59,390
Canada	56,375	54,300	60,312	58,000	56,314
Malaysia	50,960	60,637	50,877	50,324	55,140
Others	502,834	446,554	458,533	458,574	478,195
Total	**1,418,713**	**1,452,987**	**1,583,255**	**1,538,560**	**1,623,090**

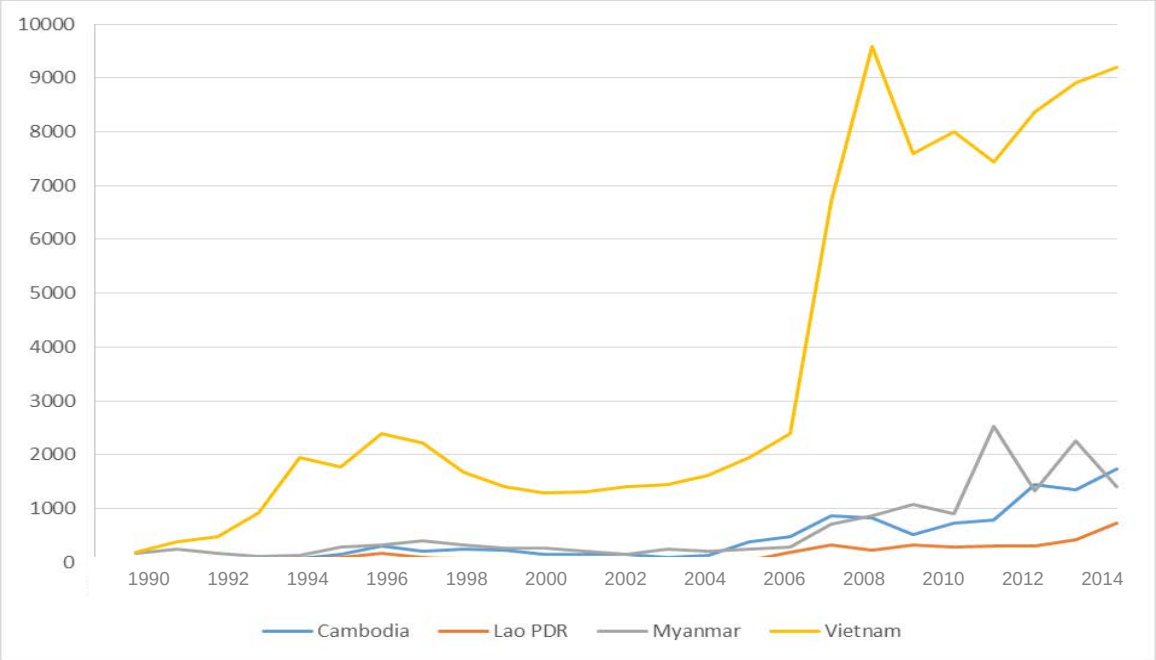
Source: ITC Trade Map, accessed at http://www.trademap.org/Index.aspx on 19 October 2016.

Table 2-5b. Imports of Mango (thousand USD)

Country	Period				
	2011	2012	2013	2014	2015
USA	402,100	424,835	501,521	492,174	544,015
China	154,828	206,888	245,046	177,499	260,190
Netherlands	171,635	186,077	216,600	251,523	233,410
Germany	119,724	111,572	131,088	161,769	169,855
United Kingdom	89,731	96,772	106,157	131,111	163,271
France	73,150	78,326	83,660	102,761	100,791
Canada	69,624	82,689	92,484	88,856	87,194
Viet Nam	15,414	30,575	74,182	124,588	82,289
United Arab Emirates	N/A	79,424	91,062	100,146	68,043
Hong Kong, China	75,787	76,976	75,987	74,233	66,771
Others	551,325	535,804	602,661	669,850	701,046
Total	**1,723,318**	**1,909,938**	**2,220,448**	**2,374,510**	**2,476,875**

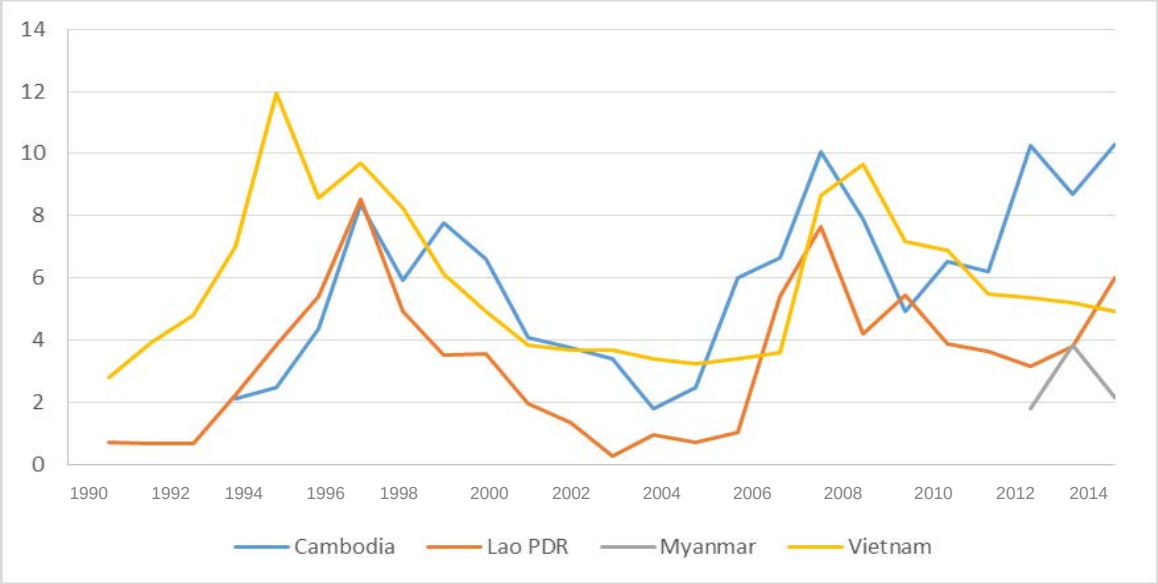
Source: ITC Trade Map, accessed at http://www.trademap.org/Index.aspx on 19 October 2016.

Figure 2-6a. Foreign Direct Investment, Net Inflows (Current US$, 1 million)



Source: The World Bank Data, "Foreign direct investment, net inflows (BoP, current US$)," accessed at http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?cid=GPD_31 on 14 October 2015.

Figure 2-6b. Foreign Direct Investment (% of GDP)



Source: The World Bank Data, "Foreign direct investment, net inflows (% of GDP)," accessed at http://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS?cid=GPD_31 on 14 October 2015.

Opportunity 3: Foreign Direct Investment

The third opportunity for the mango processing industry in Kampong Speu is the increasing trend of foreign direct investment to Cambodia, as shown in Figures 2-6a and 2-6b. Among the CLMV countries—Cambodia, Laos, Myanmar, and Vietnam—foreign direct investment to Cambodia steadily grows and reaches the second largest recipient next to Vietnam in 2014. In terms of percentage of GDP, Cambodia has become the largest recipient since 2011. This certainly creates a favorable environment for supplying funds to mango processing facilities in Kampong Speu.

Nonetheless, there are three external threats that might be harmful for exporting the Cambodian processed mangoes to the global market—fierce competition with neighboring countries in the global market, crisis in the South China Sea, and domestic political risk.

Threat 1: Competition

As seen in Tables 2-6a and 2-6b, there are many neighboring ASEAN countries that have already been exporting a large volume of mangoes to the global market. Thailand, topping the list of ASEAN mango exporting nations, exported 218,816 tons in 2015 only, which is about 3,772 times larger volume than that of Cambodia. What is more, countries outside the ASEAN countries also export mangoes. Such fierce competition in the international market can be expected as Cambodia try to increase exports of mangoes.

Table 2-6a. Exports of Mangoes from ASEAN countries (unit: ton)

Rank (2015)	Country	Period				
		2011	2012	2013	2014	2015
2	Thailand	152,285	196,441	252,904	246,676	218,816
9	Indonesia	14,231	21,740	8,786	11,294	39,389
15	Philippines	32,149	27,826	25,738	36,105	22,555
29	Malaysia	5,540	5,006	9,847	13,440	8,469
40	Viet Nam	2,728	N/A	41,173	65,379	1,888
63	Singapore	194	245	176	176	213
76	Myanmar	25,511	25,239	21,202	185	118
77	Laos	19	N/A	9	8	103
85	**Cambodia**	**1**	**11**	**0**	**8**	**58**

Source: ITC Trade Map, accessed at http://www.trademap.org/Index.aspx on 19 October 2016.

Table 2-6b. Exports of Mangoes from ASEAN countries (thousand US dollars)

Rank (2015)	Country	Period				
		2011	2012	2013	2014	2015
6	Thailand	96,345	128,139	180,342	199,320	173,050
7	Philippines	96,191	70,897	63,391	128,020	91,011
24	Indonesia	12,297	19,736	7,252	8,450	19,015
34	Malaysia	3,192	2,858	8,248	12,630	6,391
38	Viet Nam	3,803	9,741	53,709	100,457	4,356
52	Singapore	419	438	440	526	976
60	Laos	29	9	20	42	472
65	Myanmar	3,155	3,260	2,972	486	295
81	**Cambodia**	**1**	**4**	**0**	**13**	**92**

Source: ITC Trade Map, accessed at http://www.trademap.org/Index.aspx on 19 October 2016.

Threat 2: Crisis in the South China Sea

China has been making assertive claims over the South China Sea. This has led to clash with some Southeast Asian states, most notably with the Philippines and Vietnam. Below is a chronological list of major conflicts in that sea.

- On 8 January 2005, Chinese patrol boats opened fire on Vietnamese fishing boats in the Gulf of Tonkin, killing 9 people.

- On 25 February 2011, Chinese frigate fired three shots at Philippine fishing boats in the Spratly Islands.
- On 26 May 2011, Chinese vessel cut the cables of a Vietnamese oil and gas survey ship in the exclusive economic zone of Vietnam.
- On 8 April 2012, the Philippine Navy apprehended eight Chinese fishing vessels in the Scarborough Shoal.
- On 11 March 2014, Chinese Coast Guard expelled two Philippine ships from the Spratly Islands.
- On 26 May 2014, a Vietnamese fishing boat sank after a Chinese vessel crashed into it.
- On 19 August 2014, Chinese jet fighters harassed a US surveillance aircraft.
- On 12 July 2016, an international tribunal in The Hague ruled in favor of the Philippines, which led China to reproach the international community.

The conflict over the sea increases the instability of the region, and poses a potential threat to the economy of the region. If the conflict rises to the point where the US intervenes and bans import of goods from China, for instance, the countries that have close ties to China, such as Cambodia, would be damaged by the trade war between the superpowers, as well.

Threat 3: Political Risk

A threat to a mango processing industry in Kampong Speu might come from a domestic political turmoil. Table 2-7 shows seat shares of the ruling party (Cambodian People's Party, or CPP) and Sam Rainsy's parties in the opposition (Sam Rainsy Party until 2008 and Cambodia National Rescue Party in 2013). After reaching the apex of power in 2008, the ruling CPP's popularity has been declining, while the opposition party's popularity has been increasing. It is believed that the ruling party will be reluctant to concede power if the opposition wins the subsequent elections in 2018. If that happens, therefore, a great political disorder will follow, which will damage the economy of the country.

Table 2-7. Seat Shares of Parties in Elections (%)

Year	Ruling party	Sam Rainsy's party
1993	42.5	
1998	53.3	12.3
2003	59.3	19.5
2008	73.2	21.1
2013	55.3	44.7

4. Potentials and Challenges of Rice Processing Industries

After farmers produce rice, they sell harvested rice to collectors or directly to rice mills depending on their location and transportation. If it is sold to a collector, the collector sell sit to rice mills. Mills turn the harvested rice into products such as milled rice, broken rice, rice bran and husk. Broken rice can be processed into snack, noodle, or rice papers. Rice bran can be used as animal feed and bran oil. Husk can be used to produce energy for rice mills.

Table 2-8: SWOT Analysis for Rice Processing Plants in Kampong Speu

	Helpful	Harmful
Internal factors	Strength • Abundance • Labor • Government policies	Weakness • Infrastructure • Unskilled worker
External factors	Opportunity • High demands	Threat • Flood

Such processed rice is more profitable; for example, the price of rice in the domestic market is less than 1 USD per 1kg. When rice is processed into rice flake, its price can rise to 10 USD per 504g in an

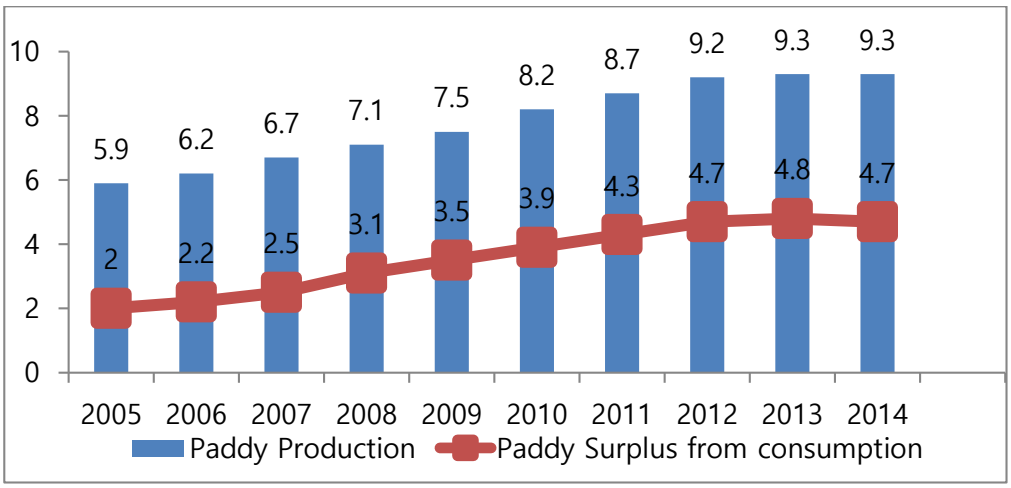
international market.[13] It thus seems reasonable to build rice-processing plants in the agro-industrial cluster proposed in Kampong Speu. To assess the potential and challenges in rice processing, we employ a SWOT analysis (Table 2-8).

Strength 1: Abundance

In Cambodia over 3 million hectares of cultivated land can produce over 9 million tons of p addy (see Figure 2-8). The production of rice is large enough for the domestic consumption, a nd the surplus of rice increased over the last decade and reached 4.8 million tons in 2013.Mill ing and polishing capacities also keep improving in recent years (Figure 2-9). Thus, the amoun t of milled rice, such as broken rice and rice bran, is large enough for rice-processing facilities.

In terms of quality, Cambodian rice is gaining better reputation in the international market as the vo lume of Cambodian rice export is on the rise every year. Moreover, Cambodian rice has won the Worl d Best Rice award in the Rice Competition in the World Rice Conference organized by the Rice Trade r three years in a row. Kampong Speu province is also famous among millers as the province pro duces high quality rice.

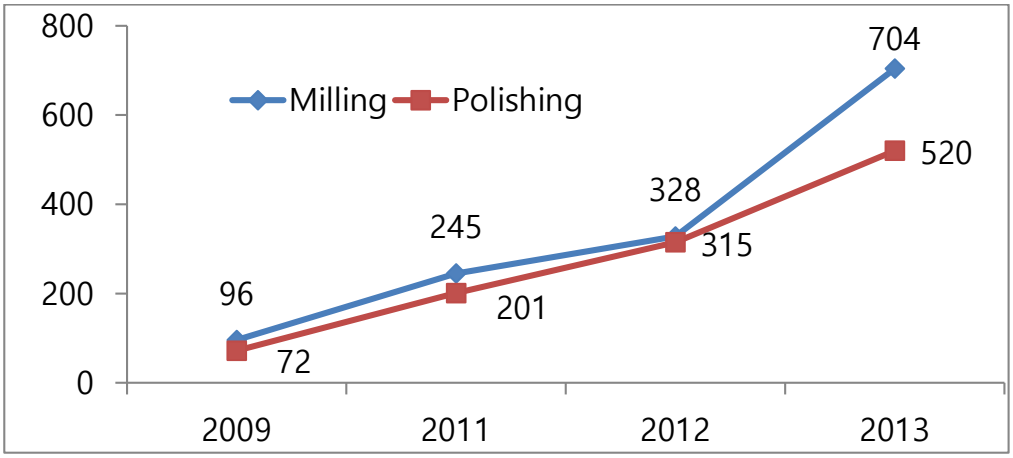
Figure 2-8. Paddy Production and Surplus



Source: Cambodia Rice Federation

[13] Price at Amazon.com (accessed on 15 December 2016).

Figure 2-9. Milling and Polishing Capacities



Source: Cambodia Rice Federation

Strength 2: Labor

As discussed above, labor is abundant and thus cheap in Kampong Speu, giving advantage to price competitiveness.

Strength 3: Government policies

Government policies including the Rectangular Strategy, Industrial Development Policy, National Strategic Development Plan 2014-2018, and Five Year Action Plan 2015-2019 of Kampong Speu province show their support for food processing industries in the country.

In particular, Kampong Speu provincial government is implementing comprehensive Five Year Action Plan 2015-2019 for investment, which covers many aspects such as socio-economic development, land use, management of natural resources, environment, natural disaster and climate change, administration, and public safety and security. The action plan also facilitates business relocation to the province, and encourages investment, especially in the agro-industrial sector.

Weakness 1: Infrastructure

In addition to the lack of infrastructure discussed above, higher price of electricity in Cambodia than neighboring countries makes the processed products less competitive in the global market. Moreover,

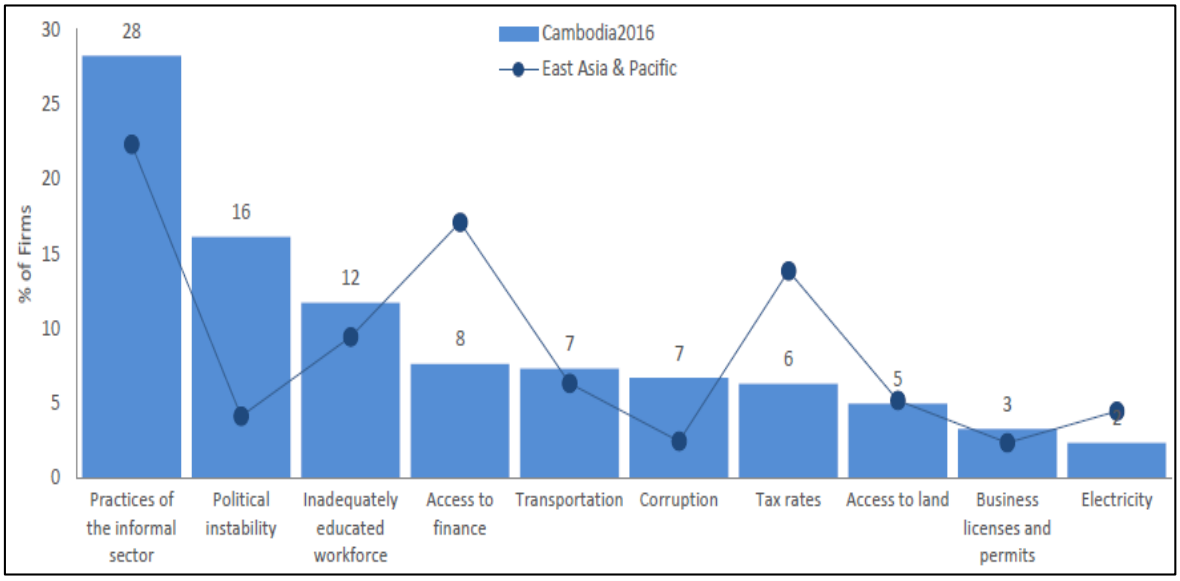
the lack of water management facilities often results in flood.

Weakness 2: Unskilled worker

The number of skilled workers is limited. Most of them prefer to work in cities where wages are higher and better socioeconomic infrastructure is equipped. Thus attracting skilled workers would be a challenge.[14]

According to the World Bank's Enterprise Survey with 373 firms in 2016, inadequately educated w orkforce, with other factors such as practices of informal sector, political instability, transportation, an d corruption, is one of the main constraints in the business environment of Cambodia. (Figure 2-10)

Figure 2-10. Constraints in Business Environment of Cambodia, Compared to East Asia & Pacific States



Source: World Bank, Enterprise Survey 2016 with 373 firms

Opportunity: High demands

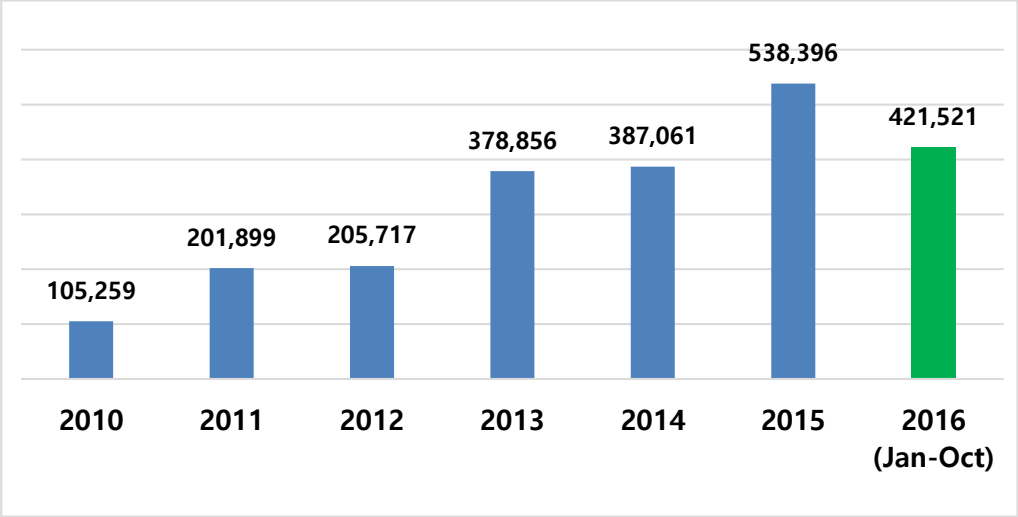
Cambodian rice is exported to more than 60 countries around the world, and the amount of e xport keeps increasing every year (Figure 2-11). There are some rice processors who are famili ar with exporting process. For example, the owner of AMRU Rice Noodle Entreprise Cambodia,

[14] Interview with CEO of Ly Ly Food on 29 August 2016

is also owner of AMRU Rice Exporter. Thus, they can easily access international markets. Wi thin one year after the establishment of AMRU Rice Noodle, the company successfully supplied their products not only to the domestic market but also to four foreign countries—Germany, Fr ance, the Netherlands, andChina.[15]

Similarly, Ly Ly Food also supplies their products to every province in Cambodia, and also supplies their rice crackers to more than 10 countries in the world. The company expanded its consumption of paddy from 4 tons per day in 2014 to 5 tons per day in 2016.[16]

Figure 2-11. Cambodia Rice Export (2010-2016 Oct)



Source: Cambodia Rice Federation

Threat: Flood

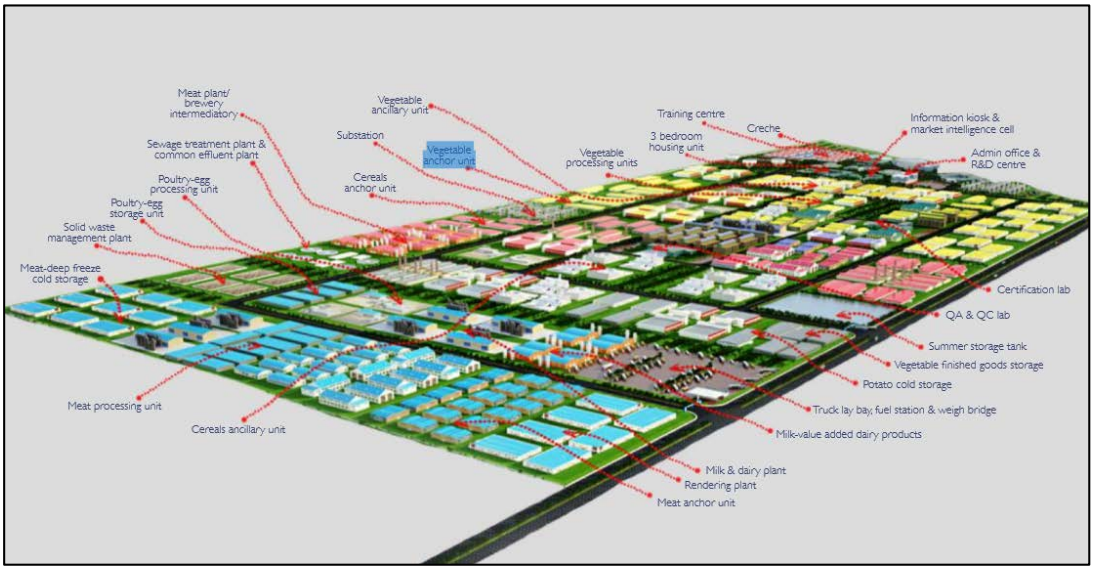
In addition to the threats discussed above, owing to poor flood management system, floods t ake places periodically in Kampong Speu province.For example, MahaSaing commune and Phn om Sruoch district suffered from flood, caused by leaking dam in Samrong Tong.[17]

[15] Interview with Mr. Song Sarith, General Manager of AMRU Rice Noodle Enterprise on 27 August 2016
[16] Interview with CEO of Ly Ly Food on 29 August 2016
[17] Phnom Penh Post 17 October 2016, accessed at http://www.phnompenhpost.com/national/trucks-rerouted-flooded-natl-road-4 on October 31 2016.

5. Policy Recommendations

An industrial cluster can provide companies with economies of scale, positive spill-over effec t, bulk purchasing, buying and selling goods between companies in the cluster, and sharing of common facilities such quality control center, training center, water-tank, etc. (See Figure 2-12. for the example of Agro-Industrial Park in Ethiopia)

Figure 2-12. Integrated Agro-Industrial Park in Ethiopia



Source: https://isid.unido.org/files/Ethiopia/Integrated-Agro-Industrial-Parks-Overview.pdf

It will be helpful to have a well-known big company joining the cluster in the beginning in order to motivate companies to join the cluster despite risks and relocation costs, Hyundai Corp oration Cambodia (hereafter HCC) already has a sizeable investment plan in mango-processing plants in Kampong Speu. Hence these mango-processing plants should be a starting point to att ract more participation in related food-processing enterprises, such as rice and other fruits proc essing plants.

In order to construct a successful agro-industrial cluster in Kampong Speu starting with mango-processing plants, the priority must be given to maximize **Strengths** (abundance, quality, labor) and **Opportunities** (high demands, free trade, foreign direct investment), while minimizing **Weaknesses**

(infrastructure, capital, brand power) and a **Threat** (competition). It is difficult to suggest policies that can deal with other exogenous **Threats** (crisis in the South China Sea, political risk), however.

To maximize the benefit of those helpful internal and external factors (strengths and opportunities) and to minimize the cost of those harmful internal and external factors (weaknesses and a threat), the government, companies, and investors should do the following three things.

First, move fast. To be competitive in the global market of processed mango, an agricultural industrial cluster should be built as early as possible.

Second, take advantage of business initiatives. The HCC currently has 3 million USD investment plan in agricultural processing facilities—starting with mango processing—in Kampong Speu. The company has already purchased 5 hectare to build an agricultural product processing center in the province.[18] The center will occupy 2 hectare and the rest will be used for the expansion of related facilities in the future.[19] Hence it will be much easier to build an agro-industrial cluster in that area.

Third, start branding and advertisement of the products. Brand power is increasingly important in the global market. To be more competitive in the market, branding and advertisement should be an imperative.

- **Location of Mango Processing Industrial Cluster**

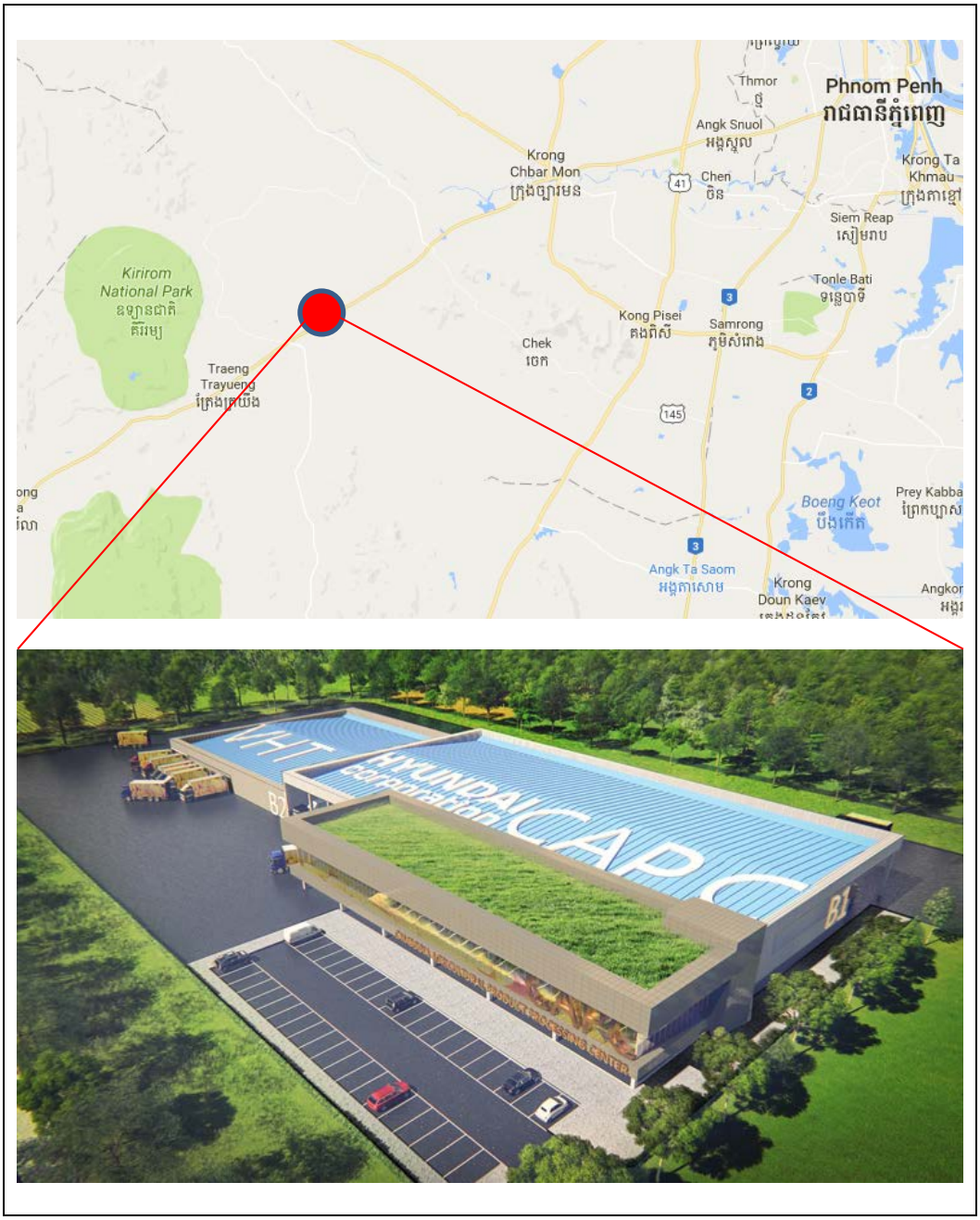
We suggest that an agro-industrial cluster should be built in the red dot in Figure 2-13. It is the 5 hectare land that the HCC has purchased and is inviting other investors and companies. The site is located in Traeng Trayueng Commune, Kampong Speu, near the Hyundai Arirang Farm, located along National Highway 4. It is approximately 70 km away from the Phnom Penh International Airport, taking about one and a half hours by car. It would take just about two hours to the Sihanoukville Autonomous Port, if the products have to be shipped.

The HCC is planning to start building an agricultural product processing center in December 2016,

[18] Interview with LEE Chang Hoon, CEO of Hyundai Corporation Cambodia, Phnom Penh, 3 December 2016.
[19] Ibid.

aiming to launch in December 2017 (see picture in Figure 2-13).[20] It should be thus an ideal location to build an agro-industrial cluster.

Figure 2-13. Site for Agro-Industrial Cluster in Kampong Speu



[20] Ibid.

- **Brand**

We suggest that Kirirom (Joy of Mountain) should be used for all mango products processed in the industrial cluster (see Figure 2-14). It is designed by the HCC, and the company will advertise the brand globally. That will help reduce the cost for branding and advertisement of the Cambodian products.

Figure 2-14. Brand of Processed Mango

- **Three-Step Approach**

To expand the agro-industrial cluster, we suggest a three-step approach starting from mango processing plants.

Step 1. Mango packaging plants

Step 2. Dry mango processing plants

Step 3. Mango juice, jam, pulp processing plants

After or during those three steps of mango processing, rice and various other fruits such as jackfruit could be processed in the cluster.

- **Government support**

From the interviews with four entrepreneurs in mango and rice-processing industry (See Appendix), we find that their common challenges are as follows.

(1) Lack of high skilled labor

(2) High utility cost

(3) Lack of sufficient investment

(4) Limited access to financial resources

(5) Insufficient access to global market

We thus request the national government in Phnom Penh and the local government in Kampong Speuto offer support in the following areas.

(1) Professional training to increase the number of skilled workers

(2) Infrastructure development (road, electricity, water) to lower utility cost

(3) Advertisement including exhibitions and business matching to attract investment

(4) Favorable loans for the establishment or relocation of companies

(5) Quarantine system, simplification of export procedures including one window service to facilitate the access to global market

III. Creating a Semiconductor Industry Cluster in Cambodia

Shi Young LEE (Chung-Ang University, Korea)
Kea YUN (Royal University of Phnom Penh)

Industrializing Cambodia:
Making a Roadmap to Construct Core
Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University,
Chairman of Jayavarman Center for Development)

III

Creating a Semiconductor Industry Cluster in Cambodia

Shi Young LEE (Chung-Ang University, Korea)

Kea YUN (Royal University of Phnom Penh)

1. Introduction

1) Cambodia Vision

The Royal Government of Cambodia (RGC) has announced 'Cambodia Vision'. According to the *Cambodia Industrial Development Policy 2015-2025*:

"The RGC envisages the transformation and modernization of Cambodia's industrial structure from a labor-intensive industry to a skill-based industry by 2025, linking with global value chains, integrating into regional production networks, and developing clusters, while strengthening competitiveness and improving productivity of domestic industries and marching toward developing a modern technology and knowledge based industry."

The 'Cambodia Vision' has set the following as its main targets:

(i) To increase the Gross Domestic Product (GDP) share of industrial sectors from 24.1% to 30% by 2025, with the growth of a manufacturing sector

(ii) To diversify the export of goods by increasing the export of non-textiles to 15% of all exports by 2025 and, at the same time, promoting the export of processed agricultural products

(iii) To encourage the formal registration of 80% of small enterprises and 95% of medium enterprises and to ensure 50% of small enterprises and 70% of medium enterprise have proper accounts and balance sheets

In order to envisage the Cambodia Vision, Cambodia needs to transform its agriculture dominant

economy to a manufacturing dominant and global (outward) oriented economy. To achieve this, Cambodia should be integrated into a global (Asia-Pacific, in particular) production value chain to strengthen its competitiveness. At the same time, it is important to improve the productivity of Cambodian workers. One way of implementing the Cambodia Vision is to create efficient industry clusters in Cambodia. For example, the development of an electronic component industry cluster can attract Cambodian workers as well as foreign investors (firms). It is also an industry cluster that can participate in the Asia-Pacific value chain and can initiate the development of a manufacturing sector and transform Cambodia's economy from an agricultural to a manufacturing-based economy. Eventually, the creation of an industry cluster can achieve the modernization of the Cambodian economy.

2) Objective

This report aims to deliver policy recommendations for the creation of a manufacturing industry cluster in Cambodia. The development of an efficient industry cluster can work as a tipping point to initiate the industrialization of Cambodia (Gladwell, 2006). In this report, our objective is to lay out specific strategic policy recommendations to effectively implement realistic policy plans. Moreover, this report also discusses policy marketing strategies to persuade potential stakeholders to be involved in policy coordination.

The development of efficient industry clusters in Cambodia can push the modernization of Cambodia and, as a result, Cambodia can become a Bridging State (BS, hereafter) in the region.[1] The precondition for the emergence of a BS is to develop a trading and logistics center in the East Asian region. An efficient trade center can be developed as the region in question (Cambodia, in this case) builds an Asia-Pacific production and logistics network. The emergence of a production and logistics network in Cambodia implies that goods and services (including components and parts) should freely flow from (and to) the rest of the world (especially neighboring countries). To establish a globalized trading center

[1] The Bridging State can be defined as "the state that connects men, commodities, and peace among intra-regional states and inter-regional states…it is the trading center through which goods are exchanged (Im, 2015)."

in Cambodia, the RGC must lower implicit, as well as explicit, trade costs. As trade costs are reduced, Cambodia can facilitate the trading of manufactured components and parts to neighboring countries (such as China, Laos, Myanmar, Thailand, and Vietnam, in particular).

Another condition for Cambodia to meet to achieve becoming a BS is to lower logistics costs by building quality infrastructures. Cambodia has comparative advantage in geographic location with respect to other nations in the (ASEAN) since it is located at the center of the ASEAN. We can basically reach each country of the ASEAN by plane within one and a half hours or less. Therefore, another objective of this report is to suggest ways to promote Cambodia becoming a BS in this region.

3) Organization of the Report

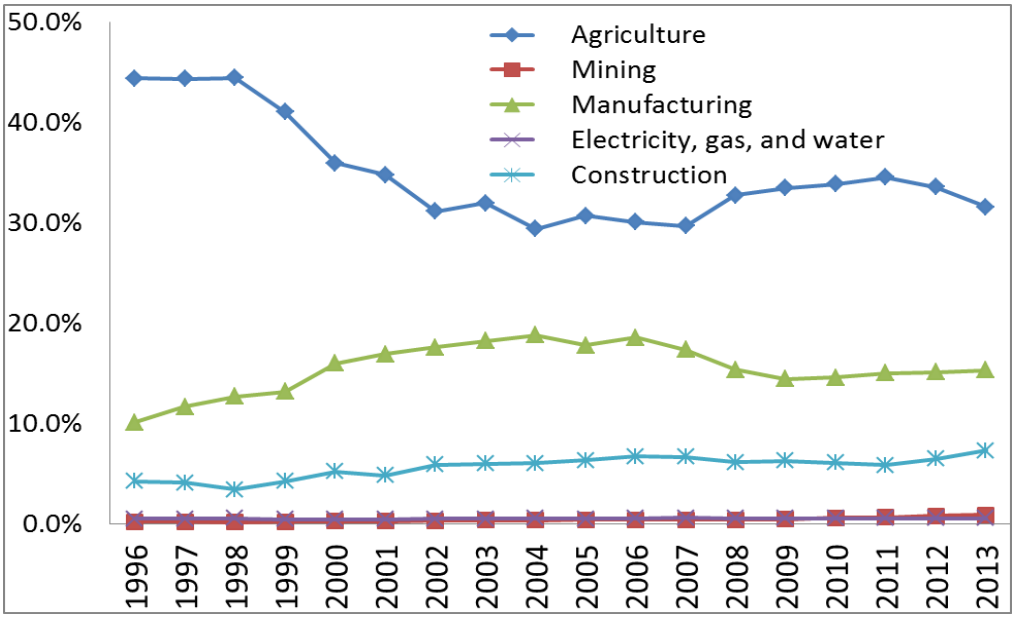
Section 2 reviews the Cambodian economy. In the section, the report discusses how the Cambodian economy is still an agriculture-dependent economy. Section 3 provides a theoretical foundation about industry clusters. The concept of an industry cluster is introduced with a discussion about how an industry cluster is related to industrialization, while at the same time, it can serve to remedy market failures. Section 4 discusses details about how to create an industry cluster in Cambodia. The questions answered in this section are ‘Where can an industry cluster be created?’ and “Which industry cluster can be created?’. In Section 5, results of field interviews regarding how some experts have reacted to the industry cluster in Kampong Speu are presented. Section 6 discusses the relationship between industry clusters and global value chains. In this section, it is postulated how global sourcing and production fragmentation can be affected by the existence of an industry cluster. Section 7 analyzes the political economy approach to industry clusters. In this section it is stressed that strong political leadership was necessary to construct an industry cluster in Kampong Speu. Globalization strategies and explanations as to why non-rival intrinsic assets may be important in determining the success of an industry cluster are also discussed. Section 8 analyzes policy marketing strategies. This section discusses persuasion strategies that can be used to convince stakeholders of the necessity of an industry cluster. The final section concludes the report.

2. Review of Cambodian Economy

1) Industry Composition

Agriculture has been the dominant sector in the Cambodian economy for many years. By 2013, employment in the field of agriculture comprised about 48.7% of the total employment in Cambodia. The agriculture sector share composes 31.6% of Cambodia's GDP, while the industry and service shares are 24.1% and 38.5% of the GDP, respectively. The manufacturing sector share has increased slightly since the year 2000 but has never reached more than 20% (Figure 3-1). The manufacturing share has increased from 12.7% of the GDP in 1998 to 15.5% of the GDP in 2013.

Figure 3-1. Cambodia's Industry Shares



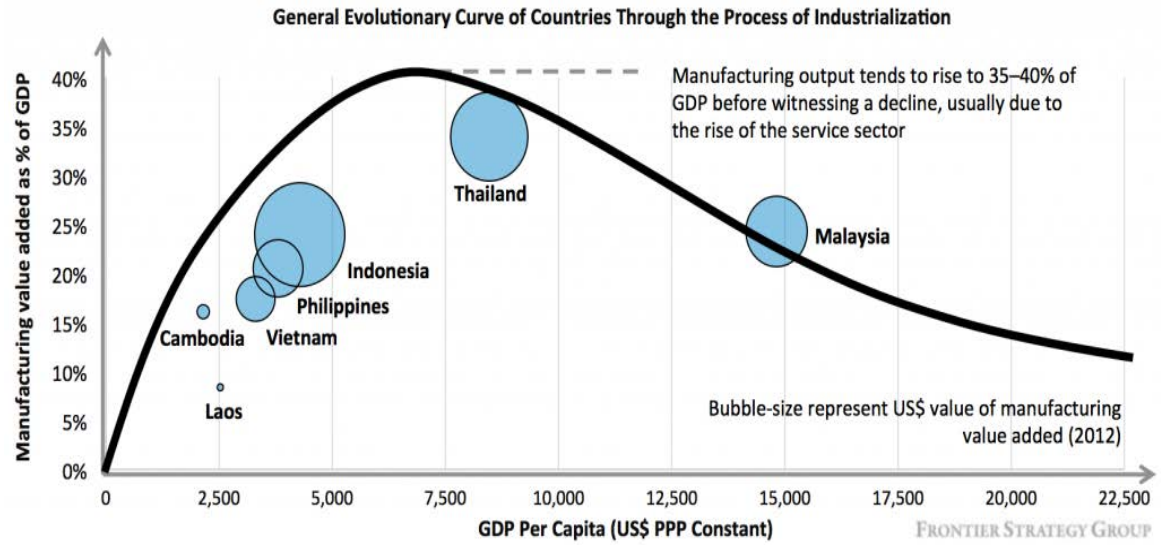
Source: ADB Cambodia (2013)

Figure 3-1 demonstrates the weak performance of the manufacturing sector in Cambodia. This is because Cambodia's participation in global value chains is substantially low. Low participation in global value chains implies less inward FDI stock (World Investment Report, 2013). This indicates low foreign involvement of the Cambodian economy, especially of the manufacturing sector. [2]

[2] However, the tourism industry share is relatively high.

Industrialization of Cambodia can be achieved by the rise of the manufacturing sector. Many other ASEAN countries are no exception. Figure 3-2 indicates that the level of per capita income is closely related to the manufacturing sector. A typical economic trend it that the manufacturing sector share increases and becomes approximately 35-40% of the GDP before declining due to the rise of the service sector. Having said this, the manufacturing sector of Cambodia is not sufficiently diverse. For example, the garment industry of Cambodia has been dominant in the manufacturing sector, creating 95% of the exports in 2013 and 13% of Cambodia's GDP in 2012. Other manufacturing sectors have not been as successful.

Figure 3-2. Process of Industrialization



Source: Frontier Strategy Group

2) Composition of Manufacturing Sector

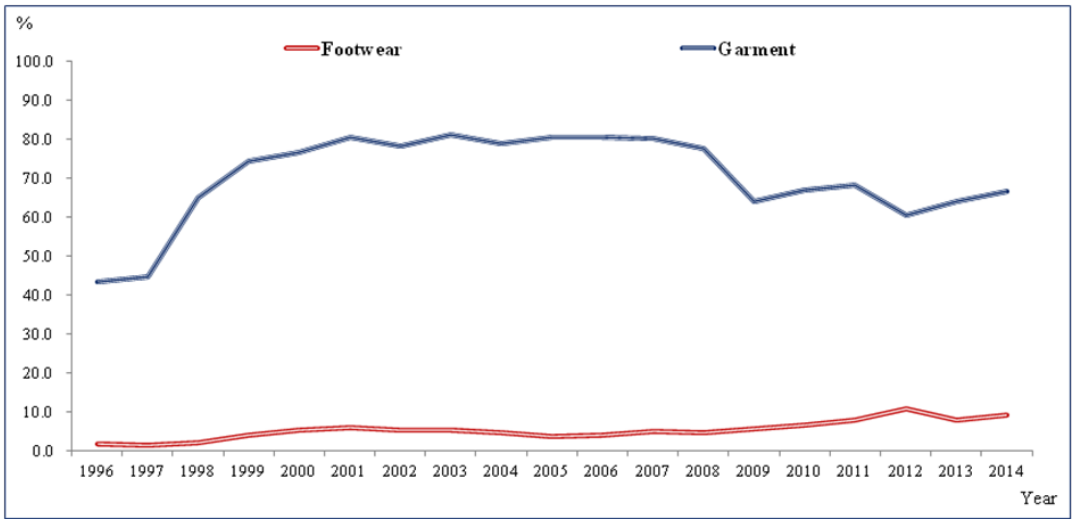
The *Cambodia Industrial Development Policy (2015-2025)* reports:

"Cambodia's industrial sector remains weak and narrow as reflected by its simple structure of manufacturing and low level of sophistication that mainly concentrates on garments and food processing."

In order to examine the above claim, we examined data obtained from (UNCTAD), as shown in Figure 3-3. As the *Cambodia Industrial Development Policy (2015-2025)* also reported, Cambodia's

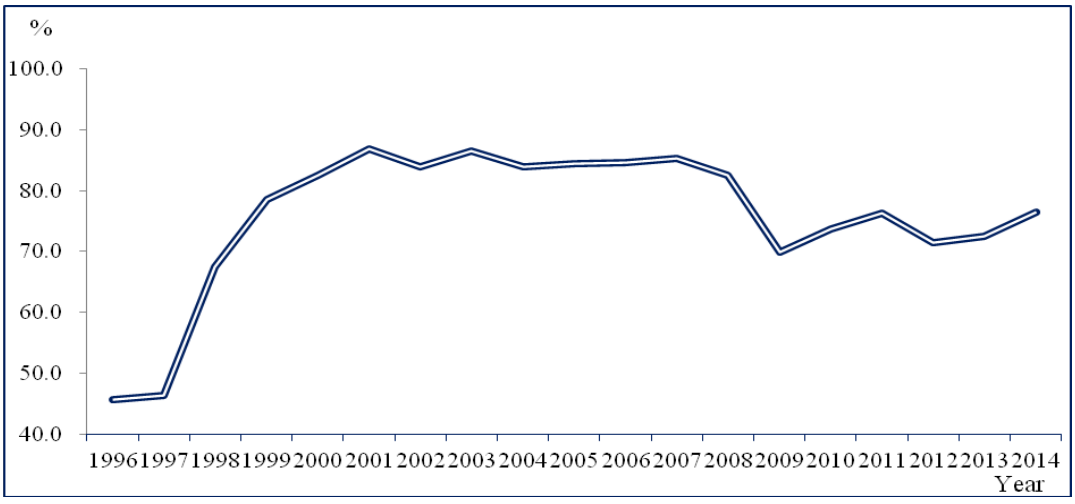
manufacturing sector has predominantly concentrated on the garment and footwear industry. This claim verifies that Cambodia's industrial sector suffers from a lack of diversity along with low levels of technological sophistication.

Figure 3-3. Share of Garment & Footwear that Accounts for % of Total Industry Production in Cambodia



Note: Garment & textile industry
Source: UNCTAD

Figure 3-4. % of Textile, Garment and Footwear Exports (of Total Cambodian Exports)



Source: UNCTAD

Figure 3-4 demonstrates the export orientation of the Cambodian economy. The export shares of garments, textiles and footwear account for about 70% of the total exports. This is a decline from the

early 2000s when these accounted for 85% of the total exports.

Table 3-1 shows the top eight export destination countries of Cambodian garment exports. The U.S. predominantly remains the export destination where most of Cambodia's garments are exported even though its share tends to decline over time. Table 3-1 demonstrates some efforts in diversifying export destinations but Cambodia still relies heavily on developed countries, such as the U.S. and some European countries, for garment exports.

Neighboring Asian countries, such as China, Thailand, and Vietnam, are not represented in the list of the top eight export destinations. This finding implies some important insights. First, Cambodia's garment industry cannot be engaged in sophisticated production fragmentation by its nature.[3] Second, Cambodia's low quality garment industry does not compete well with neighboring countries in the world market. Therefore, it is difficult for Cambodia's garment industry to engage in complementarity production with neighboring countries.

Table 3-1. Top Eight Export Destinations for Garments by %

2013		2005		2000	
US	40.1	US	70.5	US	75.9
UK	10.7	Germany	9.5	UK	8.3
Canada	8.8	UK	5.4	Germany	5.6
Germany	8.5	Canada	4.7	France	2.3
Japan	4.5	France	2.2	Netherlands	2.0
Spain	3.5	Spain	1.5	Ireland	1.2
Belgium	2.6	Netherlands	0.9	Sweden	0.7

Source: World Bank

3) SEZs

Special Economic Zones (SEZs) have been one of the most important vehicles of industrialization for many LDCs. Cambodia established approximately nine SEZs and, in doing so, employed 68,000 people (Warr & Menon, 2015), as Table 3-2 demonstrates. SEZs, known as free trade zones or export

[3] This is especially so for low quality garments.

processing zones, are set up to facilitate the import of intermediate inputs and export of the manufactured and assembled components and parts. China has been the most successful at creating and operating SEZs in the 1990s and 2000s.

Table 3-2. SEZs in Cambodia, 2014

Location	Name of SEZ	Year Established	Number of Firms Operating	Total Employment	Employees per Firm (avg)
Phnom Penh	Phnom Penh	2008	50	17,000	340
Bavet	Manhattan	2006	26	28,051	1,079
	Tai Seng Bavet	2007	17	7,968	469
	Dragon King	2013	2	280	140
Sihanoukville	Sihanoukville 1	2009	2	424	212
	Sihanoukville 2	2008	40	8,967	224
	Sihanoukville Port	2012	2	416	208
Poi Pet	Poi Pet O'Neang SEZ	2011	2	830	415
Koh Kong	Neang Kok Koh Kong SEZ	2005	4	3,953	988
Total	**All Cambodian SEZs**	**2005**	**145**	**67,889**	**468**

Source: Council for the Development of Cambodia, Government of Cambodia. (http://www.cambodiainvestment.gov.kh/list-of-sez.html)

The RGC has left the establishment and management of SEZs to private developers (Warr and Menon, 2015). This reflects weak governance of the RGC. So far, Cambodia has launched several SEZs as Table 3-2 demonstrates. However, not all of them have been successful. In fact, many of the SEZs in Cambodia have failed to generate a 'big push' so far.[4]

Warr and Menon (2015) documented that SEZs in Cambodia represent under 1% of the total employment and 3.7% of the total secondary industry employment in Cambodia. This indicates that

[4] The 'Big Push' model was originally developed by Rosenstein-Rodan (1943) and later was more thoroughly analyzed by Murphy, Shleifer & Vishny (1989). The concept is based on the idea that a firm's decision to invest depends on its expectation on what other firms will do. Even though the concept used in this paper is similar, the model is used in a different context, which will be explained later.

SEZs have not been successful in generating an employment effect in Cambodia. Since the most important secondary industry in Cambodia is the garment industry, SEZs have the potential to generate significant employment opportunities, but most of the garment industry is outside of SEZs.[5]

Some of the problems that impact the effectiveness of SEZs in Cambodia are described as follows:

(i) Lack of skilled labor and limited matching

Many young workers (who finish either primary school, secondary or tertiary education) turn out to be relatively unskilled. The curriculum of universities is not directly connected to the skills required at workplaces. The Cambodian labor market is not efficient enough to provide an effective matching system between labor supply and demand in SEZs. As a result, some SEZs need to recruit skilled employees from overseas, which can be very costly.

(ii) High utilities costs

The cost of electricity in Cambodia is about 0.17$/kwh, while in Thailand and Vietnam it is 0.09 $/kwh, being twice more expensive than neighboring countries. Some locations in Cambodia do not have access to electricity, leading them to need to install backup electricity generators that use diesel, an additional cost.

(iii) Lack of sufficient investments

Some SEZs have been licensed, but lack of investment in infrastructure has led to low participation by firms (See Table 3-2). Participation rates may be crucial in creating and maintaining successful SEZs. Without participation, SEZs can neither be sustained nor maintained. Participation rates may affect the unit cost of production and may play an important role in determining the comparative advantage of SEZs.

(iv) Limited international access

It is very important to generate sufficient demand for materials produced by SEZs. Since Cambodia cannot generate sufficient demand inside the country, it is crucial to generate demand from foreign countries (international access). Efficient Cambodian SEZs must also access several neighboring countries in order to achieve a scale economy and achieve production efficiency. Establishing location

advantage and quality infrastructure are ways to overcome lack of international access.

(v) No representative brand for SEZs

Table 3-3 demonstrates that each SEZ does not have a representative brand.[5] Some industries are located in the same SEZ and are not interdependent upon each other with respect to production. Each SEZ must represent a brand and have it well-defined. If a SEZ does not have a distinctive brand, it cannot attract potential entrants (domestic or foreign) or generate technological spillover effects due to low participation rates. Therefore, the brand of a SEZ must be well-defined in order to encourage potntial entrants to participate.

Table 3-3. Core Industry in Major SEZs in Cambodia

		Phnom Penh	Sihanoukville (KohKong)	Svay Rieng
Labor force		180,838	139,497(69,803)	350,234
Volume of Investment (SEZs)		210 Million USD	260 (69) Million USD	160 Million USD
Core industry	Garment	12	8	14
	Footwear	3	1	3
	Assembly	1	1	4
	Electronics	7	2	1
	Screws / Bolts	None	None	2
	Packaging	4	1	4
	Plastics	1	None	1

Source: Korea Development Institute (2013)

3. Theoretical Foundation of Industry Cluster

1) Introducing Industry Cluster

According to Porter (1998), an industry cluster is defined as a geographic concentration of interconnected companies and institutions located in a particular field. The key characteristic of an

[5] If a SEZ does not represent a specific brand potential firms are skeptical of the benefits that the SEZ can provide, making it unlikely to generate spillover effects.

industry cluster are location choice, choice of field, and same location. Clusters often extend vertically in production structure (via downstream and upstream firms) and participate in global production fragmentation and value chains. A cluster's boundaries can also be extended to complementary firms and institutions such as think tanks, trade associations, research institutions, specialized training and education. The core concept of an industry cluster relies on the premise that similar and related firms are located in the same place.

One of the main advantages of an industry cluster is that it promotes both competition and cooperation. By the nature of an industry cluster, similar firms compete with each other within the cluster while cooperation also takes place to optimize participation in vertical value chains and cooperation with other competing firms.[6]

It is important to constantly engage in competition and cooperation within a cluster since this can drive the direction and pace of innovation, which is the underlying force to future productivity growth. Competition and cooperation also stimulate technological spillover.

Now we introduce the fundamental concepts (location, field, the same location) of industry cluster in order. The location of the cluster in the global economy is important in determining competitive advantage. Traditionally, location choice has been viewed as important because of labor cost (wages). However, competition has become more dynamic in several different dimensions. For example, the price dimension may be crucial in determining competitive advantage but other dimensions such as quality, logistics, and services may also be important in determining competitive advantage.

Several characteristics should be considered when making a location choice for an industry cluster. The location choice can determine better access to employees and suppliers. Moreover, depending on location choice, an industry cluster can serve as a trading and logistics center. If an industry cluster can serve as the trade center in a region, then the industry cluster has a better chance of being successful. Therefore, the success of industry cluster may critically depend location choice.

The choice of manufacturing field is also important. The choice of field is inter-related with the choice

[6] Notice that competing firms often cooperate with each other. See Brandenburger and Nalebuff (1997).

of location. Some industries do not generate sufficient economies of scale via knowledge spillover. Without sufficient economies of scale, an industry cluster cannot be sustained. Complementarities via knowledge and technological linkages can determine the suitability of an industry choice. At the same time, the extensive margin of an industry cluster can also be important in determining the profitability of an industry cluster. The economies of scale and scope may interact with each other an increase each cluster's efficiency. Therefore, policymakers should carefully examine particular fields and determine whether or not the choice of field can generate economies of scale and scope.

Finally, strategically choosing the companies that share the same location provides the industry cluster with strength. The sharing of the same location matters because it determines intrinsic benefits of an industry cluster.

Porter (1998) claimed that:

"The proximity of companies in the same location and the repeated exchanges among them–fosters better coordination and trust…. Clusters mitigate the problems inherent in arm's length relationships (e.g., holdup) without imposing the inflexibilities (lessened competitive forces) of vertical integration…"

Two inherent problems can be mitigated and this makes a well-functioning industry cluster efficient and successful. Therefore, a cluster allows each member to benefit by creating a greater scale or appearing as if they had joined with others formally (without sacrificing their flexibility).

The same location provides benefits for customers as well. Potential customers can meet with many similar firms (within the same cluster). They may perceive a lower risk because the same location provides many supplier alternatives. Having options leads to low switching costs and generates additional benefits for potential customers.

Being in the same location, members of an industry cluster can communicate via repeated face-to-face interactions. This repeated face-to-face contact can stimulate knowledge spillover and generate trust within the cluster. Repeated face-to-face contact, the origin of the economies of scale effect, can generate trust, reduce free-riding and reduce moral hazard problems (Storper and Venables, 2004).[7]

[7] The repeated face-to-face contact may be the cornerstone of knowledge spillover and trust.

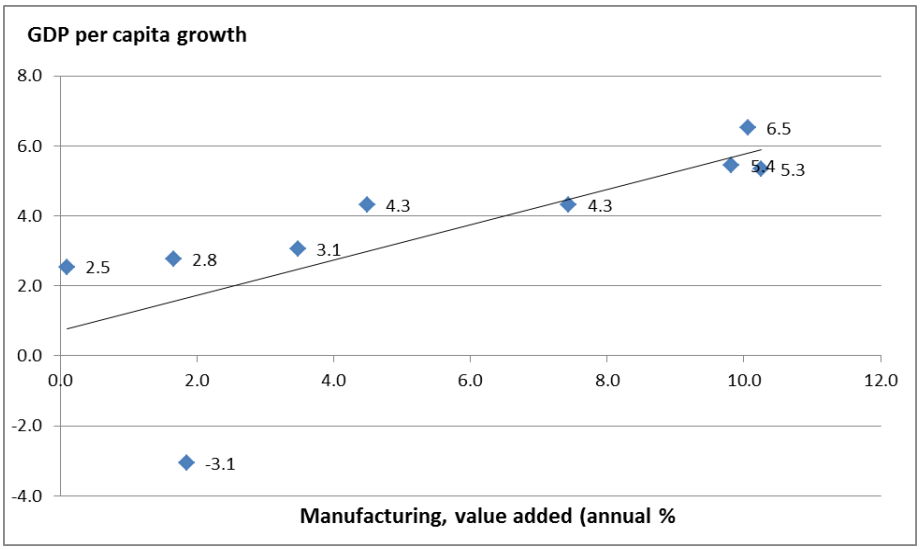
The benefits generated from multiple entities operating from the same location may be the most important forces in determining the comparative advantage of a cluster.

2) Manufacturing Sector and Industry Cluster

Several previous studies report that a manufacturing sector is an important tool for economic development and poverty reduction. According to Collier (2007), it is critical for low-income, developing countries to increase the share of the manufacturing sector and reduce the dependence on the agriculture sector in order to reduce poverty and move up into middle income status. Krugman (1991b) demonstrates that the share of manufacturing is the key in achieving the core of industrialization. Deichmann et al. (2008) reported that there is a strong, positive correlation between the rise of the share of manufacturing and the growth of per capita income.

Figure 3-5 shows a strong relationship between manufacturing and GDP per capita growth of ASEAN countries in 2014. To accelerate the rise of the manufacturing share, the RGC can create SEZs and establish efficient industry clusters within the SEZs. SEZ-Clusters can be a stepping stone to increasing the share of manufacturing in Cambodia and making Cambodia a BS.

Figure 3-5. Relationship between per capita GDP and manufacturing



Source: Data from WDI 2014

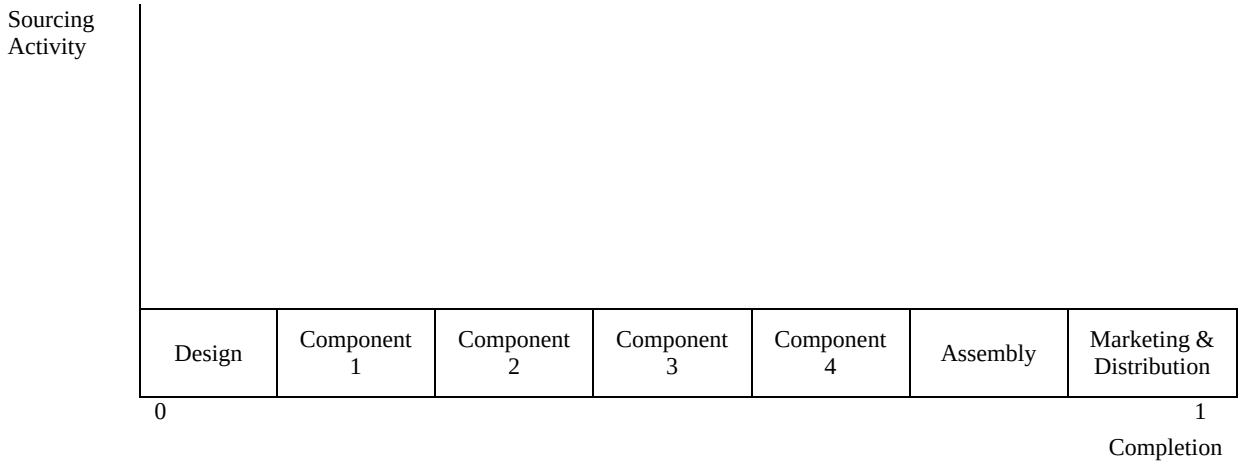
3) Industry Cluster and Global Value Chain

(1) Production Fragmentation

Since the early 1990s, firms have engaged in international production fragmentation via global sourcing or investments. International production fragmentation occurs by each component or part being manufactured in a location where its comparative advantage is prevalent. Thus, the production structure of many components and parts tends to be fragmented for many reasons.

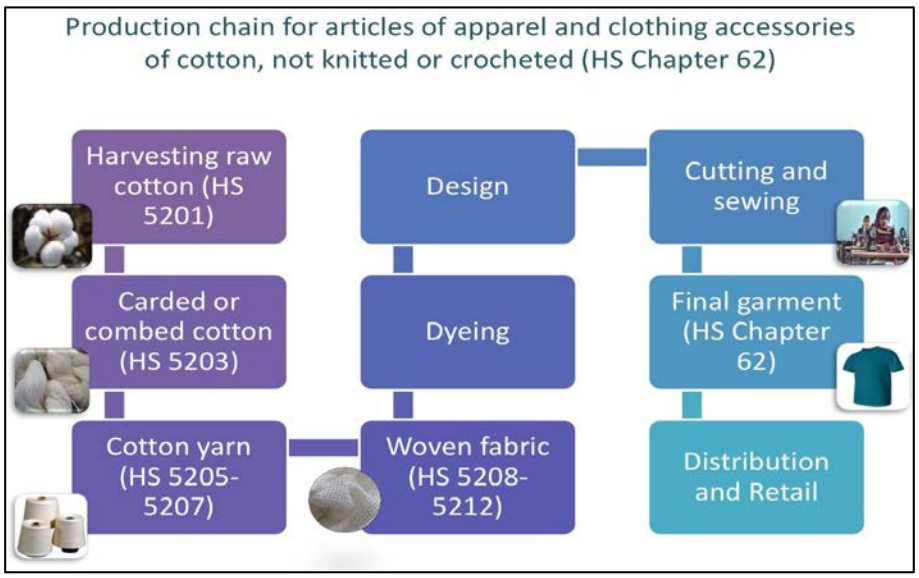
Figure 3-6 describes the structure of production fragmentation. Each shaded region represents fragmentation with the 'value added'. Assume that each component in Figure 3-6 is produced in a different country. Then adding the 'value added' of each component together makes up the total value of the final product.

Figure 3-6. Production Fragmentation Structure



Baldwin and Venables (2013) proposed two structures of production fragmentation: snake and spider. For example, the garment and textile industry may follow the snake structure of production fragmentation (Figure 3-7a). The snake production structure occurs when each component is produced in a sequential order. In the case of the snake production structure, coordination cost may be more important than with the spider production structure.

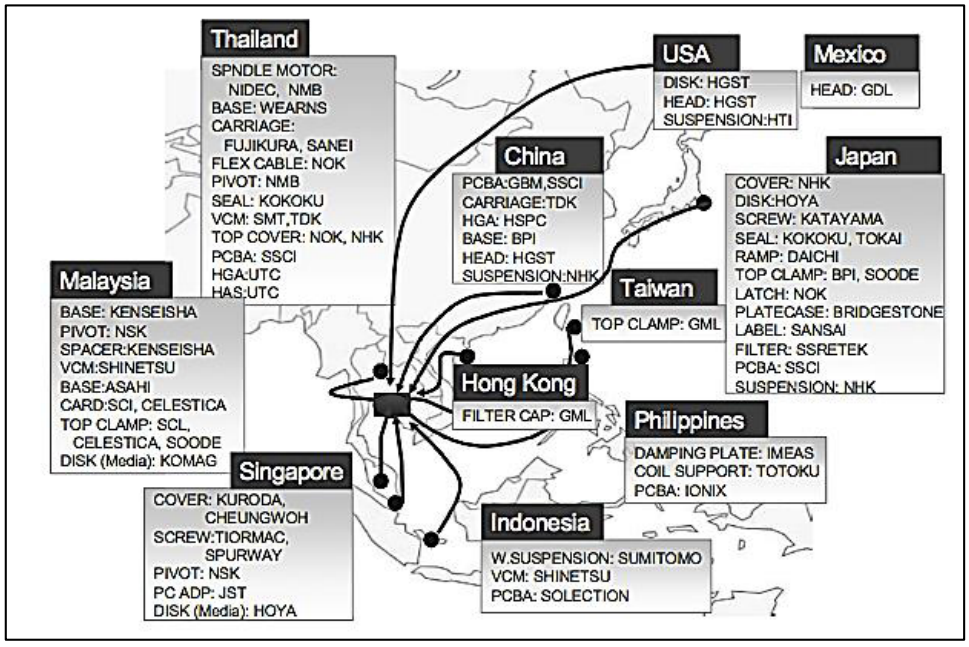
Figure 3-7a. Production Chain for Articles of Apparel and Clothing



Source: Escaith and Marti (2016)

In the case of the spider production structure, each component or part is made separately, in different locations, and then transported to one location for the final assembly. Electronic components are the primary example of the spider web production fragmentation structure (Figure 3-7b).

Figure 3-7b. Production Chain for a Hard Disc Drive



Source: Hiratsuka (2006).

It is important to create an industry cluster that can complement the existing production fragmentation structures. For example, some Vietnamese industry clusters often complement parts of production fragmentation structures that exist in China. As a new starter, Cambodia should create an industry cluster that can complement parts of the production fragmentation structures that exist in Thailand and Vietnam.

Cambodia is a member of the ASEAN and should take advantage of the ASEAN and ASEAN+1 (FTAs) Due to the expansion of global sourcing, Cambodia should participate in the Asia-Pacific value chain to take advantage of lower trade costs. The FTA substantially lowers trade costs while increasing trade and investments.

The ASEAN engages in FTA with many other surrounding neighbors. For example, the ASEAN has engaged in FTA with China, Japan and Korea via the ASEAN+1 FTA.[8] Notice that global sourcing tends to be based on near-sourcing rather than far-sourcing. This is possibly due to lower logistics costs.[9]

From Cambodia's perspective, it is important to pinpoint the niche market for the production fragmentation structure of the Asia-Pacific value chain. At the same time, emerging industry clusters in Cambodia must highlight comparative advantages of Cambodia. From analyzing Figure 3-6, it appears that the Cambodian industry cluster can concentrate on an electronic component that reflects the comparative advantage of Cambodia. It is also important to pinpoint a niche market that reflects Cambodia's comparative advantage and can take advantage of lower logistics costs.

(2) Timely Global Sourcing

Recently, consumption patterns tend to change rapidly. In order to quickly respond to rapidly changing consumption patterns, timely supply is important. Global sourcing has to be timely and shift to respond to consumers' needs and tastes. In the case of a consumer driven economy, the speed of global sourcing has become more important than ever. The trend of global sourcing has been changing

[8] The ASEAN also has ratified FTA with Australia and New Zealand.

[9] Notice that the logistics costs may not solely be affected by distance. The distance entails various types of costs including cultural and communication costs.

from far-sourcing to near-sourcing. Not only does this increase the speed of global sourcing but it also reduces logistics costs. For timely delivery and fast adjustment to consumers' needs, it is important to minimize the logistics costs.

Suppose that Cambodia establishes an electronic component industry cluster (Figure 3-7b). Cambodia should consider establishing a complementary production structure with a country such as Vietnam. In doing so, Cambodia should find a location for the industry cluster that is near Vietnam to save logistics costs. At the same time, Cambodia should consider locating the industry cluster near an airport or seaport since the success of global sourcing may critically depend on the export and import of intermediate inputs.[10]

The location of an industry cluster is important not only to saving logistics costs but also saving trade costs. Since the speed of sourcing matters, in regards to promptly responding to consumers' rapidly changing needs and tastes, the industry cluster created in Cambodia should be part of the Asia-Pacific value chain. Moreover, the industry cluster in Cambodia should take advantage of the country's membership in the ASEAN.

4) Industry Cluster and Industrialization in Cambodia

Some developing transition economies have successfully transformed into market-oriented economies. In doing so, many of them have set up industry clusters to increase their manufacturing shares and start industrialization.[11]

Once a successful industry cluster is created, other industry clusters are likely to follow. The successfully created and maintained industry cluster can work as a tipping point for industrialization. The same can be true for Cambodia.

Cambodia needs to transform its economy from agriculture dominant to manufacturing dominant. To do so, the development of a successful industry cluster is the first step to increasing the manufacturing

[10] The quality of infrastructure (of these facilities) is also important in determining the logistics costs.

[11] China and Vietnam are the prime examples of such economies. They set up many SEZs and clusters to increase their manufacturing shares and attract foreign capital.

share and starting industrialization.

For many developing countries, in order to achieve industrialization, a 'big push' may be required. The concept of a 'big push' revolves around expectations. Self-fulfilling expectation and expectation tailoring may be the key to industrialization success. If one successful industry cluster is created, then the cluster can work as the expectation tailoring device, changing stakeholder expectations about the cluster. If stakeholders end up having confidence about the capabilities of the industry cluster, in return, many industry clusters can be established in Cambodia.

Another advantage of creating a successful industry cluster stems from its salience. Because of salience, news of the success of an industry cluster can spread worldwide, changing expectations of the industry cluster. This can attract potential foreign investors as well as potential Cambodian workers.[12]

In summary, creating a successful industry cluster can stimulate and strengthen self-fulfilling expectations of stakeholders. Other industry clusters can then be established, increasing the share of manufacturing. In return, this can lead to a 'big push' for industrialization of Cambodia.

5) SEZ-Cluster

A SEZ and an industry cluster can be complementary to each other. SEZs provide many benefits to domestic and foreign investors (firms). Various provisions of SEZs can increase participation rates due to various tax (tariff) exemptions and other benefits. These benefits can attract investments from abroad.[13] Because of these provisions and benefits, a Cambodian industry cluster should be located in a SEZ. The SEZ has to be set up *a priori* and then the industry cluster can be established at the location of the SEZ.[14]

Krugman and Venables (1996) argue that industry clusters are usually created either by market forces or accidents. Even though some governments have tried to build up industry clusters, some of the

[12] A successful industry cluster can attract many workers from diverse regions of Cambodia because a successful industry cluster can pay them well.

[13] For example, Warr and Menon (2015) claim that the SEZs of Cambodia have attracted significant levels of "foreign investment, which would not have been present otherwise."

[14] We will refer to an industry cluster in a SEZ as a Cluster-SEZ.

clusters created by the government ended up as failures. Therefore, it is imperative to provide incentives for successful industry clusters.

SEZ can be one of the preconditions that can lead to building a successful industry cluster that can be sustained long term. SEZs can generate bridgehead effects for industry clusters. SEZs can also help promote investment and trade (Aggarwal, 2010). In particular, SEZs often provide incentives to promote both domestic and foreign direct investments (Aggarwal, 2010). Given domestic and foreign investments, an industry cluster, via close proximity, can accompany linkages, facilitate knowledge spillovers and exhibit demonstration effects. A SEZ can be a starting point that can spur investments, leading to an industry cluster realizing its benefits. Potential entrants (participants) may be skeptical of the benefits of the cluster. In this case, a SEZ can change the expectations of the potential stakeholders.

The cluster brand must be well-defined in order to signal to potential entrants the characteristics of the cluster. A SEZ can help to set up specific characteristic of a cluster and attract backward and forward linkages via various benefits.

International access is important since it can provide sufficient demand for a cluster.[15]

Cambodia is surrounded by several neighboring countries. To make the Cambodian cluster efficient, it must get access to several neighboring countries to achieve efficient minimum production. Location advantage and quality infrastructure must support international access. In order to attract international investments, a SEZ can facilitate the entry of foreign firms via tax incentives and the provision of other quasi-public goods.

Some observations of SEZs and industry clusters are documented in Warr and Menon's (2015) research. We point out some of their findings and provide some analysis.

(i) Investments can take a long time and returns are not quickly realized. Therefore, investors should be concerned with cash flow and financing.

(ii) The cost advantages of a SEZ can be very important in attracting domestic as well as foreign investments. Fortunately, Cambodia retains this advantage.

[15] Since Cambodia lacks of sufficient demand, this is the important point.

(iii) Various tax incentives provided by SEZs do not make a significant difference in investment decisions. Therefore, a tax incentive alone may not be sufficient in attracting foreign as well as domestic investors.

(iv) Firms in SEZs want to participate in global production fragmentation via global sourcing because they prefer to "retain their international mobility without disrupting their sources of inputs" (Warr, 1989).

Warr and Menon (2015) point out that the "international evidence is that the existence of SEZs does not necessarily cause local supporting industries to develop" because SEZ firms like to engage in global outsourcing instead. This phenomenon is prevalent especially in poor countries.[16] In this case, the benefits of separate industry clusters and SEZs may be lessened. This is why developing countries should establish a SEZ-Cluster. A SEZ alone cannot generate knowledge and skill spillover effects. An industry cluster can overcome the shortcomings of a SEZ.[17]

(v) The most important factors of host countries are labor costs (and relations), utility costs, infrastructure quality, and corruption levels. Cambodia should reduce corruption and increase infrastructure quality, especially regarding logistics.

(vi) SEZs are more likely to generate benefits if economic liberalization by host countries is imminent. Therefore, SEZs and economic liberalization of the host countries are complementary to each other.

Cambodia should open up its economy to the rest of the world more. Cambodia's logistics performance index (LPI) is low at 2.8. Only two countries (Myanmar and Laos) have lower LPIs than Cambodia. Moreover, non-tariff measures (NTMs) are very high relative to other neighboring countries.[18] The RGC should endeavor to reduce the NTMs and improve LPI.

Therefore, a SEZ combined with an industry cluster can generate various synergy effects that otherwise would be absent without either one of them. A SEZ can initiate and attract many global as well as domestic firms. Industry clusters can provide benefits to firms located in a SEZ through

[16] Notice that this is an important point. We shall discuss this point later, in detail, since it is relevant to Cambodia.

[17] Notice that a SEZ can be complementary to an industry cluster. In this case, the establishment of an industry cluster can overcome the shortcomings of a SEZ in developing countries.

[18] Examples of NTMs are export oriented measures, sanitary and phyto-sanitary measures (SPS), and technical barriers to trade (TBT).

backward and forward linkage, enhancing the productivity of the firms in the SEZ. At the same time, the RGC should put in effort to reduce corruption and NTMs and improve its logistics condition.

4. Creating Industry Cluster in Cambodia

1) Where?

When we examine possible candidates for a SEZ-Cluster location, we need to compare all of the possible regions by considering the following criteria:

(i) Market size: The market size is important in determining the profitability and outsourcing capability.

(ii) Labor cost (wage) given productivity: As the previous section discusses, the labor cost is a decisive factor, especially for Cambodia.

(iii) Infrastructure quality: Infrastructure quality is one of the most important determinants of comparative advantage. In order for a SEZ-Cluster to serve as a trade center, the quality of infrastructure is more important than any other determinants.

(iv) Logistics cost and international market access: Logistics cost is just as important as labor cost and is dependent on location choice. International market access also affects logistics costs because international market access can overcome the size of a market and can generate economies of scale.

(v) Utility cost: The utility costs are important in determining the comparative advantage of a SEZ-Cluster in Cambodia, especially since the utility costs tend to be higher than those of neighboring countries.

Table 3-4 examines and compares possible candidates for SEZ-Cluster locations based on the above mentioned criteria. After data analysis, it is concluded that Kampong Speu is an ideal location choice for a SEZ-Cluster in Cambodia.

Table 3-4. Comparison of Possible Candidates for a SEZ-Cluster

Y 2013	Population Outside Agriculture	Migration Inside the Country	Migration Abroad	Population with Professional Training	Water Cost	Electricity Cost
Battambang	20.7	5.9	8.9	9.1	1,500	750
Kompong Speu	22.6	3.5	1.4	11.1	1,650	720
Kampot	13.0	9.7	4.5	23.6	1,400	0.1150*
Phnom Penh	85.3	1.3	0.5	90.4	1,450	610-720
Sihanoukville	59.0	5.2	2.1	36.4	2,000	720
Siemreap	13.0	2.9	9.0	10.3	3,400	700

Unit: %, %, %, Riel/m^3, Riel/kWh
Note: Electricity Cost of Kampot is USD/kWh
Source: Cambodia Report

The main advantage of choosing Kampong Speu as the location for a SEZ-Cluster is its quality infrastructure. Other alternatives lack quality infrastructure. It takes years to build a quality infrastructure along with substantial amounts of funding. Therefore, due to the quality infrastructure of Kampong Speu, logistics costs can be minimized.

There is currently no SEZ in Kampong Speu. Balancing regional development is another motivation for creating a SEZ-Cluster in Kampong Speu. Abundant labor forces are available in Kampong Speu (mainly in the agriculture sector) and a SEZ-Cluster can utilize them. Furthermore, a pool of abundant skilled laborers is also available in the Phnom Penh area. The labor forces in Phnom Penh could also join a SEZ-Cluster in Kampong Speu since Phnom Penh is located right next to it.

Kampong Speu is 40 km from the downtown Phnom Penh airport by National Route No. 4,178 km from the Sihanoukville Port, and 62 km from the Phnom Penh Autonomous Port. Kampong Speu is located in between Phnom Penh and Sihanoukville, along one of the economic corridors. In the *Cambodian Industrial Development Policy* (2015), there is a master plan to develop transportation and logistic systems in this area, which is an export-oriented manufacturing zone.

Kampong Speu can share Phnom Penh's large market size and quality transport infrastructure. Phnom

Penh airport is close to Kampong Speu so Kampong Speu could save substantial air logistics costs.

Kampong Speu has easy access to international markets via nearby neighboring countries (Thailand and Vietnam, in particular). Since Phnom Penh is close to the neighboring countries, Kampong Speu can take advantage of this location.

International access may be important for developing economies since its domestic economy cannot absorb the production capacity. A SEZ-Cluster should generate sufficient demand from neighboring countries. Kampong Speu is near Vietnam and close to an airport (Phnom Penh) and seaport (Sihanoukville), allowing for easy international access.

Even though utility costs are high in Kampong Speu (reflecting Cambodia's average prices), they are similar to utility prices in Phnom Penh, especially those of water and electricity. The industry cluster is likely to be located near a large metropolitan area (Deichmann et al, 2008) similar to the semi-metropolitan districts of Ho Chi Min City, Shanghai, and Bangkok. Based on the data analyzed, it is concluded that the ideal location for a SEZ-Cluster is Kampong Speu.

2) Which SEZ-Cluster?

In order to push for industrialization of Cambodia, it is necessary to enter into a global value chain around Cambodia. Recently, international production fragmentation in the neighboring countries around Cambodia has been prevalent. Cambodia can take advantage of this regional situation and participate in complementary production fragmentation networks, especially with China, Thailand and Vietnam.

Some industries do not generate sufficient knowledge spillover. As a result, those particular industry clusters cannot be sustained long term. For example, some agriculture and garment industries may not be suitable for industry clusters since they do not generate sufficient knowledge spillover.[19] Thus, Cambodia should pick an industry that can generate sufficient knowledge spillover.[21]

Technologically sophisticated industries are more likely to generate knowledge spillover and may be suitable for industry clusters. The most suitable industry cluster for Cambodia would be an electronic

[19] Note that there may be some exceptions. A few agriculture and garment industries may generate technological spillovers.

component industry cluster which follows all of the criteria mentioned above (Section 3 and 4).

The prime electronic component industry example is the semiconductor industry.[20] Many Southeast Asian countries heavily export and import semiconductors. China, Japan, Korea, Malaysia, the Philippines, Singapore, Thailand, and Vietnam are the top exporters and importers and they all happen to be near Cambodia. Since many heavy importers of semiconductors are located around Southeast Asia, Cambodia can take advantage of the low logistics costs and can participate in the production fragmentation structure within the Asia-Pacific semiconductor value chain in some capacity.

The global production fragmentation network of the electronic industry is the most sophisticatedly designed, refined and prevalent in some neighboring countries (especially China, Thailand, and Vietnam). Therefore, it is essential to carefully investigate the inter-connectedness and estimate the demand from neighboring countries. This implies that the Cambodian SEZ-Cluster should be included in the Asia-Pacific value chain in order to take advantage of the Asia-Pacific value chain's pool of backward and forward linkages.

After industry selection, the RGC should invite a foreign multinational semiconductor corporation to create a semiconductor industry cluster in Kampong Speu. This foreign multinational corporation would make the initial investment (build factories and set up semiconductor facilities). After the setup, foreign-related (including some medium- and small-sized) and Cambodian firms are likely to follow, also investing in Kampong Speu.

Since a multinational (foreign) corporation makes a large investment, the investment is likely to be visible and salient. This can be another advantage of semiconductor industry cluster. A visible and salient investment will attract many related firms from abroad, in turn, pushing up participation rates.

By its nature, the semiconductor industry has a high participation rate. The participation rate is critical in determining the success of an industry cluster because the participation rate often determines the degree of economies of scale and scope and thus the magnitude of knowledge spillover.

[20] We also consider the food processing industry as an alternative but decided that the semiconductor industry is more appropriate to create. A companion chapter analyzes the food processing industry. Therefore, we concentrate on the semiconductor industry in this chapter.

As many international firms enter into the SEZ-Cluster, international diversification can be created and retained exercising BBS. Because, in the case of the semiconductor industry, the multinational corporation brings in related firms, the backward linkage of the SEZ-Cluster can be established and local Cambodian firms can support the backward linkage. Supporting many local firms alone tends to be labor intensive. In this case, local firms and workers can be supported by the related firms. This is known as the local labor intensive and unskilled Cambodian firms accessing the value chain of the SEZ-Cluster. The local Cambodian firms are in an appropriate position to take on this role. Cambodian workers can obtain the skills from related firms.

Traditionally, Cambodian women are famous for their weaving technique. Cambodia is a country with a long history of the tradition of silk weaving passed down from generation to generation. Kampong Speu is one of the provinces that follows this tradition. The same hand techniques that are needed for successful silk weaving are also important skills in the semiconductor industry, where many Cambodian workers have a comparative advantage[21].

A semiconductor SEZ-Cluster can hire up to approximately 40,000 workers.[22] The establishment of a semiconductor industry can generate a huge employment effect. This effect can generate large income effects and reduce poverty in this region.

The location advantage of Kampong Speu is that it, being close to the downtown Phnom Penh airport, can save logistics costs since semiconductors are mainly exported via airplanes. At the same time, some of the intermediate inputs can be imported via ships through the Sihanoukville Port. This semiconductor industry cluster is likely to generate huge technological spillover in the long run and bring industrialization to Cambodia.

3) Prospect for Semiconductor Industry

Many Southeast Asian countries heavily import from semiconductor industries. China (including

[21] The Khmer people could weave many kinds of silk products with different decorative patterns using the Ikat technique.
[22] The employment effect may not be precise, but may be close to this level.

Hong Kong), Singapore, Korea, Malaysia, Japan, Thailand, Vietnam, and the Philippines are the top Asian importers. The U.S., Germany and Mexico are non-Asian heavy importers of semiconductors. Since many heavy importers are located around Southeast Asia, Cambodia can take advantage of its location and save logistics costs. This is a sign of a potential comparative advantage in the semiconductor industry for Cambodia.

It is time to relocate some segment of the semiconductor industry from the top five Asian exporters. Some of the main Asian exporters (especially China and Korea) need to shift some of their semiconductor production facilities to Southeast Asia where the wages are relatively cheaper. In the case of the semiconductor industry, a large amount of capital is required for start-up. After start-up, many workers are needed to operate the industry and produce semiconductors. Therefore, the wage rate is important in determining comparative advantage.

Table 3-5a. Importation Rates of Semiconductors around the World

East Asia Country	2002	2005	2008	2011	2014
China	31,053	86,490	129,443	172,185	218,411
Hong Kong	21,114	41,613	61,661	84,698	113,984
Singapore	23,957	41,582	52,053	55,784	63,346
Korea, Rep.	16,944	23,545	29,749	30,150	34,829
Malaysia	22,004	26,748	20,278	30,216	33,504
Japan	15,047	21,110	23,744	21,989	26,988
Vietnam	#N/A	558	1,009	3,727	11,176
Thailand	6,064	8,697	9,546	11,172	11,004
Philippines	#N/A	#N/A	14,118	4,731	10,178
Indonesia	#N/A	#N/A	#N/A	2,272	2,099
Macao	12	8	14	15	23
Non-Asian Country	**2002**	**2005**	**2008**	**2011**	**2014**
United States	26,235	25,940	25,887	38,090	39,474
Germany	11,347	17,563	24,143	29,434	20,166
Mexico	7,694	10,472	10,638	14,990	17,291

Unit: Million USD
Note: The semiconductor industry is the sum of the HS code 8541 and 8542 (Year = 2014).
Source: UN Comtrade

Table 3-5b. Exporters of Semiconductors to the World

East Asia Country	2002	2005	2008	2011	2014
China	6,146	18,849	42,449	69,149	93,160
Singapore	28,962	53,518	72,494	83,407	91,921
Hong Kong, China	1,501	1,522	476	279	90,407
Korea, Rep.	13,109	25,589	27,741	45,051	56,761
Malaysia	18,408	23,057	10,453	34,793	39,024
Japan	29,035	38,468	44,199	44,362	34,606
Philippines	#N/A	#N/A	15,573	8,024	15,112
Thailand	4,754	6,313	8,090	9,171	8,360
Vietnam	#N/A	162	233	798	2,397
Indonesia	#N/A	#N/A	#N/A	873	757
Mongolia	#N/A	#N/A	#N/A	#N/A	3
Non-Asian Country	**2002**	**2005**	**2008**	**2011**	**2014**
United States	31,865	34,394	36,009	29,421	27,572
Germany	10,440	15,882	22,024	21,059	20,503
Mexico	1,241	1,690	1,711	2,628	2,928

Unit: Million USD
Note: The semiconductor industry is the sum of the HS code 8541 and 8542. (Year=2014).
Source: UN Comtrade

The location choice and the selection of the core industry are interdependent with each other. Since Kampong Speu is located close to Phnom Penh, it can substantially save logistics costs by exporting their final products using nearby airports. Logistics costs also play a significant role in determining the comparative advantage of the semiconductor industry. Therefore, the creation of a semiconductor industry SEZ-Cluster in Kampong Speu has several critical advantages over other industries.

5. Field Interviews

1) Analysis of Interviews

Four interviews (deputy provincial governor, director of provincial unit of Industry and Handicraft of Kampong Speu, private company employee, and environmental NGO were conducted in September of 2016. We asked similar questions of all of the interviewees and, at times, posed different questions based upon their occupations. Approximately 10-15 questions were asked, followed by some comments

(See Appendix for all of the survey questions).

All of the respondents believed that Kampong Speu is the ideal location for an industry cluster in Cambodia. They pointed out that the connectivity to a seaport (Sihanuokville) and airport (Phnom Penh airport) is superior to any other location. At the same time, it also has better infrastructure than other locations.

The respondents pointed out that another advantage of Kampong Speu is that it is near Phnom Penh where there is an abundance of skilled laborers. These responses were consistent with our analysis.

All the respondents were enthusiastic about the creation of a semiconductor industry cluster. They all emphasized the employment effects that could be generated from this industry. Since all of the respondents were concerned about the unemployment problem in Cambodia, they pointed out the advantage of a job creation effect (a huge employment effect that can be generated by the semiconductor industry).

At the same time, they believed that creating a semiconductor industry cluster could contribute to reduced poverty and crime rates. The respondents also acknowledged that creating a semiconductor industry cluster could reduce out-migration of Cambodian workers. These responses were generally consistent with our analysis in Sections 3, 4, and 5.

On the other hand, our respondents expressed concerns about the possibility of land conflict, flood, and shortage of electricity which can be challenges for semiconductor industry clusters. Since the semiconductor industry is regarded as a relatively high-paid industry, it can attract many workers especially from Phnom Penh area. However, one respondent expressed concerns about the lack of skilled workers and suggested that a training center may be necessary to provide appropriate skills to workers. Another concern expressed was that in Cambodia, protests seem to arise frequently at workplaces. Foreign investors should be aware of this problem *a priori*.

2) Some Important Issues

The two government officials were confident that the above-mentioned problems could be solved by

the Cambodian government. The provincial government of Kampong Speu seems to be interested in creating a semiconductor industry. The provincial government can provide land at a cheaper price (i.e., free rent for 50 years, as the Chinese government did in an earlier time) and authorize registration for foreign investors to build a semiconductor industry cluster. A respondent also pledged to help foreign investors solve protest problems if any arose. The government officials were enthusiastic about the establishment of a semiconductor industry cluster (and SEZ) in Kampong Speu.

The environment NGO was concerned with environmental problems that may arise from the establishment of a semiconductor industry cluster in Kampong Speu. The main concerns stemmed from the following premises:

(i) The people (of Cambodia) are less educated about environmental problems

(ii) There is no (effective) environmental law enforcement

Cambodia does not have a sound waste management program that can minimize electronic waste from a semiconductor industry cluster. At the same time, the NGO also had concerns about the labor outflow from the agriculture sector that could result in a labor shortage in the agriculture sector.

Two respondents were enthusiastic about constructing an agro-industry cluster. Kampong Speu currently is endowed with 10 million mango trees and exports mango chips to Japan. Because of this, two of the respondents were more interested in processing and direct export of agricultural products produced. Their aim is to increase the value added of agricultural products produced in Kampong Speu. However, there seems to be some confusion about the nature of an industry cluster and some bias present.[23]

The Cambodia Vision dictates that Cambodia should increase the share of manufacturing to push industrialization of Cambodia. However, increasing the share of manufacturing currently seems to be difficult. Therefore, present bias may stem from the following conditions:

(i) There is a negligible proportion of manufacturing in Kampong Speu

[23] Everyone suffers from present bias to a certain extent. When a current stock price is high, we tend to believe that investment in that stock would be a good option. This is an example of present bias.

(ii) 10 million mangos trees are grown and the provisional government officials would like to export them to increase their value added

Kampong Speu can process those mangos and export them to neighboring countries in order to increase the value added. But Cambodia does not need an industry cluster (or SEZ-Cluster) to do so. Instead, Kampong Speu needs an export promotion agency to facilitate the export of mango chips to other developed countries. When we suffer from present bias, expectations about the future need to be changed. To do so, there needs to be solid, trustworthy political leadership. The next section discusses this issue.

6. Political Economy of Industry Cluster

1) Strong Political Leadership

Present bias may be persistent, especially in developing economies like Cambodia. In order to overcome present bias, strong political leadership may be required. Otherwise, Cambodia is likely to be stuck in a bad equilibrium.

Cambodia Vision dictates that it aims to push for industrialization (as specified in the *Cambodia Industrial Development Policy: 2015-2025*) by increasing its manufacturing share. The modernization of Cambodia's industrial structure via transforming the agriculture dominant economy into a manufacturing dominant economy is the priority of the policy.

The means to achieve this objective is to create a semiconductor SEZ-Cluster in Kampong Speu. Since Cambodia is still an agriculture dominant economy, political leadership needs to change the existing climate to transform the Cambodian economy.

For a 'big push' to be implemented, a change from pessimistic expectations to optimistic, self-fulfilling expectations may be required. Only strong political leadership can tailor this expectation change. Only capable politicians can deliver an effective policy scheme and lead people (and stakeholders) toward change. The attempt to create a successful industry cluster may pose as a challenge

for future Cambodian politicians.

Krugman (1991) dictates that expectation formation can lead to multiple outcomes.

Political leadership can coordinate stakeholders and tailor their expectation formation.

Expectation formation can determine policy outcome choice. Strong, capable, and credible political leaders who can tailor stakeholder expectations are needed to help transform the Cambodian economy, which is essential to Cambodia's economic success.

The ultimate objective of the RGC is to accumulate human capital (Cambodian workers) in order to create a skill-intensive economy. For this creation to happen, an employment effect is a critical starting point. In order to generate knowledge spillover and an employment effect for Cambodian workers, Cambodia needs to create an efficient industry cluster. To do so, strong political leadership has to tailor the expectations of potential stakeholders and at the same time, deliver the following policy procedures:

(i) Invite the main foreign investor (multinational corporation) of the semiconductor industry cluster

In the case of the semiconductor industry, it is important to invite the main investor. Once the main investor decides to invest in Kampong Speu, then the participation of many firms is likely to follow. In return, the industry cluster is likely to sustain long term and generate huge employment effects for the Cambodian economy.

(ii) Set up a SEZ in Kampong Speu

In order to create an efficient industry cluster, political leadership must first set up a SEZ in Kampong Speu. This is because a SEZ can attract foreign investors to an industry cluster. Since a SEZ can offer various tax exemptions and benefits for investors, a SEZ can essentially increase the participation rate, which may be crucial in determining the success of an industry cluster.

The current SEZs in Cambodia are not very successful because of low participation rates and a lack of an industry cluster.[24] Thus, political leadership has to persuade the provincial government of Kampong Speu and local stakeholders to setup a SEZ in Kampong Speu.

[24] One of the main problems of the existing SEZs in Cambodia is due to the non-existence of industry cluster. Even though interconnected companies have to be located in the same region to generate economies of scale and knowledge spillover, different and unrelated (even different industries) firms are located within SEZs.

Political leadership must work on the terms of a contract with potential foreign investors and the provisional government must provide sufficient benefits for foreign investors. The provincial government of Kampong Speu has to figure out how to reduce start-up and relocation costs for potential foreign investors as well as domestic (medium- and small-sized) firms.

Once the SEZ-Cluster in Kampong Speu has been established and turns out to be successful, the successful SEZ-Cluster will change expectations about industry clusters and SEZs in Cambodia. As a result, the establishment of a successful SEZ-Cluster in Kampong Speu can induce demonstration effects. It is likely that other industry clusters (and SEZs) will be created in Cambodia leading to reform of the existing SEZs at the same time. It is important to have many efficient industry clusters and SEZs in Cambodia. Clusters often have inter-linkages with other clusters. The existence of inter-linked clusters tends to generate more economic benefits.[25] Creating a successful SEZ-Cluster can function as a tipping point for the rise of a manufacturing sector and the start of industrialization in Cambodia (Gladwell, 2006).[26]

(iii) Establish a trade association

A trade association may be the most appropriate choice to serve as a focal point for collective action in overcoming any obstacles of the cluster. For example, the setup of a trade association can increase the core value of the cluster by facilitating the exchange of ideas and information among members of the cluster. The main functions of a trade association can be described as follows:

- Set up a trade and investment department that can facilitate information exchanges and matching between domestic entrepreneurs and foreign investors.

Trade association induces informal (face-to-face) contact among the participants of the cluster. Repeated informal contact among members facilitates exchanges of information and fosters trust. This can substantially lessen problems in business relationships (Lee, 2010).[27]

[25] For example, the wine cluster in Davis, California enjoys a weaker linkage to other California clusters such as food, restaurants, and tourism clusters (Porter, 1998).

[26] One successful industry cluster can change expectations and push the creation more clusters.

[27] Lee (2010) posits that reciprocal exchanges facilitate cooperation and trust between the members since reciprocal exchanges often develop emotional relationships. This would deter any deviation strategy.

- Engage in a co-op purchasing policy

In case of a co-op purchasing policy for a cluster, the policy can lower the average cost of inputs (tangible) and benefit the members within the cluster. At the same time, this policy can implicitly strengthen trust (intangible) among the members of the cluster and induce future cooperation.

- Provide training programs for Cambodian workers and entrepreneurs in the cluster

2) Non-Rival Intangible and Intrinsic Assets

The establishment of a trade association can generate some positive externalities. It is important to address how non-rival intangible and intrinsic assets can be created. The mere co-location of firms within a SEZ-Cluster may not be enough. It is critical to think of ways to create the value of the SEZ-Cluster via co-location.

First, the participation of foreign investors is essential in determining the success of an industry cluster. Sufficient incentives to encourage foreign investors to be involved (as China did to attract FDI, for example) are essential. Participation in the Asia-Pacific value chain could generate sufficient market size for the products produced within the cluster.

As Figure 3-6 and Figure 3-7 indicate, the coordination problem may be severe in global sourcing within the Asia-Pacific value chain. This is why a globalization strategy may be important in delivering global sourcing for the semiconductor industry cluster in Kampong Speu.

At the same time, the trade association must deal with local opinion leaders, as well as NGOs (especially, environment NGOs), in order to create a successful industry cluster.

Cambodia must provide the vision of a successful industry cluster to persuade local opinion leaders to cooperate; local leaders must share the vision. Local opinion leaders should recognize and understand how the future benefits of the industry cluster can positively impact them and the rest of Kampong Speu.[28] The trade association should be able to effectively communicate a strategy to local opinion

[28] *Koszegi, B. and A. Szeidl (2013) show that, in the case of an attention grabbing goal, agents tend to have future bias. They jump on committing to an attention grabbing goal (benefits) and disregard the current cost.*

leaders so they can share the view.

The ultimate objective is to create non-rival, intangible and intrinsic assets for the semiconductor industry cluster in Kampong Speu. Cluster-specific, non-rival, intangible and intrinsic assets may be critical in determining the core values of a SEZ-Cluster in Kampong Speu. An intrinsic asset aims to serve as a focal point for collective action to overcome the obstacles faced by the cluster and provide positive externality for the investors of the industry cluster.

The most appropriate non-rival, intangible and intrinsic asset for a SEZ-Cluster in Kampong Speu could be the creation of a cluster brand. That is, the SEZ-Cluster should create a unique cluster brand that can be used to promote the industry cluster in Kampong Speu. Non-rival, intangible and intrinsic assets should be directed to strengthen the core-value of the cluster.

7. Policy Marketing Strategy

1) Objective of Policy Marketing

Policy marketing is the key to determine the success of a policy. The objective of policy marketing is to persuade the main stakeholders via expectation tailoring. That is, the policy marketing strategy aims to tailor expectations of stakeholders in order to induce effective policy implementation.

It is important to carefully design a policy delivery scheme (policy marketing) *ex-ante*. First, it is important to precisely pinpoint why a policy should be adopted in the first place. Credible politicians have to persuade the RGC as to why Kampong Speu needs to have the SEZ-Cluster there. In order to persuade the RGC, it is necessary to stress the location advantage of Kampong Speu. Moreover, the setup of a SEZ-Cluster in Kampong Speu does not require a huge investment (to build up infrastructure) compared to other regions.

The provisional government of Kampong Speu has to persuade the electorates of Kampong Speu as to why it needs the SEZ-Cluster there. In doing so, capable politicians must communicate with various NGOs (of Kampong Speu) prior to the announcement of the plan. Specifically, it is necessary to explain

the goal of the policy and present the long term economic benefits of the policy to the electorates.

2) Persuasion Strategy

(1) Persuasion Strategy I

Policymakers should persuade the local leaders and local opinion makers of Kampong Speu that they need to create a semiconductor cluster there. To do so, policymakers should effectively communicate with local leaders & NGOs *ex-ante.* The policymakers need to explain the goal of the policy and future (economic) benefits of the policy. To do so, the policymakers should send *simple and specific messages* so that the locals can clearly imagine the benefits of the policy and figure out its benefits by themselves. The policymakers should stress that the SEZ-Cluster in Kampong Speu can contribute to Cambodia becoming a BS in the ASEAN.

(2) Persuasion Strategy II

For a nationwide marketing strategy, policymakers should employ a 'focus strategy' as a form of persuasion. Kosezegi & Szeidl (2012) claimed that people tend to *focus on salient benefits and ignore others when they make decisions.*

In this regard, the policy marketing strategy is to make people focus on future benefits and disregard the current cost via saliency marketing. How the industry cluster can raise the income of local residents and reduce poverty needs to be explained.[29] In dealing with this point, policymakers need to make sure that the residents of Kampong Speu can envision this message in their heads so that they will realize the benefit of the industry cluster more clearly and attach their future to the industry cluster. For instance, policymakers could make a pamphlet saying that "We can send our children to schools, and even to universities, if we have a SEZ-Cluster in Kampong Speu."

[29] *Mullainathan and Shafir (2013) also made similar points about reducing the poverty rate in developing economies.*

(3) Persuasion Strategy III

Policy marketing should be directed to the general public of Cambodia as well. In doing so, the policymakers can stress *nationalism & pride* and then relate it to the issue of a SEZ-Cluster in Kampong Speu. When the policymakers employ the nationalism marketing strategy, a reference country (Vietnam, for instance) can be used to implement a comparison strategy.[30] For example, "We need this semiconductor industry in Kampong Speu to catch up to Vietnam" exhibits a comparison that might encourage nationalism and pride.

Simons (2010) claims that "if people are proud of their organization's mission, then they will assume shared responsibility for its success." Policymakers should build the purpose of the mission in the electorate's mind to have them take pride in the purpose. If this occurs, the electorate will actively support the policy.

8. Concluding Remarks

1) Justifications for Industry Cluster

In the case of developing countries like Cambodia, market failure may be persistent. This is precisely the reason why the RGC should make efforts to create an industry cluster. Otherwise, Cambodia may not escape from the present bias and may be stuck in a bad equilibrium for a long time. Therefore, it is imperative to create a semiconductor industry cluster to increase the share of manufacturing and push for industrialization.

One of the main advantages of creating an industry cluster is the fine division of specialization in the global value chain (Vo, 2016). As Cambodia starts industrialization, it is important to find the appropriate niche market. The establishment of an industry cluster can help Cambodia find the niche market. This is done to pinpoint the comparative advantages for Cambodia of low labor costs and

[30] The utilization of the reference country can be effective since agents make the comparison given the reference point.

location advantage.

Political leadership may be important in delivering an efficient industry cluster. Political leadership can tailor expectations of stakeholders and overcome present bias. At the same time, institutions like trade associations can be established by political leadership.[31]

2) Moving Forward

This report is a policy paper. A policy paper should provide precise policy implementation plans. A step-by-step policy prescription follows.

(1) Task force team

The task is to create an industry cluster in Kampong Speu. To do so, the RGC should form a task force team of approximately four to five members. The members should include members of the RGC and provisional government of Kampong Speu, entrepreneurs, and some experts. This task force team should spend time precisely determining which semiconductor component to create in the industry cluster.

(2) Visit tour

The next step is to find the main investor for the semiconductor industry in Kampong Speu. To do so, the task force team should initiate visit tours to invite potential investors from China, Korea, or Taiwan.

(3) Provision of incentives

In order to attract potential foreign investors, the task force team must provide sufficient incentives since competition for foreign investment is often fierce. Many members of the ASEAN (especially developing economies in the ASEAN) compete to attract FDI from the rest of the world.

[31] Of course, the trade association may be run by members of the association. Thus, the maintenance of the trade association may not be run by policymakers.

(4) Promotion of the combination of Kampong Speu and a semiconductor industry

Kampong Speu is an ideal site for constructing an industry cluster. The semiconductor industry could be the ideal industry for Kampong Speu. The task force team should deliver a semiconductor industry cluster promotion strategy in Kampong Speu based on data presented in Section VIII.

3) Challenges

There are some challenges to constructing a semiconductor industrial cluster in Kampong Speu. First, other countries also like locating semiconductor industry clusters in their countries. Thus, Cambodia has to compete with other countries to attract foreign investments. Cambodia needs to demonstrate comparative advantage and pinpoint an appropriate niche market in the Asia-Pacific semiconductor production chain. Second, there are some concerns about environmental impact (discharge of polluted waste, in particular). Third, the majority of the Cambodian labor force lacks skills. Appropriate training programs should be provided for unskilled workers. Furthermore, there are frequent demonstrations and strikes by workers and their unions in Cambodia. The foreign investors should cooperate and determine a way to deal with these demonstrations.

IV. ICT and Related Infrastructure Development in Kampong Speu

Yoo Suk YANG (Chung-Ang University, Korea)
Rapid SUN (University of Puthisastra)

Industrializing Cambodia:
Making a Roadmap to Construct Core
Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University,
Chairman of Jayavarman Center for Development)

IV

ICT and Related Infrastructure Development in Kampong Speu

Yoo Suk YANG (Chung-Ang University, Korea)

Rapid SUN (University of Puthisastra)

1. Introduction

The main axis of Cambodian Bridging State Strategy (BSS) is polycentric S-shaped pillar which connects the major four nodes of Siem Reap, Phnom Penh, Kampong Speu, and Sihanouk Ville, in which each node plays interconnected division of labor. The reason why Kampong Speu is identified as one of the four major nodes is that Kampong Speu is located in between Phnom Penn and Sihanouk Ville and the suburbs of capital city Phnom Penh.

This report is based on the Bridging State Strategy for Cambodia in order to exploit the opportunities of the ASEAN Economic Community (AEC) launched in 2015, to utilize the China's ambitious "One Belt One Road" plan through taking the bridging state position and to position in Regional Comprehensive Economic Partnership (RCEP), Cambodia will secure its physical and institutional connectivity, along with its full economic integration, which will contribute toward opening new market opportunities, attracting investment, and securing technology transfer to Cambodia. It was suggested that the meaningful bridging state is not given to Cambodia simply based on its geopolitical reason, but is to be achieved by strategically develop Cambodia's inter- and intra-connectivity.

The Bridging State Strategy of Cambodia suggests a new hub airport in the center of greater capital area and the road system of connecting Kampong Speu with the maritime center of Sihanouk Ville and the capital city of Phnom Penh. This network is the basis of the developing the industrial center of modern Cambodia by providing communications (on and off-line), transportation (area, road, and

railroad), and other infrastructural facilities. Particularly, it was suggested that Greater Capital Area Airport, Industry Clusters, Science and Technology Park (Research Belt) be supported by the broadband network infrastructure.

The Royal Government of Cambodia (RGC) has already identified the priority areas of ICT in the Connect Asia-Pacific Summit in 2013 with the vision of "Smartly DIGITAL": (i) Investing in ICT infrastructure (ii) Stimulating innovation and creative use of ICT (iii) Encouraging innovative Public-Private partnership (PPP) (iv) Promoting sustainable development through ICT (v) Fostering digital inclusion and (vi) Achieving digital literacy and building human and institutional capacity. However, it has been criticized that "Smartly Digital" is only a vision and the bottom line is how much Cambodia put its concerted efforts and how soon these actions have to be completed.

On the other hand, the NSDP 2014-2018 clearly shows the nation's priority in the ICT sector very well and in detail. The plan, however, does not include concrete measures how to finance the projects following the plan. For example, it is not clear whether Cambodia leaves the mission of building a nationwide fiber optic backbone to private operators. The underlying reason is the lack of finance to execute the plan, making the guidelines as a list of nominal statements.

For this reason, it seems virtually impossible for Cambodia to elevate Cambodia's economy and infrastructure in a short run and simply to follow the steps many developing nations that took export-driven economic growth model earlier. Since there are many obstacles difficult to solve following others' experience, it is recommended for Cambodia to differentiate her growth strategy. "Something Cambodian approach" is needed to differentiate the strategy, particularly in the area of ICT infrastructure.

The following are a list of issues to decide for priority setting and government's strategic initiative:

- Universal service vs. cream skimming
- Private sector driven vs. government led approach
- General education and training vs. Elite education
- Open approach vs. somewhat sovereign approach
- Select-and-focus vs. Across-the-board

These issues are not independent from each other since the bottom line of the issues deals with how much a government can take the leadership in shaping the ICT industries while encouraging the private sector to participate in the development process. It looks contradictory from the short run perspective, but a good balanced solution is possible by segmenting the market and prioritize the strategic initiatives differently depending on the segments from a long term perspective.

The recommended strategic principles for Cambodia under the Bridging State Strategy last year to rapidly catch-up immediate issues of ICT infrastructure were be summarized as (1) Select-and-focus (2) “Aim High” (3) ICT sovereignty and (4) Wait until the other industry infra get established. While Cambodia has relied on the market-driven approach in the physical infrastructure development by allowing the private sector work, it is important for Cambodia to keep the role of public or government sector to stimulate the facility-based competition in the private sector, by making the public enterprises to be potential entrants or competitors at any time. The new Telecommunications Law passed in 2015 reflects Cambodia’s choice of strengthening the role of government and focusing on the research and development in order to catch up the gap of innovative human resource capacity between Cambodia and the neighboring ASEAN member countries.

In case of ICT HRD, it was suggested to set the priority to highest level of human resources that can lead the education sector, government sector, research sector or industry later on. ICT training programs or institutions for the industry had better based on the market forces, so the role of the government is limited to providing incentives to the industry to train its employees, such as tax incentives.

However, balancing the supply and the demand for ICT resources is not important for high-level engineers and designers, since the market for skilled ICT human resources is not bounded by the national border. Despite the relatively small and underdeveloped ICT manufacturing or service business industries compared with those of the neighboring countries, the velocity of knowledge and technology adoption across the border is very high due to the internet and the diffusion of affordable digital information devices. Here comes the reason why the development of human capital in the ICT industry is critical to speed up the development of ICT infrastructure and ICT industries in the long run.

The key is to empower the human resources with both the ICT related expertise and the foreign languages (English, Thai or Vietnamese, Korean, Chinese). The advanced education should be carried out in English as a primary language as “follow-the-leader” strategy is a model for Cambodia.

For the above reasons, this report focus on how to develop the human resources and the ICT software industrial cluster that will eventually become the cornerstone of Cambodia’s industrialization. It is expected that these suggested projects for ICT infrastructure and industrial cluster, particularly in Kampong Speu, become the nation’s role models to be benchmarked later by many other local governments in Cambodia in order to find out their suitable model of development.

This report is composed of benchmarking the science and research parks both in the developing and developed countries, followed by the exploratory review of the universities that lead the science and research capability of their nearby science and research parks. Also, considering the Cambodia’s current higher education situation of having no collegiate university with the international standards of quality education, the case of Seoul National University in Korea is examined, following the case of China’s University Town in which many recognized higher education institutes got together in a very short period of time.

2. Trends

1) Industry Trend in Cambodia

Cambodia’s industrial sector remains weak and narrow based as reflected by its simple structure of manufacturing and low level of sophistication that mainly concentrates on garments and food processing, while most manufacturing activities are still family-based and do not have the capacity to compete in the international market. Key features of Cambodian industries consist of a lack of diversity in industrial base; an informal and missing middle structure; a weak entrepreneurship, an urban-centered industry, a low value addition and low level of technology application.

With vision toward 2030, particularly as expressed in the “Rectangular Strategy – Phase III”, the

Royal Government of Cambodia (RGC) has prepared and adopted the “Industrial Development Policy” to promote the country's industrial development that will help maintain sustainable and inclusive high economic growth through economic diversification, strengthening competitiveness and promoting productivity. The adoption is motivated by the following considerations: First, the favorable geopolitical spillovers in terms of linking Cambodian economy and its industry to the region especially within the ASEAN Economic Community and regional economic liberalization frameworks; Second, the potential role of industrial sector in promoting growth and creating new jobs in the context of an open economy, a demographic dividend and major structural changes that are conducive for industrial growth; Third, the critical role of industrial sector as a policy tool to enhance the performance of core economic sectors, like agriculture and services, that will further contribute to boosting economic growth; and Fourth, the importance of the industrial sector as a focus for initiating both structural reforms and governance reforms of key national economic institutions with the aim at boosting economic productivity in long term and avoiding falling into the “middle income trap”.

The RGC’s vision is to transform and modernize Cambodia’s industrial structure from a labor intensive industry to a skill-driven industry, through connecting to regional and global value chain; integrating into regional production networks and developing interconnected production clusters along with efforts to strengthen competitiveness and enhance productivity of domestic industries; and moving toward developing a technology-driven and knowledge-based modern industry. The realization of this vision will contribute to national economic development, sustainable and inclusive high economic growth, employment creation, increased valued added to the economy and increased income for the Cambodian people through promoting the development of the manufacturing sector and agro-processing industry through integration into regional and global production chain; positioning the development of industrial zones so as to ensure critical mass, economic linkages and competitiveness; development of economic corridors, streamlining the operational procedures for Special Economic Zones (SEZs) and developing new industrial parks and industrial clusters.

2) ICT Trend in Global

A university research park, science park, or science and technology park is an area managed in a manner designed to promote innovation.

- Silicon Valley (USA) was a pioneer in the development of science parks the world. Originally known as Stanford University Science Park, Silicon Valley dates back to the early 1950s. It was followed by Sophia Antipolis (France) in Europe in the 1960s and Tsukuba Science City (Japan) in Asia in the early 1970s. This trio represents the oldest and the most well-known science parks in the world. [1]
- Today, there are over 400 science parks worldwide and their number is still growing. At the top of the list comes the USA, which is reported to have more than 150 science parks. Japan comes next with 111 science parks. China began developing science parks in the mid-1980s and now has around 100, 52 of which were approved by the national government and the remainder by local governments.[2]

It is a physical place that supports university-industry and government collaboration with the intent of creating high technology economic development and advancing knowledge. Research parks exist to enhance collaboration between academia, industry and government. The purpose of these parks is to promote the economic development and competitiveness of cities and regions by creating new business, adding value to companies, and creating new knowledge-based jobs.

There are many approximate synonyms for "university research park"; science park, technology park, technopolis and biopark. The appropriate term typically depends on the type of affiliation the parks has with an institution of higher learning and research, and also perhaps the sort of science and research in which the park's entities engage.

These parks differ from typical high-technology business districts in that university research parks and science and tech parks are more organized, planned, and managed. They differ from science centers in that they are a place where research is commercialized. Typically businesses and organizations in the

[1] http://www.unesco.org/new/en/natural-sciences/science-technology/university-industry-partnerships/science-parks-around-the-world/

[2] http://www.unesco.org/new/en/natural-sciences/science-technology/university-industry-partnerships/science-parks-around-the-world/

parks focus on product advancement and innovation as opposed to industrial parks that focus on manufacturing and business parks that focus on administration.

The parks offer a number of shared resources, such as

- incubators, programs and collaboration activities,
- uninterruptible power supply (UPS),
- telecommunications hubs,
- reception and security,
- management offices,
- restaurants,
- bank offices,
- convention center,
- parking, internal transportation,
- entertainment and sports facilities, etc.

In this way, the park offers considerable advantages to hosted companies. Usually, science and technology parks are supported by universities in order to bring in industry with which they can collaborate, and by local government in order to improve the prosperity of the community. Incentives to attract companies to the area are often offered as part of the entire package.[3]

It is conventionally known that a science park must:

- Have access to qualified research and development personnel in the areas of knowledge in which the park has its identity.
- Be able to market its high valued products and services.
- Have the capability to provide marketing expertise and managerial skills to firms, particularly Small and Medium-sized Enterprises, lacking such a resource.
- Be inserted in a society that allows for the protection of product or process secrets, via patents, security or any other means.
- Have the backing of powerful, dynamic and stable economic actors, such as a funding agency, political institution or local university.
- Include in its management an active person of vision, with power of decision and with high

[3] https://en.wikipedia.org/wiki/Science_park

and visible profile, who is perceived by relevant actors in society as embodying the interface between academia and industry, long-term plans and good management.

- Include a prominent percentage of consultancy firms, as well as technical service firms, including laboratories and quality control firms.

(1) The role of the Science and Technology Park in Economic Development

From the empirical evidence that is available, four ways in which science and technology parks can boost local economic development and increase local innovative capacity can be identified.

(i) Science and technology parks can encourage and facilitate the formation and growth of new businesses based upon the research knowledge and expertise available within a higher education institute or other research organization.[4] The existence of a Science Park, near a higher education institute encourages researchers to consider the commercial exploitation of their research and offers them a location amenable to this process.[5] Science and technology parks can also play an important role in complementing regional business promotion activities by promoting the establishment of new businesses and by furthering the growth of existing businesses.[6]

(ii) Science and technology parks can also act as a catalyst for change in a region. They often provide new sources of employment in an area of traditional industries and help to change the image of the area by demonstrating that it can create, attract and support high-tech industry.[7]

(iii) Science and technology parks can act as a mechanism to upgrade the technological sophistication and added value of existing industry by providing a location where technical support can be given to local firms which manufacture and market products.

(iv) Science and technology parks, particularly technopolises, highlight the importance of environmental and infrastructure factors in technology-led economic development. Since the main

[4] A. Strub (1989). The Science Parks in the European Context, in: Suman, H. (eds), op. cit. pp. 29--36

[5] I. Dalton (1993), Setting the Scene on History, Objectives and Resources, in: T. Broadhurst (eds), The Development and Operation of Science Parks, UKSPA, Birmingham, pp. 1-10.

[6] H. Fielder (1992) Innovation Zentrum in Deutschland, Osterreich und der Schweiz 1992/93, Wiedler Verlag, Berlin

[7] U. Hilpert (1991), Regional Innovation and Decentralization; High Tech Industry and Government Policy, Routledge, London.

resource is highly skilled people in the science and technology parks, the quality of life is a main competitive dimension in the development strategy.[8] As part of such a strategy, an attractive community including housing and cultural facilities can be constructed within the parks to help attract skilled engineers and scientists from major cities or foreign countries.

(2) Science Park and Types of Business Cluster

The term business cluster, also known as an industry cluster, competitive cluster, or Porterian cluster, was introduced and popularized by Michael Porter in *The Competitive Advantage of Nations*(1990).

(i) *Factor endowment clusters* - They are created because a comparative advantage they might have linked to a geographical position. For example, wine production clusters are located in sunny regions surrounded by mountains, where good grapes can grow. This is like certain areas in France such as Burgundy and Champagne, as well as Lombardy, Spain, Chile and California.

(ii) *Low-cost manufacturing clusters* - These clusters have typically emerged in developing countries within particular industries, such as automotive production, electronics, or textiles.

- Examples include electronics clusters in Mexico (e.g. Guadalajara) and Argentina (e.g. Córdoba). Cluster firms typically serve clients in developed countries.
- Drivers of cluster emergence include availability of low-cost labor, geographical proximity to clients (e.g. in the case of Mexico for U.S. clients; Eastern Europe for Western European clients)[9]

(iii) *Knowledge services clusters* - Like low-cost manufacturing clusters, these clusters have emerged typically in developing countries. They have been characterized by the availability of lower-cost skills and expertise serving a growing global demand for increasingly commoditized (i.e. standardized, less firm-specific) knowledge services, e.g. *software development*, *engineering support*,

[8] R.W. Similor et al. (eds) (1991), Creating the Technopolis: Linking Technology, Commercialisation and Economic Development, Ballinger, Cambridge, MA.

[9] Altenburg, T., Meyer-Stamer, J., 1999. How to promote clusters: policy experiences from Latin America. World Development 27 (9), 1693-1713

analytical services.[10] Bangalore in India, Recife in Brazil and Shanghai in China are examples of knowledge services clusters.

- Multinational corporations have played an important role in "customizing" business conditions in these clusters. One example for this is the establishment of collaborative linkages with local universities to secure the supply of qualified, yet lower-cost engineers.

Science and technology park (or research park) as well as industry cluster can be seen as a value network that is critical to the competitive advantage of a nation (Porter 1990)[11] which requires property development, networking of academic and research institutes with the business circles, and generating innovations that will be commercialized later.

The main concept of science and technology park is the idea that scientific knowledge leads in some linear progression to technological innovation (Quintas et al. 1992)[12]. Korean government has put significant level of investment in Daedeok Innopolis since 1973. The focus for the development of Daedeok Innopolis has, therefore, been shifted gradually from a hardware concept of the park development to a software concept for more comprehensive innovation, which form today a key policy instrument for combining academic research, technical research and development (R&D) and market-driven solution provision (Launonen and Viitanen 2011).

For this study, we have examined a number of research parks in Vietnam, Italy, U.S., India and Indonesia following the case study of Daedeok Science Town which is a model to follow we suggest.

3. Benchmark Cases

1) Benchmark: Daedeok Science Town (DST) in Korea

The science park development in Korea began to gain momentum in the 1970s when the Daedeok

[10] Manning, S. 2013. New Silicon Valleys or a New Species? Commoditization of Knowledge Work and the Rise of Knowledge Services Clusters. Research Policy, forthcoming.

[11] Porter, M.E.(1990) “Competitive Advantage of Nations,” “Harvard Business Review” 68(March-April): 73-93.

[12] Quintas, P., Wield, D., and Massey, D.(1992) “Academic-industry links and innovation: questioning the science park model,” Technovation 12(3) : 161-75.

Science Town (Daedeok Innopolis, since 2005)1 was established as a national R&D center. In particular, the Daedeok Science Town was intentionally created as an engine of enhancing the national competitiveness of high technology and economic prosperity through the agglomeration of research institutes and universities in a planned science city. In practice Daedeok Science Town was an ad hoc solution to three pressing problems, (i) the over concentration of population and industrial activities in the Seoul metropolitan area, (ii) bottlenecks in the application and admission process to to[class universities located in Seoul (iii) and a common recognition to catch up with the developed countries in advanced technological industries.[13]

Daedeok Science Town was established as a central government initiative and local authorities were excluded from the initial planning. Designated sites are eligible for limited financial assistance from government in connection with their planning costs. The government also provides indirect financial support for Daedeok Science Town development through industrial relocation incentives, constructing infrastructure such as roads connecting the sites and housing estates and urban facilities by the Land Development Agency. In addition, central government provides some initial support for incubation and innovation centers adjacent to experimental universities of engineering.

Daedeok Innopolis (new name) has undergone continuous self-renewal over the past forty years to better respond to the economic demands of the nation. Today, Daedeok Innopolis has been reorganized as a global-cluster that signifies our entrenchment and renewed commitment to placing Korea's high-tech prowess in the global spotlight.[14]

Daedeok Innopolis (formerly Daedeok Science Town) today is the legally designated area and composed of 5 areas. The area includes Yuseong-gu and Daedeok-gu of Daejeon Metropolitan City and areas in the vicinity thereof, prescribed by Presidential Decree.

[13] MOST (Ministry of Science and Technology), The Basic Plan of Technobelt in Korea (MOST, Seoul, Korea, 1989) (in Korean).

[14] Deog-Seong Oh and Insup Yeom, "Daedeok Innopolis in Korea: From Science Park to Innovation Cluster," WTR 2012:1, pp.141-154

Table 4-1. Daedeok Innopolis Town

Establishment	November 1973 Korea National Government Initiated	
Address	81 Expo-ro Yuseong-gu, Daejeon Metropolitan City, Republic of Korea	
Employment	55,614 person (9,055 PhDs) as of 2010 *About 11% PhDs in Republic of Korea	
Tenants	129 organizations (in relation with R&BD) : 30 Government Research Institutes(GRI), : 42 Private Research Institutes (PRI) : 8 Support Agencies (public) : 5 Universities(HEIs) : 14 Public Institutes : 22 non-profit Institutes 1,179 high-tech companies (SMEs) : Spin-offs from GRIs and PRIs, high technology-based venture businesses	
Major Fields of Science and Technology	IT (40%), BT (14%), Material Science (9%), Chemical Engineering (8%), Energy Resource (8%) etc.	
Size (Developed Area)	Total area: 70.4km^2 Zone 1. Daedeok Science Town(DST; 1972~1999): 27.8km^2 - for research and education, and includes a residential area Zone 2. Daedeok Techno-Valley(DTV; 2005): 4.3km^2 - venture business area, pilot plants Zone 3. Daedeok Industrial Complex; 1988): 3.1km^2 - local industrial park & manufacturing area Zone 4. Projected area (Green-Belt area): 30.2km^2 - green belt area and includes land set aside for incoming Zone 5. Agency for Defense Development: 5.0km^2 - for military and defense-related industry	

Table 4-2. Daedeok Science Town Land Use Plan

Land Use Plan	Size (unit= Pyong)	
Research institute area	820,000	
Educational institute area	500,000	
Residential area	690,000	
Public/Commercial/Park	350,000	40,000/46,000/340,000
Roads	540,000	
Productive green area	1,070,000	
Forest green area	740,000	
Green belt area	790,000	
Reserved area	2,600,000	
Total	**8,100,000**	

Daedeok Innopolis now has a size of 70.4 km^2, about 2.5 times the size of Daedeok Science Town, which was built beginning in 1973 (Daedeok Science Town 27.8 km^2, Daedeok Techno Valley 4.3 km^2, Daedeok Industrial Complex 3.2 km^2, Agency for Defense Development 3 km^2 , Green Belt 31.2 km^2 , and Hanwha 0.9 km^2, etc.).

Daedeok Innopolis started as the national research and development hub in 1973 and has been transformed into the innovative cluster where research institutes, academia and industries work together to create synergy especially since the Innopolis special law was enacted in 2005. Based on the special law, the supporting and managing organization for the region, the Innopolis Foundation was established in 2005 with 4 strategies such as commercialization of R&D results from Government Research Institutes (GRIs), creating venture ecosystem for enterprises, disseminating success practices to nationwide as the national project, and building the global business environment to become a global standard cluster.

(1) From Science and Technology Park to Innopolis[15]

In the beginning, the Daedeok Science Town was planned to accommodate eight focal research areas ranging from maritime and ship-building, electronics and electric to agricultural industries with a size of 27.8 km^2, known as Zone I now, and a population of 50,000. A new university was planned to establish along with 4 new middle- and high-schools and three elementary schools. A total of one university, five high schools and six elementary schools were supposed to provide education services to this area with a population of 50,000 (approximately 5,200 households) and to the adjacent residential areas.[16]

The Daedeok Innopolis (formerly *Daedeok Science Research Park)*, the first such complex, was built in 2005 to be a, "knowledge-based innovative cluster." Following that, R&D complexes were

[15] This part is based on the public relation materials of Daedeok Innopolis and the site of Innopolis Foundation (www.innopolis.or.kr).

[16] Basic Construction Plan of Daedeok Science and University Town, December 1973, Ministry of Science, Republic of Korea (http://www.archives.go.kr)

established in Daegu, Busan and Gwangju, too.[17]

Table 4-3. Brief History of Daedeok Science and Research Park

1968.12	Comprehensive Master Plan of Science and Technology (1967-1986)
1973.1	Plans finalized for Daedeok Science Park and University Town
1973.11	Designate the Education and Research Zones by the Ministry of Construction
1974	Construction begins
1975	Ground-breaking of Korea Research Institute of Standards and Science (KRISS)
1978	Relocation of government-funded research institutes (KRISS first moved to Daedeok Science Town)
2005	the Daedeok Science Town Special Zone has been renamed as Daedeok Innopolis

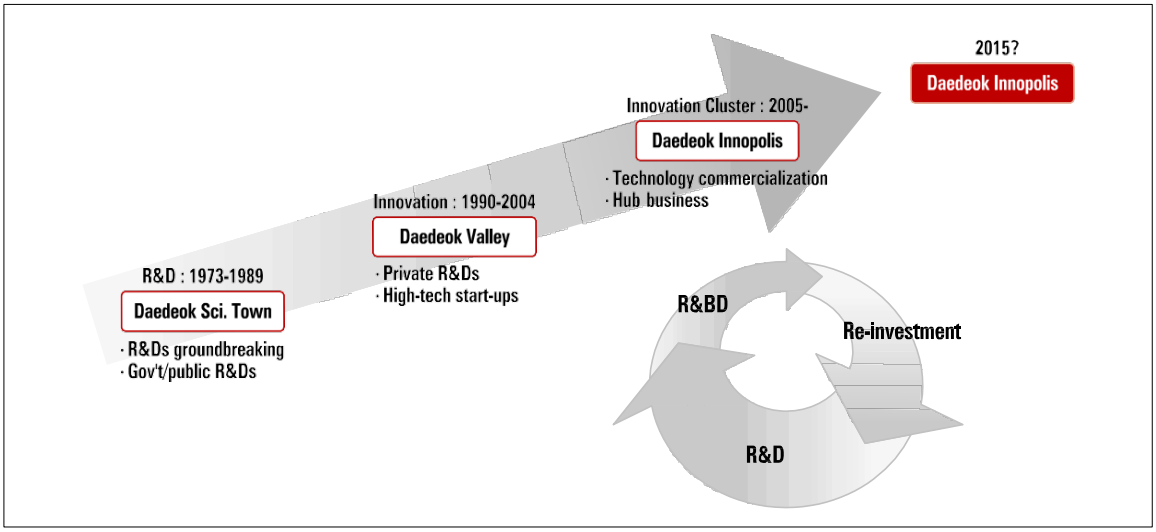
Table 4-4. Daedeok Innopolis Total Area (70.4km^2)

Zone I (27.8 km^2)	**Daedeok Science Town**, the original science and research park planned in 1968. Government-funded and private research institutes including ETRI with a high concentration of research institutes, comprising the Venture Cooperation Complex and universities including KAIST
Zone II (4.3 km^2)	Daedeok Techno Valley Base of research and production for high-tech industries in Daedeok Science Town
Zone III (3.2 km^2)	Daedeok Industrial Complex Representative industrial base of Daedeok Innopolis
Zone IV (31.2 km^2)	Northern Green Belt Northern area on the outskirts of Daedeok Science Town (marked for future development)
Zone V (3.9 km^2)	Agency for Defense Development is located here

There are three distinct processes in the development of Daedeok Innopolis, such as (i) science park at initial stage, (ii) technopolis at middle stage and (iii) innovation cluster at mature stage. The changing main functions of Daedeok (R&D, Business, Management and Infrastructure) have changed as Daedeok Science Town developed into a technopolis and then to an innovation cluster.

[17] D.S. Oh (2014), "Sustainable Development of Technopolis: Case Study of Daedeok Science Town/Innopolis in Korea," *Technopolis: Best Practices for Science and Technology Cities,* D.S. Oh and F. Phillips (eds) Springer-Verlag London 2014, p. 91.

Figure 4-1. Evolution of Daedeok Science Park



Source: https://www.innopolis.or.kr/eng/

(i) The Initial Stage: Science Park Model

At the initial stage, Daedeok Science Town (DST) in 1973 was the sole science town in Republic of Korea which had been developed as a mecca of science and technology with a strong research workforce. DST was intentionally created as an engine of enhancing national competitiveness in high technology and economic prosperity through the agglomeration of research institutes bringing together many national and regional development policy efforts over the last 40 years.

The master plan represented a concrete attempt by central government to create a science city outside the capital region. The dominant role of the government is particularly evident in the initial stages of DST development, as DST was established by a central government initiative; local authorities were excluded from the initial planning of the science city program particularly that of DST.

In the early 1990s, completing construction of DST became a high priority, there was a change in the expectations of the role of DST due to the changing economic and social climate. DST was envisaged to change its role from pure scientific research to applied research and development that is directly applicable to commercialization.[18]

[18] Seo, Junseok "Creating Start-ups through Technology Transfer in Science Technology Park: A Case Study of Daedeok Innopolis," WTR 2013;2:21-37

The development feature of Daedeok Science Town at the initial stage shows us the model of a science park. As a national hub for development of science and technology, the main objectives in the initial stage of the Science Park are: (i) constructing infrastructure of the science park that also includes zoning and city planning (Regulating green areas, building-to- land ratio, floor space index, and etc.), (ii) managing and operating the Science Park and (iii) constructing institutional infrastructure to regulate environmental pollution, to activate business and R&D activities, and to enhance the convenience of residents should be established.

In this stage, education and research were led by research centered higher education institutes that provided improved training of experts in basic science, while public research institutes, mostly government-funded, focused on conducting national R&D projects and constructing national R&D infrastructure.

Private R&D institutes (or centers) formed a hierarchical relationship with their parent firms and concentrated on R&D related to their business. In this stage, the commercial potential of R&D results in basic science or engineering from research centered higher education institutes promoted the construction of the Science Park: Also, business incubation centers and technology exchange centers were built both in higher education institutes and R&D institutes to support technology commercialization.

Since the Science Park was initially built as a national science and technology town, business activities were not recognized in the initial stage. Legal structures or institutes that manage business facilities did not exist in this stage.

The function of Science Park Management Office includes designing the Science Park, selecting occupying institutes of the Science Park, and other management functions. Education, research, and residential facilities were harmonized with each other in the Daedeok Science Town.

Table 4-5. Functional features of Science Park Model

Function	Main Features	Key Role
R&D	HEIs that lead advanced science technology R&D. Government affiliated research institutes : In order to increase national science and technology capacity, major R&D projects were supported by the government. (government affiliated institutes)	HEIs, National R&D Center
Business	Firms that originated from research institutes in advanced science fields. Venture firms that originated from labs in HEIs or research institutes (research centered HEIs).	Spin-offs of R&D labs
Infrastructure	Management departments in HEIs or research institutes. A special management institute, which is established by the central government, managed and operated the Science Park. → An independent management institute is established. The Science Park should be managed, designed, and developed by the central government.	Administration and Management of on science park development

Source: Oh (2008)

(ii) The Middle Stage: Techno Polis model

The techno polis model, a total system for innovation and technology commercialization, represents the middle stage of Daedeok, because both higher education and research institutes actively supported business incubation activities, such as containing legal support and constructing infrastructure (business incubation center, and etc.). For this, co-operation between the Science Park and the local government became important for collaborative activities. As R&D capacity of the Science Park was enhanced, industrial areas were expanded next to the Science Park. As various infrastructures were expanded in the Science Park, a legal structure to efficiently manage and operate the infrastructures was established.[19]

The roles of higher education institutes became more important in this stage. All the institutes conducted technology commercialization and collaborative research with firms, research institutes, and other higher education institutes. As higher education institutes and firms' R&D activities

[19] Sam Ock PARK et Yangmi KOO, "Innovation-driven cluster development strategies in Korea," European Journal of Industrial Economics and Policy, No. 5, 2012.

increased and expanded public research institutes' functions increased and expanded too by supporting the creation of venture firms. The government affiliated research institutes conducted national R&D projects and collaborative R&D projects.

A system to utilize research results from research and higher education institutes in order to support potential entrepreneurs and venture firms was necessary. As the number of venture firms increased, an integrated support system for venture firms was established such as customized business incubation, specialized collaborative networks, venture communities, venture capital programs in order to support venture firms efficiently and flexibly.

The management and operation services should include education programs which are developed by public institutes, financial aid for venture firms, marketing services, institutional support, various equipment, facilities, and etc.

Also in this stage, access to quality life was also enhanced as the transportation system, land-use, and amenities improved. The cultural and social integration of researchers, staffs and their families with local residents was emphasized to make best use of the local infrastructure.

Table 4-6. Functional features of Techno polis Model

Function	Main Features	Key Role
R&D	Active collaborative research programs among industries, HEIs, and research institutes Enhancing local R&D support capacity.	Collaboration among firms, HEIs, and research institutes
Business	Various business incubation centers were promoted by active technology commercialization and sound entrepreneurship. Venture activities and technology commercialization activities of venture firms or middle sized firms are supported by local governments.	Various business incubation centers
Management & Infrastructure	A multi-functional office takes job to cope with the expansion of the Science Park. To control the surrounding area of the Science Park, the institute collaborated with the local government to connect the activities of the Science Park with local innovation. The role of the local government was expanded to develop venture firm areas, establish various support institutes and etc. for local economic prosperity, to encourage private firm investment and participation.	Local government's support in business activities, R&D activities, management activities/Multi-functional management institute

Source: Oh (2008).

(iii) The Mature Stage: Innovation Cluster Model

At the mature stage of development, Daedeok Innopolis takes innovation cluster model: a center of business excellence on high-tech industry. In order to establish an innovative cluster, the collaborative system among firms, higher educational institutes, and research institutes are enhanced. Regional innovation cluster of national or local strategic industries are created in Daedeok Innopolis.

A specialized science and technology network is established to maximize innovation of science and technology. At the end, global marketing strategies and efforts were enhanced to attract foreign institutes and foreign investment into the Science Park.

At this stage, it is important to create clusters of related institutes to promote the growth of strategic industries, along with providing financial support to the specific technology-oriented venture firms.

Table 4-7. Functional features of Techno polis Model

Function	Main Features	Key Role
R&D	Active collaborative research programs among industries, HEIs, and research institutes Enhancing local R&D support capacity.	Collaboration among firms, HEIs, and research institutes
Business	Various business incubation centers were promoted by active technology commercialization and sound entrepreneurship. Venture activities and technology commercialization activities of venture firms or middle sized firms are supported by local governments.	Various business incubation centers
Management & Infrastructure	A multi-functional office takes job to cope with the expansion of the Science Park. To control the surrounding area of the Science Park, the institute collaborated with the local government to connect the activities of the Science Park with local innovation. The role of the local government was expanded to develop venture firm areas, establish various support institutes and etc. for local economic prosperity, to encourage private firm investment and participation.	Local government's support in business activities, R&D active-ties, management activities/ Multi-functional management institute

Source: Oh (2008).

(2) Limitation of the Daedeok Science Town (Daedeok Innopolis)

Despite the success of Daedeok Innopolis, there has been a criticism that the private participation was very limited in the initial stage of the Daedeok Science Town. Each research institute was initially allotted its own land enclosed by gates and fences, which later in the 1990s and on became a barrier in nurturing commercialization activity and leveraging research capacity of the town.[20] Even though today's Daedeok Innopolis (DI), has made the meaningful performance as a science technology park, it has not contributed to improving the regional innovative system.[21]

Three problems have been identified by the experts in order to enhance the regional innovative system through Daedeok Science Town: (i) Lack of local government initiative, (ii) lack of private participation and (iii) lack of interactions among government research institutes.

(3) The Role of The Development of Daedeok Science Town

Two facts of Daedeok Science Town's development deserve attention: (1) the growth of the site itself and (2) the links with the universities and the industrial estates, impacting on regional developments.

(iv) Growth of Daedeok Science Town

Before designation as the national science town by the government in 1973, the area was farming land. The initial area of development was limited to the academic and research area which was 1,078 acres, only 16% of today's Daedeok. Five government research institutes and three R&D centers from private firms, as well as Chungnam National University, were operating in this area by 1979.

In 1981 the master plan was changed and 38.5% of the Daedeok Science Town site was designated as a research and education area so that research facilities could be established there. This research and education area was again increased to 3,202 acres in 1985, 46.6% of the whole site. This

[20] The San Diego cluster in the United States is almost seamlessly linked by its landscape, research institutes and biotechnology companies share the entire land together rather than building their own fences. The coexistence of industries with academia was the result of effort to create a campus like environment, which would be attractive to talent and enterprises.

[21] Sang-Tae Kim and Gi-Don An, "A Comparison of Daedeok Innopolis Cluster with the San Diego Biotechnology Cluster," WTR, 2012

prompted central government to actively relocate government research facilities to Daedeok Science Town. These included 12 research institutes, three central government administrative offices and the Korea Institute of Science and Technology (KAIST). The relocation of KAIST has had an important symbolic function in reinforcing the image of DST as the center of high-technology development in Korea.

Another major government policy was the relocation of the third administrative headquarters of central government to Dunsan New Town next to Daedeok Science Town, which eliminated the skepticism of the private sector on the success of Daedeok Science Town. Most private firms began to construct their research facilities from 1990 onward.

Daedeok Science Town is also the site of a new town project within its area. Undertaken by the Korean Land Development Agency, this began in 1974 and involves 3,842 acres including the housing estate in DST and the surrounding area.44 1,653 acres (43%) of its area had been fully developed by 1985.

Table 4-8. Growth of R&D centers and related institutions in DST: number of centers (and their employees)

R&D centers and related institutions	1979	1985	1990	1992
Government or public institutes	5 (3,879)	3 (2,350)	11 (791)	5 (2,685)
Private institutes	3 (719)		5 (713)	26 (5,155)
Branch offices of government			3 (244)	2 (91)
University and colleges	1 (1,146)	(11)	1 (827)	
Total	**9 (5,744)**	**4 (2,361)**	**20(2,575)**	**33(7,931)**

Source: Oh, D.S. et al. (1992)
*Number of centers then under construction or planned.
*Figures in parentheses are the number of employees.

(v) University links and their role in development[22]

Two national universities and one private college are located within the area. The concentration of high-level educational institutions in Daedeok means that the site has access to the important

[22] Deog-Seong Oh and Insup Yeom, "Daedeok Innopolis in Korea: From Science Park to Innovation Cluster," WTR 2012:1, pp.141-154

resource of highly skilled scientific and technical personnel. They play a pivotal role in cultivating a highly specialized workforce, as well as pursuing the close linkage between research and education.

The two universities in Daedeok played different roles. Chungnam National University will act as an intermediary between the research centers in DST and the industries in Taejon, while Korea Advanced Institute of Science and Technology (KAIST) focuses on research activities and has closer linkages with the research centers in Daedeok as well as those in the whole country.

Chungnam National University was relocated at the initial stage of development of Daedeok Science Town from the inner city of Taejon. KAIST was established at the end of the 1960s in Seoul with three major objectives: (i) encouraging scientific intellectuals to lead R&D activities in technology, (ii) educating students who are gifted in science and (iii) promoting R&D activities through collaboration between university and research institutes. It was relocated to Daedeok in 1990 based on central government's initiative to promote Daedeok Science Town as the nation’s center of high-technology. Most of the R&D centers of private firms, which have been or will be located in DST, are expected to gain from these direct and functional links with KAIST.

The location of KAIST has been evaluated by the incoming private firms as the most crucial locational factor, and recruitment of graduates from the university is one of the main considerations in their decision to settle in the area. In 1992, KAIST planned a business incubator and acquired land for it. The incubator, which is legally part of KAIST, aims to accelerate technology transfer between academic and research institutions and private firms. It is expected that technology entrepreneurs from KAIST or R&D centers in DST, will mature to the point where they can graduate from the incubator and continue their development as viable enterprises. Although it is only at the planning stage, the KAIST incubator is a very interesting example of university efforts to promote technology transfer and spin-offs from the university.[23]

[23] Deog-Seong Oh, “High-Technology and Regional Development Policy: An Evaluation of Korea's Technopolis Programme,” HABITAT INTL. Vol. 19, No. 3, pp. 253-267, 1995 Elsevier Science Ltd

(4) International Cooperation of Today's Daedeok Science and Technology Park

The K-STP (Science and Technology Park) models have increasingly been used as benchmarks by many nations that want to push economic and social development as Korea has done.[24]

As of today, the Ministry of Science has been offering consultations on scientific models to Ecuador, Kazakhstan and Kuwait. The Korean science ministry said that it will cooperate with Peru and share its science- and technology-oriented model, and solidify the foundation for economic and social development. Also, it plans to share Korea's experiences with science- and technology-centered economic development, and raise global awareness about Korea's innovative clusters which can possibly be linked to business opportunities with corporations and public research centers across Central and South America.

Table 4-9. Daedeok Innopolis today (Resident Institutions by Areas in 2009)

	District I	District II	District III	District IV	Total
Enterprises	365	363	277	1	1,006
Educational institutions	5	0	0	0	5
Government-sponsored institutions	28	0	0	1	29
Government agencies	13	1	0	0	14
Public institutions	8	0	0	0	8
Other non-profit institutions	20	4	3	0	27
Total	**439**	**368**	**280**	**2**	**1,089**

Source: Statistics report of Daedeok Innopolis in 2011, the Innopolis Foundation

2) Benchmark: Saigon Hi-Tech Park in Vietnam[25]

Saigon Hi-Tech Park is one of Vietnam's two national hi-tech parks and considered one of Ho Chi Minh City's five focal economic projects serving as the driving force for the city's development. Saigon Hi-Tech Park has received exceptional support from both the central and local governments, as well as

[24] http://www.korea.net/NewsFocus/policies/view?articleId=127091
[25] https://heeap.org/partners/saigon-hi-tech-park-shtp

from other relevant state agencies. As a result, the Park has been authorized to offer the highest tax incentives and one-stop investment application service to investors.

After 11 years of development, as one of the only three national hi-tech parks and one of Ho Chi Minh City's five focal projects serving as the driving force for the city's development until 2015, Saigon Hi-Tech Park (SHTP) has become a trustworthy destination for hi-tech investment in Vietnam.

Towards 2020, SHTP is to be a technopolis playing an important role of strongly enhancing the technological and intellectual base of Ho Chi Minh City (HCMC) and the Focal Economic Region of Southern Vietnam, and serving as a Vietnam's model of technological innovation, intellectual capital development and innovation economy.

- Location: 15km from downtown Ho Chi Minh City, opposite to Vietnam National University, Ho Chi Min City along the Hanoi Hiway and on the future line 1 of the HCMC metro (2014).
- Size: 326 ha (95% utilized) and is currently being expanded to 913 ha.
- The new phase is focusing on education, bio-technology, start-up incubators, training centers, software, R&D, telecom.
- Incentives: High-tech investors are given preferential treatments with land leases and taxation, as well as support for customs services.

3) Benchmark: Software Technology Parks of India, Bangalore [26]

The first Computer Policy of 1984 and Software Policy of 1986 emphasized the concept of software development and export through data communication links. This policy's objective was to develop software in India using Indian expertise on sophisticated computers, which were being imported duty free. This way, one could make use of the low cost expertise available in India and avoid the expense of time and cost in traveling abroad.

STPI's role began in the government's shadow and it was more of an entrepreneurial role of working directly with software companies and working like a corporate. However, this did not mean that STPI functioned like a typical government department. The role of STPI was more of a service provider that

[26] http://blr.stpi.in/background/beginning.html

could be leveraged by software companies.

The concept of STP Scheme was evolved in 1991 and enunciated the following objectives:

- To establish and manage infrastructure resources such as Data Communication facilities, Core Computer facilities, Built-up space and other common amenities.
- To provide 'single window' statutory services such as Project approvals, import certification software valuation and certification of exports for software exporters.
- To promote development and export of software services through technology assessments, market analyses, market segmentation and marketing support.
- To train professionals and to encourage design and development in the field of software technology and software engineering.

STPI has played a seminal role in earning India’s reputation of an IT superpower today. STPI was established in 1991 by the Indian government.

- To promote the development and export of software and software services including ITeS/Bio-IT
- To provide data communication services including value added services to IT/ITeS related industries.
- To promote micro, small and medium entrepreneurs by creating conducive environment for entrepreneurship in the field of IT/ITeS.
- To provide statutory and other promotional services to the exporters
- Software in Bangalore, India
- STPI maintains internal engineering resources to provide consulting, training and implementation services.
- Services cover network design, system integration, installation, operations and maintenance of application networks and facilities in varied areas
    - 100% foreign equity, tax incentives, duty-free import, duty-free indigenous procurement, CST reimbursement, DTA entitlement, and deemed exporting.
- STPI centers also provide a variety of services including
    - high-speed data communication,
    - incubation facilities,
    - consultancy,
    - network monitoring,
    - data centers and data hosting.

- STPI provides physical hosting for the *National Internet Exchange of India.*
- STPI now has a presence in many of the major cities of India

The STP scheme is a 100 percent export oriented scheme for the development and export of computer software, including export of professional services using communication links or physical media. This scheme is unique in its nature as it focuses on one product/sector, i.e. computer software. The scheme integrates the government concept of 100 percent Export Oriented Units (EOUs) and Export Processing Zones (EPZs) and the concept of Science Parks/Technology Parks, as operating elsewhere in the world.

In fact, countries like Mauritius, Sri Lanka, Nepal, Algeria, Indonesia, etc. are taking the help of STPI to set up similar technology parks with the same concept.

(1) The Clustering Effect of STPI [27]

Among STPI Centers in 52 locations, the major Industry concentration is at Bengaluru, Noida, Chennai, Hyderabad and Pune, reflecting the technology clustering effect similar to other technology clusters like Silicon Valley, Boston, Dallas, Ireland, Sweden and Tokyo.

(i) First Phase

In 1991-92, there were very few Indian companies who were doing software exports from India. Those exporting software included few multinational companies like Texas Instruments, Hewlett Packard, and Digital. One could term this as the first phase of the developmental process.

(i) Second Phase

: In the second phase of the developmental process, the concept of the "Offshore Development Work" took birth. This second phase of the development, which started in 1993, took India, in fact Bengaluru in particular, to greater heights by 1998-99. By the end of March 2001, the Industry has grown to US $ 5.7 billion in software exports with 380 multinational companies establishing base in India with the largest concentration of the technology services. All the Global Leaders in Hi-Tech areas like IC Design,

[27] http://www.mah.stpi.in/clustereffect.html

Communication Software and System Software have setup a base for their operations in India.

(iii) Third Phase

The success of the 2nd phase paved the path for the third phase of development to take place. The third phase of development led to very close and intimate relations with the Silicon Valley start-up companies. In fact, every small Hi-Technology Start-up Company in Silicon Valley valuated at millions of dollars in US market, started establishing their development Centers in Bengaluru.

(iv) Fourth Phase

During the fourth phase of the development many Indian companies started owning the intellectual property within India and earning the royalty from the global players.

(2) Key Success Factors of India' Software Industry

Despite the lack of hardware related IT industry in India, India boasts of its remarkable global competitive in the software related IT industry. With GDP per capita of $1,805 in 2015 and low level of social infrastructure development, India is expected to grow at a higher rate in the coming years. Behind its economic growth potential, the software industry is positioned as the core of India's economic growth engine.

The Indian software industry has a pyramidal structure, with a few large indigenous firms dominating the sector. Among the 3,000 firms exporting software from India, the three largest firms each have more than $1 billion in annual sales. At the other extreme, the smallest 2,900 firms have annual sales of less than $10 million, with most less than $2 million. The largest five firms account for 32 percent of software exports, while the smallest firms own a 14 percent share. Smaller firms play a more significant role in the domestic market where they supply software services to small and medium sized domestic firms in different sectors.[28]

The basis for the Indian software industry's growth actually goes back decades, to the formative years

[28] Ashish Arora , "IT and regional development: lessons from the growth of the software industry in India, Ireland, Israel, Brazil and China," Working Paper No. 60, London School of Economics and Political Science, LSE, UK. 2008

when Indian engineering and scientific talent was first developed in national and educational and research institutions. From those early roots, at least three types of firms have emerged: the local offshore development centers," which serviced US multinationals' needs; the multinationals' own development centers; and small startup companies.

India's remarkable success of its software industry has been regarded as the results of the role of government investment in technical education, facilitating role of government policies, and the role of industry association in promoting the Indian software brands abroad and lobbying for favorite policies.[29] Some key government policies facilitating the development of the software industry in India are Key Policies of Software Industry Promotion in India include (i) duty exemption of software imports, (ii) tax exemption on income by exporting software, (iii) simplified license procedures of software-related foreign direct investment and (iv) build infrastructure like software techno park (STP).[30]

Different view on the success of the selected regions in India points out four critical factors: (i) availability of adequate skilled labor and specialized infrastructure, (ii) pro-employer labor and policy reforms, (iii) ethnic linkages of immigrant professionals abroad who returned to establish firms in their native states, and (iv) their existing technological capabilities at the beginning of reforms. Among these four factors, the most important strategy was to provide specialized factors of production (skilled labor and infrastructure) for the industry.[31]

- India has long had a strong mathematical and logical/analytical tradition, and the supply of mathematically trained graduates, as well as engineers, was initially a valuable stimulus to the industry.
- Certain policy interventions (e.g., infrastructure, educational policy, STPIs, etc.) and entrepreneurship were also necessary ingredients in some instances of success, although many would argue that the software industry initially grew in spite of the Government and its restrictions, especially during the early protectionist periods. More recently, venture

[29] Bhatnagar, Subhash, 'India's Software Industry', Technology, Adaptation, and Exports: How Some Developing Countries Got It Right, Vandana Chandra (Ed.), World Bank, 2006, Pp. 95-124.

[30] NASSCOM, 2000.

[31] Rajendra Kumar, THE DEVELOPMENT OF THE SOFTWARE INDUSTRY IN POSTREFORM INDIA: COMPARATIVE REGIONAL EXPERIENCES IN TAMIL NADU, ANDHRA PRADESH, AND KERALA, Cambria Press, New York, 2009

capital has been necessary to stimulate further growth, particularly of startups

- India's connection to its overseas Indian population

(3) Software Techno Parks (STPs) in India

STPs in India play an important role as an incubator by providing low interest financing, technical assistance and market research to new startups, as well as global communication services. The Indian government promoted the software industry by establishing 20 STPs across the country, providing a package of incentives and encouraging exports of software and services.

The key to the success of the Indian software exports is the supply of trained, low cost software professionals. By the late 1980s, India was graduating approximately 150,000 English-speaking engineers and science graduates, with only a limited demand for their services from the rest of the economy. Most of the leading firms recruit either engineers or students with degrees in mathematics or science. Many also have in-house testing and training programs. [32]

Responding quickly to the growing demand, a number of Indian firms arose in quick time. The government encouraged this growth by considerably simplifying the process for obtaining the numerous clearances and permits that any firm in the organized sector in India typically needs. Finally, given the many weaknesses in the Indian financial system, Indian entrepreneurs greatly benefited from the low levels of initial investment required to start a software services firm.

(4) Characteristics of the Indian Software Industry

The most obvious one is its export orientation, accounting for 65% of the total software revenue. Over 80% of exports are software services including custom software development, consultancy and professional services.

The early phase was also marked by the creation of a number of companies, such as the Computer

[32] Uma S. Kambhampati, "The software industry and development: the case of India," Progress in Development, January 2002 2: 23-45, Sage Publications

Maintenance Corporation (CMC) (1978), Tata Consultancy Systems (TCS) (1968) and Hindustan Computers Limited (HCL) (1976) (Evans, 1995; Heeks, 1996). This phase of India's development was also attended by the arrival of international high-tech companies in the 1980s and 1990s (continuing even up to today). This rise in foreign investments came with reforms to improve the environment for foreign direct investments, specifically, the creation of special software technology park zones (managed by Software Technology Parks of India [STPIs]).

Indian firms usually provide low-level design, coding and some types of testing services for export. For domestic clients the industry provides a wider range of services that usually spans the entire lifecycle of software development. In particular, some of the domestic projects are much larger and more challenging than export projects, with the screen based trading system for the Bombay Stock Exchange and the Reservation System for Railways, both by executed by CMC, an experienced public sector firm, being two recent examples.

Even in technology-based industries, technology may not be the only means of entering the industry value chain, as the Indian case makes very clear. Despite being technically not very sophisticated, the Indian software industry has grown even as wages have increased year on year. Instead of moving aggressively into product design, Indian firms focused on taking on lower end functions such as maintenance and support. Based on the Indian case, Arora(2008) recommended that moving up the value chain can be accomplished in a variety of ways; moving up the technology chain is not the only way, nor always the best.[33]

Based on a comparative analysis of India, China, Israel, Ireland and Brazil, it has been identified that the Indian software industry is widely admired for its rapid growth over the last two decades, based on the sizeable investments in human capital, relative to their internal needs, and a diaspora of engineers in the United States (and to a lesser extent in Great Britain).

[33] Ashish Arora , "IT and regional development: lessons from the growth of the software industry in India, Ireland, Israel, Brazil and China," Working Paper No. 60, London School of Economics and Political Science, LSE, UK. 2008

4) Benchmark: Bandung Techno Park, Indonesia [34]

The establishment of Bandung Techno Park is the realization of the dream of IT Telkom academic community of wanting to develop Teknopark as a bridge between the ICT sector and educational institution in the world of energy industry. IT Telkom as one of the institutions of higher education in the field of Information Technology and the National Telecommunication has the ability and the Human Resources that are sufficient to develop applied research that can be utilized by the public.

Since the beginning of 2007, Telkom Institute of Technology is trusted by the Ministry of Industry to develop UPT Telematics in order to grow and develop Small and Medium Enterprises (SMEs) in the field of ICT (Information and Telecommunications). Since 2007 until now, the Ministry of Industry provides a number of modern devices, while the UPT activities are supported by Disperindag Jabar Telematics. Activities that have been conducted are trainings in ICT in order to foster SMEs, with the purpose to lifting the National Industry. Since 2009, Telkom Institute of Technology is also trusted by the Ministry of Industry to develop Telecommunication Design Center (PDT). PDT was inaugurated by the Minister of Industry on January 12, 2010. On January 12, 2010, it will also be conducted cornerstone-laying of Bandung Techno Park in the campus environment of Telkom Institute of Technology.

Both of these institutions are the forerunners of Teknopark with the name of Bandung Techno Park which was inaugurated by the Minister of Industry on January 19, 2010. In 2009 the Ministry of National Education entrusted the development of Business Incubator to Bandung Techno Park.

Along the way and the need for a greater role of Bandung Techno Park as well as a variety of considerations, starting in November 2011 Bandung Techno Park management was separated from IT Telkom. Therefore, Bandung Techno Park is expected to provide more real and more extensive role for the public in West Java or even the nation.

- Mission
    - Increasing cooperation among academic, business, government in ICT development

[34] http://bandungtechnopark.com/profile/?lang=en

which includes: infrastructure, applications, content, context and regulation
- Driving the development of economy and culture based on knowledge and technology
- Creating independent and competitive ICT resources
- Cultivate people who are able to utilizing ICT in enhancing welfare
- Creating technopreunership in society

Telkom University was formed out of a merger of four higher education institutions under Telkom Education Foundation. Telkom University was officially founded on July 17th, 2013,

- Telkom Institute of Technology (IT Telkom), Telkom Institute of Management (IM Telkom), and Telkom Polytechnic and Telkom School of Art and Design (STISI Telkom)

5) Benchmark Cases in the developed countries

(1) The Science and Technology Park Berlin-Adlershof in Germany [35]

The Science and Technology Park Berlin-Adlershof is Germany's largest science and technology park and one of the most successful high technology locations.

Ten non-university research institutes, six institutes from the Humboldt-Universität zu Berlin and 1,000 companies are located in the area with the size of 4.7 square kilometers. The scientific facilities and companies in the technology park generated a turnover of 679 million euros in 2013 – 6.4% above the previous year.

(i) Location:

- Southeast Berlin;
- Very close to Berlin Brandenburg Airport BER.
- Focal areas:
- Innovation and Business Incubation Center Berlin (Innovations- und GründerZentrum Berlin-Adlershof - IGZ)
- International Start-Up Center (Internationales Gründerzentrum Berlin-Adlershof - OWZ) Media Technology Center (Medientechnologiezentrum - MTZ)
- Center for Photonics and Optics (Zentrum für Photonik und Optik)

[35] http://www.businesslocationcenter.de/en/business-location/commercial-real-estate/technology-sites-and-other-sites-of-the-future/technology-centers-and-business-incubators/the-science-and-technology-park-berlin-adlershof

- Center for Microsystems and Materials (Zentrum für Mikrosysteme und Materialien)
- Center for IT and Media (Zentrum für IT und Medien)
- Center for Biotechnology and Environment (Zentrum für Biotechnologie und Umwelt)
- Center for Solar Cell Systems (Zentrum für Photovoltaik).

(ii) Infrastructure and services:

- Chemistry, biology and physics laboratories, cleanrooms, workshops and offices available in the Technology Centers;
- The Innovation and Business Incubation Center (Innovations- und Gründerzentrum - IGZ) and the International Start-Up Center (Internationales Gründerzentrum - OWZ) offering Start-up-Services;
- Joint project development, active involvement in professional networks;
- National / international collaborations;
- Event, trade fair and visitor service.

(iii) Environment:

- 1,000 companies and 16 scientific institutions;
- About 15,000 employees and more than 8,400 students;
- Science and technology park with roughly 500 technology-focused companies, 6 natural science institutes from the Humboldt Universität zu Berlin and 10 non-university research institutes;
- Media City (Medienstadt) with about 146 companies;
- Over 360 businesses, shops, hotels and restaurants in the immediate vicinity;
- Room for further growth;
- 66 hectares of landscape park space.

(2) Research Triangle Park in the U.S.[36]

The **Research Triangle Park** (**RTP**) is one of the largest research parks in the world. It is named for the three hub cities of Durham, Raleigh and Chapel Hill, or more properly for the three major research

[36] http://www.intlexposurescience.org/ISES2017/

universities in those three cities (Duke University, NC State University, and the University of North Carolina at Chapel Hill respectively).

RTP is one of the most prominent high-tech research and development parks in the United States. It was the park was developed by the Research Triangle Foundation in 1959 with the initiatives of state and local governments, nearby universities, and local business interests.

The park covers 7,000 acres (2,833 ha) situated in a pine forest with 22,500,000 square feet (2,090,318 m^2) of built space. The park is traversed by Interstate 40, the Durham Freeway and NC 540. It is managed by the Research Triangle Foundation, a private non-profit organization.

The park now includes over 200 companies employing 50,000 full-time workers and 10,000 contractors. It is home to the second largest IBM operation in the world, smaller only than the one in India; the company has around 14,000 employees in RTP. The park hosts one of GlaxoSmithKline's largest R&D centers with approximately 5,000 employees. Cisco Systems' campus in RTP, with approximately 5,000 employees, is the second highest concentration of its employees outside of its Silicon Valley corporate headquarters.

(3) AREA Science Park of Trieste, Italy

- the leading Science and Technology Park in Italy with multidisciplinary features and facilities located in Trieste and in technoAREA Gorizia (the branch-technology pole in Gorizia)[37]
- managed by the Consorzio per l'AREA di Ricerca Scientifica e Tecnologica (*Consortium AREA*), a public research organization of the Italian Ministry of University and Research set up in 1978, with 168 highly specialized staff (63% graduate or PhD)… … and with a high self-financing capacity (total revenues: 28 MEuro - 70% from Regional, National, EU projects and services to SMEs)
- two extended campuses (55 hectares) in Padriciano and Basovizza on the hills surrounding Trieste in the Region Friuli Venezia Giulia, plus one campus in Gorizia
- state of the art facilities (90,000 m^2), world-class infrastructures and instrumentation
- 86 R&D organizations:17 PROs, 69 industrial R&D centers and knowledge-intensive

[37] http://www.ita-slo.eu/progetti/ricerca_dei_partner/2011012422065276/

companies

- 2,450 qualified persons: researchers, technicians, managers, entrepreneurs and service staff

(4) University of Iowa Research Park in the U.S. [38]

As well as leasing land and buildings, the Research Park is home to a world class ***business incubator program*** that has nurtured nearly 100 UI spinouts and other new ventures since its start in 1984.

(i) Location:

- The Research Park is located on Coral Ridge Avenue/Highway 965 near interstates 80 and 380 and U.S. Highways 1, 6, and 218.
- The Park is in the fast-growing community of Coralville
- about 10 minutes from the main UI campus in Iowa City
- within 15 minutes to airport

(ii) University of Iowa STEM Initiatives:

- Kirkwood Regional Center
- the 100,000-square-foot Kirkwood Regional Center at the University of Iowa will open in the UI Research Park
- the result of a unique collaboration involving Kirkwood Community College, the University of Iowa, and school districts in and around Iowa City.

The UI's involvement with the center presents unique opportunities for collaboration, mentoring, research, career preparation, and the development of innovative teaching/learning ecosystems and career pathways across the STEM disciplines for K-12, community college, and university students and educators.

- A regional center paired with a university.
- The Univerisity of Iowa can provide students with rich opportunities to learn from and work with researchers using cutting-edge tools and systems like the National Advanced Driving Simulator, located next door to the center.

[38] https://researchpark.uiowa.edu

- Businesses to identify potential interns and future employees; and students to accelerate their academic and professional careers while saving money.
- The center will be positioned to more effectively promote and support careers in Science, Technology, Engineering and Math (STEM) fields, enriching the experience for students pursuing technical jobs as well as for those who choose to pursue advanced degrees and research.
- The center's unique approach to combining learning and experience and helping students succeed from "cradle to career" promise to make it a national model.

(4)-1. Business incubation

- amenities and facilities to support new business ventures
- Offers office and wet lab space
  - offices and suits for lease
  - board and conference rooms equipped for advanced presentations
  - Shared equipments space
  - a nurturing business environment to new technology-based ventures
- Support from the University, State, City of Coralville and private sector

(4)-2. Amenities

Incubator tenant companies draw on the vast research and business resources of The University of Iowa, a dynamic regional business community and supportive local and state governments.

Services include

- access to UI Libraries, access to UI stores and core facilities and vendor discounts
- Hazardous waste management services
- Shared Copier/fax machine
- Educational seminars
- Networking opportunities
- Emergency backup generator
- Shipping/receiving area and mail/package handling
- Daycare services just offsite
- Paved bicycle/hiking trail throughout park
- Nearby dining, hotels, conference facilities, shopping, recreation and fitness

(5) The University of Hawai‘i at Hilo Research Park[39]

The University of Hawai‘i at Hilo Research Park contains many high tech and informational facilities.

- Caltech Submillimeter Observatory Facility
- Federal USDA: Institute for Pacific Island Forestry (IPIF)
- Gemini Observatory
- ‘Imiloa Astronomy Center of Hawai‘i
- Institute for Astronomy (IFA)
- Komohana Agricultural Complex:

The College of Tropical Agriculture and Human Resources (CTAHR) has 8 Research Experiment Stations and 3 Extension/ Research offices located on Hawai`i Island. The mission is to promote the success of Hawai`i's agriculture, strong and healthy communities, and sound stewardship of Hawai`i's land and natural resources through Research and Extension programs. The faculty and staff conduct educational and applied research programs to increase diversified agriculture, promote safe and healthy food products, control invasive species, enhance environmental conservation, and train adults and youths in leadership and life skills.

4. Requirement of University Research Park

As seen in the cases of U.S. University Research Parks, the existence of research-centered university is a must for a successful university research park, since the university generates a variety of innovative ideas, research outputs, and human research resources. Particularly for high-tech research park, the following groups of researchers have to be available.

(i) University with research capabilities (graduate level research)

(ii) Researchers with doctorate degrees from the advanced nations (USA, Japan, Korea, EU, Russia, etc) who will lead the research projects, manage the project and conduct the core research

[39] https://hilo.hawaii.edu/uhh/research_park/

(iii) Engineers with BS, MS to support the research project

University research parks, initiated by public Universities in the United States, are located in the land managed by the universities, so called federal endowed land or matching land by the state for higher education for science and technology.

1) Land-Grant University in the U.S. [40]

In the United States, the concept of publicly funded agricultural and technical educational institutions first rose to national attention through the efforts of Jonathan Baldwin Turner in the late 1840s. Upon passage of the federal land-grant law in 1862, Iowa was the first state legislature to accept the provisions of the Morrill Act, on September 11, 1862. Iowa subsequently designated the State Agricultural College (now Iowa State University) as the land grant college on March 29, 1864.

This law gave states public lands provided the lands be sold or used for profit and the proceeds used to establish at least one college—hence, land grant colleges—that would teach agriculture and ICT arts.

Ultimately, most land-grant colleges became large public universities that today offer a full spectrum of educational opportunities. However, some land-grant colleges are private schools, including Cornell University, the University of Delaware, and the Massachusetts Institute of Technology (MIT).

(1) Types of federal support

- federal lands to each state for the establishment of a public institution
- the funding provisions of the acts
- https://en.wikipedia.org/wiki/Land-grant_university#cite_note-4 deral funding to the states or to the land-universities[41]

Land Endowment requires the administration to manage and administer the endowed land and sometimes the details of endowed land management are set by laws if necessary. Usually the

[40] https://en.wikipedia.org/wiki/Land-grant_university#cite_note-4
[41] http://www.nap.edu/catalog/4980/colleges-of-agriculture-at-the-land-grant-universities-a-profile

consolidated revenue of utilizing the endowed land include fund collected from taxes imposed under the *Taxation (Rural Area) Act* on land, fund derived from the disposition of any of the land subdivided, fund derived from payments made to the government on account of local improvements and fund derived from the maintenance or operation of any work or service for the convenience or use of the occupants of the subdivided land.

2) University Park (University Town: 大学城) in China

Principally, after 2000, over 100 university towns have been built across China, not only in large cities such as Beijing, Shanghai and Guangzhou, but also in small cities such as Kunshan, Langfang, etc.

The distinction between the two types of university towns lies in their relation to the city or towns: in Europe universities emerged organically in locations where scholars and students gathered over time; in the US, however, large-scale settlements came after the emergence of universities.[42]

Along with the acceptance of the notion that modern education is key to the rise of economy and society, most developing countries have prioritized the development of a modern system of higher education. Countries such as China also take the construction of university town as an important tool to support high-level education and cultivate much needed high-level intellectuals.

Due to the national policy set by the Education Ministry in 2000 to sustain and bolster China's upgrading industries, almost all Chinese universities expanded their enrollment quotas. The total enrollment of universities went from just 597,000 in 1989, to 1.59 million in 1999, 3.20 million in 2002, and 5.04 million in 2005. Given that most campuses of Chinese universities are located within the old central areas of large cities, problems of overcrowding and space deficiency are severe. In Chinese universities, most students live and study within the campus. As high-density central areas could not provide the large amount of cheap land required to improve public facilities such as universities,

[42] https://en.wikipedia.org/wiki/College_town

constructing University towns therefore becomes an ideal choice.[43]

A Chinese model of higher education, Higher education hub or university cluster.

2)-1. University Town of Shenzhen (深圳大学城)

University Town of Shenzhen is a tertiary education hub or university cluster, located near Xili Lake (西丽湖) in the Nanshan District, Shenzhen, Guangdong Province, China.

There are six higher education institutions with of a total of 50,000 students located in the area:

- Graduate School at Shenzhen, Tsinghua University (清华大学深圳研究生院)
- Graduate School at Shenzhen, Peking University (北京大学深圳研究生院)
- Graduate School at Shenzhen, Harbin Institute of Technology
- (哈尔滨工业大学深圳研究生院)
- Shenzhen Institute of Advanced Integration Technology, Chinese Academy of Sciences (中国科学院深圳先进技术研究院)
- South University of Science and Technology (南方科技大学)
- Xili Campus of Shenzhen University (深圳大学西丽校区)

2)-2. Songjiang University Town or Songjiang University City (松江大学城)

Songjiang University Town is a tertiary education hub located in the outskirts of Shanghai in Songjiang District.

- established in the year 2000 and foundations built in 2005
- an area of 533 Ha (China's biggest tertiary education hub)

The following universities which have campuses in the university town:

- Shanghai International Studies University
- Donghua University
- DeTao Master Academy

[43] Zigang Li, “Speculative urbanism and the making of university towns in China: A case of Guangzhou University Town,” Habitat International. Volume 44, October 2014, Pages 422–431.

- Shanghai Institute of Visual Art
- East China University of Political Science and Law
- Shanghai University of International Business and Economics formerly Shanghai Institute of Foreign Trade
- Shanghai Lixin University of Commerce
- Shanghai University of Engineering Sciences

2)-3. Guangzhou Higher Education Mega Center (HEMC), Guangzhou University Town or Guangzhou University City (广州大学城)

Guangzhou University City is an area featured by higher education institutions that are located on Xiaoguwei Island(小谷围岛) in Panyu District, Guangzhou, China. It was opened in 2004. With an area of approximately 17.9 km^2 and millions square meters of indoor space, the complex is capable of accommodating 350 to 400 thousand people.

Table 4-10. Process of Guangzhou University City Development

Phase	University	Chinese	Est.	Type
Phase I	Sun Yat-sen University	中山大学	1924	National
	South China University of Technology	华南理工大学	1952	National
	South China Normal University	华南师范大学	1933	Provincial
	Guangdong University of Foreign Studies	广东外语外贸大学	1995	National
	Guangdong University of Technology	广东工业大学	1995	Provincial
	Guangzhou University	广州大学	2000	Provincial
	Guangzhou University of Chinese Medicine	广州中医葯大学	1956	National
	Guangdong Pharmaceutical University	广东药学院	1958	Provincial
	Xinghai Conservatory of Music	星海音乐学院	1932	Provincial
	Guangzhou Academy of Fine Arts	广州美术学院	1953	Provincial
Phase II	Jinan University	暨南大学	1906	National
	Guangzhou Medical University	广州医科大学	1958	Provincial

In phase I of the project, ten local higher education institutions set up new campuses on the Xiaoguwei island with a total capacity of 120,000 students. All (except Guangzhou University which was relocated to the Mega Center) still maintain their old campuses within the city. In the phase II, two more

universities set up campuses in Xinzao town which is located across the river on a separate site. The twelve institutions are:

3) Establishing the National University System (Case of Seoul National University in Korea)

In Cambodia, despite the Royal Universities and many private universities, there is no collegiate university comparable to higher education institutes available in most of the developed and advanced nations. Royal universities in Cambodia are more likely to be a college with very limited areas of major, and scalltered in Phnom Penh. But for most research parks led by the universities in the benchmark cases, a higher education institute with full research capabilities in science and technology, and higher level of courses are offered in management, liberal arts, arts, social science or other crucial major areas.

(1) The Origins of Korea's First National University [44]

Seoul National University (SNU) was founded on August 27, 1946 by merging ten institutions of higher education around the Seoul area. The schools which have been merged were: Gyeongseong University, Gyeongseong College of Education, Gyeongseong Women's College of Education, Gyeongseong Law College, Gyeongseong Industrial College, Gyeongseong Mining College, Gyeongseong Medical College, Suwon Agriculture College, Gyeongseong College of Economics, and Gyeongseong Dentistry College.

The origin of Seoul National University (SNU) dates back to the late 19th century when Korean Emperor Gojong established modern higher education institutions which later became part of SNU. After gaining independence from Japan in 1945, one hundred dignitaries of the National Committee on Educational Planning proposed opening a national university by making use of the Seoul University buildings. The Department of Education of the United States Army Military Government in Korea, formalized in an Ordinance to establish Seoul National University on August 22, 1946. And following the ordinance, Seoul National University opened in October 1946 with nine colleges and one graduate

[44] www.21pw.com/dictionary/Seoul-National-University_155839

school.

The Colleges included were those of the Liberal Arts and Sciences, Engineering, Agriculture, Law, Education, Commerce, Medicine, Fine Arts, and Dentistry. After the Korean war, the University soon began restoration with the goal of building a university for the nation, as the premier institution of higher education that could represent the country.

Through the administering of strict entrance exams beginning in 1955, only the most highly qualified students began to enter the University. Young and passionate professors joined the school as well, placing the school as the indisputable leader of higher education in Korea.

All Colleges and Graduate Schools except for medical schools in Yeongeon and the College of Agriculture in Suwon, moved to the current Gwanak campus in February 1975. The university was reorganized with 15 Colleges, one Graduate School, and three Specialized Schools.

The purpose of the ordinance formulated as “improved facilities for higher education will be made available to the people of Korea.

- merger of certain existing educational facilities into a reorganized Seoul National University
- recruitment of the best available teaching staff
- the elimination of inefficiencies in present operations
- to raise the academic standards of the university to the point where they are equivalent to those of leading institutions of higher learning throughout the world

(2) Relocation [45]

SNU campuses had been dispersed around Seoul and Suwon since its establishment in 1946. Centralizing them in new campus in Gwanak, southern Seoul, SNU completed its relocation in three places: main campus in Gwanak, medical campus in Yeongeon, and agricultural campus in Suwon. The relocation of campus was based on a 10-year plan to move all scattered colleges to in a new area of 5,445,000 m2 (544.5 Ha).

The major reasons of relocating Seoul National University to a new area were: (1) the Gwanak area

[45] https://www.useoul.edu/history/timeline?year=1975

was within 15 km from the central area of Seoul, (2) it supported government's long-term plan to develop southern part of Han River, and (3) it was close to the university forest and surrounded by beautiful nature

Table 4-11. Number of students in graduate programs

COLLEGE OF	1978	1979
Humanities	90	140
Social Sciences	254	380
Natural Sciences	140	300
Engineering	224	400
Public Administration	100	150
Agriculture	59	90

5. Kampong Speu: A Location for Cambodia’s University-led Research Park

1) Why Kampong Speu

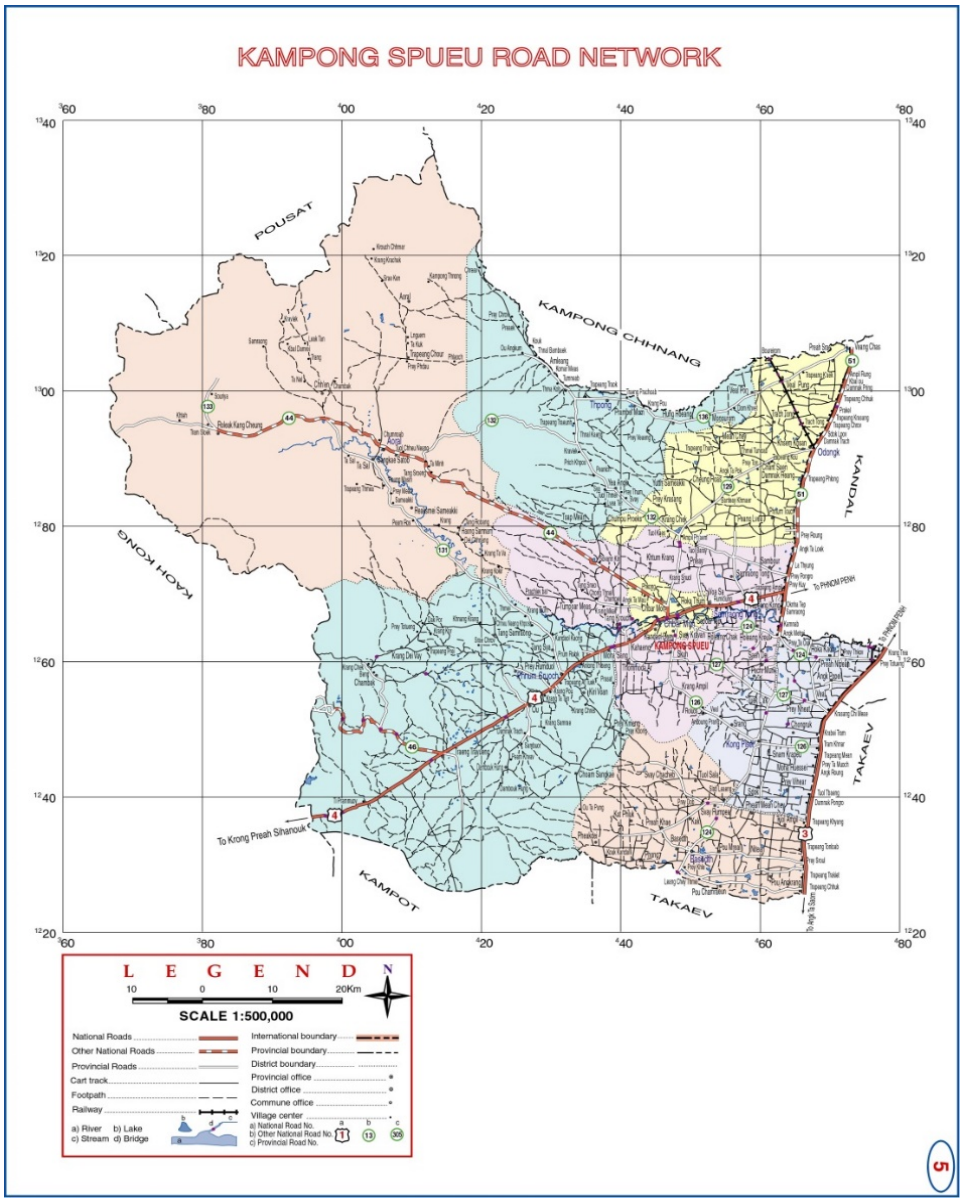
Kampong Speu, west of Phnom Penh and almost on the capital's doorstep, is a province that’s often overlooked, but an ideal place to get off the beaten track. Speu is the Khmer word for “starfruit”, but Kampong Speu is actually famous for its palm sugar, which is considered the best in the Kingdom. The province also produces plenty of teuk t'not chu, or palm wine. Mount Aoral (Phnom Aoral) is tallest mountain located in this landlocked province bordered by Kandal, Koh Kong, Pursat, Kampot, Takeo and Kampong Chhnang. It is at 1813 meters above sea level.

Kampong Speu is located at a strategic location along National Road No. 4 connecting it to the national capital, Phnom Penh International Airport and the deep seaport of Sihanoukville. It has plenty land which has a potential to be developed for manufacturing, commerce and agro-industry. The infrastructure in Kampong Speu is very well developed transportation infrastructure linking it to major National Roads (No. 5, No. 3, No. 51 and No. 41).

The province is provided considerable sources of minerals such as sand and stone for building

construction. With a lot of availability of a young and experienced labor force, it is a good incentive to build various manufacturing industries based on the strategic location of the province and availability of young labor. The province has its specialties to develop agri industry such as rice, sugar cane, corn, cassava, mango and etc. Kampong Speu can become home of a tourism industry or research park by utilizing natural resources such as Kirirom National Park and Aoral Mountain.[46]

Figure 4-3. Kampong Speu Province



[46] http://www.cambodiainvestment.gov.kh/

(1) Geography

Table 4-12. Geography of Kampong Speu

Provincial Capital	Chbar Mon Town
Total area of the Province	6,969.72 km square
Landscape	Mountainous and plain area
Total Population	793,769 persons
Population Density	114 persons/km2
Population age over 18years	472,746 persons (Men: 225,675, Women: 246,971)
Temperature	20.3 Celsius - 37.7 Celsius (Average: 29.0 Celsius)
Rainfall	765 - 1,512.2 mm/year (Average: 1,150 mm/year)
Administrative Boundary	Number of districts: 8 Number of communes: 87 Number of villages: 1,375
Adults with literacy (15-45years)	368,251 persons (Men: 180,840, Women: 187,411)
Provincial Border	East: Kandal and Takeo Provinces West: Koh Kong and Preah Sihanouk Provinces North: Kampong Chhnang and Pursat Provinces South: Takeo and Kampot Provinces

(2) Education

(2)-1. Education in Kampong Speu

Education in Kampong Speu has been improved in the past decades. It has achieved national development goals as well as millennium development goals of the United Nations.[47]

However, the province still has many challenges to overcome such as:

- Decentralize education management to sub national like provincial and district educational office
- Some schools has very limited classrooms and enough grades
- Six communes have no lower secondary school which is not complied by the provincial education policy
- Very limited facilities and resources for teachers and students

[47] Provincial Development Plan of Kampong Speu 2015 - 2019

Kampong Speu has 3 higher education institutes (2 private and 1 new established public). However, the existing 2 provide no engineering or ICT major program. Kampong Speu Institute of Technology is established in 2016 located in Am Rieng village, Tkong district, Kampong Speu province under the supervision of Ministry of Education, Youth and Sport (MoEYS) and supported by Thai princess foundation. The institute is designed dedicatedly for technology and engineering which provide skill training for people and research.

The institution was established with 11 departments as the following:

A. Department of civil engineering

B. Department of electric engineering

C. Department of electronic engineering

D. Department of mechanic engineering

E. Department of chemical food engineering

F. Department of computer science

G. Department of computer technology for business

H. Department of Veterinary

I. Department of agronomy science

J. Department of hotel and tourism

K. Department of business administration

Table 4-3. Education Statistic in Kampong

Particulars	Number of Schools	Disadv. Schools	Number of Classes	Classes in Pagoda	Enrollment		Repeaters		Teaching Staff		Non-Teaching Staff		Total Staff	
					Total	Girl	Total	Girl	Total	Female	Total	Female	Total	Female
Whole Province	536	0	3,871	21	164,670	79,477	5,558	2,303	4,152	1,642	842	162	4,994	1,804
By Area Of Location:														
- *Urban Area*	33	0	267	2	11,987	5,851	469	156	414	227	88	37	502	264
- Rural Area	503	0	3,604	19	152,683	73,626	5,089	2,147	3,738	1,415	754	125	4,492	1,540
By Type Of School & Edn. Level:														
- *Pre-School*	133	0	205	1	7,208	3,728	0	0	174	171	6	6	180	177
- Primary School	312	0	2,810	20	114,188	55,215	5,086	2,157	2,078	860	561	112	2,639	972
- College (Grade 7-9)	69	0	408	0	19,608	9,505	114	20	988	327	135	24	1,123	351
- Lycee (Grade 10-12)	2	0	41	0	2,672	1,234	66	28	78	18	8	1	86	19
- Lycee (Grade 7-12)	20	0	407	0	20,994	9,795	292	98	834	266	132	19	966	285
- Lower Secondary Level (Grade 7-9)	89	0	629	0	31,239	15,188	172	30	1,431	485	205	34	1,636	519
- Upper Secondary Level (Grade 10-12)	22	0	227	0	12,035	5,346	300	116	469	126	70	10	539	136
Characteristics Of Primary Schools:														
- *Cluster - Core School*	48	0	608	5	27,305	13,027	1,100	454	496	237	144	31	640	268
- Cluster - Satellite School	264	0	2,202	15	86,883	42,188	3,986	1,703	1,582	623	417	81	1,999	704
- School Not In Cluster	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Annex School	6	0	28	0	686	340	85	43	9	1	0	0	9	1
- School In Pagoda	37	0	306	0	11,745	5,737	508	198	235	98	56	8	291	106
Disadvantaged School (All Level)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(2)-2 Higher Education in Cambodia

There are 118 higher education institutions locating in the city as well as 19 provinces in Cambodia among which 47 of them are public institutions and 76 others are private ones. In addition, 71 of higher education institutions are organized and controlled by Ministry of Youth and Sports, 12 of them by various ministries or agencies, and 59 others by private organizations. Among all of these organizations providing higher education, there are 38 organizations who not only provide students education at Bachelor degree level but also at a higher level of Master degree.

Noticeably, the total amount of professors teaching at higher education level at various universities is 12,256. Among these figures, 1,819 lecturers are female which equal to 15.66%. However; among these 12,256 lecturers, there are 2,964 lecturers who have a Bachelor's degree of which 894 headcount are females (30.16%), and 8,321 others holding a Master degree, of which only 929 are females(11.17%), whereas only 971 professors who have achieved a PH.D. Significantly not much of female have completed a PH.D., only 95 (9.78%) of them have.[48]

In 2013, the total amount of students studying at higher institutes are 255,791. Among these amount, 23,678 are taking associate degree (9.2%), other 216,053 are taking bachelor degree (84.4%), some 14,997 are taking master degree (5.8%) and the rest 1,063 are taking Ph.D. degree (0.6%).

Further, MOEYS (2013) highlights a growing mismatch between graduate skills and labor market needs; for instance, undergraduates studying business administration accounted for 47 percent of total enrolments compared to agriculture (4 percent), engineering (3 percent), health (5 percent), law (6 percent) and ICT (8 percent). Despite the volume of students graduated with ICT background (8 percent), the limited number of qualified students in the ICT field is still a major challenge as most of them work at low level skill.

[48] Congress Report of MoEYS on Higher Education 2015

Table 4-14. Target in higher education

	Higher education	Actual 2014-15	Goal 2015-16	Actual 2015-16
1	% of scholarship students in foundation year	8%	11%	10.55%
2	% of enrollment in higher education(18-22years old)	15%	15%	12%
3	Lecturers achieved an MBA has increased by 1000 and PH.D. By 250 people			
	- Master degree in home country	70	80	41
	- Ph.D. in home country	30	30	3
	- MBA from abroad	70	80	18
	- Ph.D. From abroad	20	20	17
4	% of students completed ASEAN program	88%	89%	6.9%
5	% of students getting a job after graduating	72%	74%	89.6%
6	% of institutions having a clear budget planning	20%	40%	25%
7	% of institutions achieved a high quality with internal standard	20%	20%	21.9%
8	Budget for higher education industry	8%	12%	9%

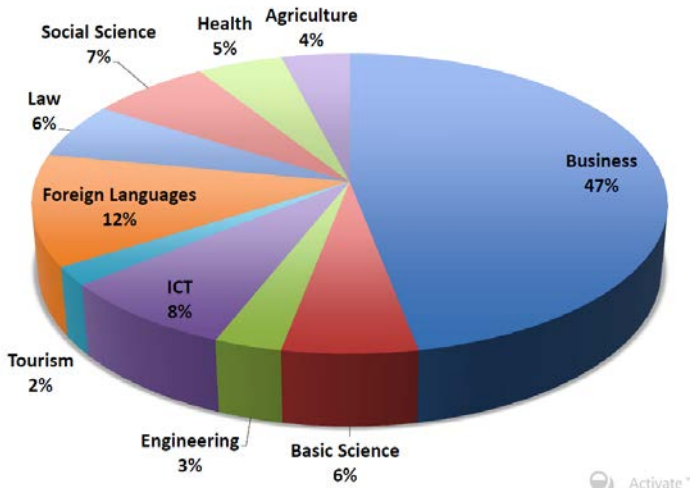
Table 4-15. Number of student in various degree

Education provider	Associate	Bachelor	Master	Doctoral
Public HEI	5456	96459	3402	138
Private HEI	18222	119594	11595	925
Total	**23678**	**216053**	**14997**	**1063**

Source: MOEYS Department of Higher Education 2013

(3) Physical Infrastructure in KS

Figure 4-4. percentage of student by majors



Source: MOEYS Department of Higher Education 2013

Table 4-16. Physical Infrastructure in KS

Electricity	Total Supply Amount	Electricity power supply to the province is covered by EDC Phnom Penh.
Water	Supply amount	1,387,000 -1,395,000 m3
	Major water supply plant	12 Plants: 1,387,000 -1,395,000 m3
Transportation	Car & motorcycle (motorcycle: 58, 410, cars: 446, minibus: 2,484, truck: 420, large truck: 53)	
Road	1 digit national roads	Total: 84 km (NR No.4: 77 km, NR No.5: 7 km)
	2 digit national roads	Total: 270 km (NR No. 41: 45 km, NR No. 51: 38 km, NR No. 44: 140 km, NR No. 43: 23 km, NR No. 46: 26 km)
	Provincial (3digit) roads	Total: 154 km (RNo.141: 4 km, R No.143: 35 km, R No.130: 31 km, R No.1440: 34 km, R No. 140: 50 km)
	Total length	3,274.15 km
Telecom Infrastructure	Fix line Operators	2
	Mobile Operators	8
	Internet Service Providers	5
	Submarine backbone	MCT submarine cable linked to Asia America Gateway (to be completed by mid 2017) AAE-1 submarine cable linked to Asia, Africa, Europe (to be completed by end 2017)
	Fiber Optical Operators	7
	Microwave towers	344
Rail road	Currently no operation (total length 12.3km in the province): Phnom Penh - Battambang: 10km, Phnom Penh-Kampot: 2.3Km	
Airport	None	
Port	Dry Port	None
	Sea Port	None
	River Port	None

(4) Current Industry and Recommended Industry Development in line with BSS

Currently, the main industry in Kampong Speu are Textile/Garments and Footwear with textiles and garment factories; footwear factories; Agri-industry with Rice milling factory, sugar factories and corn drying factories; and animal feed factories.

Other manufacturing are Pharmaceutical manufacturer, carton box factories, safety helmet factory, handbag factory, roof tile factory and mattress factory.

With low labor cost, textile and garment industries will be continuously promoted for human resource development that will contribute to the further development of the manufacturing sector in the province. The provincial government plans to promote agri-industry utilizing the abundant natural resources. Particularly, food processing will be promoted in order to increase the added-value to existing agricultural products by taking advantages of the province's transportation system.

With the above potential physical infrastructure and central geographic location which is connected to the maritime center of Sihanouk Ville and the capital city of Phnom Penh, Kampong Speu can be developed to become new airport hub adjacent to the greater capital area, also industrial center of modern Cambodia which provides goods and services, communications (on and off-line), logistics and transportations (area, road, and railroad), infrastructural facilities and industry clusters and Science and Technology Park supported by the broadband network infrastructure.

According to the Bridging State Strategy Report 2015, Kampong Speu is situated on the main axis in Cambodia, polycentric S-shaped pillars from Siem Reap, Phnom Penh, Kampong Speu, to Sihanouk Ville, in which each city and area plays the role of interconnected division of labor.[49] In addition, the available mountainous regions have potential for tourism resorts and eco-tourism areas for instance, Aural mountain region and Kirirom National Park. These ideal locations can be transformed to a national university research park, which will be proposed in the following chapter.

[49] Bridging State Strategy Report 2015

6. Review: Current Policies and strategies emphasizing Higher Education, Research and Development, and ICT in Cambodia

Launching a successful National University Research Park in Kampong Speu will require several categories of policy, investments, coordination from different sources in the public sector. Private sector investment can be expected to follow such public policy, investments and coordination in a reasonable period of time if there is a clearly demonstrated commitment from the Royal Government of Cambodia (RGC), related ministries and Kampong Speu authority to carry the project through its startup phases, a process that is expected to take from 30 to 40 years.

Currently, there are some approach policy, investment and coordination from Public sector from various sources, which we can will generally be focused on the following:

1) Current Policies of RGC

Cambodia has graduated from low-income to lower-middle income country status in 2016. With her ambition, Cambodia vision is to transform from a lower-middle income to an upper-middle income country by 2030 and a developed country by 2050. To achieve this, the Royal Government of Cambodia has put forward the policy and strategy priority on education targeting human resource development, youth capacity building, developing knowledge and know-how, entrepreneurship, skills, and creativity and innovation in every sector particularly in science and technology, and R&D.[50]

With support from KOICA, the national science and technology master plan 2014 – 2020 has been approved in 2014. The new council of science and technology (NCST) has been established which ministry of planning works as secretariat. The national strategic development plan 2014 – 2018 has integrated the vision of Cambodia's National Master Plan of Science and Technology (S&T) which is making the Leap to an Innovative S&T Nation and its objectives are (1) establishment of an S&T foundation, (2) securement of R&D capability, (3) creation of S&T environment, and (4) improvement

[50] Rectangular Strategy-Phase III of the Political Platform of the Royal Government of Cambodia of the Fifth Legislature of the National Assembly

of core industrial capacity.[51]

Cambodia requires to diversify in its industry that can contribute the social and economic development toward maintaining a sustainable and inclusive high economic growth. The Industry Development Policy has set “New Economic Growth Strategy” which stresses importantly on economic diversification, competitiveness strengthening, and productivity enhancement in line with the structural transformation of the domestic economy and the evolving global and regional economic architecture in as much as the utilization of national resources to its fullest potential. Industrial development would require comprehensive reforms in infrastructure and in institutions, investment in both human resource and physical infrastructure, promotion of technological development and innovation to create the foundation for harnessing the new growth potentials and promoting competitiveness, both being the prerequisites for development and the unavoidable steps to escape falling into the middle- income trap.[52]

Cambodia's economy has been developing continuously through policy of openness, now it needs a turning point that leads to continuous self-sustained growth by adopting Korea's S&T as both countries have a similar historical background. ICT have been defined in order to verify the role of S&T in the industrial sector.

Due to the lack of infrastructure, reliable electricity, big investment and human resources, Cambodia's focus is mainly a software-oriented ICT, reinforcement of software competence is required. In addition, the promotion of tasks in terms of organization, technology, R&D, and culturing HR is also required.[53]

Globalization and regional integration have significant impacts on all sectors of Cambodian economy; therefore, higher education development needs to adapt and conform to global and regional trends. Responding to this context, the Ministry of Education, Youth and Sport has formulated Cambodian Higher Education Vision 2030 aiming at identifying long term direction and clear roadmap for development of this sub-sector. Cambodian Higher Education Vision 2030 will ensure comprehensive equity and access for students, efficient and smooth coordination and management of higher education,

[51] NATIONAL STRATEGIC DEVELOPMENT PLAN 2014-2018
[52] Industry Development Policy 2015 – 2025
[53] national science and technology master plan 2014 – 2020

necessary mechanisms to support higher education system, and development of human resources who will contribute fully to national development.[54]

The Education Strategic Plan (ESP) 2014-2018 has set the action plans to improve the higher education sector and institutes in order to build their capacity to strengthen planning and monitoring, manage research grants and scholarships and so absorb more funds for programs expansion. A research culture has begun to emerge through the implementation of an innovative research grant program and there is now stronger regional cooperation, collaboration and jointly implemented activities. ASEAN integration will provide opportunities for collaboration between institutions, joint research and quality standard setting. Thus, the ESP has highlight the important of action plans to carry out as the following:

- Research and publication program:
    - Create a Higher Education Research Fund.
- Establishment of National University:
    - conduct feasibility study on establishment of National University.

Separately, ICT sector plays very important role in supporting Cambodia into regional integration and connectivity. ICT sector especially Internet are significant parts of ASEAN economic integration community as well as contribute to the development and growth for all parts of socio-economy. ICT sector is significantly contributed to the development of socio-economic in Cambodia through creating an attractive investment environment, employment, increasing revenue, and improving productivity via receiving new technologies to create jobs in other industries such as production cost and chain value and supporting raw materials, logistic service, financial sector, and training skills.[55]

The T-ICT development policy 2020 has laid out some framework to improve Literacy Level, Skilled Human Resource Development, capacity building, Standardization, Research and Development on T-ICT Sector by encouraging cooperation between public and private universities.

[54] Cambodian Higher Education Vision 2030
[55] T-ICT Development Policy 2020

Table 4-17. Indicator of capacity building of ICT, T-ICT policy 2020

	Rate of Goal 2020
Percentage of central government officers having basic ICT skills	95%
Percentage of local government officers having basic ICT skills	75%
Percentage of students finishing high school equipped with basic ICT skills	100%
Percentage of ICT skill workforce of the total skill workforces	15%
Number of ICT specialist for Research and Development	30 among 1million people
Number of ICT Researcher in ICT Sector	10 among 1million people

Source: Objective of T-ICT Policy 2020

These current policies have laid the foundation and framework to develop qualified human resources, to kick start the R&D activities, and to transform Cambodia to knowledge & digital based economy. However, the achievement required strong commitment both from the Royal Government of Cambodia, relevant ministries and authorities.

Some policies were poorly implemented and designed in a very fragmented way in order to allocate limited budget to as many areas as possible. What is critical for Cambodia to successfully implement the current policies and plans is to set a priority among a number of areas mentioned in the policies and plans. Without prioritizing the alternatives listed, the whole policies and plans become meaningless, resulting in nothing improved.

Therefore is recommend the RGC provide adequate resources to accommodate the new project of NURP through dedicated funding, place the NURP project higher in policy agenda, and consider it as the priority areas for national development. It is essential to develop a new complimentary and approach policy toward the NURP in a way to achieve a fruitful cross fertilization of both research and business communities.[56]

[56] Report on Regional Research Intensive Clusters and Science Parks in European Union 2007

(1) Cultivation of Human Resource in ICT

(1)-1. Cultivation program under MoEYS

Among MOEYS S&T-related policies are the supply of basic facilities and devices, expansion of registration for S&T-related courses, and curriculum revision. These contents are largely composed of basic implementation environment development for S&T education, focusing on government funding for S&T support programs and cultivation of highly-educated S&T manpower through support for studying abroad. [57]

Specific S&T manpower cultivation plans and improvement of research and development are suggested in the Education Strategic Plan 2014-2018 and the Master Plan for Research Development in the Education Sector 2011-2015.

(1)-2. Cultivation Program under MLVT

The Technical and Vocational Education and Training (TVET) Policy was implemented through the National TVET Development Plan (NTB, 2008) to reduce poverty. TVET suggests encouragement of self-employed businesses, small loans support, implementation of small business support programs, and promotion for employment of adolescents who are not attending to a local, vocational training, or educational institution. However, it suggests providing education in industrial technologies as required by region instead of designating specific industries and technologies.

(1)-3. Cultivation Program under MPTC

Previously, RGC has formulated policy and legal provisions to urge research and development such as research and development master plan 2011-2015, science and technology master plan 2014-2020, Cambodia industrial development policy 2015-2025.

Meanwhile, RGC has built national institute of posts, telecommunication and information communication technology (NIPTICT) and integrated in the management of MPTC in 2014. It's a

[57] Master Plan for Research Development in the Education Sector, MOEYS, 2011

national institute which is in charge of training and urging T-ICT research and development sector. Moreover, law on telecommunication to create capacity building, research and development fund require concerned telecommunication operators and individuals to pay tribute 1% of total revenue by 2017.

Even those there are policy and legal framework to support this task, research and development of science and technology is not strengthened. ICT research and development is an important catalyst for urging ICT industrial development is limited because of human resource shortage, coordination mechanism, policy, and precise master plan for urging research and development on the sector.

(2) Research in Higher Education Institutes

(2)-1. Royal Academy of Cambodia (RAC)

RAC has the highest number of staff member with a PhD, S&T professors, and students in Cambodia. The total teaching staff, including professors, number 240, and there are 200 students. Although it has master and PhD courses and six- to twelve-month study abroad programs, its research performance is poor due to insufficient research facilities and governmental support (http://www.rac-academy.edu.kh).

(2)-2. Royal University of Phnom Penh (RUPP)

RUPP has approximately 9,000 students, 420 full-time staff, and 294 professors (11 PhDs and 116 Masters). The science faculty is divided into biology, chemistry, computer science, environmental science, mathematics, and physics. RUPP is the only university that operates laboratories for basic experiments (physics, chemistry, etc.). The science faculty has been encouraging professors and students to write articles, and it operates Master's and PhD courses.

However, RUPP has financial difficulties because of discontinuous governmental support. It also has a fundamental issue in that the education quality is steadily worsening because its professors have side jobs and students change major.

(2)-3. Institute of Technology of Cambodia (ITC)

ITC, the only national institute of technology, has bachelor's courses for electrical and energy engineering, computer science, chemical and food engineering, civil engineering, rural engineering, and mechanical and industrial engineers. Among its 90 professors, 40% have Master's degrees and four professors in the chemistry, chemical and food engineering, and electrical and energy engineering department have PhD degrees. Although it is a national university, most of budget comes from foreign aid (http://itc.edu.kh).

(2)-4. National Polytechnic Institute of Cambodia (NPIC)

NPIC, a national technical college, was established as a higher education institution under MLVT by EDCF capital in 2002. NPIC provides automobile engineering, CAD/CAM, civil engineering, culinary art (bakery and cookery), electronic engineering, electrical engineering, computer science, mechanical engineering, and tourism and hospitality courses. It also provides a wide range of academic degree courses with the goal of cultivating high-quality engineer (Jisoon Jang, 2005).

NPIC has established partnerships with universities in Korea, Indonesia, and so on for student exchange programs. Although Korea has dispatched experts to NPIC to educate students, the period of dispatch is too short and support for educational facilities is insufficient. Most graduates become teachers in lower- and upper-secondary schools or choose jobs that are not relevant to their majors (http://npic.edu.kh, Kong Ravuth, Vice President of NPIC).

(2)-5. Royal University of Agriculture

Royal Univrsity of Agriculture (RUA) is a leading agricultural university in Cambodia, shall progressively achieve an international level of quality in education, research and extension of agriculture, related sectors and sustainable use of natural resources. In Cambodia, RUA plays a vital role in educational programs associated with agriculture and related sectors for all levels.

Despite the rigorous policies and strategies currently available in Cambodia, the reality is serious lack

of capability to implement the good intentions of the current policies and plans. The major reason of this shortage stems from the limited government budget allocated to the higher education and the lack of human resources that are capable of conducting research projects on the international standards. It will definitely take a long time to establish the internationally recognizable higher education quality and research and development capacity in Cambodia across the board. Therefore it is recommended to funnel the budgetary and strategic resources to a selected area as a starting point that can be the foundation of Cambodia's future in developing technologies.

2) Financial support

Investment on research of the science and technology is only 0.05% of GDP in 2002.[58] The number is lower than regional countries such as Thailand has invested on the sector up to 0.2% of GDP, 0.1% of GDP in Philippine, and Indonesia has 0.1% of GDP in 2007. Based on the initial survey in 2015, the investment was increased to 0.11% of GDP equal to almost 20 million USD.[59]

National Budgets allocation is necessary for stable and continuous research and development. At the same time, the foreign capital required for research and development should be maintained to overcome the scale limitations of the country's budget.

Plans and budgets were not separately allocated to S&T in the NSDP Update 2009-2013 and the PIP 2012-2014.

Although S&T is not specified in NSDP update 2009-2013 and PIP 2012-2014, budgets for S&T related sectors can be found. For example, US$ 251.1 million was allocated to the Technical and Vocational Training sector related to S&T manpower, and US$ 62.8 million to the Post & Telecommunication sector related to ICT, accounting for 4% and 1.0% of the total budget, respectively.[60]

[58] http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=KH
[59] Initial Survey of secretariat general of National Council of Science and Technology
[60] Cambodia Science and Technology Master Plan 2014 - 2020

(1) National Budget of MoEYS

National Budget 2015 is a budget with in-depth reform characteristics and with the improvement of both preparation process and its contents to serve as an effective tool for responding to the priority policies of the government and to the desire of the people in the context of the regional integration, globalization, as well as the management capacity for economic and social development, in line with the new phase of Cambodia, especially in Education sector. [61]

Until recently Cambodia's state investment in education has languished. As a percentage of government expenditure, Cambodia spent until recently less than 12% of their total budget. This was ranked 140th in the world. Since early in the new millennium the numbers have improved slowly. In Singapore the percentage is around 20%, while in Japan, with its relatively ageing population and its excellent existing education infrastructure, the percentage is close to 10%.

Table 4-18. Education Budget, percentage in GDP

Year	Education Budget (%)
2010	13.1%
2007	12.4%
2004	10.1%*

Source: World Data Atlas

Current budget for the MoEYS compared to national budget increased in 2014 (16.23 %) and in 2016 (17%). Percentage of teaching staff, leadership and management are women has gradually increased.[62] The education strategic plan, or ESP ratified in 2014 by the Ministry of Education, Youth and Sport (MoEYS) set out an aggressive boost in education spending, taking the figure north of 20% this year, up to 23.1% in 2017 and towards 26% in 2018.

With the budget increased 17% in 2016, the amount of 36,879.8 million riels (4%) are allocated to

[61] http://www.mef.gov.kh/documents/shares/budget/booklet-budget-in-brief-2015.pdf

[62] SUMMARY REPORT ON THE EDUCATION, YOUTH AND SPORT PERFORMANCE IN THE ACADEMIC YEAR 2012-2013

higher education. With the ESP 2014, the budget will be increased to 20% of education budget in 2018.

Figure 4-5. 5 years Budget plan allocated to MoEYS

Available resource estimate	2014	2015	2016	2017	2018
IMF GDP growth	7.2%	7.4%	7.4%	7.5%	7.5%
IMF US$ dollars	17,288	19,090	21,078	23,294	25,628
in riels (x 4000)	69,152,000	76,360,000	84,312,000	93,176,000	102,512,000
GDP at constant 2000 price (million riels)	**68,618,000**	**75,636,000**	**83,422,000**	**92,143,000**	**101,548,000**
in dollars	*16,943*	*18,676*	*20,598*	*22,474*	*24,768*
Total Gov't expenditures	**8,258,703**	**8,833,509**	**9,708,630**	**10,684,753**	**11,729,804**
MoEYS share as % of GDP	2.0%	2.2%	2.4%	2.7%	3.0%
MoEYS share as % of Gov't expenditure	16.3%	18.6%	20.7%	23.1%	25.7%
MoEYS share (NSDP 2014-2018 estimates)	**1,342,049**	**1,642,042**	**2,010,286**	**2,464,679**	**3,015,043**
in million dollars	*336*	*411*	*503*	*616*	*754*
Education PIP (2014-2016)	**430,093**	**462,371**	**261,821**	**0**	**0**
On-going (2014-2016) in riels	201,703	200,069	95,399	0	0
in million dollars	*50*	*50*	*24*	*0*	*0*
Planned (2014-2016) in riels	228,390	262,302	166,422	0	0
in million dollars	*57*	*66*	*42*	*0*	*0*

Source: National Strategic Development Plan 2014-2018

Table 4-19. National Budget for Higher Education, Fiscal Year 2016

Higher Education and Research Development	36,879.8
Improvement of quality in Higher Education	3,732.8
Developing Research System	4,444.7
Strengthening the quality of education, research and social skill	3,632.6
Strengthening the quality of education, research in culture and fine art	459.5
Improvement of the training and research	3,811.4
Strengthening the quality of training and research	2,387.3
Strengthening the quality and output of training and research	5,783.6
Improvement of the training and research	3,396.0
Strengthening the quality and output of training and research	3,177.0
Strengthening the quality and output of education and research	3,026.0
Education accreditation	2,410.2
Strengthening the quality and output of training and research	618.2

Source: Brief of National Budget of MoEYS, Fiscal Year 2016

(2) ICT Research and Development (R&D) Funding

Research and Development Funding on Telecommunications, Information Communications and Technology was established under the new telecommunications law.[63] The telecom operators shall contribute one percent (1%) of gross income to the fund in order to promote capacity building, research and development in telecommunications and ICT. The fund can be contributed by government, private sector and donors. The main purpose of the fund will be eligible dedicatedly for the following:

- Capacity building of Telecommunications and ICT
- Research, development and innovation of Telecommunications and ICT
- Support new start-up of Telecommunications and ICT
- Provide scholarship to student in the field Telecommunications and ICT
- Promote event related to capacity building and enhance the research, development and innovation in the field of telecommunications and ICT
- Support the competition and entrepreneurship in the field of telecommunications and ICT

The fund will allow legal higher institutes, telecom operators and organization which work in telecoms and ICT to request the budget for their activity based on the action plan adopted by the board. It is expected the establishment of the fund will be started in 2017 with initial budget 1 million USD contributed by telecom operators.

3) Information Communication Technology

(1) Infrastructure

T-ICT infrastructure development is not different from other infrastructure, it is an important key to support economic growth, economic efficiency, economic realization, and strengthening competition. The RGC has priority to build and increase T-ICT backbone infrastructure and place priority on strategic objective. Media and service quality have been gradually strengthened by the infrastructure development through financing and private sector investment sources. Actually, nationwide cable optic

[63] Research and Development Fund on T/ICT

infrastructure has been expanded and connected to Viet Nam, Lao, Thai. At the end of 2015, cable optic backbone infrastructure reached to 25.411 Km and only 20.300 Km in 2014. Meanwhile, there three companies such as TELCOTECH, CHUAN WEI, and CFOCN had received license and successfully constructed an undersea cable optic and conducting business plan to achieve its project.

Among the three companies, TELCOTECH and CFOCN had contracted on the concession with RGC to have construction rights and handing over international telecommunication service via an undersea cable optic system and relevant infrastructures in Cambodia as construction, business owner, and transference. The two companies predicted to finish the infrastructure construction at the end of 2017. Whereas, the concession negotiation with CHUAN WEI is being processed. The two sides are predicted to finish negotiation and reaches to the contraction in 2016. So, through the infrastructure development, Cambodia will have ability and advancement in supporting Internet service to meet the need of domestic people. But, however, the noticeably achieved advancement, recently there are some issue related to T-ICT infrastructure in Cambodia:

- Inflow of telecommunication service and Internet with foreign countries depends entirely on bordering Countries' telecom and broadband infrastructures, due to the lack of Cambodia's undersea cable optic and its own satellite.
- Development regions on cable optic backbone and supporting infrastructures and the development scope is not yet coverage around the Country.
- The scarce telecommunication resource management such as radio frequency spectrum and heading No. are not efficient to use the resource for strengthening the scope of T-ICT infrastructure.
- Cable optical backbone infrastructure stability is limited.
- Infrastructure supporting other sectors such as national information structure didn't expanded.

The previous infrastructure development has noticeably urged growth of the service momentum, in which the number of mobile sim card reached 20,8 Million (136 % of total population) in 2015 compared to only 3,8 Million (28% of total population) in 2008. Whereas Internet subscription with the amount of 6,8 million equal to 45% in 2015 and only 20000 equal to 0,15% in 2018 of the total

population.[64]

However, infrastructure shortage is stills be regarded as an important issue which can be stirred digital gap in society. High level of digital gap in rural and urban citizens is observed that telecommunication service has been mostly used in urban centers. The digital gap can be caused unfair of receiving chances and benefits which was handed over by technology in society. Infrastructure issue is not comprehensively expanded and there are some overarching problems related to the digital gap:

- Lacking of electricity at rural areas
- Encouraging mechanism making to strengthening rural infrastructure and wherever without economic potentials
- Fixed phone and Internet services are expensive compared with ASEAN Countries, less developed countries if compared with living standard levels
- Mainstreaming national language to information content and other software programs are limited.

(2) ICT literacy

ICT literacy is an important foundation in developing the sector. An understanding the technology will push the growth of ICT usage to meet the need of citizen in today and future market.

In general context, the Ministry of Education, Youth and Sport has formulated “Policy and ICT Usage Strategy in Education Field 2004-2008 “aiming to increase knowledgeable people and skills as well as to use ICT as an effective tool to achieve the ‘’Education for Everyone’’ target. ICT curriculum is incorporated in the previous program of the Ministry of Education by starting in universities, technical training institutions, teacher training tertiaries, and some of high schools. Teacher training program in some schools has been started since 2003 and gradually implemented. Computer book,” Life and ICT Skills” has been compiled as Khmer language for grade 10 student, achieving and agreeing the program for technology training in high school. “Principle Plan on ICT in Education Field 2008-2013” is the initiative to make ICT usage to be more comprehensively, improving efficiency of education for

[64] T/ICT Development Policy 2020

everyone and build ICT capable driving force. There was 7% of nationwide schools could be accessed to Internet in 2013. Even if there was an effort in improving ICT literacy among teacher and student, there are 3 other problems: (1) Lack of ICT trainers, (2) Lack of comprehensive connectivity infrastructure in schools, and (3) Technical equipment such as computer to install in schools, must be immediately settle to hand out ICT curriculum.

Separately, in public institutions, RGC has increased ICT literacy mainstreaming for middle and local government officials in development projects. There was 40% of middle government officials could use computer and basic software programs such as software program for administration, Internet and Email in 2008. Recently, government officials training has been actually held in each of Ministry- Institution. But, Cambodia stills lack of organizing and implementing master plan for training all level of government officials to meet the context of collective development and technology evolution.

4) ICT Industry

The main T-ICT industry in Cambodia are telecommunication and Internet service providers. The industry has contributed to increase 0.4% of economic growth in 2005 and 5,5% in 2012. There are 10 companies including foreign company in 2015 which invested on telecommunication sector and 30 Internet service providers, but actually there are only 16 companies being processed. Beside telecommunication industry, Cambodia doesn't have an ICT industry diversity and any actual plan for urging the development of the sector following some countries in East Asia which has tried to develop and achieved comprehensively benefits from the service and other productions such as telecommunication and software program development services, computer equipment production, electronic, and other ICT services. Some countries in ASEAN regions are focusing on software/ application development services. Due to the software demand market in the world is gradually increased and is expected to reach $13 trillion in 2015 according to NIPA of Republic of Korea.

Cambodia has potential for development and attracting industrial field development by many local favorable factors and the whole regional and global evolution. Reliable political and macro-economic

stability, favorable geography, youth growth which is labor force of the industry, as well as the commitment to reform of RGC to mobilize investment as an attractiveness to investment in the industry especially ICT industrial fields. But, Cambodia has some overarching challenges which were an obstacle for the development of ICT industry. These challenges comprise of (i) Lack of skilled human resources both quantitative and qualitative, (ii) ICT standards, and (iii) Development in the sector is fragile.

(i) Cambodia needs human resources to support production demand and service providing in ICT industries. Previously, ICT-skilled human resource development is a burden of tertiary education. The core plan of ICT in education field 2008-2013, Ministry of Education, youth and sport has purposes to develop ICT vocational capability, and necessary telecommunication message for graduate student to get employment in the society by the knowledge. As a result, ICT graduate student has increased 7% of the total amount in 2009 and 8% in 2011. But, the quantity of human resource didn't meet the need of the market demand because of limited quality of human resources. Based on the evaluation of center of information training (CIT) in 2009, however, ICT graduate student is about 1.6 time higher than the actual demand, but the number of qualified student is much lower and could not supply those demands. Eventually, by the observation in 2013 indicated that there was 48.3%, newly ICT graduate student couldn't have enough ability to apply skilled works. Education system reforming plan in the fifth legislature aimed at ensuring better teaching and learning by reform examination and school curriculum in which ICT subject has been integrated in those schools and training ICT skilled in other tertiary educations. This is RGC's determination in revising both qualitative and quantitative to supply the demand of ICT sector and attract investment for more employment on the sector.

(ii) Beside human resource challenge, Cambodia didn't have an international T-ICT standard providing system. The standard is important to provide confidence with product and Technological service, and eliminate commercial technical barrier. So, ICT standard development is a main factor to attract investment and sustainable T-ICT industrial development.

(iii) Previously, RGC has formulated policy and legal provisions to urge research and development

such as research and development master plan 2011-2015, science and technology master plan 2014-2020, Cambodia industrial development policy 2015-2025. Meanwhile, RGC has built national institute of posts, telecommunication and information communication technology (NIPTICT) and integrated in the management of MPTC in 2014. It's a national institute which is in charge of training and urging T-ICT research and development sector. Moreover, law on telecommunication to create capacity building, research and development fund require concerned telecommunication operators and individuals to pay tribute 1% of total revenue by 2017. Even those there are policy and legal framework to support this task, research and development of science and technology is not strengthened. ICT research and development is an important catalyst for urging ICT industrial development is limited because of human resource shortage, coordination mechanism, policy, and precise master plan for urging research and development on the sector. In 2006, there was only 13 persons could work as researcher and developer among 1 million.

(iv) Cambodia must look into software development manufacturing rather than ICT hardware manufacturing. Based on the study, software development becomes strategic key to drive the innovation, research and development, labor force especially profitability to the economy. ICT hardware manufacturing is required very big investment, spend long time to nutrition the labor force and production, need strategy to enter to market and provide log margin to the manufacturers.

7. National University Research Park (NURP) in Kampong Speu

1) Policy Recommendation

From the experiences of the benchmark cases, several policy implications are found for Cambodia in establishing industrial clusters in Kampong Speu.

National University Research Park (NURP), located in Kampong Speu is recommended, which is a science and technology-centered research park led by a university which has research capability. First of all, the central government has to designate a certain area which is adjacent to the existing national

parks like Aural and Kirirom in Kampong Speu and endow the land to the university or universities. The size of the university research park is considering the future of Cambodia, at least 30 to 40 years of time horizon. It is natural that the university research park requires additional space as the Cambodian economy develops, as seen in the cases of Vietnam, Indonesia and S. Korea.

The research park or research town has to be located in the area which is close to the major roadways, railways or airport. Normally, it is recommended to designate a land larger than 600 ha as the research area which contains the university zones, residential zones, commercial zones and industrial zones. When fully developed, the area will be a town with a population of 50,000 to 60,000. This designated area cannot be developed for the purpose other than the research park. Once an area is designated, the official administration and management organization has to be established in order to efficiently operate the grand university research park project.

The university research park is to be located within the property of the university, and can provide related services in order to facilitate private or public research institutes, organizations or centers of the public and private entities. The university with national land endowment by the central government is going to develop and manage the university research park. All the revenues from operating the research park will be put into the university development fund or university research fund which will be used to facilitate research projects and support research related activities.

In this section, particularly, the following implications sounds meaningful.

(1) Establish NURP (National University Research Park) with a long-term perspective.

a. Designate an area as the Science and Technology Park
b. University Town (Complex)

(2) Construct a University Town by endowing land for higher education of science and technology, particularly ICT software

(3) Establish a National Collegiate University of Cambodia and Relocate the Campus from Phnom Penh to the University Town

(4) Plan to relocate ICT related government research institute to the newly established research park

(5) Select one or two private university to join the University Town based on a competition procedure

a. 10 year plan to establish a campus and development plan for collegiate university and higher quality-education plan
b. Campus housing for married faculty
c. Labs and office for fulltime faculty members
d. Dormitory for graduate and undergraduate students

(6) Establish a Software Research Institute of Cambodia which will set the national standards for government software development and provide guidelines for software development

(7) Share university facilities for students

a. Library
b. Computer labs
c. Canteen
d. Medical center
e. Cultural and Religious Activities
f. Sports facilities
g. Bookstores
h. Student unions
i. Landscape etc.

(8) Build on/ off site infrastructure within/to-from university town

It is expected that Cambodia has to continuously improve its productivity in order to sustain its export-driven manufacturing policies. However, a number of barriers wait in front of Cambodia that have to be overcome in order to cope with the growing global competition. The continuous supply of low cost labor forces are limited. It is difficult to raise the value-added to natural resources that are abundant in Cambodia due to the lack of appropriate processing facilities and the lack of qualified highly skilled technicians and engineer. Further, despite the efforts by the government to improve the overall education system, it is hard to expect Cambodia's capability to absorb appropriate technologies and knowledge because Cambodia begins to focus on higher education recently.

These are the reasons why Kampong Speu is selected as the strategic region in an effort to create the competitive advantages strategically. Not all the provinces can be the candidate for strategic selection under the Bridging State Strategy for ICT industrial cluster, since easy access and proximity to Phnom

Penh are the critical requirements for strategic selection of the location. Access to Phnom Penh implies the possibility of continued supply of skilled or human resources, while the closeness to Phnom Penh means secured access to the existing and increasing demand for the higher value-added services and outputs created in Kampong Speu.

As a starting project for the ICT cluster in the long run, the software park (or software research park) is suggested as the most appropriate ICT cluster considering the lack of Cambodia's ICT hardware manufacturing industry and the dominant market power of Phnom Penh as a source of educated human resources that can be relatively easily trained and converted to low-medium tier solution engineers, computer graphics experts, designers and system engineers. The overall design of the National University Research Park (NURP) is as follows.

(1) The National University Research Park (NURP)

Here, a University Research Park, in more detail an ICT University Research Park is suggested for Kampong Speu, in which a complex of universities with ICT specialization will host growing number of selected graduate and undergraduate students to meet the demand for qualified engineers as the ICT related industries develop over the years.

The NURP is a nationally designated area which contains a university complex (or town) with higher education zones of selected universities, zones for research institutes, residential zones, commercial zones and green park zone. Also it is recommended that the NURP be developed in three to four phases over the next 30 to 40 years and the development plan has to be regularly reviewed and modified considering the international and technological trends. The establishment of the NURP is required a strong commitment and political supports from RGC in order to transform Cambodia to knowledge society and digital economy. The RGC shall develop clear mechanism and indicators to achieve this establishment. With Education Strategic Planning 2018, the ministry of education, youth and sport (MoEYS) shall shift the plan, which is to establish the national university in 2018, to the establishment of NURP. MoEYS will play a leading role in the newly establish council which is in-charged of the

NURP with the relevant ministries and authorities.

(2) The University Complex (University Town)

The university complex or university town is composed of campuses of collegiate universities, either public or private. Each university develops its campus on its nationally endowed land over time, starting from college of engineering, college of science and technology, college of arts and design to college of social science and college of business administration. One of the major task left is how to establish a national collegiate university in Cambodia and how to introduce effective competition in the higher education by allowing private collegiate universities if needed.

The national university located in the university complex select entering college students that only meet the required talents and intellectual capabilities. All entering college students are given full scholarship. Few qualified graduate students are accepted as research assistants or assistant researchers with full scholarship or grant. The student to fulltime faculty ratio of the university has to meet the minimum level of international standards and to be improved to the level of Asian Top 100 university, for example.

The selection of a private collegiate university, if any, will be based on the competition of proposals. Proposal include the plan and commitment of the private university on how to establish a collegiate university, how to secure quality education, how to encourage research activities, how to invest on university facilities and etc.

It is recommended that the university town or complex provides libraries, dormitories and on—campus housing whose capacity are large enough to accommodate most of the students and many of faculty members. A number of research laboratories equipped with proper computer and research facilities are provided to the qualified faculty members who can pursuit research projects independently or in collaboration with researchers in foreign higher educational or research institutes.

(3) The Software Research Park neighboring with the University Complex

It is suggested for NURP to starts with the software research park in the first phase of developing the university research park, considering the current status of Cambodia's ICT industries.

Although Cambodia is suffering from the lack of ICT equipment or device manufacturing, the demand for ICT services and ICT application services in Cambodia is growing very rapidly as the economy grows in a rate higher than the neighboring ASEAN members. Cambodia imports all of the equipment and devices used for ICT services now and it will take a long time to build up the ICT manufacturing sectors.

However, the ICT services are fundamentally based on software that are imbedded or independently developed in the connected world. This is the area where human capital plays the most important role and is expected for Cambodia to find out the appropriate part in the global or regional value chain of the software industries.

In order to find out the appropriate roles in the value chain, it is recommended to establish a software center for research or ICT research center in the software research park zone in the NURP.

Figure 4-6. Operation of the NURP

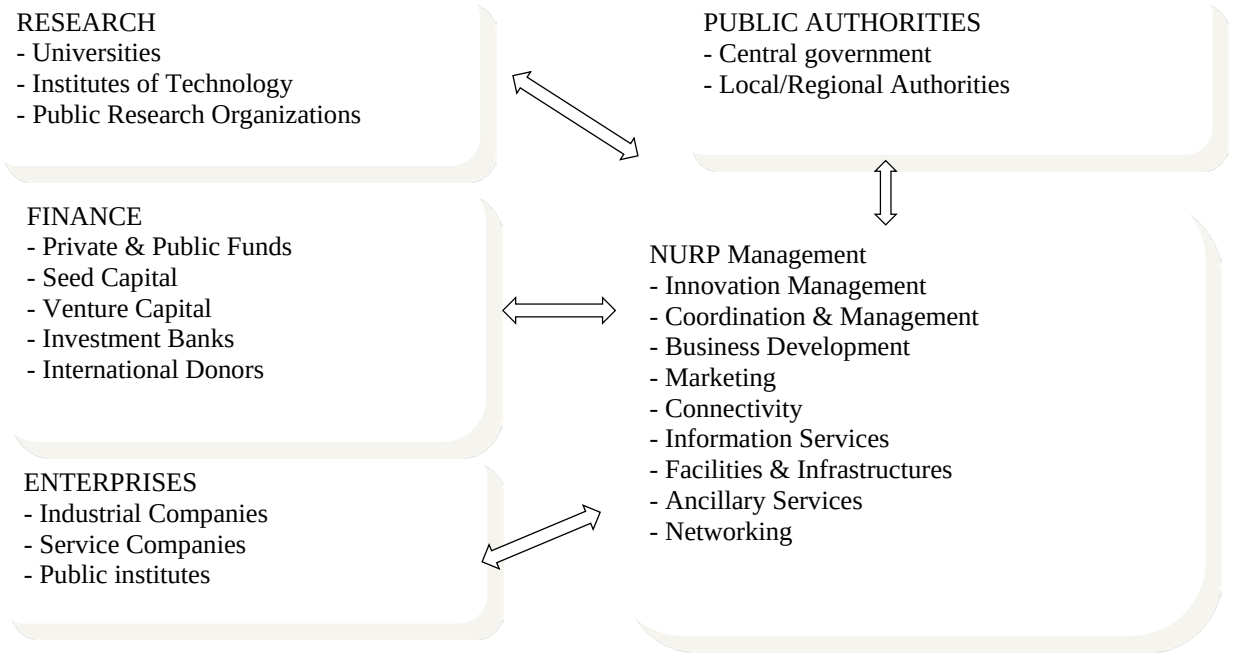


Figure 4-6 describes the operation of the National University Research Park when the research park is completed.

(4) Adjust the relevant policies and strategies to fortify and focus NURP

The existing budget of higher education sector from MoEYS shall be revised and reallocated to the NURP. According to ESP 2018, the increment of 20% budget for higher education of MoEYS can provide a key contribution to the NURP. The scholarship programme for higher education within MoEYS can be supported the students who study and live at NURP. The ICT R&D funding from Ministry of Posts and Telecommunications can stimulate the new research activities in the new research institute as well as facilitate to relocate the existing government ICT research institute.

The on-going established national R&D fund under the National Council of Science and Technology (NCST) can also provide big support to NURP especially in line its action plan priority to support software and digital programme.

2) Action Plan: National University Research Park (NURP)

(1) A council has to be established in order to scrutinize the issues related with designating the area specifically for the NURP and for designing a grand development plan.

A council in charge of National University Research Park is led by the Ministry of Education, Youth and Sport and comprises of representatives from the Ministry of Posts and Telecommunications, the Ministry of Economics and Finances, the Ministry of Industry and Handicraft, the Ministry of Planning, and the Authority of Kampong Speu province. The council will be served by secretariat established by the council. The council is responsible to approve the action plan proposed by the secretariat and to establish the mechanism to review, evaluation and monitoring the action plan quarterly and annually. The council coordinates the implementation of action plan, challenges and measures to be taken.

One of the major task of the council is to complete the designation of the land, the size of the land for each component of the NURP, and take appropriate measures to secure the land. The grand objective

of the NURP is to complete the inter-connectivity between Cambodia's research institutes and counterparts in the neighboring ASEAN members and the intra-connectivity within Cambodia.

Another major task is to integrate the establishment of NURP into national and sub-national development plan. It is important that the next revision of National Strategic Development Plan by Ministry of Planning is set the priority of the establishment of NURP and relevant ministries and Kampong Speu Authority set the action plan in the annual public investment program following the NSDP. The NURP development has to be included in the strengthening institution program supported by national research and development fund established by the national council of science and technology (NCST).

- Delegating the power from national authority to local authority in Kampong Speu in order to reduce the long process and complicate administrative procedure regarding the investment, licensing, tax clearance, etc. A new public administrative town requires to be established or decentralized from national level to the new town in line with the decentralized programme by the RGC.
- Establishing one window services for university town.

The university town will be housed up to 50,000 – 60,000 populations comprised of researchers, students, experts, investors, etc. The one window services must be established in order to attract the people to relocate to a good and efficient administrative town. The services can be ranged from land management, building permit, wedding certificate, etc.

- The investment in NURP from private sector should be encouraged with the tax incentives.

Any technology firm operates in the university complex can get tax exemption which was applied to Special Economic Zone model. Council of Development of Cambodia (CDC) requires to have a policy and guideline to push more investment in this sector. Ministry of Foreign Affairs and International Cooperation can highlight the important of international cooperation in Science and technology with donors and development partners.

- Allocate more budget on research and development in the field of science and technology from public and private sectors. The incremental of R&D budget should be reflected to the

annual economic growth in Cambodia with 7% increase of GDP in the past 10 years. It is recommended the budget of R&D should be increased to 1% of GDP in 2025. A national R&D funding under the national council of science and technology (NCST) shall be established. The NCST plays important roles in planning, set forward strategies and coordination of research between relevant ministries and agencies.

- A task to develop master plan of NURP in cooperation with property investment developer and real estate agency in order to prepare the infrastructure, building sites, landscape, park, building, etc. the developer and real estate agency are in charge of the marketing, promoting the value of the university complex and represent the NURP in negotiating the lease agreement with private sector or company.
- A task to develop offsite infrastructure such as electricity, water, sewage, highway, railroad, bus system, fiber optic, housing, medical center, shopping mall, etc… to sustain the development of NURP in next 30 to 40 years. The infrastructure development is required to meet the demand of NURP phase to phase. It will provide easy access to the researchers and the increasing of population in the university complex. The task will be approved by the council and must be endorsed by the minis terial cabinet meeting. It will be incorporated into relevant ministries and Kampong Speu action plan in the coming years.
- A separate university management is needed to plan the first public collegiate university in Cambodia. Alternatives have to be extensively reviewed and discussed to set up a model of Cambodia's collegiate university that is compatible with the international standard in terms of facilities, student to faculty ratio, curriculum and research capacity.

A plan to establish the first national collegiate university in Cambodia that will evolve to a internationally qualified university in the long run or a private collegiate university by providing national-level and local-level incentives

Since the university is assumed to receive a national land grant or endowment, the Ministry of Education, Youth and Sports takes the initiative to design an internationally recognizable collegiate university. Since the focus of interest is engineering, science and technology, one alternative is to establish a new higher education institute for research and the other alternative is to combine several incumbent colleges that are carefully selected. Possible institutes include Institute of Technology of Cambodia (ITC), Royal University of Phnom Penh - Faculty of Engineering, University Puthisasstra, Norton University, Royal Academy of Cambodia, National Polytechnic Institute of Cambodia (NPIC)

and Phnom Penh Institute of Technology (PPIT).

The establishment of a national collegiate university must be followed by the continuous reform in higher education of Cambodia, such as very competitive selection procedure of students, securing international quality faculty, providing exchange programs with qualified higher education institutes or research organizations and affiliation with key universities in the four ASEAN members (Malaysia, Thailand, Vietnam, Indonesia). Also the national collegiate university takes the role of enhancing the quality education through an affiliation program with the provincial colleges in Cambodia. The university is a leading research in Science and Technology which has research policy to support researchers, such as more incentive or allowance, develop research culture within student and regularly publish research publication.

(2) A task force has to be established to determine the direction of software research in the NURP in the first phase of its development. Even before the task force for NURP, it is meaningful and important for Kampong Speu to launch an interim committee for the promotion of software industry in Cambodia. The committee select strategically 3-5 software areas to be developed in Cambodia in line with Cambodia's GAIS project.

As an immediate action, it is recommend to establish a Software Research Institute of Cambodia (SRIC) which will set the National Standards for government software development and national guidelines for software development. Or alternatively The department of e-government under the supervision of MPTC can be expanded to Software Research Institute of Cambodia.

The SRIC is going to provide the national software standards for the continuing GAIS (government administration information system) and conduct a series of long-term research projects such as software related technology research, national informatization related technology research, and Cambodia's E-government framework research.

When established, a relocation plan of the SRIC to the NURP has to be made, covering a new research facility that can host joint research programs in software with ASEAN's ICT joint research program

and can receive World Bank Grants or ADB's aids for research. A leading role of the SRIC in the NURP as a government-led research institute is to provide a research platform in cooperation with the foreign agencies like NIA (National Information Society Agency) in Korea. In addition, the SRIC has to propose the software development process as a methodology to make developed software applicable to the GAIS and ICT industries in Cambodia.

- A task to build partnership with industry and private sector has to be developed. The partnership is strategic important key to transform the research projects in NURP to the market which is commercialized.
- Another task is to design a relocation plan of government-led research institutes or government inspection organizations that conduct research. A collection of government-led research institutes would be a great momentum for the NURP if they are relocated in order to fortify their research capabilities and collaboration with the university researchers. Depending on the characteristics and roles of the government research institutes, the relocation plan can be made based on the University Research Park development plan over the next thirty to forty years of time span. Since the NURP begins with the software research park, it is recommended that the Ministry of Post and Telecommunication of Cambodia (MPTC) relocate the research function of the National Institute of Posts and Telecommunications and ICT (NIPTICT).
- Another action to be taken is to plan how to support the software research park in order to facilitate research activities from the beginning. For example, software related services to be provided in the Software Research Park (1st phase of the NURP) are research software services, access to open sources and the research platforms. For this, the NURP will provide free super WiFi access.
- Another action when the research park starts is to provide the 100 Gbps backbone between NURP and Phnom Penh and connect the NURP with the NREN (National Research and Education Network) in order to make more participants from selected universities and national research institutes in Cambodia.

V. Social and Physical infrastructure Modeling

Yong Shik CHOO (Chung-Ang University, Korea)
Sakal PHOU (Union of Youth Federations of Cambodia)

Industrializing Cambodia:
Making a Roadmap to Construct Core
Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University,
Chairman of Jayavarman Center for Development)

V

Social and Physical infrastructure Modeling

Yong Shik CHOO (Chung-Ang University, Korea)

Sakal PHOU (Union of Youth Federations of Cambodia)

1. Defining "Infrastructure"

Infrastructure is indispensable to achieve the main development targets in developing countries, such as urbanization, industrialization, export promotion, equitable income distribution, and sustainable economic development. However, the term 'infrastructure' has not been clearly defined and often used in various ways at the users' convenience. Hirshman, referring to infrastructure, proposed the concept of social overhead capital, which supplements direct productive capital, and is mainly built by public bodies.[1] Johnson defined 'infrastructure' as the productive capital structures that underpin the economy and society and contribute over time to the achievement of its economic and social goals, by doing so, dividing infrastructure into economic and social ones. 'Economic (or Physical) infrastructure' is defined as "that part of an economy's capital stock that produces services to facilitate economic production (e.g. electricity, roads and ports) or serves as inputs to production or is consumed by households (water, sanitation and electricity)." In contrast, 'Social Infrastructure (SI)' usually refers to "services such as health, education and recreation that have both a direct and an indirect impact on the quality of life" (DBSA, 2006).

The distinctive feature of SI is its "social" nature. In this sense, SI is purported to meet the basic needs of communities and enhance the quality of life, equity, stability and social well-being. Normally, the

[1] Hirshman, The Strategy of Economic Development, 1958.

term “social infrastructure private-public partnership (PPP)” is used to describe PPPs that construct, and later deliver services for, hospitals, prisons, libraries, schools, cultural facilities and affordable housing. This category is often seen as distinct from other types of “economic” PPPs which are typically used to build and operate roads, railways, bridges, tunnels and water facilities. However, teasing out the elements in a PPP which may be considered more “social” than others is a major challenge. Social infrastructure PPPs, arguably more than economic infrastructure PPPs, address policy goals more explicitly defined in “social” terms, such as social justice, community access or fair treatment. Further, in social infrastructure partnerships, goals are often defined in terms of outcomes for specific social groups and “communities”, whereas in economic infrastructure partnerships, the focus may be on outcomes for users as individuals and the “general public”. However, in practice, both economic and social infrastructure PPPs have significant social impacts on individuals, communities and the general public alike. For example, an economically-oriented road construction may also result in substantial displacement or radical changes to a specific community. Hence, a distinction between social and economic infrastructure PP has been increasingly ambiguous, ambiguous and meaningless.[2]

Another feature which differentiates social from economic infrastructure is that the former is associated with services traditionally delivered by welfare agencies, commonly known as ‘human services.’ In the provision of human services, staff costs represent a significantly higher proportion of operating costs than in a road construction. Jefferies et al. (2006) find that while in a hospital staff costs represent 90 per cent of operating costs, in a toll way staff costs are minimal and most expenditure is on maintenance. However, human services evoke a wide range of emotions among service users, service providers and the general population such as hope, fear, care or dignity among recipients. They also evoke emotions among their staff, such as the rewards of ‘helping people,’ often set-against working in a bureaucratic environment ensuring that recipients are treated equally. Hence, the outcomes of human services are more difficult to predict as they are dependent on the way staff interpret policies (a factor

[2] Tony Gilmour, Ilan Wiesel and Simon Pinnegar, Martin Loosemore, “Social infrastructure partnerships: a firm rock in a storm?” Journal of Financial Management of Property and Construction · November 2010

less significant in economic infrastructure projects) as well as how recipients react to them. Therefore, SI often refers to the soft aspects of social organization, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions. It also encapsulates the concept of culture eg, the values, shared beliefs, customs, behaviors and identity that underpin the way society works and help shape and define who we are as community members. It is similar to the concepts of civil society and social capital around which there is a burgeoning international literature.[3]

Considering the nature and characteristics of industrial cluster building in Kampong Speu (KSP), Cambodia, this policy paper, as in the figure 1, sees infrastructure composed of social and physical ones, and defines SI as 'encompassing the physical facilities to provide social services (hardware) and its social capital (software) making it efficient and effective.'

1) Hardware

The hardware means facilities which provide social, public services. Social infrastructure is that which is developed at a household or community scale, is intended for the delivery of basic services and which has a direct and/or indirect impact on the quality of life. It is the interdependent mix of facilities, places, spaces, programs, projects, services and networks that maintain and improve the standard of living and quality of life in a community. Therefore, the physical facilities providing them are essential. Examples are health, education, community support, information, the sports and recreation, housing, emergency services, transportation, etc..

2) Software

The software indicates basically social assets making production activities effective and efficient, namely social capital composed of trust, social norms and networks and reducing transaction costs. Developing and solidifying effective, trustful and reliable linkage between stakeholders, such as

[3] Other definitions include: OECD (2001) "The networks, together with shared norms, values, and understandings which facilitate co-operation" and the World Bank (2006) "The degree of trust in a society and the ability of people to work together for common purposes."

national/provincial government, business investors, and community is essential to create or enhance comparative institutional advantages. To enhance the software may require institutional reforms. The other important roles of the software are to mobilize people for promoting industrialization and facilitate benefit sharing to preclude or minimize resistance to industrialization and solicit the support of or co-opt local social entities, such as NGOs.

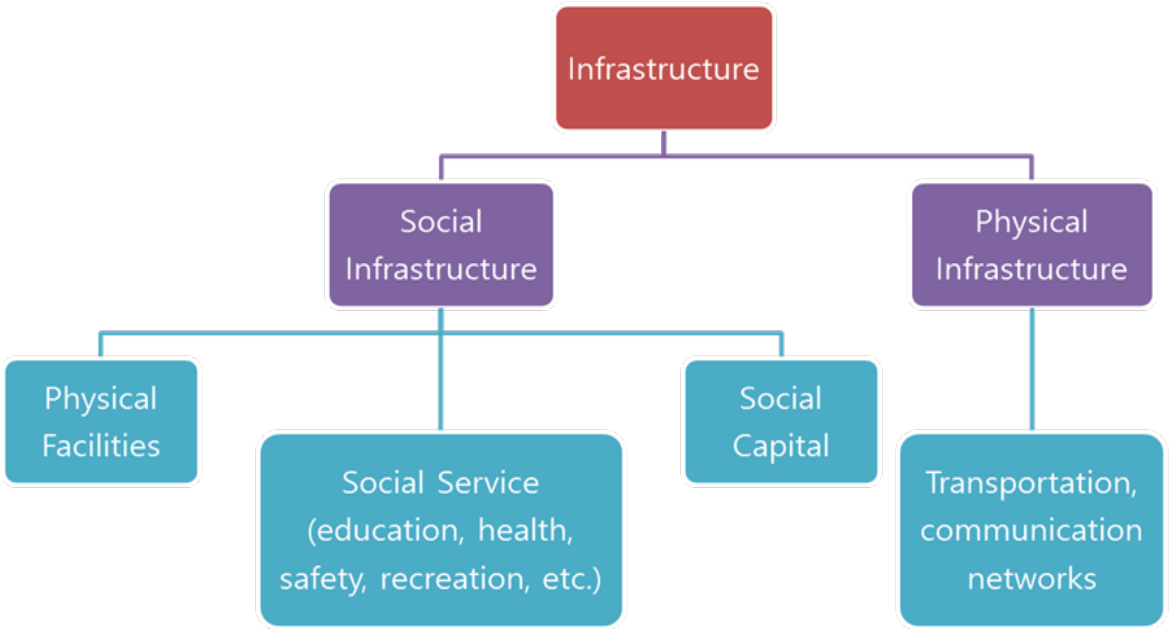
Therefore, the SI definition above includes the following facilities and services:

Universal facilities and services such as education, training, health, open space, recreation and sport, safety and emergency services, religious, arts and cultural facilities, and community meeting places

Lifecycle-targeted facilities and services, such as those for children, young people and older people

Targeted facilities and services for groups with special needs, such as families, people with a disability and Indigenous and culturally diverse people.

Figure 5-1. Infrastructure



2. The Importance of Infrastructure in Sustainable Development

1) Infrastructure and Sustainability

In 2015, the United Nations picked up the "Sustainable Development Goals (SDGs)" as the post-2015 development agenda succeeding to MDGs. The key differences between the two development agendas are that SDGs put an emphasis on economic growth the MDG slighted, although it was seen as a tool to fight and eliminate poverty as the latter did. Nevertheless, it is very notable that the centrality of growth in development was proposed and pushed forward mostly by developing countries. In particular, the SDGs addressed infrastructure as very integral to economic growth and its sustainability. "Infrastructure is core to our quality of a life—a fact that explains the prevalence of infrastructure, both implicitly and explicitly, in the Sustainable Development Goals." According to the UN, Population growth, migration and urbanization trends demand an increase in infrastructure development, especially in emerging economies and developing countries. For example, energy-related infrastructure and an expansion of the electricity grid are necessary to provide energy access to urban and rural areas. Transportation infrastructure— such as roads, railways, ports, airports—is a key for people's mobility from home to work, and for connecting rural areas to domestic and regional markets, contributing to a country's economic development. Sustainable water infrastructure will improve people's lives by providing access to water and help managing scarce resources in a sustainable manner.

The post-2015 development agenda "Transforming Our World: The 2030 Agenda for Sustainable Development" includes 17 Sustainable Development Goals, each with their respective targets and indicators, and a plan for implementation. Infrastructure appears both as an explicit goal and as an implicit means to implement and achieve other SDGs. The SDG 9 of "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" is the most direct call for increased investment in sustainable infrastructure. It states that infrastructure is "a crucial prerequisite for industry," and that both social and economic infrastructure is necessary to produce "a context for industry to flourish." Other SDGs emphasizes the important role to be played by infrastructure as below.

- The SDG 1—*end poverty in all* Student unions *its forms everywhere*—the targets relate to access to basic services, building resilience and reducing vulnerability to climate-related

extreme events, and other economic, social and environmental shocks. Good infrastructure is needed to provide this resilience, as well as for public service delivery, such as education, healthcare or access to water and energy.

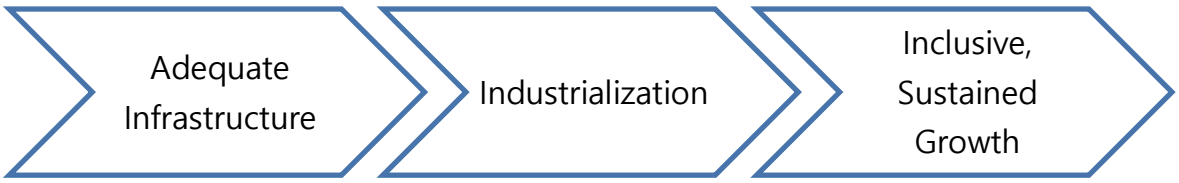
- SDG 2—*end hunger, achieve food security and improved nutrition and promote sustainable agriculture*—the targets refer to an increase in investment for rural infrastructure, which illustrates the importance of infrastructure investment, not only in urban but also in rural areas.
- SDG 3—*ensure healthy lives and promote well-being for all at all ages*—target 3.8 focuses on access to quality essential health-care services for which the development of health centers and hospitals in urban and rural areas will be essential.
- SDG 4—ensure inclusive and equitable quality education and promote lifelong learning opportunities—target 4.a demands the construction and upgrading of learning facilities.
- SDG 5—*achieve gender equality and empower all women and girls*—target 5.4 points at the need for provision of public services and infrastructure for social protection of unpaid care and domestic work.
- SDG 6—*ensure availability and sustainable management of water and sanitation for all*—this goal and the underlying targets focus on availability, access, and sustainable water management, all which require carefully planned infrastructure projects.
- SDG 7—*ensure access to affordable, reliable, sustainable and modern energy for all*—targets 7a and 7b refer explicitly to the promotion of investment in and expansion of energy infrastructure.
- SDG 11—*make cities and human settlements inclusive, safe, resilient and sustainable*—targets relating to infrastructure planning or issues such as waste management, transportation, climate change mitigation and adaptation, and resource-efficiency, require sustainable infrastructure development to reach this goal.
- SDG 12—*ensure sustainable consumption and production patterns*—target 12.7 refers to the implementation of sustainable procurement practices and policies that will have to be reflected in the procurement of infrastructure projects as well.
- SDG 13—*take urgent action to combat climate change and its impacts*—this goal implies that infrastructure projects have to be structured in a way that helps on the mitigation and adaptation front, as well as being explicitly developed to protect the poor and vulnerable groups of the effects of climate change.
- SDG 17—*the means of implementation* of the SDGs and post-2015 agenda—the targets refer among others to multi-stakeholder partnerships. Public-private partnerships (PPPs) will become increasingly important as a way of delivering infrastructure.

2) Key Concepts

In order to understand why the SDGs put such a stress on infrastructure for sustainable development, some concepts are clarified as below.

(1) Inclusive and Sustained Economic Growth.

Figure 5-2. SDGs and Infrastructure



Inclusive Economic Growth: Inclusive growth represents growth that generates decent jobs, gives opportunities for all segments of society, especially socially excluded groups, and distributes the income and non-income gains from prosperity more equally across society

Sustained Economic Growth**:** Sustained economic growth, in the sense of dynamic, enduring, or self-propelling growth, requires structural and especially technological change, that is, the ability of an economy to constantly generate new fast growing activities characterized by higher value added and productivity. Industrial development has been historically and continues to be for most countries an important phase of their growth process, especially in the transition from predominantly agricultural economies.

Sustainable Economic Growth: Inclusive and sustained economic growth can improve the quality of life and avoid reaching physical limits as far as the environment is protected and resources are not completely depleted.

(2) Industrialization

A pull-effect on other sectors due to productive linkages. An expanding industrial sector enables economic diversification and fuels the demand for more and improved primary goods (agriculture,

forestry, fishing and mining) and services (banking, insurance, communications, trade and transport). Agro industry, for example, provides capital and services to farmers (e.g. seeds, fertilizers and equipment, training, production and market information), promotes entrepreneurship and creates jobs, adds value through agroprocessing, and connects farmers with markets through the handling, marketing and distribution of agricultural products. As a result, the productivity, diversity and quality of agricultural production, farm returns, economic stability for rural households, food security and innovation throughout the value chain can be enhanced. An efficient agro-industry, combined with enhanced investment in agriculture, can help spur agricultural growth and, especially where focused on smallholders who rely upon land for their livelihoods, it can increase farmers' incomes and jobs and reduce food insecurity and malnutrition.

Inclusive and Sustainable Industrialization: By increasing the potential for decent job creation in high productivity sectors and thereby progressively improving wages, industrial structural change not only sustains economic growth but also has potential to make it inclusive. For example, As labor shifts from agriculture to higher value added and higher productivity sectors, wages, skills, labor conditions and opportunities for female employment can all be upgraded. Industrialization leads to increasing resource efficiency in production that responds to environmental concerns.

(3) Infrastructure Development

Ensuring sustained, inclusive and sustainable growth through industrial structural transformation requires investments in economic and other infrastructure.

Adequate economic infrastructure improves productivity and reduces the costs of existing and new productive activity. Good infrastructure also helps saving on logistics costs and palliative investments such as electricity generators; on the time to get to work or to organize production processes with the attendant effect on labor productivity; on communication and information exchange time and costs; and on health expenditures due to less stress and better environmental conditions

World Bank (2009) notes that a 10% increase in broadband penetration increases GDP growth by 1.4%

in developing countries, on average. The availability of infrastructure may help to attract investment, deepen markets and generate agglomeration economies through attracting productive capacity to a specific location. Located in places where disadvantaged groups are situated and when affordable access is addressed, energy, water, roads and communication facilities will have a direct impact on reducing inequality and making growth more inclusive. Gender sensitive or tailored health and social infrastructure, for example, can improve the security of women and girls and help their free movement and education. Proximity between jobs, residential locations and infrastructure, especially in disadvantaged areas, will contribute to narrowing spatial disparity and improve economic opportunities for all.

3) Does infrastructure matter for economic growth, poverty reduction and environmental sustainability?

(1) Infrastructure and Growth

There exists broad agreement with the idea that infrastructure generally matters for growth and productivity, although some studies suggest its impact seems higher at lower levels of income. Nevertheless, there remains tremendous variety in the findings, particularly as to the magnitude of the effect, with studies reporting widely varying returns and elasticities. In general, three things as below should be considered to understand the effect of infrastructure on sustained growth.

First, leaps and bounds - network effects. Infrastructure services are mostly provided through networks, a fact that implies a nonlinear relation with output. With increasing returns, the marginal productivity of investments will rise with the scale and "spread" of the network and thus will exceed the average productivity of investment until the market is saturated.

Second, apples and oranges - heterogeneity in the quality of infrastructure investments. Heterogeneity is a problem with measuring infrastructure stocks and services (a km of one lane road counts as much as a km of five-lane highway). Politically or socially motivated projects are likely to exhibit lower rates of return, as their objectives are to bring in the votes or satisfy some social objective rather than to

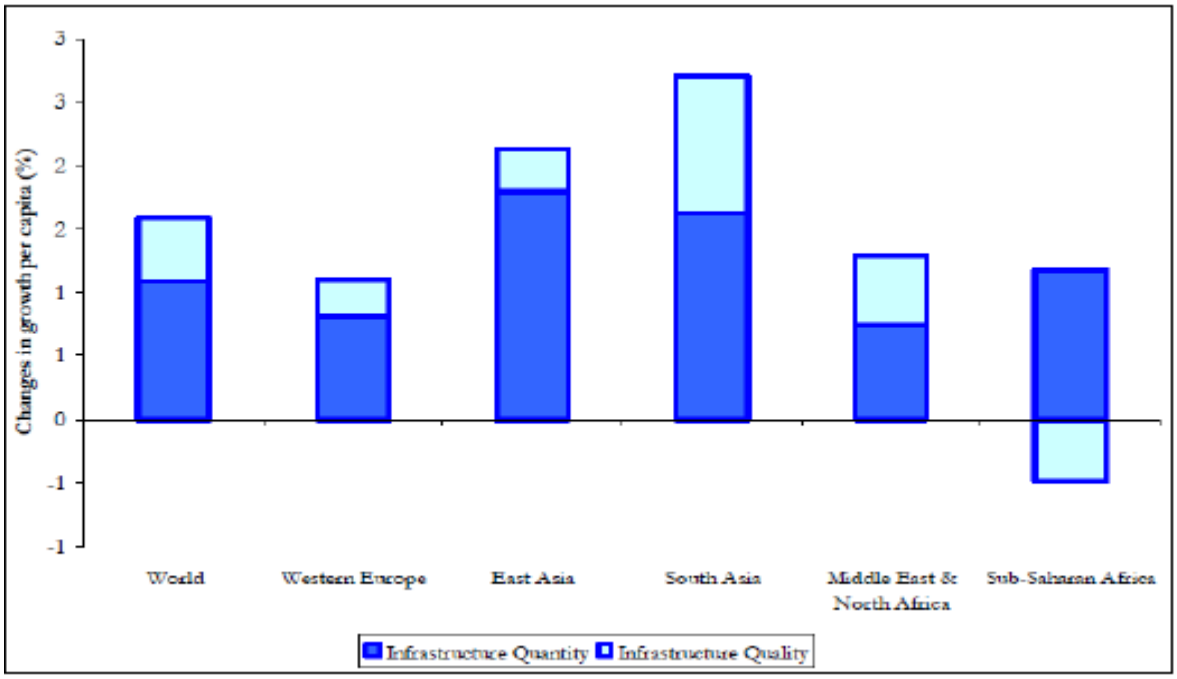
maximize growth.

Third, which came first - endogeneity of infrastructure investments: Causality runs both ways between income and infrastructure. Indeed, most infrastructure services are both consumption and intermediate goods, and many studies have documented that electricity consumption and demand for telephones and cars increase along with disposable income. Both infrastructure quantity and quality are significant influences on growth, according to case studies as shown in the figure 5-3.

(2) Infrastructure and Poverty Reduction

Infrastructure development affects the richer people but its impacts are much greater for individuals already suffering from malnutrition or less likely to receive quality medical attention. One study shows that increased infrastructure quantity and quality reduces inequality (see figure 5-4).[4]

Figure 5-3. Infrastructure and Growth



Source: Calderón and Servén (2010), Figure 2. Bars show changes in average per capita growth for 2001-5 versus 1991-5 due to changes in infrastructure quantity and quality.[5]

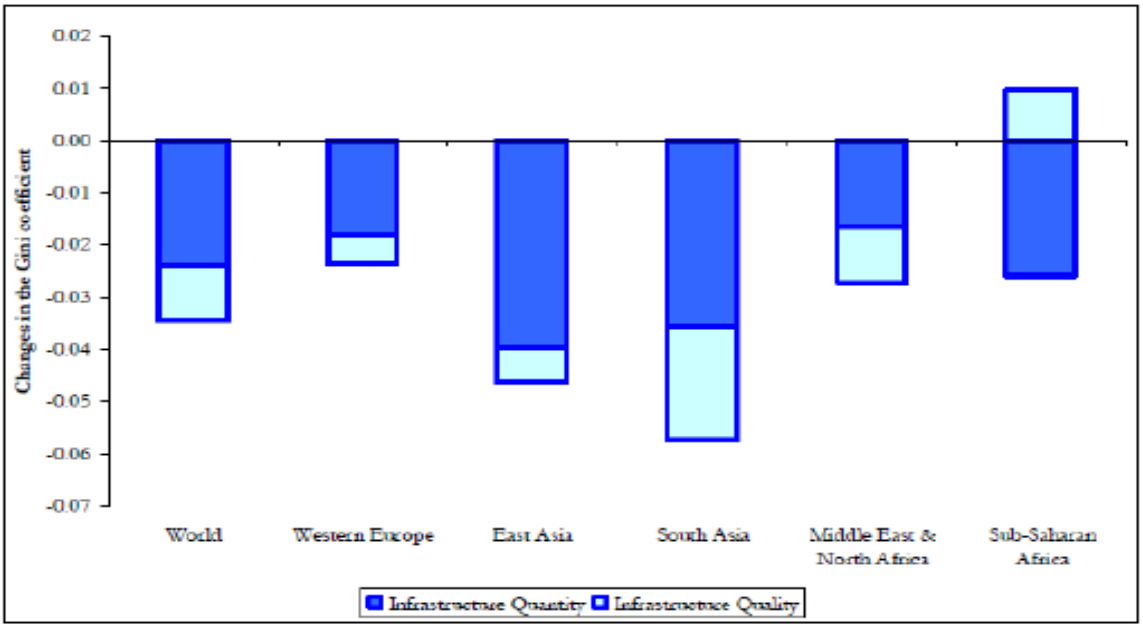
[4] Calderon, César, and Luis Servén.

[5] Calderon, César, and Luis Servén. 2010. "Infrastructure in Latin America". Draft prepared for the Handbook of Latin American Economies.

(3) Infrastructure and Sustainability

While the direct effects of these improvements are economic, they also can help facilitate more sustainable development (e.g., less depletion of land and water resources). Management and upkeep of infrastructure affect not only the quality of services but also the environmental consequences of its use. substantial investments in improved water management and congestion-reducing road capacity will not produce economic or environmental benefits without proper maintenance.

Figure 5-4. Infrastructure and Inequality



Source: Calderón and Servén (2010), Bars show change in Gini coefficients for 2001-5 versus 1991-5 due to changes in infrastructure quantity and quality changes.

4) Infrastructure and Competitiveness

With sustainable growth, what is important to sustainable development is sustainable competitiveness. In the1987 publication of the report *Our Common Future*, "sustainable development was defined as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs," which actually means eco- and environment-friendly development. The concept of sustainable competitiveness places more emphasis than the concept of sustainable development does on the importance of productivity as a driver of prosperity and long-term growth.

Sustainable competitiveness means the set of institutions, policies, and factors that make a nation productive over the longer term while ensuring social and environmental sustainability. Social sustainability, in turn, is defined as the institutions, policies, and factors that enable all members of society to experience the best possible health, participation, and security; and that maximize their potential to contribute to and benefit from the economic prosperity of the country in which they live. In this context, environmental sustainability is defined as the institutions, policies, and factors that ensure an efficient management of resources to enable prosperity for present and future generations.

The purpose of sustainable competitiveness is to achieve sustainable, inclusive, high-quality growth and prosperity. In that sense, the major goal of social infrastructure is to achieve competitive growth (comparative advantage, skill, education), sustainable growth (environment, hygiene, health) and inclusive growth (community engagement). World Economic Forum provides indicators related to sustainable competitiveness composed of social sustainability, environmental sustainability and sustainability adjusted competitiveness as seen in Figure 5-5. The indicators show that Cambodia's Global Competitiveness is undermined by the poor social sustainability that implies the weakness of social infrastructure.

3. Analysis of Interviews

The research team was dispatched to KSP and had interview local government officials on two main subjects: physical structure and social structure. The findings are as below.

1) Land issue

As of now, no land concession available in KSP but three possible options. We can buy the land from private sector or ask the owner of the land concession for a share of their land. In the latter case, governor could mediate the transaction. Another option is to purchase wrongly operated concession land. There are two sites for such a case in Kampong Speu. One of them is located in Aural areas.

Figure 5-5. Components of Sustainable Competitiveness

① Indicators of Social Sustainability

Access to basic necessities	Vulnerability to economic exclusion	Social cohesion
• Access to sanitation	• Vulnerable employment	• Income Gini index
• Access to improved drinking water	• Extent of informal economy	• Social mobility
• Access to healthcare	• Social safety net protection	• Youth unemployment

② Indicators of Environmental Sustainability

Environmental policy	Use of renewable resources	Degradation of the environment
• Environmental regulations (stringency and enforcement)	• Baseline water stress	• Level of particulate matter concentration
• Number of ratified international environmental treaties	• Wastewater treatment	• CO_2 intensity
• Terrestrial biome protection	• Forest cover change	• Quality of the natural environment
	• Fish stocks' overexploitation	

③ Sustainability Adjusted Competitiveness Index

	GCI 2014-5		SSA GCI		ESA GCI		SA GCI	
	Rank	Value	Value	Direction	Value	Direction	Value	Direction
Thailand	31	4.66	4.63	_	4.38	↓	4.51	-
Indonesia	34	4.57	4.31	-	4.26	↓	4.28	↓
Philippines	52	4.4	4.26	-	4.25	-	4.25	-
Vietnam	68	4.23	4.11	-	3.67	↓	3.89	↓
Cambodia	95	3.89	3.58	↓	3.85	-	3.71	-

Source: WEF 205-6
GCI: Global Competitiveness Index
SSA GCI: Social Sustainability Adjusted Global Competitiveness Index
EAS GCI: Environment Sustainability Adjusted Global Competitiveness Index
SA GCI: Sustainability Adjusted Global Competitiveness Index

2) Location of industrial Clusters

The KSP governor's suggestions is the Aural area along the road number 44. The area is a high land and thus, we don`t have to care about flood in rainy season. It has relatively a good infrastructure. The

government has the will to construct a national road from KSP to Porsat and KohKong province passing through this area. The area is located near Chbar Morn District (capital of KSP and the most populated area), only 40km away from Chbar Morn. The area is good for logistics and transportation since it is located in the middle between Phnom Penh City, airport and Presh Sihanouk Vill.

3) Special Economic Zone (SEZ)

The KPS government can support us to get the designation of the industrial cluster sties as SEZ. In order to do it, we have to clarify goals and purposes that must be legal; must obtain a right to invest; and need cooperation and support from central government.

4) Civic and Social Service

KSP plans to divide the province into resident, commercial and industrial, and entertainment areas. Chbar Morn district is the best with good geography, high population and good infrastructure. The local government also plans to build a university and a proper hospital to serve the citizens living in this area. The KSP vice governor told that industries should have their own training center and healthcare for urgent need of the employees. In particular, an agricultural center linked with ‘one village one product policy could be set up to support farmers. In this case, the center must be located inside the clusters.

5) NGO issues

NGOs or any related organizations will not oppose to industrialization as far as industries do not violate the human rights, follow the law, and the purpose is to serve the benefit for both parties (investors and workers). But opposition by political agitation, for example the Civil Company case, is possible. If there are any protests, the KSP government will take action to protect both parties, or play a moderator role to find solutions for this issue.

Proactive actions are needed to engage NGOs or workers to get them to know the purpose of the industry. It may be desirable to hire experts who know well about and are closer to the workers. The

best way to engage NGOs is advertising what benefits the workers and community can get from industrialization.

For NGO that works on garment sector, there is no depth connection between NGO and factory. However, on cultivation and feeding animals, there are two organizations that work on this. One is Clean Cambodia Organization (Sart Kampuchea Organization) and other one is CEDAC. But CEDAC remains only a savings group, not very active.

Currently, there is no serious child abuse due to the strong Labor Law and Union Law. However, it might be good to work with local and commune governments to engage community.

6) Types of industry

Any kind of industrialization is good but agro-industry is recommended, e.g., mango and sugar cane. Industry is usually seen to provide a higher salary or an opportunity to learn a high level technology.

In order to co-op women, we have to show to protect their interest, such as working conditions because women require special incentives than man, to give higher wages than other sectors (not only women, even men also want to work if they can get a lot of wage).

The local government or governor needs to create skill for them which is desirable in the labor markets. Considering the present labor market agriculture-related clusters is better.

7) Airport: (interview with Phnom Penh international airport staff)

Currently, three airports operate in Cambodia in Phnom Penh City, Siem Reap Province and Kampong Som Province. All those three are under the control of a French Company (the Vinci company) and the contract is over in 2040. The current Phnom Penh International Airport are expected to operate for 30 to 40 years more. There is no plan to build a new one as of now. All the three international airports are operated by the Vinci company; the locals ones are under the jurisdiction of Civil Aviation. Recently, Prime Minister Hun Sen made the announcement that there would no airport in KSP for the time being.

8) Transportation

The central and local governments plan to construct a national road in Kompong Speu, passing through the provincial town to Bor Seb. Maybe, within one to two years, there will be a road connection between national road number 3 and number 4.

If the industrial clusters are built in the Aural area. The Chan Tnal and Trang Chek to Aural connection will be very useful, which means the road numbers 132 & 136 leading to the Phnom Penh area.

There will be a road connection between national road in Kompong Speu to Koh Kong province which means the road from Aural to Koh Kong. It passes through Road 51 which is from Oudong to Road 5 and to Road 4. This road connection can more efficiently transport goods without crossing to Road 4 which means from Koh Kong to Aural going through Chbar Morn to Oudong and then to Phnom Penh. Some goods can be transported to Tonle Sab River, so we don't need to cross from Phnom Penh to Road 4.

Only the national road number 3 (from Phnom Penh to Kam Pot), is sponsored by the Korean government. For most cases, the Chinese government signed contracts with the Cambodian government on constructing roads or bridges.

Regarding express ways from Phnom Penh to Sihanoukville passing through KSP or Kampot, a group of researchers had conducted a survey on this project, but not sure when the construction will start.

4. Policy Guideline

1) Physical Infrastructure: Transportation Networks: Kampong Speu as a Center of External and Internal Logistics and Distribution

In order to develop KSP as a center of external and internal logistics and distribution as seen in the figure 5-6, it must be critical to link industrial clusters with domestic and external markets. With that prospect, we can think of the transportation network as in the table 5-1.

The figure 5-7 maps the transportation network with the projected and current road system.

Figure 5-6. KSP as a Center of Logistics and Distribution

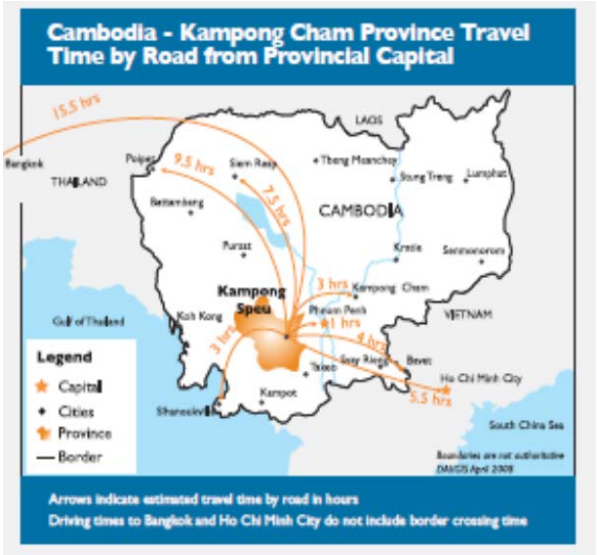
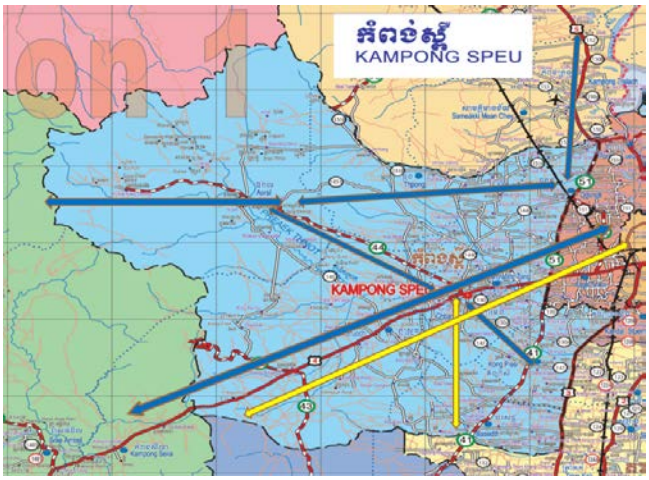


Table 5- 1. Transportation Networks

Projected logistics of transportation
- Chbar Morn to Borseth: planned (linking NR 3&4) - Aural to Koh Kong: planned (Extension of NR 44) - Linkage of NR. 3 & 4: idea - Expressway from PP to SV: research done, not yet confirmed - Chang Tnal and Tram Chek to Aural: already exist (Rd. 132 & 136): From Koh Kong to Aural going through Chbar Morn or to Oudong to Phnom Penh
Logistics of transportation with the current road system
- Aural → Oudong → Phnom Penh or national road 5 - Aural → Koh Kong - Aural → Rd. 44 → Rd. 41 or national road 3 → Kampot - Aural → Rd. 44 → national road 4 → Sihanoukville

Figure 5-7. Transportation Network



2) Social Infrastructure Modelling

Social infrastructure modelling must consider the three elements: competitive growth, sustainable growth and inclusive growth. The table 5-2 summarizes the elements of social infrastructure.

Table 5-2. In-cluster Social Service

Social Service	Functions
Education-Industry linkage: professional schools linked with companies in the cluster areas	- Training to acquire technology and knowledge for immediate use in the cluster. - Employed by the cluster companies after training - Accumulating human capital and technical knowledge.
Short Short-term technical training course for community people	- Engaging community people - Ensuring long-term labor supply
One Stop service center	- Micro-finance and micro-insurance: inducing labor workers from neighborhood. - Provision of fertilizer and other materials
Environmental protection	- Strengthening environmental regulations
Medical center	- Medical treatment - Health education - Ambulance to carry patients - Company medical insurance
Hygiene management	- Improving long-term health conditions
Soft infrastructure	- Bonding between people and communities - Bridging gaps that could exist between groups - Linking across the boundaries of power

(1) In-cluster Social Service Complex

Competitive growth requires enhancing education level, strengthening technical training and supporting employees' needs for working. The facilities providing those services must be built within the clusters to make workers have an easy access to them. Education-Industry linkage is very important - for example, professional schools linked with companies in the cluster areas. The students can be trained to acquire technology and knowledge for immediate use in the cluster. After training, they could be hired by the cluster companies. This education-industry linkage can also accumulate human capital and technical knowledge.

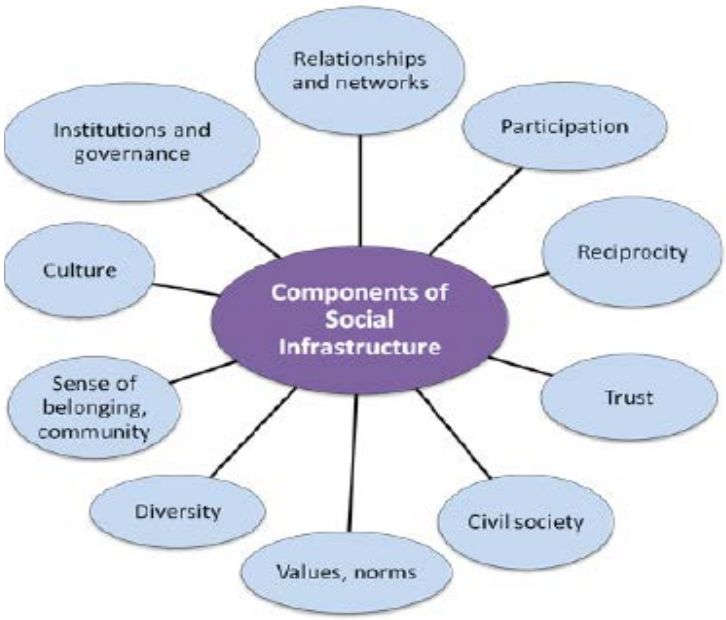
Short Short-term technical training course for community people are recommended. This service can contribute to engage the community people and by training them, the cluster can secure a long-term

labor supply too. The community people will prefer to stay than to leave the community to find jobs.

One Stop Service Center is a concept to speed up and facilitate the provision of services necessary to workers and farmers. Micro-finance and micro-insurance is effective mechanism to induce labor workers from neighborhood. Provision of fertilizer and other materials and knowledge and information is very beneficial to community people.

Sustainable growth requires environmental protection and the improvement of health and hygiene conditions. Environmental protection is an important requirement imposed by the international community and necessary for sustainable development. In order to do it, the central and local government must revise and strengthen environmental regulations in accordance with international rules. A medical center is critical. In KSP, particularly, medical service is far deficient. An in-cluster medical center can provide emergency as well as routine medical treatment and could be effective inducement for the community. Since in Cambodia national medical insurance is limited, the cluster companies should find a way to provide insurance coverage to the employees ad community people. The hygiene management is necessary for long-term health improvement. Cambodia is poor in hygiene management. Education and training on hygiene management also need to be provided.

Figure 5-8. Soft Infrastructure

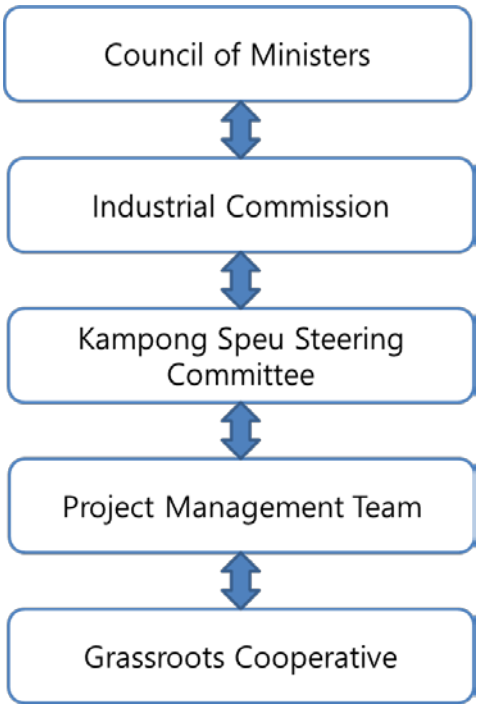


For inclusive growth, the cluster needs to strengthen the soft side of social infrastructure. Social infrastructure refers to both relationships between people and the effectiveness of institutional structures. Key dimensions to be considered are: *bonding between people and communities, bridging gaps that could exist between groups, and linking across the boundaries of power.* The figure 5-8 shows the key components of soft infrastructure.

(2) Governance Structure

For bonding, bridging and linking, it is suggested to form governance structure for implementing projects as in the figure 5-9.

Figure 5-9. Governance Structure



Beneath Council of Ministries, Industrial Commission is set up in order to link local and central government authorizes. Industrial Commission is led by Council Minister supported by minister-level high ranking officials; high-level Kampong Speu provincial officials are also join the commission. Key developers are given memberships. The commission makes final decisions on key issues. Kampong

Speu Steering Committee is led by the Kampong Speu governor. Developers and representatives from community, NGOs, cooperatives, labor unions and other relevant local organizations participate. The committee plans, supervises and monitors the project. Project Management Team is set up based upon sector by sector and implements day to day works. Grassroots Cooperative is composed of representatives from local communities, women's society, farmers' association, agricultural cooperatives, labor unions, NGOs and other important organizations; and communicates with the leaders of the Project Management Team.

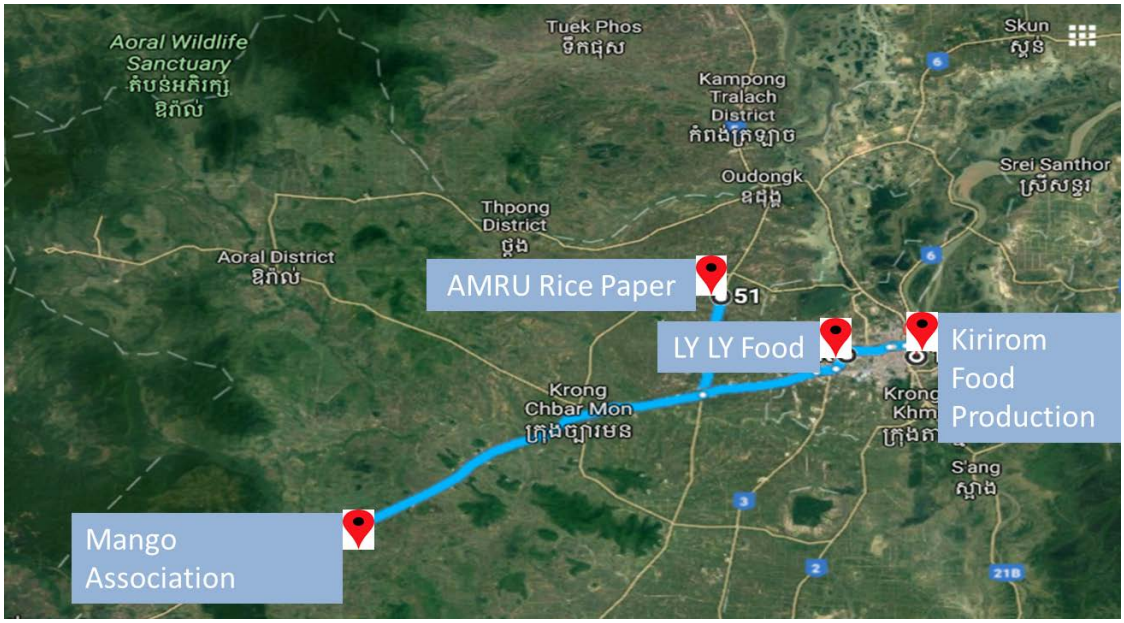
Appendix & References

Industrializing Cambodia:
Making a Roadmap to Construct Core
Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University,
Chairman of Jayavarman Center for Development)

II. Agro-Industrial Cluster in Kampong Speu

Interviews with Mango Association in Kampong Speu and Three Agricultural Processing Companies.



1) Mango Association in Kampong Speu Province

Interview with Mr. In Chayvan, President of the association (27 August 2016).

(1) Overall of Mango Association

- Started in 2012
- Member: 135 members
- Surface: 10,000 ha / Total Surface of Mango plantation in Kg Speu: 40,000 ha
- Contract Farming: 15,000 Ton
- Total Export: Thailand, Vietnam, and China, around 300,000 tons in 2015
- With association, price keeps increasing from 1050 Riel/Kg to 1200 Riel/Kg, never below 1000
- Location: Phnom Srouch, Oral, SamroungTorng, Khpong, Utdong, Borset and KorngPisey.
- Plantation: 5 ha to 1000 ha/ owners

(2) Challenge:

- No market and depend on CO of other country.
- Access to Finance to collect mango, limited.
- Shortage of VHT machine, difficult to apply MOU.
- No brand for mango

(3) Advantage:

- No labor shortage: 30,000-40,000 Riel/day
- Abundant mangoes in Kampong Speu:
  - 4 years old: 20kg x 200 trees
  - 5 years old: 50kg x 200 trees
  - 10 years old: 500-700kg x 200 trees

2) Interview with CEO of LY LY FOOD (29 August 2016)

(1) Overall of Ly Ly Food

- Phnom Penh City
- Open: 2002
- 20 kinds of cakes with more than 10 flavors.
- Staff: 95
- External support: UNIDO, SES, GTZ, BASF, OVOP, NPCC, JODC, IMPACT CAMBODIA, etc.
- Raw Material: Rice, maize, cassava, 200T/months
- Export destination: Over 10 countries (Malaysia, China, Canada, Australia, Myanmar, Vietnam, Thailand, US, and Korea)
- Source: Battambang, Kampong Cham, SvayRieng
- 4 tons/day in 2014 => 5 tons/days

(2) Challenge:

- Competitiveness: electricity price
- Exempt the import tax of inputs
- Labor outflow, lack of skilled labor

- Seek for market
- Capacity building on food standard and quality
- SPS… sometimes it is non-tariff barrier trade policy
- Encourage the domestic enterprise
- Capacity Building
- Production cost and Financial cost with low interest rate
- Easy documentation for export
- United among domestic SMEs not to compete each other
- Increase financing to SMEs in Cambodia

(3) Map of Ly Ly Food Domestic Supply in Cambodia

3) Interview with Mr. Song Sarith, General Manager of AMRU Rice Noodle Enterprise

(27 August 2016)

(1) Overall of AMRU

- Start in 2015
- Supply domestic market, German, Netherlands, France and China

- Raw Materials:
    - Rice from Kampong Cham and Prey Veng
    - 3 ton/day

(2) Product Type:

- Rice Processing
- Noddle and rice paper: Normal Rice
- Future: Organic
- Banh Trang: Better quality rice.

(3) Advantages:

- Labor from surrounding area (enough)
- Location Choice: Near Special Economic Zone, Phnom Penh
- Self transportation

(4) Challenges:

- Seeking good partner
- Market Promotion
- Access to finance

4) Interview with Marketing Manager of Kirirom Food Production (7 September 2016)

(1) Overall of Kirirom Food Production

- Started in October 2014.
- Invested in a dried fruit manufacturing plant
- Farm: 500ha in Kirirom.
- Surface: 39,000ha out of 65,250ha of agricultural land is dedicated to mango production.
- Export destination: US, China, Vietnam, Malaysia, Thailand, Canada, Australia, Singapore, South Korea, and Japan.
- Environment: compost all byproducts, like skins and seeds.
- Labor: 300 persons (Peak), 80 persons (Not Peak)
- Future: Organic mango

- Harvest season of mango: Feb-May (Main) and Oct-Dec (small season)
- Process other crop (papayas and pineapples) during Jul-Sep.
- Support by:NPCC, APO, etc

(2) Strength:

- Close to plantation
- Quality: Freshness

(3) Challenge:

- Oversupply leads to price drop
- Need storage
- Lack of top management staff
- Cold storage
- SPS Technology
- Disinfection technology

5) Summary of Findings from Interviews

(1) Characteristics:

- New business
- Still family-base
- Urban-centered

(2) Challenges:

- Lack of high skilled labor
- High utility cost
- Lack of sufficient investment
- Limited access to financial resources
- Insufficient access to global

References

ADB Cambodia. 2013. http://www.adb.org/data/main

Aggarwal, Aradhna. 2010. *"Economic Impacts of SEZs: Theoretical Approaches and Analysis of Newly Notified SEZs in India." MPRA Paper* #20902.

Altenburg, Tilman, JÖRG Meyer-Stamer, J. 1999. How to promote clusters: policy experiences from Latin America. *World Development.* 27(9): 1693-1713

Anwar Shah. 1992. Dynamics of Public Infrastructure, Industrial Productivity and profitability. *The Review of Economics and Statistics*. 74(1): 28-36.

Arora, Ashish. 2008. "IT and regional development: lessons from the growth of the software industry in India, Ireland, Israel, Brazil and China," Working Paper No. 60, London School of Economics and Political Science, LSE, UK.

A. Strub. 1989. The Science Parks in the European Context, in: Suman, H. (eds), op. cit. pp. 29--36

Baldwin, R. and A. Venables. 2013. "Spiders and Snakes: Offshoring and Agglomeration in Global Economy," *Journal of International Economics*, 90(2): 245-254.

Ban Sung Hwan, Pal Yong Moon, and Dwight H. Perkins. 1980. *Rural Development*. Cambridge: Harvard University.

Bartlett, C., Ghoshal, S., and P. Beamish. 2008, *Transnational Management*, Fifth edition, McGraw Hills.

Basic Construction Plan of Daedeok Science and University Town, December 1973, Ministry of Science, Republic of Korea (http://www.archives.go.kr)

Bhatnagar, Subhash. 2006. 'India's Software Industry', Technology, Adaptation, and Exports: How Some Developing Countries Got It Right. Vandana Chandra (Ed.). World Bank. pp. 95-124.

Blank, Paul W., 1999. "The Pacific: A Mediterranean in the Making." *The Geographical Review*. 89(2).

Brandenburger, A. and B. Nalebuff. 1997. *Co-opetition*, Currency & Doubleday.

Brodhag, C., & Taliere, S. 2006. Sustainable development strategies: Tools for policy coherence. *Natural Resources Forum*, 136-145.

Buchanan, J. M. and Yoon, Y. J. 2000. Symmetric tragedies: commons and anticommons. *Journal of Law and Economics*. XLIII. 1–13.

Calderon, César and Luis Servén. 2010. "Infrastructure in Latin America". Draft prepared for the Handbook of Latin American Economies.

Cambodia Industrial Development Policy 2015-2025 . http://www.cambodiainvestment.gov.kh/cambodia-industrial-development-policy-2015-%E2%80%93-2025-3.html

Canning David. 1998. A Database of World Infrastructure Stocks, 1950-95, Working Paper, World Bank.

Carothers, Carothers. 2011. *Aiding democracy abroad: the learning curve*. Washington D.C.: Carnegie Endowment.

Cerin, P. 2006. Bringing economic opportunity into line with environmental influence: A Discussion on the Coase theorem and the Porter and van der Linde hypothesis. *Ecological Economics,* 209-225.

Chenery, H.B. 1974. *Redistribution with Growth*. London: Oxford University Press.

Chenery, H.B. 1979. *Structural Change and Development Policy*. New York: Oxford University Press.

Collier, P. 2007. *The Bottom Billion*, New York: Oxford University Press.

Cooper, P. J. and Vargas, M. 2004. *Implementing sustainable development: From global policy to local action.* Lanham, MD: Rowman and Littlefield Publishers, Inc.

Ciccone, A. and K. Matsuyama. 1996. "Start up Costs and Pecuniary Externalities as Barriers to Economic Development." *Journal of Development Economics. 49 :33-59.*

Council for development of Cambodia

Dehio, Ludwig, 1962. *Precarious Balance: Four Centuries of the European Power Struggle*. New York: Alfred A. Knopf.

Deichmann, U., Lall, S., Redding, S., and A. Venables. 2008. "Industrial Location in Developing Countries." *World Bank Research Observer.* 23(2): 219-246.

Dernbach, J. C. 1998. Sustainable development as a framework for national governance. *Case Western Reserve Law Review.* 1-103.

Dernbach, J. C. 2003. Achieving sustainable development: The Centrality and multiple facets of integrated decisionmaking. *Indiana Journal of Global Legal Studies*, 247-285.

Denison Edward F and William K Chung. 1976. How Japan's Economy Grew so Fast. The Brookings Institution.

Devarajan, Swaroop, and Heng-fu Zou. 1996. The Composition of Public Expenditure and Economic Growth. *Journal of Monetary Economics.* 37: 313-44.

D.S. Oh. 2014. "Sustainable Development of Technopolis: Case Study of Daedeok Science Town/Innopolis in Korea." *Technopolis: Best Practices for Science and Technology Cities.* D.S. Oh and F. Phillips (eds). Springer-Verlag London. 91-116.

Deog-Seong Oh and Insup Yeom, "Daedeok Innopolis in Korea: From Science Park to Innovation Cluster," WTR 2012:1, pp.141-154

Deog-Seong Oh. 1995. "High-Technology and Regional Development Policy: An Evaluation of Korea's Technopolis Programme," HABITAT INTL. 19(3): 253-267. Elsevier Science Ltd.

Easterly and Rebelo. 1993. Fiscal Policy and Economic Growth. *Journal of Monetary Economics.* 32: 417- 58.

Escaith, H. and D. Marti. 2016). *"Global Value Chains and Rules of Origin,"*. WTO.

Five Year Action Plan of Provincial Government of Kampong Speu Province, 2015-2019

Frischmann, B. M. 2005. An economic theory of infrastructure and commons management. *Minnesota Law Review*. 89: 917–1030.

Frischmann, B. M. 2009. Spillovers theory and its conceptual boundaries. *William & Mary Law Review*. 51: 801–824.

Frischmann, B. M. and Lemley, M. A. 2007. Spillovers. *Columbia Law Review*. 107: 257–301.

Gerschenkron A. 1962. *Economic Backwardness in Historical perspective: A Book of Essays,* Harvard 25 University Press, Belknap Press.

Gipouloux. 2011. *The Asian Mediterranean: Port Cities and Trading Networks in China, Japan and Southeast Asia, 13th-21st Century*. Cheltenham, UK: Edward Elgar.

Gladwell, M. 2006. *Tipping Point: How Little Things Can Make a Big Difference*. Little Brown and Company.

H. Fielder. 1992. *Innovation Zentrum in Deutschland.* Osterreich und der Schweiz 1992/93. Wiedler Verlag, Berlin.

Heller, M. A. 1998. The tragedy of the anticommons: property in the transition from Marx to markets. *Harvard Law Review*. 111: 621–688.

Hirschman, Albert O. 1958. The Strategy of Economic Development.Westview Press.

Hirschman, Albert O. 1971. "Political Economics of Possibilism." *A Hope: Essays on Development and Latina America*. New York: Oxford University Press.

Il Sakong. 1993. Korea in the World Economy. Institute for International Economics.

Im, Hyug Baeg. 2015. "The Regional Peace Building in 'East Asian Mediterranean Era'." *paper presented at Shanghai Forum. May 22-25.* Fudan University, Shanghai, China

Im, Hyug Baeg. 2014. "Exceptional Difficulties of Peace Building in Korean Peninsula: An Eclectic Approach." *Viennese Contributions to Korean Studies*, Vol. 6.

Im, Hyug Baeg. 2008. "East Asian Regionalism in the Era of Globalization." *paper presented at Beijing Forum. November 6-9.* Beijing, China.

Im, Hyug Baeg. 2006. "The US Role in Korean Democracy and Security since Cold War Era." *International Relations of Asia-Pacific*. 6(2).

Im, Hyug Baeg et al. 2015. *Bridging State Strategy for Cambodia*, KOICA APP 1-1.

Implementation Guideline No. 5

I. Dalton. 1993. Setting the Scene on History, Objectives and Resources, in: T. Broadhurst (eds), The Development and Operation of Science Parks, UKSPA, Birmingham, pp. 1-10.

Industrial Development Policy 2015-2025. http://www.cambodiainvestment.gov.kh/cambodia-industrial-development-policy-2015-%E2%80%93-2025-3.html

Integrated Agro-industrial Parks in Ethiopia. https://isid.unido.org/files/Ethiopia/Integrated-Agro-Industrial-Parks-Overview.pdf (seen in November 2016)

International Trade Center. 2014. *Road Map for Developing & Strengthening the Processed Mango Sector*. Switzerland: Beatrice Ng'ayu& Genevieve Audet-Belanger.

ITC Trade Map, accessed at http://www.trademap.org/Index.aspx on 19 October 2016.

Kazushi Ohkawa and Henry Rosovsky. 1973. *Japanese Economic Growth*. Stanford University Press.

Kim Kwangsuk and Kim Joonkyung. 1997. "Korean Economic Development: An Overview." in D. Cha, K. S. Kim, and D. Perkins (eds.). *The Korean Economy 1945~95: Performance and Visison for the 21st Century.* KDI.

Koszegi, B. and A. Szeidl. 2013. "A Model of Focusing in Economic Choice." *Quarterly Journal of Economics*, 128(1): 53-107.

Krugman, P. 1991A. "History vs. Expectations." *Quarterly Journal of Economics*, 106(2): 651-667.

Krugman, P. 1991B, "Increasing Returns and Economic Geography," *Journal of Political Economy,* 99(3): 483-499.

Krugman Paul. 1994. The Myth of Asia's Miracle, Foreign Affairs, Nov/Dec.

Krugman, P. and A. Venables. 1996. "Integration, Specialization, and Adjustment." *European Economic Review*. 40(3-5): 959-967.

Kuznets Simon. 1955. Economic Growth and Income Inequality. *American Economic Review*. 45: 1-28.

Lee, Choong Lyol. 2016. "AEC and Global Value Chains and Industrial Clusters in Southeast Asia." *paper presented at International Conference on Making a Roadmap to Construct a Core Industrial Cluster in Kampong Speu, Cambodia. December 16-17*. University of Puthisastra, Phnom Penh, Cambodia.

Lee, Shi Young and Kea Yun. 2016. "Creating a Semiconductor Industry in Cambodia." Hyug Baeg Im et al. *Making a Roadmap to Construct a Core Industrial Cluster in Kampong Speu, Cambodia*, 2016 Koica Academy Partnership Program 1-1.

Lee, S. 2010. "Economics of *Guanxi* as an Interpersonal Investment Game." *Review of Development Economics*, 14(2): 333-342.

Long, N., Reizman, R., and A. Soubeyran. 2005. "Fragmentation and Services." *The North American Journal of Economics & Finance*. 16(1): 137-152.

Lombard, Days. 2007. "Another 'Mediterranean in South East Asia." *Chinese Southern Diaspora Studies*, Vol. 1.

Manning, S. 2013. New Silicon Valleys or a New Species? Commoditization of Knowledge Work and the Rise of Knowledge Services Clusters. Research Policy.

Mason Edward S, Kim Mahn Je, Dwight H. Perkins, Kwang Suk Kim and David C. Cole. 1980. *The Economic and Social Modernization of the Republic of Korea*. Harvard University Press.

Ministry of Agriculture. Forest and Fisheries of Cambodia. Annual Report 2015.

Ministry of Agriculture. Forestry and Fisheries. "Agricultural Sector Strategic Development Plan 2014-2018." http://twgfr.org/download/Meetings/DP%20Meeting/DP%20Meeting%20on%2016-Feb-2015/8-Draft%20Agriculture%20Strategic%20Development%20Plan%202014-2018.pdf

MOST (Ministry of Science and Technology). The Basic Plan of Technobelt in Korea (MOST, Seoul, Korea, 1989) (in Korean).

Mosley Paul. 1985. The Political Economy of Foreign Aid: A model of the Market for a Public Good. *Economic Development and Cultural Change*. 33(2): 373-93.

Mullainathan, S. and E. Shafir. 2013. *Scarcity: The True Cost of Not Having Enough.* Penguin Books.

Murphy, K., Shleifer, A., and R. Vishny. 1989. "Industrialization and Big Push." *Journal of Political Economy*. 97(5): 1003-1026.

Naoyuki Yoshino and Masaki Nakahigashi. 2000. Economic Effects of Infrastructure; Japan's Experience after World War II. *JBIC Review.* 3: 3-19.

Narayana R, Kocherlakota and Kei-Mu Yi. 1996. A Simple Time Series Test of Endogenous vs. Exogenous Growth Models. *The Review of Economics and Statistics*. 78(1): 126-34.

Nurkse, R. 1953. Problem of Capital Formation in Underdeveloped Countries, Blackwell.

NASSCOM, 2000.

National Committee for Sub-National Democratic Development. http://www.ncdd.gov.kh/en

National Institute of Statistics, Socio-Economic Survey 2009, 2014

National Strategic Development Plan 2014-2018. http://www.mop.gov.kh/Home/NSDP/NSDP20142018/tabid/216/Default.aspx

NIS-MoP Agriculture Census in Cambodia (2013)

OECD. 2001. "The networks, together with shared norms, values, and understandings which facilitate co-operation."

World Bank. 2006. "the degree of trust in a society and the ability of people to work together for common purposes."

Pangestu, Mari and Sudarshan Gooptu. 2002. "New Regionalism: Options for China and East Asia," unpublished paper.

Pempel, T. J. 2006. "The Race to Connect East Asia: An Unending Steeplechase." *Asian Economic Policy Review.* 1.

PFI. "Strengthening Long-term Partnerships." pp. 12. available at http://www.hm-treasury.gov.uk/pfi_strengthening_long-term_partnerships.htm

Pigou, A. 1920. *The Economics of welfare.* London: Macmillan and Company.

Pirenne, Henri. 1939. *Mahomet et Charlemagne,* trans. by Bernard Miall. New York: Barnes and Noble.

Porter, Michael. 1990. "Competitive Advantage of Nations." *Harvard Business Review*. 68: 73-93.

Porter, Michael. 1998. *The Competitive Advantage of Nations*. New York: Free Press).

Porter, Michael. 1998. "Clusters and the New Economics of Competition." *Harvard Business Review***.** 77-90.

Porter, Michael and van der Linde, C. 1995. "Toward a new conception of the environment-competitiveness relationship." *Journal of Economic Perspectives*. 9(4): 97-118.

Porter, Michael and van der Linde, C. 1999. “Green and competitive: Ending the stalemate.” *Journal of Business Administration and Politics*, 215-230.

Rectangular Strategy Phase III. http://www.cambodiainvestment.gov.kh/content/uploads/2013/11/2013-Rectangular-Strategy-III-En8.pdf

Quintas, P., Wield, D., and Massey, D. 1992. “Academic-industry links and innovation: questioning the science park model.” *Technovation.* 12(3): 161-75

Mead, Walter Russel. 1999/2000. “The Jacksonian Tradition and American Foreign Policy,” *National Interest.*

R.W. Similor et al. (eds). 1991. *Creating the Technopolis: Linking Technology, Commercialisation and Economic Development*, Cambridge, MA: Ballinger.

Rajendra Kumar. 2009. *The Development of the Software Industry in Post reform India: Comparative Regional Experiences in Tamil Nadu, Andhra Pradesh, and Kerala*. New York: Cambria Press.

Rio Declaration on Environment and Development. Rio de Janiero, Brazil: United Nations .

Roy Bahl, Chuk Kyo Kim and Chong Kee Park. 1986. *Public Finances during the Korean Modernization Process*. Harvard University Press.

Sang-Tae Kim and Gi-Don An. 2012. “A Comparison of Daedeok Innopolis Cluster with the San Diego Biotechnology Cluster.” *WTR.*

Sauer, C., Gawande, K. and G. Li. 2003. “Big Push Industrialization: Some Empirical Evidence for East Asia and Eastern Europe.” *Economics Bulletin*. 15(9): 1-7.

Scott, James and C. Steele. 2011. "Sponsoring Democracy: The United States and Democracy Aid to the Developing World, 1988–20011" *International Studies Quarterly*. 55(1): 47-69.

Sharyn Briggs, Dee Elliott. Vanessa South East Queensland Regional Plan 2005–2026.

Simons, R. 2010. *Seven Strategy Questions A Simple Approach for Better Execution*. Harvard Business Review Press.

Stoddart, H. 2011. A Pocket guide to sustainable development governance. Stakeholder Forum. United Nations Conference on the Human Environment. (1992).

Storper, M. and A. Venables. 2004. “Buzz: Face to Face Contact and Urban Economy.” *Journal of Economic Geography*. 4: 351-370.

Takeshi Shinohara. 2000. IT Revolution and eODA. *JBIC Review.*

Tsuneaki Yoshida. 2000. Japan’s Experience in Infrastructure Development and Development Cooperation. *JIBC Review.* 3: 62-92.

Tony Gilmour, Ilan Wiesel and Simon Pinnegar, Martin Loosemore. 2010. “Social infrastructurepartnerships: a firm rock in a storm?” *Journal of Financial Management of Property and Construction*.

Venables, A. 2010. “Economic Geography and African Development.” *Papers in Regional Sciences.* 89(3): 469-483.

Vernon W. Ruttan. 1989. Why Foreign Economic Assistance? *Economic Development and Cultural Change.* 37(2): 411-24.

Vo, T. 2016. “Deepening International Integration: Can Vietnam Be a New Manufacturing Hub?” *paper presented at ASEAN Workshop*, Vietnam.

Warr, P. 1989. “Export Processing Zones: The Economics of Enclave Manufacturing.” *The World Bank Research Observer.* 4(1): 65-88.

U. Hilpert. 1991. Regional Innovation and Decentralization; High Tech Industry and Government Policy. London: Routledge.

Uma S. Kambhampati. 2002. “The software industry and development: the case of India.” Progress in Development. Sage Publications.

Un, Kheang and Jae Hyeok Shin. 2015. "Geopolitical and Geoeconomic Environment." in Im, Hyug Baeg et al. *Bridging State Strategy for Cambodia*. KOICA APP 1-1, 2015.

United Nations General Assembly. 1987. Report of the world commission on environment and development: Our common future. Oslo, Norway: United Nations General Assembly, Development and International Co-operation: Environment.

Warr, P. and J. Menon. 2015. “Cambodia’s Special Economic Zones,” ADB WP #459.

www.cambodiainvestment.gov.kh/

http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=KH

http://www.mef.gov.kh/documents/shares/budget/booklet-budget-in-brief-2015.pdf

Bridging State Strategy Report 2015

Cambodia Science and Technology Master Plan 2014 - 2020

Cambodian Higher Education Vision 2030

Congress Report of MoEYS on Higher Education 2015

Industry Development Policy 2015-2025

Initial Survey of secretariat general of National Council of Science and Technology

Master Plan for Research Development in the Education Sector, MOEYS, 2011

National science and technology master plan 2014-2020

National Strategic Development Plan 2014-2018

Rectangular Strategy-Phase III of the Political Platform of the Royal Government of Cambodia of the Fifth Legislature of the National Assembly

Report on Regional Research Intensive Clusters and Science Parks in European Union 2007

Research and Development Fund on T/ICT

SUMMARY REPORT ON THE EDUCATION, YOUTH AND SPORT PERFORMANCE IN THE ACADEMIC YEAR 2012-2013

T/ICT Development Policy 2020

South China Morning Post. 2016. "Why does China react so strongly over the South Korea-based anti-missile system?" February 12.

World Bank. 1994. *World Development Report*. Oxford University Press.

World Bank Data. "Foreign direct investment, net inflows (% of GDP)," accessed at http://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS?cid=GPD_31 on 14 October 2015.

World Bank Business Environment Survey. 2016. accessed at http://www.enterprisesurveys.org/data/exploreeconomies/2016/cambodia

World Bank. 2015. Cambodian Agriculture in Transition: Opportunities and Risks. Accessed at http://documents.worldbank.org/curated/en/805091467993504209/Cambodian-agriculture-in-transition-opportunities-and-risks

World Integrated Trade Solution (WITS). accessed at http://wits.worldbank.org/CountryProfile/en/Country/KHM/Year/2014/TradeFlow/Import/Partner/all/Product/16-24_FoodProd#. extracted in October 2016.

World Investment Report. 2013. "Global Value Chains: Investment and Trade for Development." *UNCTAD*.

"REPORT on A Study Research Sub-Supporting Study Project on Economic Corridors and Industrial Estates, Ports & Harbors, Metropolitans and Alternative Roads in Cambodia." accessed at http://www.csdcambodia.org/report_on_a_study_research_csd_2010/Report%20on%20a%20study%20Research%20CSD%202010.pdf

Young Alwyn. 1995. "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience." *The Quarterly Journal of Economics.*

Zigang Li. 2014. "Speculative urbanism and the making of university towns in China: A case of Guangzhou University Town." *Habitat International.* 44: 422–431.

http://www.nap.edu/catalog/4980/colleges-of-agriculture-at-the-land-grant-universities-a-profile

http://www.unesco.org/new/en/natural-sciences/science-technology/university-industry-partnerships/science-parks-around-the-world/

Industrializing Cambodia:

Making a Roadmap to Construct Core Industrial Clusters in Kampong Speu

Editor: Hyug Baeg IM (Professor of Korea University,
Chairman of Jayavarman Center for Development)

KACDC
Peace & Democracy Institute
Korea-Asia Center for Development and Cooperation

KOICA
Korea International Cooperation Agency

본 출판물은 외교부 보조금 민관협력사업의 일환으로
2016년 한국국제협력단과 고려대학교 산학협력단이 협력하여 출간하였습니다.